ISSN 2320-7302
eISSN 2393-9834

Estd. 1995

Journal of Dental Specialities

JDS

Volume 3, Issue 1, March 2015

Bibliographic Listings:
EBSCO, HINARI, OAJI
SIS DATABASE, Academic Keys
Cite Factor, ASI index, JI Factor.

INNOVATIVE PUBLICATION

Publication of
I.T.S Group Dental Institutions
Murad Nagar Greater Noida
www.its-jds.in

Dr. R.P. Chadha has printed the Journal of Dental Specialities in association with Innovative Publications, H-2/94,Bengali Colony, Mahavir enclave, Part-1, New Delhi-45, Official publication of I.T.S Centre for Dental Specialities and Research, Muradnagar, Ghaziabad(Uttar Pradesh) owned by Durga Charitable Society.
Editor: Dr. Hari Parkash.

ISSN 2320 – 7302 eISSN 2393 – 9834

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CASE SERIES

"A journey well begun is half done"

Prof. (Dr.) Hari Parkash
Editor – in - Chief

Research is considered as the highest form of academics. The MDS curriculum aims to orient the post graduate doctors towards research and for this a Thesis/Dissertation has to be submitted 6 months before appearing for the final examination as per DCI guidelines, 2007.

For any thesis work to be carried out, a thesis protocol has to be submitted within 6 months of joining the MDS course. The thesis protocol has to be formulated very diligently and systematically. This is one of the documents which has to be submitted to the university at the time of final examination. However, currently many of the universities and institutions are not giving the thesis protocol its due importance. Instead of a detailed protocol that can guide a student with the Thesis, a single paper format is being submitted. This should be changed gradually and thesis protocol should once again be prepared very diligently.

The first step towards the preparation is identification of the lacuna in literature for which the research needs to be carried out. The next step involves scanning of literature to verify the facts and establish a Null Hypothesis which 'refers to a general statement or default position that there is no relationship between two measured phenomena'. Subsequently a scientifically proven methodology needs to be adopted for the study. A pilot work should be carried out beforehand to check the feasibility of the study or to verify any additional work needed for the fulfilment of the study.

The contents of the Thesis Protocol should include: Introduction, Review of Literature, Aims & Objectives, and Materials & Methods with Statistical Tests, Bibliography, Consent forms and proformas for collecting data. The Introduction should clearly mention the lacuna in literature and the need to carry out this study along with the Null Hypothesis. The Review of Literature should incorporate relevant work done by other researchers in the same field and clearly identify the lacuna in the literature. The Aim should be clearly identified and the objectives should be drafted which would aid later on in writing the results. The Material & Methods should clearly identify the Inclusion & Exclusion criteria. The sample size should be statistically significant. Statistics section should include the biostatistics test to be applied and the method of recording the readings. All the references should be according to Vancouver Style.

Another crucial parameter in In Vivo studies is the informed consent of the patient. The consent form should be in a language understood by the patient. The patient should have full right to withdraw from the study at any given time.

Once the Thesis Protocol has been prepared it has to be presented before an Institutional Ethics Committee which should be constituted as per the ICMR Guidelines. This Institutional Ethics Committee should be recognised and registered with the Ministry of Health & Family Welfare, Directorate General. The recommendations of this Committee should be taken very seriously and the changes should be incorporated in the Protocol at the earliest. A certificate of approval for the study should be obtained from this Committee before commencing with the thesis. This certificate is required later on while submitting the research work for publishing in any National or International journal.

I am hopeful that this Editorial would benefit the post graduate students who are in the process of writing up their thesis protocol. I thank all the contributors, readers, reviewers for their continual patronage and support to this journal.

Dental education in India and its future prospects

Prof. (Dr.) C. Bhasker Rao
Chief Mentor & Clinical Director, Vasan Health Pvt. Ltd, India.

The practice of dentistry in India is no less than ancient, with references to dental hygiene in the Sushrutha Samhita dating back to the 6th Century BC; Dental education was integral to the universities of Nalanda (~500 AD to 1200 AD) and Taxila (several centuries BC). While this public awareness and academic emphasis perhaps waned to an extent for large parts of the second millennium AD, there was a resurgence following advent of British rule in the 18th Century. Professional dental education commenced only in 1854 with the advent of the Lahore Medical and Institute of Dentistry of undivided India; the oldest dental institute that remained in partitioned India was the Dr. R. Ahmed Dental College and Hospital of Kolkata, founded in 1924. The enactment of Dentist Act in 1948 and consequent formation of Dental Council of India in 1949 paved the way for professional dental education in India. Since then the curriculum has been revised few times more as an academic activity focussed on carving out emerging specialities from the existing ones without touching the basic concept with which it emerged. However, the approach to dental education in the country has become obsolete and there is a failure to incorporate current methods of evidence-based education. The current trends used can, at best, be considered archaic and is far left behind by most countries—even smaller neighbours such as Nepal—where teaching and evaluative methods have evolved with an emphasis on competency testing. The focus has shifted away from conventional lecturing and practical training to problem-/case-based learning, small group discussion, assignments, mentoring, comprehensive oral health care and general dentistry; evaluation, too, has included objective structured practical/clinical examination (OSPE/OSCE), competency assessment and the like. Also lacking is an integration of the preclinical and clinical components of dentistry, and of dentistry and the medical subjects, thereby denying students the opportunity of proper vertical integration of the course. This potentially undermines a thorough appreciation and understanding of clinical application of the basic sciences and the medical undercurrents in dentistry. These, coupled with a lack of exposure to other emerging areas such as special health care needs, geriatric dentistry, infection control and asepsis, basic life support, and soft skills such as communication skills, critical thinking, and practice management, is a reflection of the catching up India needs to do with the rest of the world.

Another interesting and yet unfathomed trend is the pursuit of dentistry today by women—the male–female ratio of dental students is already skewed towards the latter, owing to a variety of social factors, women dentists may not choose to open independent practices and instead prefer to join corporate clinics, which are largely present in urban locales; graduates—both males and females—may also prefer an urban rather than a rural setting for their practices. All of this may amplify the lack of available skilled dentists to cater to vast swathes of our population.

These raise several questions on the current dental curriculum and the new graduates:

- Is the dental curriculum providing the required knowledge & skills to become a competent general practitioner?
- Is the basic medical training adequate to deal with any untoward medical emergencies in practice?
- Are the graduates competent to provide dental care for geriatric population which is on the rise?
- Can our graduates handle confidently people with special health care needs?
- Do the new graduates understand comprehensive care with the fragmented or piece meal care training?
- Are they getting any formal training in communication skills, practice management and critical thinking?
- Do they really feel confident to go in to practice? If so why so much frustration among graduates looking for options other than dentistry?
- Is the need for dental and oral healthcare of rural areas being addressed?
- If not, what incentives may be provided to plug the void currently in existence?

The purpose of education is to educate students to serve their patients and communities well and prepare students to continue to grow in skill and knowledge over their lifetime in practice. The following solutions may be essential to ensure this and infuse confidence into the prospects of the future of our profession:

1. Vertical integration of dental education and close linkages to medicine and the health care system on all levels, including research and patient care. This is because many of the basic science discoveries that will be most influential in shaping future oral health and practice may occur outside dental colleges—in universities, medical institutes, and in government, industrial, and other research laboratories.
2. Dental faculty and educators will need to teach, incorporate and display appropriate models of clinical practice to prepare students and colleges for transformational change.
3. To prepare for the future, the dental community—educators, practitioners, regulators, and policymakers—will benefit from continued testing of alternative models of education, practice, and performance assessment for both dentists and allied dental professionals.

Major reforms are the need of the hour in our dental educational system and incentives for practice of dentistry is necessary in general, and particularly in rural settings. If this is not achieved, then we will simply not be keeping pace with, or be responsive enough, to changing patient demographics, patient desires and expectations, budding interdisciplinary expertise and practice needs, new scientific discoveries, breakthroughs and information, focus on quality improvement, and integration of emerging technologies. And dentistry will be left behind as the profession that missed the bus.

Comparisons of chondroitin sulphate levels in orthodontically moved canines and clinical outcomes between two different force patterns

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ABSTRACT

Purposes: The aims were to monitor remaining interrupted force magnitudes, and to compare chondroitin sulphate (CS) levels in gingival crevicular fluid (GCF) of moved mandibular canines, rates of space closure and patients' pain and discomfort between interrupted and continuous orthodontic force patterns.

Materials and method: Fifteen Class I malocclusion patients (5 males and 10 females; aged 17.00 ± 3.18 years) who required orthodontic treatment with first premolar extractions, were recruited. Interrupted force pattern was generated by elastomeric chains, and continuous force pattern by Nickel-Titanium closed coil springs. Initial force magnitude was 120 g. Elastomeric chains were replaced by new ones at the end of fourth week during the loaded periods. During the unloaded and the loaded periods, remaining interrupted force magnitudes were measured, and those of continuous force pattern were calibrated and controlled. GCF samples were collected with Periopaper® strips. CS levels were measured by competitive ELISA with WF6 monoclonal antibody during the 8-week control, the unloaded and the 8-week loaded periods. Rates of space closure were measured, and amount of pain and discomfort was assessed by visual analog scale (VAS) scores.

Results: Medians of interrupted force magnitudes were 120.0, 60.0, 50.0, 37.5 and 25.0 g, and after elastomeric chain replacement were 120.0, 62.5, 37.5, 25.0 and 25.0 g respectively. There were no significant differences in the median CS levels between the 8-week control and the unloaded periods, and between right and left mandibular canines. Medians of CS levels during the loaded periods, both interrupted and continuous force patterns, were significantly greater than those during the unloaded period (P=0.008 and P=0.027 respectively). Differences between medians of CS levels of interrupted and continuous force patterns during each 1-week loaded period were not significant. There was no significant difference in the rates of space closure, and the patients' pain and discomfort between interrupted and continuous force patterns.

Conclusion: Both interrupted and continuous force patterns, with 120 g initial force magnitude, cause no difference in biochemically-assessed bone remodeling activity, same rate of space closure and same patients' pain and discomfort. Initial orthodontic force magnitude, of both interrupted and continuous force patterns, may play an important role for alveolar bone remodeling and clinical outcomes.

Received: 24-10-2014
Accepted: 26-03-2015

Key words: Chondroitin sulphate, Gingival crevicular fluid, Interrupted force, Continuous force

INTRODUCTION

Force-generating materials such as elastomeric chains (interrupted force pattern) and Nickel-Titanium closed coil springs (continuous force pattern) are normally used for canine retraction. Elastomeric chains, delivering interrupted force pattern, must be replaced during orthodontic treatment, are effective for orthodontic tooth movement and have cost-benefit reason for being used in clinical orthodontic practice.[1] Nickel-Titanium alloy's characteristics are super-elasticity and shape memory effect, so Nickel-Titanium closed coil springs can express long range of light and continuous force during orthodontic tooth movement.[2,3]

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Some studies compared efficiency of interrupted orthodontic force pattern generated by elastomeric chains to that of continuous force pattern generated by Nickel-Titanium closed coil springs during orthodontic tooth movement.[1,4-7] Leethanakul and colleagues used interleukin-1ß and interleukin-8 levels in human gingival crevicular fluid (GCF) during orthodontic tooth movement as biochemical markers for evaluating effects of either interrupted or continuous force pattern, and concluded that continuous force pattern generated by Nickel-Titanium closed coil springs gave higher rate of canine movement, which correlated with interleukin-1ß and interleukin-8 levels.[7]

Within 24 hours after initial orthodontic loading especially at compression sites, cellular response includes release of cytokines and/or growth factors that triggers biological processes relating to alveolar bone remodeling.[7,8] In our previous study[9], we applied our patented WF6 monoclonal

antibody, raised against the WF6 catabolic epitope of CS[10], to compare CS levels in GCF of orthodontically moved maxillary canines between two different force magnitudes, and proposed that 70 g of continuous retraction force should be more suitable than 120 g continuous retraction force, for maxillary canine movement, because there was no difference in biochemically assessed bone remodeling activity, same rate of tooth movement, reduced pain, better comfort and less tooth tipping. We then speculated that initial orthodontic force magnitude, in both interrupted and continuous force patterns, might bring about similar alveolar bone remodeling and clinical outcomes. The aims of this study were, therefore, to monitor remaining interrupted force magnitudes, and to compare CS (WF6 epitope) levels in GCF of orthodontically moved mandibular canines, rates of space closure and patients' pain and discomfort between interrupted and continuous orthodontic force patterns.

MATERIALS AND METHODS

Subjects

Fifteen patients (5 males and 10 females; aged 17.00 $\pm$ 3.18 years; ranged from 11.97 to 22.92 years) were recruited. These patients met following criteria: (1) good general and oral health; (2) lack of antibiotic therapy during previous 6 months; (3) absence of anti-inflammatory drug administration in the month preceding the study; (4) no pregnancy (women); and (5) Class I malocclusion that required orthodontic treatment with first premolar extraction and distal canine movement. All patients received repeated oral hygiene instruction, and gingival health was controlled and maintained throughout the entire study. This study was approved by the Human Experimentation Committee of the Faculty of Dentistry, Chiang Mai University. Informed consent was obtained from all subjects.

Experimental Design

During the 8-week control period, GCF samples from right and left mandibular canines were collected with Periopaper® strips (ProFlow Inc., Amittyville, New York, USA) as control data. Orthodontic pre-adjusted brackets (Roth prescription slot 0.018" x 0.025") (3M Unitek Inc., Monrovia, California, USA) were bonded on mandibular teeth 3 weeks after first premolar extractions.

Prior to loading, at the beginning of first week during the 8-week loaded period, GCF samples of right and left mandibular canines were collected with Periopaper® strips as baseline data. During the 8-week loaded (experimental) period, the right mandibular canines were moved by Dynaflex® elastomeric chains (Dynaflex company, St. Louis, Missouri, USA), and the left mandibular canines by Nickel-Titanium closed coil springs (GAC, Central Islip, NY, USA). Initial orthodontic force magnitudes were calibrated at 120 g, for both interrupted (right) and continuous (left) force patterns, to move the mandibular canines distally on 0.016 x 0.016 inch stainless steel wire (Fig. 1). Elastomeric chains were replaced by new ones at the end of fourth and eighth weeks. Remaining interrupted force magnitudes generated by elastomeric chains was measured, at the end of each week from first to eighth week during the loaded period, by a force strain gauge (Dentaurum, Ispringen, Germany). Continuous force magnitudes generated by Nickel-Titanium closed coil springs were also calibrated and controlled at 120 g at the end of each week from first to eighth week during the 8-week loaded period. GCF samples from right and left mandibular canines were then collected with Periopaper® strips during the 8-week loaded period as experimental data.

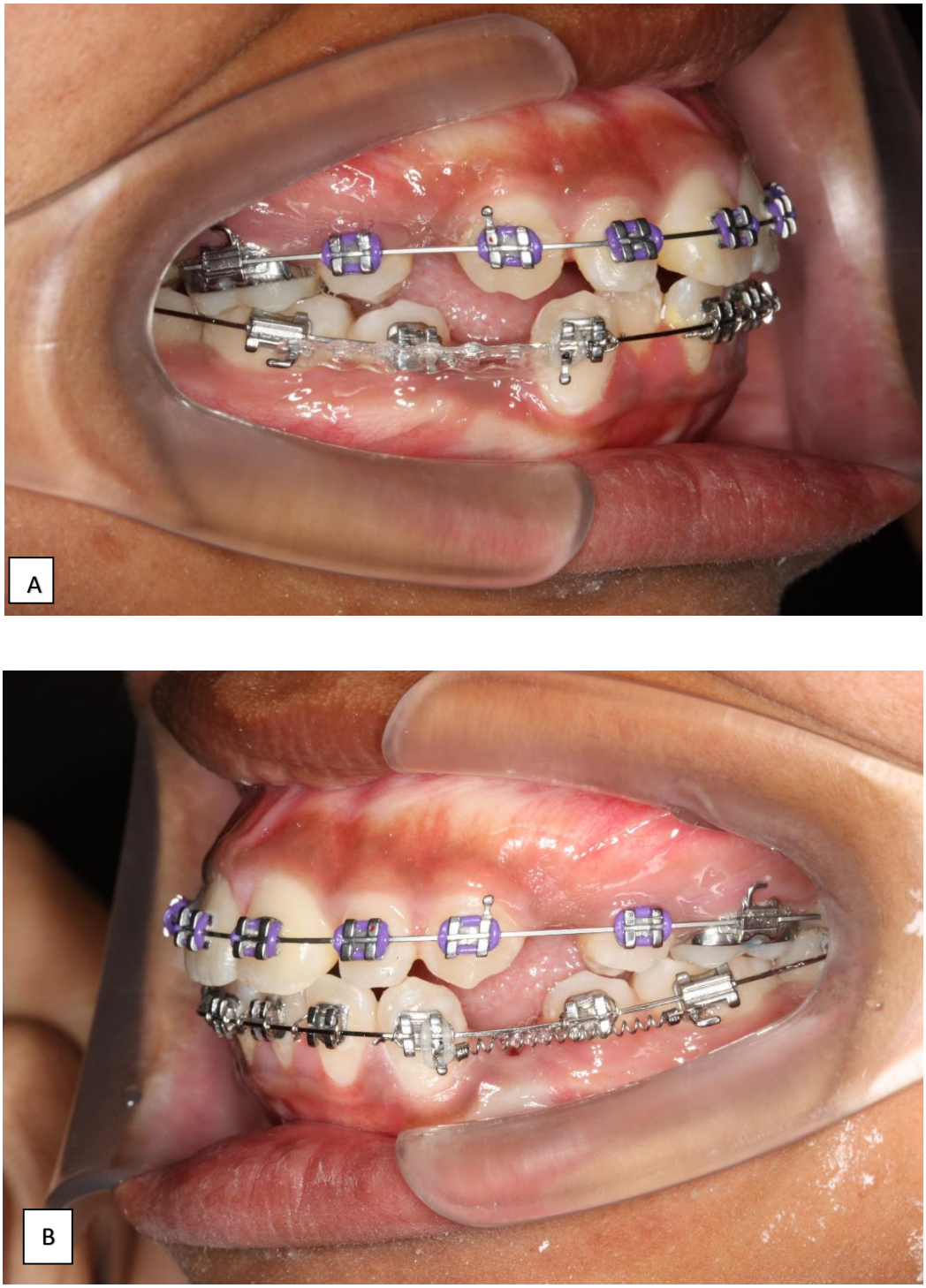

Fig. 1: The right (A) and the left (B) experimental mandibular canines were retracted using either elastomeric chains (interrupted force pattern; 120 g initial force magnitude) or Nickel-Titanium closed coil spring (continuous force pattern; 120 g initial force magnitude).

GCF Collection

GCF collection was conducted as described previously.[9] Briefly, the teeth were gently washed, and isolated with a cotton roll. Then, supragingival plaque was removed without touching the marginal gingiva, and the crevicular site was gently dried with an air syringe. GCF was collected using 10.0x1.0 mm Periopaper® strips (ProFlow™, Amityville, NY, USA) placed into the distal gingival sulcus of the mandibular canine until light resistance was felt, and left in the sulcus for 30 seconds. Care was taken to avoid mechanical injury to periodontal tissue. Strips contaminated with blood were discarded. Immediately after collection, the last 2.0 mm of

Periopaper® strip containing the GCF sample was cut off, individually transferred to microcentrifuge tubes, and individually stored at -80°C until further processing. An analytical instrument (Periotron 8000™, Oralflow Inc., Plainview, NY, USA) was used to measure the GCF volume. The volume of the GCF collected from the last 2.0 mm of each Periopaper® strip was averagely 0.01 µl.[11] To recover the CS biomolecules from Periopaper® strips, addition of 200-µl quantity of phosphate-buffered saline (pH 7.4) was performed, and the tube was then vigorously shaken for a few minutes at room temperature. The recovery rate (approximately 98 %) from each strip was determined by a dye-binding assay, using known concentrations of sulphated GAGs as standards.[12]

Determination of the distance of tooth movement

The study casts were made prior to and after orthodontic mandibular canine movement every 4 weeks until the 12th week in order to obtain a clearer picture of naturally slow tooth movement. The distance of mandibular canine movement was measured by using an ABSOLUTE digimatic caliper (Mitutoyo Corporation, Kawasaki, Japan). The measurement, which measured the maximum distance from the cusp tip of an orthodontically moved mandibular canine to the buccal groove of the first permanent mandibular molar, was performed.[1] The rate of space closure in millimeters (mm) per month was then calculated. To assess intra-examiner reliability and error of the method, the study models were re-measured by the same investigator 1 week later. The measurements were compared to the initial measurements using a paired t-test. There was no statistically significant difference between these two measurements.

Evaluation for the amount of pain and discomfort

Visual analog scale (VAS) was used to evaluate patient's pain and discomfort during orthodontic mandibular canine retraction. The patients reported their pain experience separately for each force pattern using the VAS at the end of first and fifth weeks during the loaded period. The linear scale properties ranged from 0 (Absence of pain) to 10 (Worst possible or unbearable pain).

Competitive inhibition ELISA with WF6 monoclonal antibody

The quantitative ELISA to determine the WF6 epitope of CS was performed using a protocol described previously.[10] In brief, microtiter plates (Maxisorp®, Nunc, Roskilde, Denmark) were coated overnight at room temperature with 10 µg/mL shark PG-A_1 fraction (100 µl/well) in coating buffer (20 mM sodium carbonate buffer, pH 9.6). On the following morning, the plates were washed three times with Tris-IB 150 µl/well and dried. Bovine serum albumin (BSA) 1% (w/v) 150 µl/well in incubating buffer (Tris-IB) was added to all plates. The plates were incubated at 37˚C for 60 minutes to block non-specific adsorption of other proteins to the plates and washed. After washing, 100 µl/well of the mixture, samples or standard competitors (Shark PG-A_1D_1 fraction: range 39.06-10,000 ng/mL) in mAb against the WF6 epitope (1:100) were added for 60 minutes at 37˚C. Subsequently, the plates were washed, and the IgM-specific peroxidase-conjugated anti-mouse immunoglobulin (100µl/well; 1:2,000) was added and incubated at 37˚C for 60 minutes. Then, the plates were washed and the peroxidase substrate (100 µl/well) was added and incubated at 37˚C for 20 minutes to allow the color to develop. The reactions were stopped by the addition of 50 µl/well of 4M H_2SO_4. The absorbance ratio at 492:690 nm was measured using a Titertek Multiskan® MCC/340 multiplate reader (ICN/Flow Laboratories, Costa Mesa, California, USA). The minimal detection level of ELISA for CS was 0.019 ng/ml.

Protein Assay

Total protein concentration was determined by using the Bio-Rad protein assay (Bio-Rad Laboratories, Hercules, California, USA), based on the Bradford dye-binding procedure, a simple colorimetric assay for measuring total protein concentration. The known concentrations (0-1,000 µg/µL/well) of BSA standards and the GCF samples were added to the microtiter plates (10 µL/well) in triplicate. A mixture between dye reagent and de-ionized distilled water at 1:4 was added to each well (200 µL/well). The plates were incubated at room temperature for five minutes and the absorbance was measured at 620 nm. Protein concentrations were determined from a standard curve of BSA standards.

Statistical analysis

The data were analyzed using the Statistical Package for Social Sciences version 17.0 for Windows (SPSS Inc., Chicago, Illinois, USA). The Kolmogorov-Smirnov test was used to determine the distribution of CS (WF6 epitope) levels, the rates of space closure and VAS scores. The differences between the CS levels by either interrupted or continuous force pattern at each week during the 8-week control period and the unloaded period (baseline data) were compared using the Friedman's test. The differences between the CS levels at the unloaded period (baseline data) and during the 8-week loaded period (experimental data) were compared using the Wilcoxon signed-rank test. The differences between the two CS levels of force pattern (interrupted and continuous), as well as VAS scores, during each experimental period were compared using the Mann-Withney U-test. The differences between the mean rates of space closure with interrupted force pattern and those with continuous force pattern were determined by the Independent-T-test. The results were considered statistically significant at $P<0.05$.

RESULTS

Force generated by either elastomeric chains or Nickle-Titanium closed coil spring during the 8-week loaded period

The medians of forces generated by elastomeric chains at the beginning of first week to the end of fourth week were 120.0, 60.0, 50.0, 37.5 and 25.0 g, respectively. Then, after elastomeric chain replacement, the medians of forces generated by elastomeric chains at the beginning of fifth week to the end of eighth week were 120.0, 62.5, 37.5, 25.0 and 25.0 g, respectively. Force generated by Nickel-Titanium closed coil springs at the beginning of first week to the end of eighth week was calibrated and controlled at 120 g (Fig. 2).

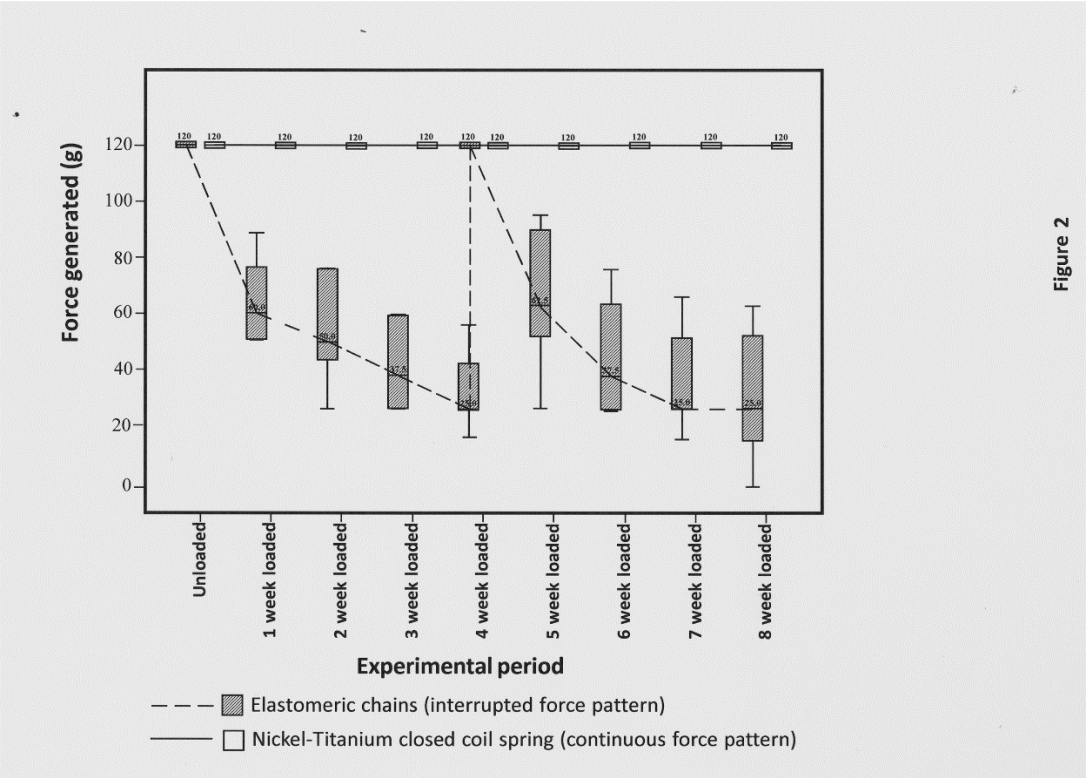

Fig. 2 Boxplot graph of forces generated by either elastomeric chains (interrupted force pattern; 120 g initial force magnitude) or Nickel-Titanium closed coil spring (continuous force pattern; 120 g initial force magnitude) during the unloaded and the 8-week loaded periods

Elevated levels of CS (WF6 epitope) in GCF of orthodontically moved mandibular canines

During the 8-week loaded period (experimental data), the medians of CS levels around the right (interrupted force pattern) and the left (continuous force pattern) mandibular canines were 0.57 and 0.66 mg of total protein, respectively, and were significantly greater than those during the unloaded period (baseline data) (P=0.008 and P=0.027 respectively) (Fig. 3). Graphs depicting the profile of CS levels around the right (interrupted force pattern) and the left (continuous force pattern) mandibular canines, from one of our subjects, during the control, the unloaded (baseline) and the loaded (experimental) periods are shown in Fig. 4.

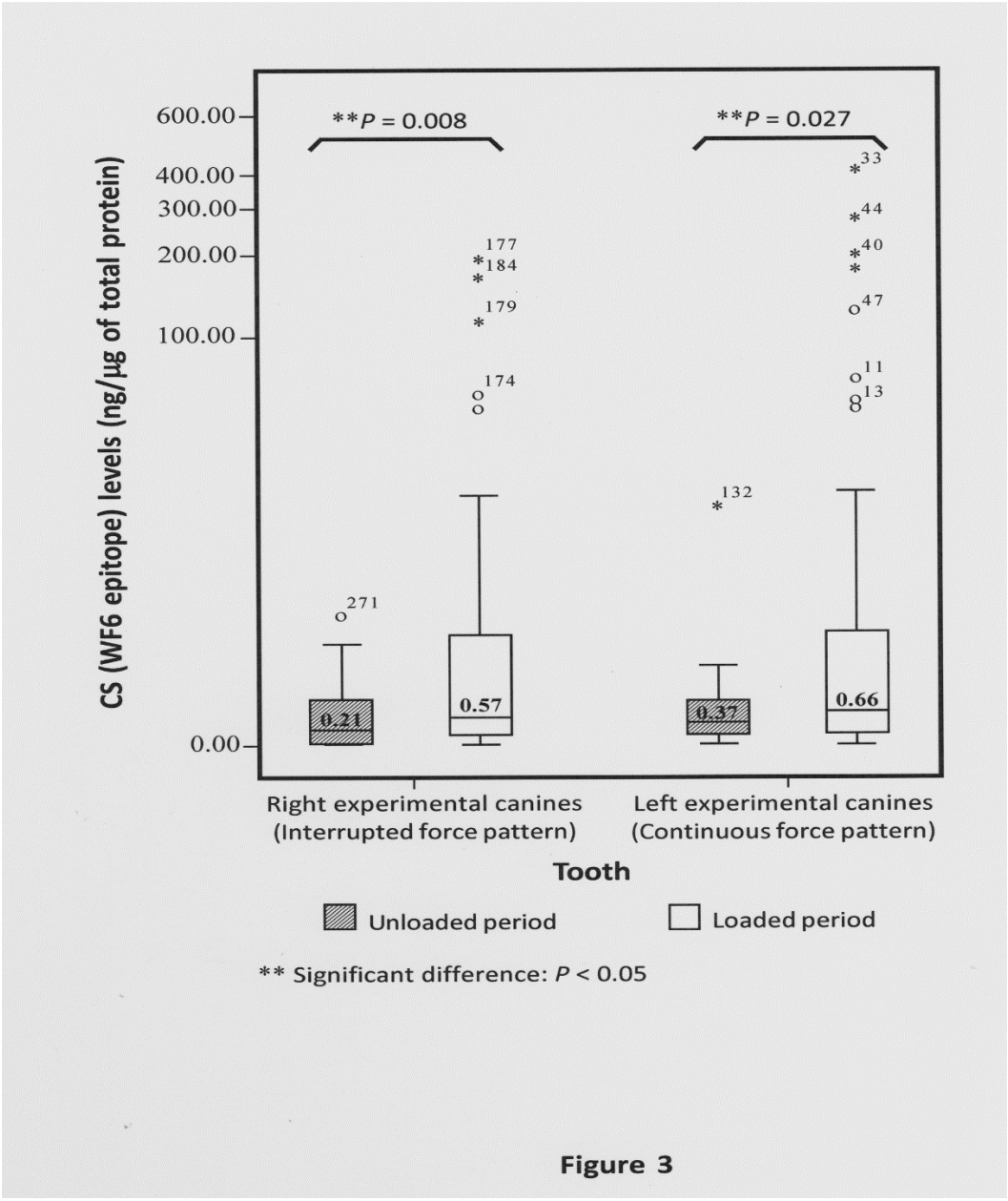

Fig. 3 Boxplot graph of the chondroitin sulphate (CS; WF6 epitope) levels around the right and left experimental mandibular canines during the unloaded and the loaded periods (with interrupted and continuous force patterns). The boxes represent the values from 25th to the 75th percentile. The middle lines represent the medians. The vertical lines extend from the minimal to the maximal values, excluding the outlier marked with small open circles. The small asterisks represent the extreme values.

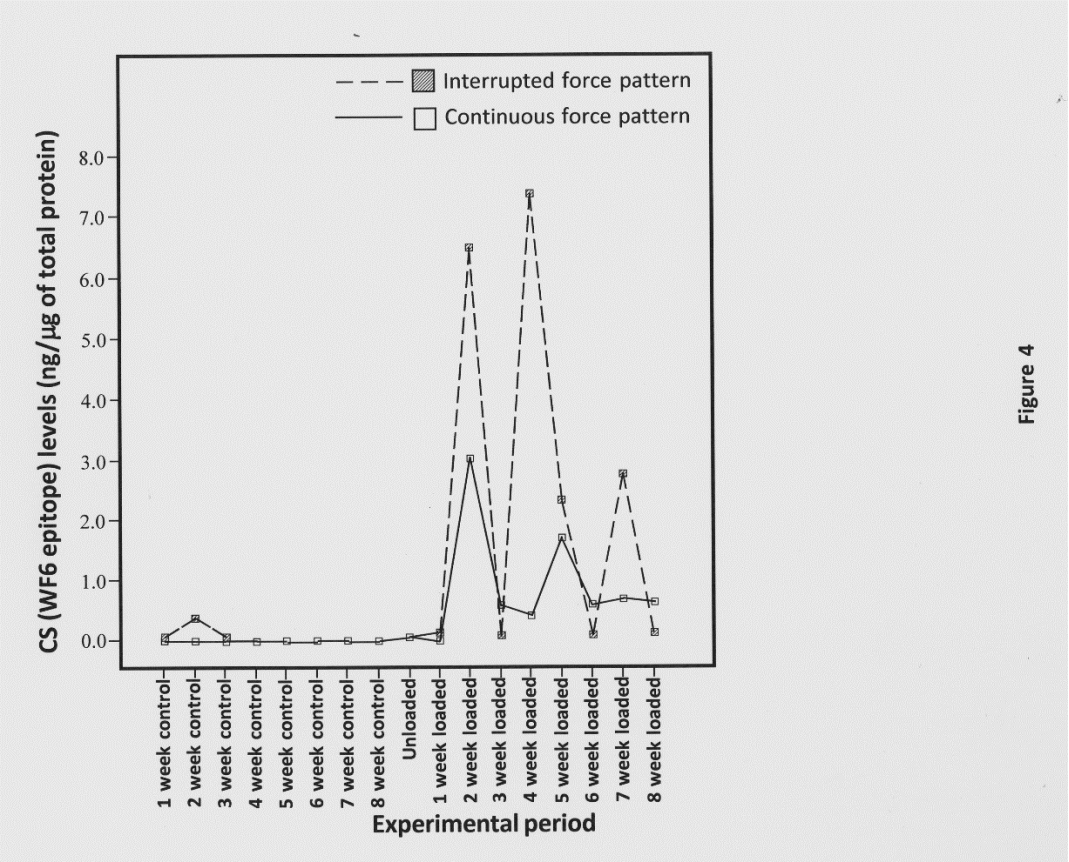

Fig. 4 Profile graph of the chondroitin sulphate (CS; WF6 epitope) levels around the right (interrupted force pattern) and the left (continuous force pattern) mandibular canines, from a subject, during the 8-week control, the unloaded and the 8-week loaded periods

The medians of CS levels around the right (interrupted force pattern) and the left (continuous force pattern) experimental mandibular canines during each 1 week period (the 8-week control, the unloaded and the 8-week loaded periods) are shown in Fig. 5. During the 8-week control period (control data) and during the unloaded period (baseline data), the medians of CS levels around the right (interrupted force pattern) mandibular canines were 0.90, 0.49, 0.66, 0.70, 0.75, 0.87, 0.77, 0.84 and 0.21 ng/μg of total protein, respectively, and the medians of CS levels around the left (continuous force pattern) mandibular canines were 0.61, 0.47, 0.42, 0.53, 0.46, 0.60, 0.53, 0.42 and 0.37 ng/μg of total protein, respectively. There was no significant differences in the median CS levels between the control and the unloaded periods, and between the right and the left mandibular canines.

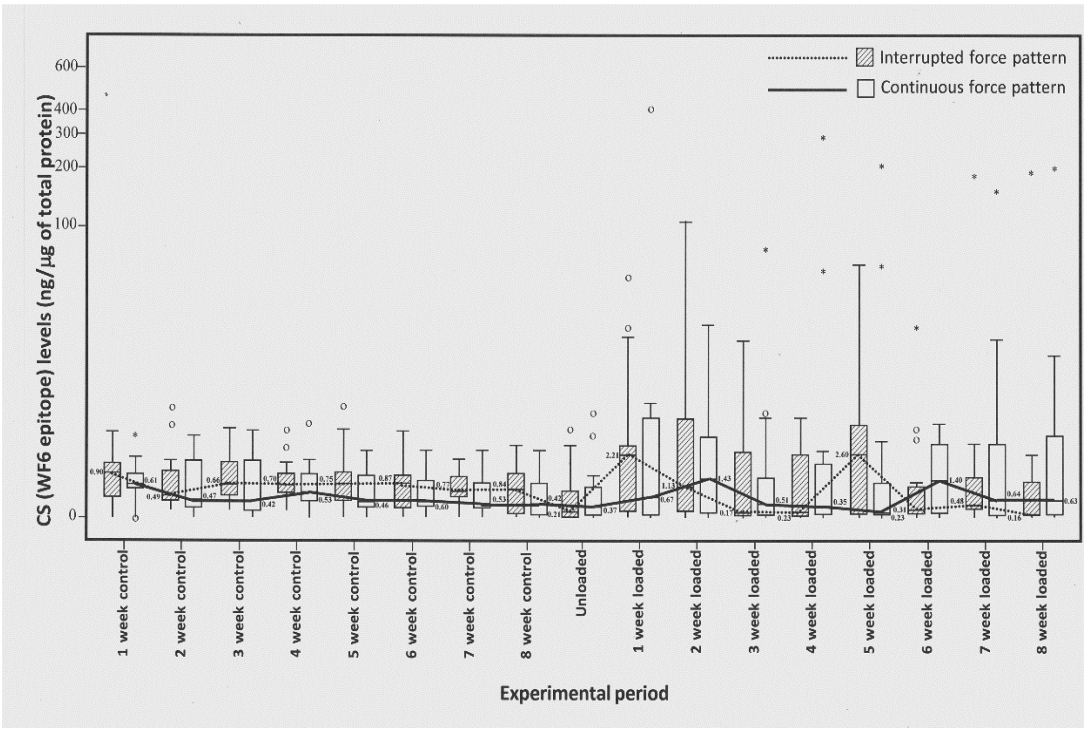

Fig. 5 Boxplot graphs of the chondroitin sulphate (CS; WF6 epitope) levels around the right (interrupted force pattern) and left (continuous force pattern) experimental mandibular canines during each 1 week period during the 8-week control, the unloaded, and the 8-week loaded periods. Note the cyclical pattern of a broken line connecting the median CS levels in gingival crevicular fluid (GCF) samples of right mandibular canines, and of a solid line connecting the median CS levels in GCF samples of left mandibular canines. The small asterisks represent the extreme values.

During the 8-week loaded period (experimental data), the medians of CS levels around the right (interrupted force pattern) mandibular canines were 2.21, 1.13, 0.17, 0.23, 2.60, 0.31, 0.48, and 0.16 ng/μg of total protein, respectively, and the medians of CS levels around the left (continuous force pattern) mandibular canines were 0.67, 1.43, 0.51, 0.35, 0.23, 1.40, 0.64, and 0.63 ng/μg of total protein, respectively. There was no significant differences in the medians of CS levels between baseline and experimental data, and the medians of CS levels in GCF of the right and those of the left experimental mandibular canines during each one-week loaded period.

No difference in the mean rates of space closure and in the medians of VAS scores of the patients' pain and discomfort between two different force patterns

The mean rate of space closure by interrupted force pattern was 0.70 ± 0.55 mm/month, and that by continuous force pattern was 0.86 ± 0.37 mm/month (Table 1). Comparisons of mean rates showed statistically insignificant differences. At the end of first week, the medians of VAS scores of the patients' pain and discomfort resulting from interrupted (5.33) and from continuous (4.89) force patterns were not significantly different, and at the end of fifth week, the medians of VAS scores of the patients' pain and discomfort from interrupted (4.44) and from continuous (5.11) force patterns were not significantly different.

Table 1 The rates of space closure [in millimeters (mm)/month] are shown as the minimum, maximum, mean, and standard deviation between two different force patterns (n =15)

Force Patterns	**Rates of space closure (mm/month)**			
	Minimum	Maximum	Mean	Standard Deviation
Interrupted	0.25	1.67	0.70	0.55
Continuous	0.25	2.17	0.86	0.37

DISCUSSION

Previously, we applied our patented WF6 monoclonal antibody, raised against WF6 catabolic epitope of CS[13] to monitor changes of CS levels in peri-miniscrew implant crevicular fluid (PMICF) during orthodontic loading[11], in GCF of intruded maxillary molars,[14] and in GCF of moved maxillary canines under two different force magnitudes.[9] In this present study, we evaluated the effects of either interrupted (generated by elastomeric chains) or continuous (generated by Nickel-Titanium closed coil spring) orthodontic force pattern by monitoring changes in CS levels in GCF of orthodontically moved mandibular canines.

To evaluate the effects of either interrupted or continuous force during orthodontic loading, some investigations selected various inflammatory mediators in GCF such as interleukin-1ß, interleukin-8 and prostaglandin E_2 as biomarkers.[7,15] Leethanakul and colleagues reported a significant greater elevation of interleukin-1ß and interleukin-8 levels at 24 hours after the first activation, compared with the control sites. Our present study used the levels of CS which was a kind of tissue break down products, detected in GCF, as biomarker for assessing alveolar bone remodeling and periodontal response to orthodontic loading. In our study, the medians of CS levels were elevated 1-2 weeks after force application with either interrupted or continuous force pattern, and then it gradually decreased.[7] For both orthodontic force patterns during the loaded period, CS levels showed cyclical changes at the 3-4 week intervals, and this was consistent with bone turnover rate. These changes comprised many peaks of high CS level during the loaded period. Compared to the cyclical changes in CS levels during the loaded period, the pattern of CS levels during the control period remained very low, and this was similar to that detected in periodontally healthy sites,[16] and that in the control group as reported by Insee *et al.*[9]

Leethanakul and colleagues reported that IL-1ß and IL-8 levels caused by a continuous force pattern were significantly higher than those caused by an interrupted force pattern during all experimental periods, and suggested that continuous force pattern (generated by Nickel-Titanium closed coil spring) had a greater effect on cellular activity than did interrupted force pattern (generated by elastomeric chains).[7] However, our present study showed that the effects of both orthodontic force patterns on CS levels were not significantly different. The difference between those two studies may be due to different experimental sites (maxillary canines versus mandibular canines) and different initial force magnitude (170 cN versus 120 g). While the tooth is moved by orthodontic force, deflection of alveolar bone and remodeling of periodontal tissues occur. Alveolar bone deflection can be just started in response to an initial orthodontic force and then osteocytes behave as mechanoreceptors. Stress produced in alveolar bone by orthodontic force can immediately generate electrical effects and may cause bone remodeling.[8] The initial orthodontic force magnitude, both continuous and interrupted force pattern, may produce rapid changes in metabolic activity of alveolar bone after being applied to a tooth. Investigations relating to the response of alveolar bone remodeling to various initial orthodontic force magnitude should be further carried out.

Our results showed that mean rate of space closure by continuous force pattern was insignificantly different from that by interrupted force pattern. These results agreed with those reported by Lee and colleagues.[15] Our results also agreed with those reported by Nightingale and Jones[17], although they investigated the efficiency of continuous and interrupted force patterns during maxillary anterior contraction. Many previous studies reported that continuous force pattern produced significantly higher rates of canine movement than did interrupted force pattern[1,4,5,7]; however, those previous studies used higher initial force magnitudes (150-200 g for Nickel-Titanium closed coil springs and 170-450 g for elastomeric chains) than that used in our present study (120 g initial force magnitude). At the beginning of the loaded period, our subjects reported similar pain and discomfort for both right (interrupted) and left (continuous) mandibular canines because of similar 120 g initial force application. Although the remaining interrupted force was gradually decreased after force application as shown in Fig. 2 (for example 60.0 g at 1-week loaded and 62.5 g at 5-week loaded), our subjects still reported similar VAS scores of pain and discomfort for both force patterns. Our results agreed with that of Samuels and colleagues.[4] however, they used 150 g continuous force pattern and initial 400-450 g interrupted force pattern, and VAS score evaluation of pain and discomfort was not implemented.

In our present study, the median of CS levels was highest at 1-week and 5-week loaded periods after force application with interrupted force pattern, and at 2-week and 6-week loaded periods after force application with continuous force pattern. These results showed cyclical pattern of elevated CS levels (or alveolar bone remodeling) with 3-4 week interval during the loaded periods, in contrast to the unloaded or control periods which showed non-cyclical pattern. Bone remodeling process involves osteoclastic bone resorption and osteoblastic bone formation. Osteoclasts act as major resorbing cells in bone remodeling process, and have a limited life span of 12.5 days.[18,19] Therefore, the peak levels of CS

1 to 2 weeks after force activation found in this present study are consistent with average life span of human osteoclasts.

It should be noted that all experimental data during the 8-week loaded period have been pooled. So, during the 8-week loaded period (experimental data), the medians of CS were significantly greater than those during the unloaded period (baseline data). In the contrary, if all experimental data during the 8-week loaded period have been divided into 8 one-week periods, and then compared. The resulted showed that there were no significant differences in the medians of CS levels between baseline and experimental data. The reason is that the number of sample in each group of one-week period has been decreased, and this resulted in a statistically non-significant difference.

Both interrupted and continuous force patterns, with 120 g initial force magnitude, are within the optimum range of orthodontic force for mandibular canine movement, so we propose that the 'initial' force magnitude, rather than force magnitude alone, plays an important role in triggering the biological processes relating to alveolar bone remodeling because two different force patterns with same 120 g initial force magnitude cause no difference in biochemically assessed bone remodeling activity, the same patients' pain and discomfort, and the same rate of tooth movement during mandibular canine movement. Suggestions for further studies are that other biomarkers which are closely related to osteoclastic activity or to root resorption process should also be simultaneously monitored.

ACKNOWLEDGEMENTS

We thank Dr M. Kevin O Carroll, Professor Emeritus of the University of Mississippi School of Dentistry, USA, and Faculty Consultant at Chiang Mai University Faculty of Dentistry, Thailand, for his critical reading of this manuscript. This paper was orally presented at the 90th European Orthodontic Society 2014, Warsaw, Poland.

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How to cite this Article: Threesuttacheep R, Pothacharoen P, Kongtawelert P, Ongchai S, Jotikasthira D, Chatiketu P, Krisanaprakornkit S,
Comparisons of chondroitin sulphate levels in orthodontically moved canines and clinical outcomes between two different force patterns. J Dent Specialities, 2015; 3(1):5-15

Source of Support: Faculty of Dentistry; the Center of Excellence for Innovation in Chemistry, Faculty of Medicine, Chiang Mai University
Conflict of Interest: All authors report no conflict of interest related to this study.

Effect of prosthodontic rehabilitation on the nutritional status of maxillectomy patients in Indian subjects – A hospital based study

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ABSTRACT

Statement of problem: Malnutrition amongst cancer patients is a frequent finding. Patients face difficulty in mastication and deglutition due to defects in maxilla during post-surgical period.

Objective: Obturators help in restoring the function of maxillectomy patients. Therefore, it is important to assess their nutritional status of these patients after prosthodontic rehabilitation.

Materials and methods: Total 38 patients were enrolled in the span of one year, out of which 17 were dropouts. Surgical, intermediate and definitive obturators were fabricated as per requirement. Mini Nutritional Assessment (MNA) Performa and various blood bio chemical parameters like serum albumin, globulin, total protein, serum sodium, potassium, calcium, alkaline phosphatase and haemoglobin were used to assess the nutritional status. Assessments were made at three different time intervals; just before maxillectomy, 3 months after maxillectomy and 3 months after the delivery of definitive obturator.

Results: Nutritional status of the patients decreased three months after maxillectomy but increased three months after delivery of definitive obturator in comparison to baseline values. On application of one way ANOVA followed by Bonferroni correction, the mean difference of the MNA score of maxillectomy patients at three months after rehabilitation with definitive obturator was found to be statistically significant as compared to that obtained 3 months after maxillectomy and before maxillectomy ($P < 0.05$). Mean values of haemoglobin, albumin and total protein three months after rehabilitation with definitive obturator increased significantly from the values obtained three months after maxillectomy and just before maxillectomy ($P < 0.05$).

Conclusions: Prosthodontic rehabilitation with definitive obturator is one of the prime factors in the improvement of nutritional status and general health of the maxillectomy patients which is evident by the increment in MNA score and serum albumin, haemoglobin and total protein values.

Received: 02-02-2015
Accepted: 24-03-2015

Keywords: Oral cancer, Definitive obturator, Mini Nutritional Assessment

INTRODUCTION

Malnutrition has been defined as a subacute or chronic state of nutrition, in which a combination of undernutrition (insufficient food intake) and inflammation has led to a decrease in muscle mass, fat mass, and diminished function, i.e., immune function, cognitive function and muscle strength.[1] It is a common problem among maxillectomy patients which may be due to the local effect of the etiological factors like cancer or fungal infections or due to its treatment therapies i.e. surgical excision, radiotherapy and chemotherapy.[2]

Advancements in surgical techniques and technology have led to treatment of larger and more extensive cancers of the head and neck region.[3] This leads to significant improvement in the survival rate but also results in various functional and cosmetic problems in such patients. Patients may experience chewing problems which may result either because of poor dental status or trismus. It becomes difficult for the patient to wear dental prosthesis for about three months after surgery and not uncommonly even up to six months after radiotherapy or chemo-radiation, due to either radiation-induced mucositis, oral edema, tender oral mucosal surfaces, surgically induced changes in anatomy, or time needed to fabricate a new prosthesis.[4]

Quality of life of the maxillofacial patients is also affected, which make them psychologically weak and affects their ability to bear the trauma of surgical procedure. [5] Therefore, prosthetic restoration of the resulting defect is an essential step because it signals the beginning of patient's rehabilitation.[3] The goal of prosthodontic rehabilitation is to minimize morbidity, ensure a good QOL for the patients and uphold their self-image during their traumatic psychological adjustments.[6]

There are several studies that show a significant association between malnutrtion and malignancy.[2, 7, 8] Nevertheless, these studies were hampered by retrospective design and heterogenous patient groups with respect to the type of cancer, staging and treatment. Moreover, it is clear from these reports that no consensus exists regarding effect of prosthodontic rehabilitation on the nutritional status of maxillectomy patients.[9] Based on the facts discussed above, this study was designed to

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evaluate the effect of prosthodontic rehabilitation on the nutritional status of these patients.

MATERIALS AND METHODS

Sample size was calculated using G Power statistical software, where the power was set at 0.80, with effect size of 0.05 and a two tailed alternative hypothesis calculation of 0.07.

A total of 38 patients within age range of 18-60 years; irrespective of sex indicated for maxillectomy were enrolled consecutively from May, 2011 to April, 2012. These patients were thoroughly informed about the procedure and verbal and written consents were obtained from each patient. Ethical clearance was obtained from the Ethics Committee of the institution before starting the study (Ref. No. IESC/T-425).

Data could not be completed for 17 cases because of following reasons; six patients did not underwent maxillectomy due to psychological fear; three patients were treated with only palatal debridement; one patient died, four patients reported with recurrence of the cancer, three patients did not report during the process of fabrication of definitive obturator. Thus, only 21 patients were followed up to the 3rd assessment and completed all questionnaires at all intervals.

Treatment procedure

Surgical, intermediate and definitive obturators were fabricated as per requirement and healing conditions of the patients. Assessments for the evaluation of nutritional status and oral health status were made at three different time intervals i.e. before maxillectomy (T_0), three months after maxillectomy (T_1) and three months after delivery of the definitive obturator (T_2).

Pre surgically, surgical obturator was fabricated in auto-polymerising acrylic resin (DPI-RR, Cold cure, Dental Products of India, Mumbai, India) as per conventional method and was given to the patient. Surgical obturator was adjusted and inserted following resection by the surgeon or the prosthodontist.

Post surgically, patients were recalled 10-15 days after surgery and an intermediate obturator extending in to the defect was fabricated in heat cure acrylic resin (Travelon, Dentsply Limited, Addleston, UK). Patients were instructed regarding the insertion and removal of the prosthesis; maintenance of proper hygiene of both the defect and prosthesis, and were advised to remove the obturator at the time of sleeping and to store it in water with some antiseptic. Denture brush and denture cleansing tablets were advised for the cleaning of the prosthesis. They were recalled after 24 hours following placement of intermediate obturator to examine the defect area for any trauma or discomfort.

Definitive obturator was fabricated in heat cured material approximately three months after surgery when the complete healing of the wound had taken place. Instructions regarding cleaning of prosthesis and mastication were given to the patients.

Nutritional assessment:

1. Nutritional assessment with Mini Nutritional Assessment:

Several techniques are available for the assessment of nutritional status in patients. [10-14] MNA was used in this study because of its extensive validation in older patients and its previous use in cancer populations. [12, 15-19] In brief, the MNA consists of four additive items: anthropometric assessment (four questions), global evaluation (six questions), dietetic assessment (six questions), and subjective assessment (two questions). It consists of 18 questions and each answer has a numerical value and contributes to the final score, which has a maximum score of 30. It has threshold values of ≥ 24 for well-nourished, 17-23.5 for at risk of malnutrition, and <17 for malnourished.[15]

2. Nutritional assessment through blood bio chemistry

Blood samples of all the patients were taken to evaluate following parameters: Haemoglobin, Serum protein, Serum albumin, Serum globulin, Serum calcium, Serum phosphate, Serum alkaline phosphatase, Serum glucose, Serum sodium, and Serum potassium.

Serum albumin is a reflection of nutritional status and protein intake.[20] It also provides useful prognostic significance in cancer. Calcium, phosphate and alkaline phosphatase levels are useful in screening for metabolic bone diseases including vitamin D deficiency.[21] Total body potassium is an indicator of anabolic state. [22, 23] The effect of cancer on sodium and potassium is non- specific. The metabolic relationships between electrolytes, minerals, and cancer show no general abnormalities. Specific disorders of metabolism may be produced by hormone secreting tumours, and an increased utilization or excretion of minerals and electrolytes may result. [24]

Statistical Analysis

Nutritional parameters were analyzed for significant differences between the categorized variables, such as MNA and blood biochemistry values using repeated measure analysis of variance; one way ANOVA followed by post hoc analysis with bonferroni correction. Friedmann test was used to assess the changes in blood biochemistry value of alkaline phosphatase (as the standard deviation of these variables was computed to be high).

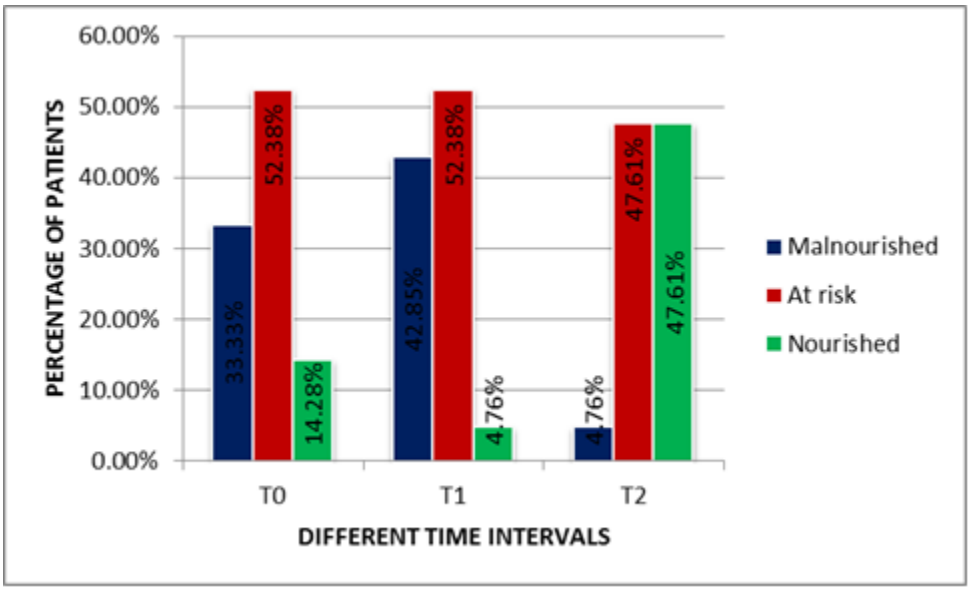
The analysis was performed using SPSS (version 15) and results were considered statistically significant for p values <0.05 with confidence interval of 95%.

RESULTS

In the present clinical study, it was found that MNA scores of patients decreased three months

after maxillectomy but increased three months after rehabilitation with definitive obturator in comparison to baseline values.

Before maxillectomy, majority of the patients (52.38%) were at risk of malnutrition, 33.33% of the patients were malnourished and only 14.28% of the patients were nourished. Three months after maxillectomy, percentage of the patients at risk of malnourishment remained 52.38% but percentage of malnourished patients increased up to 42.85% and percentage of nourished patients decreased to 4.76%. Three months after rehabilitation with definitive obturator, percentage of patients at risk of malnourishment were 47.61% while only 4.76% of the patients were malnourished and 47.61% of patients were found to be nourished (graph 1).



Graph 1: Bar diagram showing nutritional status of maxillectomy patients at different time intervals

On application of one way ANOVA followed by Bonferroni correction, the mean difference of the MNA score of maxillectomy patients at three months after rehabilitation with definitive obturator was found to be statistically significant from the MNA score three months after maxillectomy (T_2-T_1) and before maxillectomy (T_2-T_0) ($P < 0.05$). But mean difference of MNA score before maxillectomy and three months after maxillectomy (T_0-T_1) was not statistically significant ($P > 0.05$) (table 1).

Table 1: Comparison of Nutritional Status of Maxillectomy Patients at Different Time Intervals (n=21)

Time interval	Mean difference (Nutritional Score)	Significance
T_0-T_1	0.024	0.983
T_1-T_2	-4.09	0.001
T_0-T_2	-4.07	0.001

T_0: Before maxillectomy, T_1: Three months post maxillectomy, T_2: Three months after definitive rehabilitation

Analysis of blood bio chemistry parameters showed a statistically significant increase in the mean values of haemoglobin, albumin and total protein at three months after rehabilitation with definitive obturator in comparison to values at three months after surgery and before maxillectomy. There was no statistically significant difference of these parameters before surgery and 3 months after maxillectomy ($P>0.05$) (table 2).

Table 2: Comparison of blood biochemistry variables of maxillectomy patients at different time intervals (n=21)

Time Interval	Haemoglobin		Albumin		Total Protein	
	Mean Difference	Significance	Mean Difference	Significance	Mean Difference	Significance
T_0-T_1	0.095	0.731	-0.014	1.0	-0.233	1.0
T_1-T_2	-1.600	0.001	-0.386	0.001	-0.419	0.001
T_0-T_2	-1.505	0.001	-0.400	0.001	-0.652	0.001

DISCUSSION

Modern day cancer therapy may contribute either directly or indirectly to altered nutritional status of the cancer patient. The potentially life-saving maxillectomy operation is extremely disabling making effective speech, mastication and swallowing virtually impossible.[25]

Reduced masticatory efficiency resulting from the tooth loss may lead to a change in the dietary preferences to compensate for the greater difficulty of eating certain foods.[26] Maxillectomy patients report significantly more chewing difficulties than normal people and a change in their food choices as per their preferences is not uncommon. [26, 27] Therefore, it is mandatory to assess maxillectomy patients for early signs of malnutrition and to provide them with adequate nutritional support along with the required treatment.

The findings of the present study showed that most of the patients were malnourished before maxillectomy. There was a further decline in the nutritional status of these patients after maxillectomy but an improvement in nutritional status was seen at three months after rehabilitation with definitive obturator.

These findings suggested that a large proportion of patients in the clinical oncology setting might benefit from rehabilitation. According to Ravasco et al (2007), metabolic effects of the disease and side effects of the therapy put the patient with malignant disease at risk of malnutrition.[28] Difficulties in biting, chewing and swallowing after surgery may lead to poor nutrient intake.[29]

The texture, temperature, consistency, nutrient content and frequency of oral feedings might be changed during and after treatment.[29] So, the balance between the proper supply of nutrient required for the wound healing and limitation of their availability due to altered oral status is disturbed. All these factors may lead to decreased nutritional status three months after surgery. Baeur et al (2002) reported high prevalence of malnutrition in cancer patients using SGA (subjective global assessment) performa.[10]

Psychosocial factors may be considered as reason for poor nutritional status.[30] Diagnosis of cancer often leave the patient in different psychological situations, where he/she confronts himself/herself with fear of isolation, fear of death and dying, fear of social stigma and social discrimination. This situation could somehow change food intake and, consequently, the nutritional status of the patient.[31] Wittenaar et al (2011) evaluated the malnutrition ratio in head and neck cancer patients undergoing surgical resection according to which prevalence of malnutrition in the period 0-3 months after surgery was significantly higher (25%) than in the periods more than 3-12 months and 12-36 months after treatment.[4]

Good retentive, stable and comfortable obturator prosthesis restores the masticatory function and deglutition in maxillecomy patients.[32] The placement of an obturator restores oro-nasal separation to allow an increase in intraoral pressure and a decrease in nasal airflow rate. It provides immediate improvement in speech articulation and intelligibility, voice quality and swallowing that approximates pre-surgical function enabling the patient to eat and drink immediately; which may be a reason for increased nutritional status of these patients after definitive rehabilitation.[33] As the time passes, the patient adapts by restructuring him/herself psychologically, thereby minimizing the side effects of treatment.[31]

Results of the present study also showed statistically significant change in mean difference of albumin, total protein and haemoglobin 3 months after delivery of definitive obturator as compared to their levels before surgery and 3 months after surgery.

Reduced synthesis of the albumin is usually a consequence of intake deficits.[2] The ongoing inflammatory response in cancer patients may also lead to reduced concentration of albumin in such patients.[34] The nutritional support for maxillectomy patients associated to an oral diet achieved a significant increase in the total caloric ingestion resulting in increased values of nutritional markers. Definitive obturator enables a maxillectomy patient to swallow, speak and chew effectively. So, an increase in serum albumin, total protein and haemoglobin could signify an anabolic response in these patients.

Gonclaves et al (2005) found an increase in value of albumin and haemoglobin after nutritional intervention in cancer patients subjected to radiotherapy.[35] According to Yao et al (2011), albumin levels increased significantly after dietary implementation in head and neck cancer patients who underwent surgical excision. They postulated that nutritional support after operation can significantly improve the nutritional status of the patients, reduce the infectious complications and improve the prognosis.[36] In conclusion, definitive rehabilitation of maxillectomy defects is one the prime factor in improvement of nutritional status

and general health of the patients which is evident by the increase in MNA score and blood nutritional marker values. The improvement of nutritional status may also be attributed to other reasons like elimination of etiological factor, improvement in body metabolism, improved nutritional intake and psychological well-being of these patients.

Limitations of the study: Study with longer follow up and large sample size is required.

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How to cite this Article: Bansal K, Jain V, Pruthi G. Effect of prosthodontic rehabilitation on the nutritional status of maxillectomy patients in Indian subjects – A hospital based study. J Dent Specialities 2015;3(1):16-21

Source of Support: NIL
Conflict of Interest: None Declared

Sella turcica morphology- a diagnostic marker for skeletal class II malocclusion?

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ABSTRACT

Objective: The aim of this study is to describe shape and measure the size of the sella turcica in subjects with class I and class II skeletal types and to check whether sella can be considered as diagnostic marker for skeletal class II malocclusion.
Material and Methods: Lateral cephalometric radiographs of 44 individuals (age; 15–30 years) were taken and classified skeletally; 22 as Class I and 22 as Class II (11 males and 11 females in both groups). The linear dimensions (length, depth and diameter) of sella turcica were measured. Student's t-test was used to calculate differences in linear dimensions.
Results: Results show that the sella turcica presented with normal morphology in the majority of subjects (61 percent). No significant differences were found in linear dimensions between genders. Significant difference was found in the depth of sella between Class I and Class II subjects ($p<0.05$) with smaller depth measurements in skeletal Class II subjects.
Conclusions: Significant difference was found in depth of sella between Class I and Class II subjects with smaller depth measurements in Class II subjects. It is concluded that size of sella turcica can be used to approximate the size of the pituitary gland in skeletal Class II malocclusion. Skeletal class II cases due to mandibular deficiency are associated with smaller depth of pituitary fossa.

Received: 06-02-2015
Accepted: 26-03-2015

Keywords: Sella turcica, Skeletal class II, Morphology, Lateral cephalograms

INTRODUCTION

In cephalometric analyses of neurocranial and dentofacial morphology, the sella point constitutes an important reference point. Many studies[1,2] have illustrated the changes in sella turcica shape during growth (Fig. 1). Apposition at tuberculum sellae and resorption at posterior boundary of sella turcica occurs upto age of 16-18 years. Thus point sella would be displaced backwards and downwards during growth and development. There are very few cephalometric standards available on normal growth and development of sella turcica.[3]

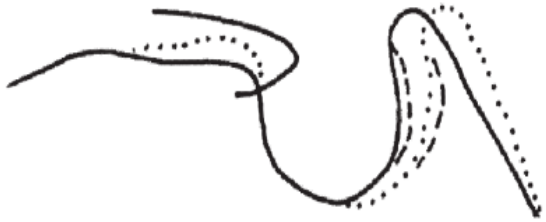

Fig. 1 contour of normal sella turcica morphology analysed from lateral cephalograms, from childhood (solid line) to adulthood (dotted line). Upper contour of anterior wall of sella turcica appears to be perpendicular and unchanged during normal course of development. The increasing size of the sella turcica under normal conditions is a result of resorption and apposition process on the dorsum sellae.

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Morphology of sella turcica may vary from individual to individual, and the establishment of normal standards will aid in the process of eliminating any abnormality in such an important region.

Therefore, the aim of this study was

- to analyse the morphological shape and measure the linear dimensions of sella turcica to determine if there is any relationship between sella morphology and skeletal class i.e. skeletal class I and class II patterns
- to check whether sella morphology can be used as a marker for skeletal class II malocclusion

MATERIAL AND METHODS

The data comprised of lateral cephalometric radiographs taken from archives of Department of Orthodontics, IDST, Modinagar. The sample size was calculated maintaining the standard deviation at 5 and least permissible error at 1.5, with power of 80%. This showed that we needed a sample of at least 40 subjects (20 in both groups). Cephalometric radiographs of 44 patients (22 males and 22 females) aged 15–30 years were used in the study. Radiographs had been taken by trained radiographic technicians in a standardized manner using the same cephalostat. Only radiographs that had the clearest reproduction of the sella turcica area

were selected. All linear measurements were corrected for magnification differences prior to the statistical analyses. The radiographs were distributed according to skeletal relationship; 22 Class I & 22 Class II. Classification of skeletal type into Class I or Class II was based on the ANB angle (SNA and SNB) and was categorized as follows: angles ± 2 degrees Class I skeletal base and angles more than 4 degrees Class II.

As the ANB angle is affected by the position of nasion and jaw rotations, so to overcome the limitations of the ANB angle and to further describe jaw severity/discrepancy, the Wits analysis was used: "AO-BO" = 0-4mm class I skeletal base and more than 4 mm Class II. The ANB angle and Wits analysis indicate only the magnitude of the skeletal jaw discrepancy, regardless of which jaw is at fault. So the distance of Nasion perpendicular to point A and Nasion perpendicular to Pogonion was also calculated. The subjects who were characterized by class II malocclusion due to mandibular deficiency only were selected for the study. Table 1 shows the distribution of malocclusion in the subjects according to skeletal relationship and gender.

Table 1: Subjects grouped according to gender and skeletal Class.

Skeletal Class	CLASS I	CLASS II
MALES	11	11
FEMALES	11	11
TOTAL	22	22
SNA	83.22°	83.32°
SNB	80.04°	76.86°
ANB	3.09°	6.68°
AO-BO	2.22mm	6.45mm
N perp-A	1.58mm	1.72mm
N perp-Pog	3.88mm	7.43mm

Cephalometric tracing of sella turcica: The sella turcica on each cephalometric radiograph was traced on thin acetate paper under optimal illumination. This tracing was superimposed on graph paper marked in square millimetres to calculate the sella area.[3] The configuration of the sella turcica, which consisted of the tuberculum sella, the sella turcica floor, the dorsum sellae, and both anterior and posterior clinoid processes, was drawn.

Shape of the sella turcica: To determine the variations in shapes of the sella turcica, the six different morphological appearances of sella given by Axelsson[4] et al. was used (Fig. 2).

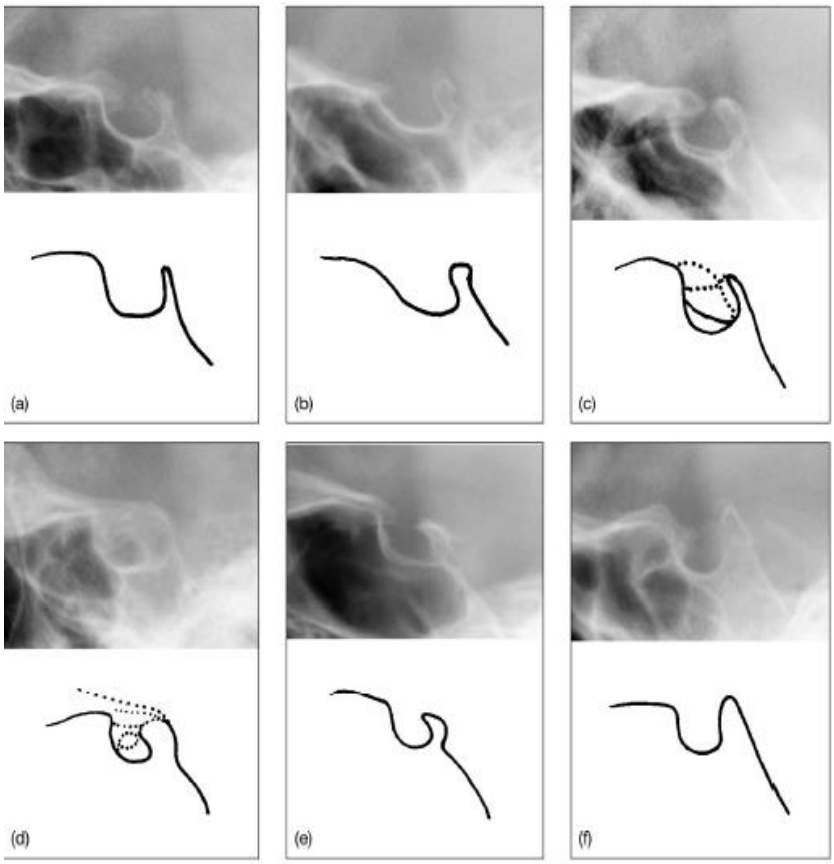

Fig. 2 Different morphological type of sella turcica: a) normal sella turcica, b) oblique anterior wall, c) double contour of floor, d) sella turcica bridge, e) irregular dorsum sella, f) pyramidal shape of dorsum sella.

Size of the sella turcica: The linear dimensions of sella turcica were measured using the methods of Silverman[3] and Kisling[5]. All reference lines used in the current study were located in the midsagittal plane (Fig.3). The length of sella turcica was measured as the distance from the tuberculum sella to the tip of the dorsum sellae. The depth of the sella turcica was measured as a perpendicular from the line above to the deepest point on the floor. A line was also drawn from the tuberculum sella to the furthest point on the posterior inner wall of the fossa. This was considered as the antero-posterior diameter of sella turcica.

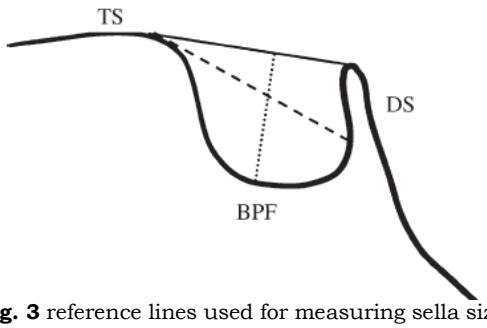

Fig. 3 reference lines used for measuring sella size: TS- tuberculum sella; DS- dorsum sella; BPF- base of pituitary fossa; black line- length of sella; dashed line- diameter of sella; dotted line- depth of sella.

Statistical analyses: To assess the error of location of the reference points and digitizing procedure, 20 randomly selected tracings were retraced and remeasured after 2 weeks. Casual errors were assessed by using Dahlberg's formula, and systematic errors were ascertained by using paired t tests. No casual errors were found.

A Student's t -test was used to calculate the mean differences in sella turcica linear dimensions between males and females, and between the different skeletal classes (significance was calculated at the 0.05 level).

RESULTS

Shape of the sella turcica: The morphology of the sella turcica appeared to be normal in shape in the majority of subjects (61.36 per cent), regardless of gender, age, or skeletal type (Table 2). Variation in morphological appearance was present in 38.64 per cent of the individuals; an irregular dorsum sella was found in 15.91 per cent, while an oblique anterior wall, sella turcica bridge, pyramidal shape of dorsum sella and a double-contoured floor were present in 9.09, 6.82, 4.55, and 2.27 percent respectively. No significant differences were found in morphology of sella turcica when compared between class I subjects and class II subjects (Table 3). Nor any difference was found when morphology was compared in between genders (Table 3).

Table 2 Frequency distribution of sella turcica type

MORPHOLOGY	FREQUENCY	PERCENTAGE	CUMULATIVE FREQUENCY	CUMULATIVE PERCENTAGE
Normal sella turcica	27	61.36	27	61.36
Oblique anterior wall	4	9.09	31	70.45
Sella turcica bridge	3	6.82	34	77.27
Double contour of floor	1	2.27	35	79.54
Irregular dorsum sella	7	15.91	42	95.45
Pyramidal shape of dorsum sella	2	4.55	44	100
Total	44	100	44	100

Table 3 Frequency distribution of sella turcica type according to skeletal class and gender

MORPHOLOGY	CLASS I	CLASS II	p-value	Males	Females	p-value
Normal sella turcica	14	13		15	12	
	63.6%	59.1%		68.2%	54.5%	
Oblique anterior wall	1	3		2	2	
	4.5%	13.6%		9.1%	9.1%	
Sella turcica bridge	0	3		0	3	
	.0%	13.6%		.0%	13.6%	
Double contour of floor	0	1	**0.126**	1	0	**0.179**
	.0%	4.5%		4.5%	.0%	
Irregular dorsum sella	6	1		2	5	
	27.3%	4.5%		9.1%	22.7%	
Pyramidal shape of dorsum sella	1	1		2	0	
	4.5%	4.5%		9.1%	.0%	
Total	22	22		22	22	
	100.0%	100.0%		100.0%	100.0%	

Size of the sella turcica: The linear dimensions of the sella turcica located in the midsaggital plane area are presented in Table 4. The average length, depth, and diameter of the sella turcica for both females and males are shown. When comparing linear dimensions of sella turcica between genders, no significant differences between females or males in terms of length, depth, or diameter size could be found.

Table 4 Sella turcica linear dimensions for females and males (in millimetres).

	Gender	n	Mean	Standard Deviation	t-value	p-value
Length	Female	22	9.43	2.156	.7318	>.05
	Male	22	9.20	2.213		
Diameter	Female	22	11.75	1.804	.8472	>.05
	Male	22	11.48	1.822		
Depth	Female	22	7.93	1.094	.6205	>.05
	Male	22	8	1.234		

In order to determine if subjects with different skeletal patterns presented with different linear dimensions of the sella turcica, irrespective of gender, a Student's t -test was performed. A significant difference was found between skeletal classes in the depth of the sella turcica ($p < 0.05$; Table 5a & 5b). The mean depth was significantly smaller in Class II subjects as compared to class I subjects.

Table 5(a) Sella turcica linear dimensions for skeletal class I and class II (in millimetres).

	Skeletal class	n	Mean ± SD	Standard error of mean
Length	Class I	22	9.4546 ± 2.0869	.4449
	Class II	22	9.1818 ± 2.2759	.4853
Diameter	Class I	22	11.75 ± 1.8306	.3903
	Class II	22	11.4773 ± 1.7960	.3829
Depth	Class I	22	8.3863 ± .9377	.1999
	Class II	22	7.5455 ± 1.214	.2588

Table 5(b) t-test results for comparison of effects of skeletal Class on sella linear dimensions (in millimetres).

	Class I	Class II	t-value	p-value
Length	9.4546 ± 2.0869	9.1818 ± 2.2759	.6808	>.05
Diameter	11.75 ± 1.8306	11.4773 ± 1.7960	.6205	>.05
Depth	8.3863 ± .9377	7.5455 ± 1.214	.0140	***<.05**

*p <.05 shows statistical significant difference between class I and Class II for sella turcica depth.

DISCUSSION

The pituitary gland originates in the embryo as a result of interaction between two ectodermal tissues; neural ectoderm gives rise to the posterior pituitary, whereas a portion of the oral ectoderm develops into the anterior pituitary gland. A number of common molecular pathways are involved during the early stages of pituitary, dental, and skull development, which include signalling mediated through bone morphogenetic proteins, fibroblast growth factors, and hedgehog proteins.[6,7] Moreover, disruption in these signalling pathways can give rise to inherited syndromic conditions that can include abberations of the sella turcica as part of the clinical spectrum of the disease.

This study describes the morphological appearance and linear dimensions of the sella turcica in subjects with skeletal class II malocclusion. The rationale came from previous observations demonstrating an increased prevalence of localized dental anomalies and extremes of craniofacial skeletal variation in subjects with sella abnormalities.[8] Furthermore, it has been demonstrated that anomalies associated with sella turcica can be a feature of human craniofacial syndromes.[9] Shape variation in the sella turcica has long been reported by many researchers.[10-14] Gordon and Bell[10] classified the sella turcica into circular, oval, and flattened, or saucer shaped. Davidoff and Epstein[15] used the term 'J-shaped sella ', while 'omega sella' was introduced by Fournier and Denizet.[16]

In a recent study Axelsson[4] et al., the shape of the sella turcica was categorized into six main types; normal sella turcica, oblique anterior wall, double-contoured sella, sella turcica bridge, irregularity (notching) in the posterior part of the sella, and pyramidal shape of the dorsum sellae (Fig.2). Sella turcica bridging or calcification of the ICL (interclenoid ligament) is seen in association with inherited developmental conditions that can affect the craniofacial region.[17]

An alteration in the shape of the sella turcica can be misleading since it may be present in 'normal' subjects[11,13,14], as well as in medically compromised subjects such as those with spina bifida[18] and craniofacial deviations.[19]

In the current study, approximately 61 percent of the subjects appeared to have a normal shaped

sella turcica, while 39 percent presented with different aberrations. Axelsson[4] et al. reported 68 percent as normal. The finding of an irregular notching of the dorsum sella was about 19 percent in present study and 11 percent in the previous study. A doubled contour floor was present in 2.27 percent of the subjects of the current study, which is much lower than that reported by Alkofide.[20] In the current study, sella bridge was found in only 6.82 percent of the subjects which is much more than that previously reported by Alkofide.[20] These differences can be due to different sample size and ethnic origin of subjects in current study. Moreover in present study both partial and incomplete calcifications of ICL were counted as sella turcica bridge.

When determining if any differences existed in the present study between males and females in terms of sella turcica size, length and diameter are found to be more in females while depth is more in male subjects (Fig. 4). But these differences are not statistical significant. Similar findings were reported by Israel[21] who concluded that sella turcica size in young adult males and females were almost the same. On the other hand, Haas[22] compared the mean size in square millimetres of the sella area of boys and girls aged 3 – 17 years and found some differences due to gender. He reported that the sella turcica of boys was greater than girls, but after 17 years of age, the sella of females were slightly larger than that of males.

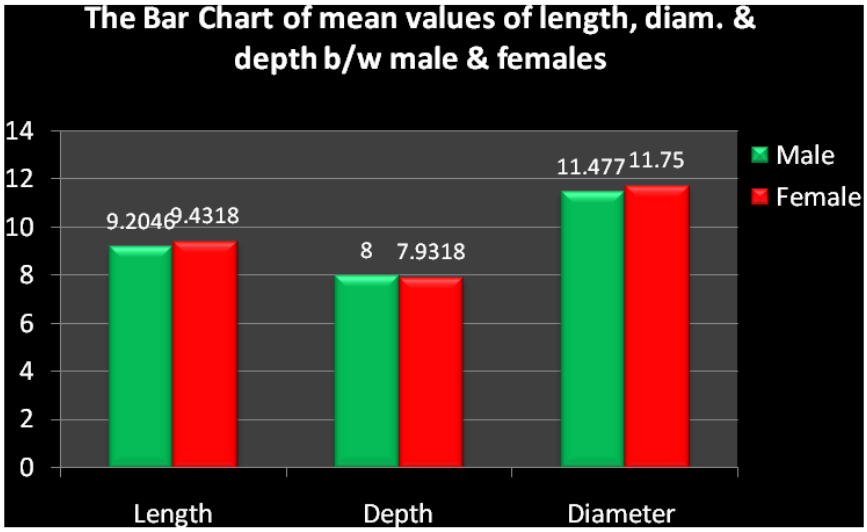

Fig. 4 The bar chart of mean values of length, diam. & depth b/w male & females

Preston[23] showed no statistically significant correlation between facial type and the mean sella area of the pituitary fossa. however, contrary to the current study in which linear dimensions were used, the mean sella area was measured by Preston.[23] Alkofide[20] compared linear dimensions of sella turcica in skeletal Class II and Class III subjects, and found a significant difference between the diameter of the sella turcica in both classes. An increase in diameter size was found to be more common in Class III subjects, while a reduced diameter size was more prevalent in Class II individuals. In the present study, when skeletal type and linear dimensions of sella turcica were evaluated, differences were found in length, depth and diameter of sella in skeletal class I and class II (Fig. 5). In general class II subjects have smaller dimensions of sella turcica. But statistical significant difference is found only in depth of sella between class I and class II. (Fig.5). We feel depth is a more reliable parameter than diameter because it uses base of pituitary fossa as the reference point. In measuring diameter, furthest point on the posterior inner wall of the fossa is used which is difficult to locate.

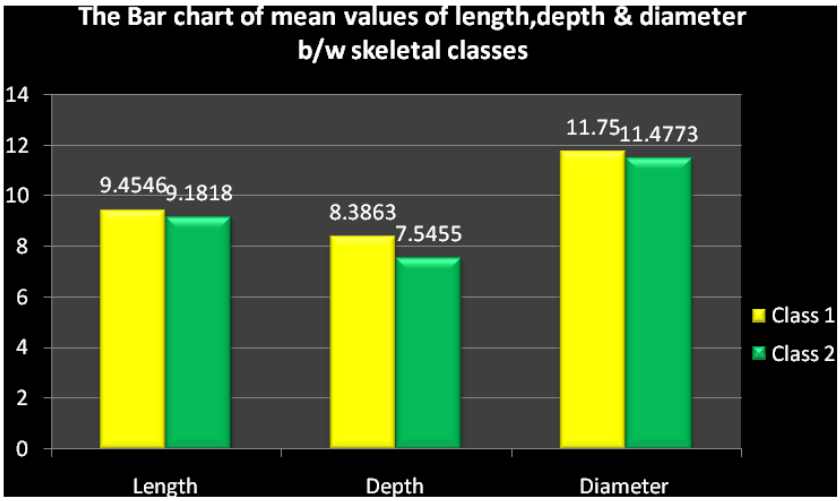

Fig. 5 The Bar chart of mean values of length, depth & diameter b/w skeletal classes

CONCLUSIONS

It is concluded from the study that the linear dimensions of sella can be used to approximate the size of the pituitary gland in different malocclusions. This may aid the clinician when confronted with an abnormally large or small sella area on lateral cephalograms. The orthodontist should also be familiar with the different shapes of the sella area, in order to help distinguish pathology from normal developmental patterns.

Following conclusions are drawn from the study:

1. Approximately 61 per cent of the investigated subjects had a normal sella shape.
2. No significant differences in size of the sella could be found between genders.
3. When sella size was compared with skeletal type, a significant difference was found in depth of sella between Class I and Class II subjects. Smaller depth measurements were apparent in Class II subjects.
4. Average depth of sella in class II skeletal malocclusions is found to be 7.55mm

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How to cite this Article: Vaishnav PD, Philip P, Shetty S, Mogra S, Batra P, Dhillon M. Sella turcica morphology- A diagnostic marker for skeletal class II malocclusion? J Dent Specialities, 2015;3(1):22-28

Source of Support: NIL
Conflict of Interest: None Declared

Quantitative and qualitative analysis of T- lymphocytes in varying patterns of oral lichen planus - An immunohistochemical study

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ABSTRACT

Background: Oral lichen planus (OLP) is a T- cell mediated autoimmune disease in which the T cells trigger apoptosis of the basal cells of the oral epithelium. An early event involves keratinocyte antigen expression or unmasking of an antigen that may be a self-peptide. Later, the T- cells (mostly CD8 positive and some CD4 positive cells) migrate into the epithelium resulting in basal cell degeneration facilitated by a chemokine-mediated migration. These migrated CD8 positive cells are activated directly by antigen binding to major histocompatibility complex (MHC) - I on keratinocyte or through activated CD4 positive lymphocytes. Subsequent antigen presentation to CD4 positive T cells & interleukin (IL)-12 activates CD4+ T helper cells which activate CD8 positive T cells through receptor interaction, interferon-γ and IL-2. The activated CD8 positive T cells in turn kill the basal keratinocytes through tumor necrosis factor (TNF) - α or granzyme B activated apoptosis.

Aims and Objectives: To evaluate CD4 & CD8 positive T-lymphocytes qualitatively & quantitatively and their distribution in various clinical variants of oral lichen planus.

Methodology: The study comprised of a total 20 cases of OLP (atrophic-erosive and reticular variant) and 5 cases of normal oral mucosa which were histopathologically confirmed and then subjected to immunohistochemical staining with CD8 positive and CD4 positive antibodies using heat induced epitope retrieval method.

Results: The mean number of CD4 positive and CD8 positive cells were higher in atrophic-erosive variant of oral lichen planus (OLP) in comparison to the reticular variant.

Conclusion: Increased count of T lymphocytes in atrophic-erosive variant as compared to reticular OLP suggests their possible role in immunological mechanism in the pathogenesis of OLP and probably explains the reason for their higher malignant transformation rate as compared to other clinical forms of OLP.

Key words: Oral Lichen planus, Keratinocytes, Oral Mucosa, Premalignant, CD4 Positive T-Lymphocytes, CD8 Positive T-Lymphocytes

Received: 16-02-2015
Accepted: 26-03-2015

Introduction

Lichen planus (LP) is a chronic inflammatory mucocutaneous disorder that affects the skin, mucous membranes, nails, and scalp. Prevalence of oral lichen planus is about 0.5% to 2% with female to male ratios of approximately 2:1.[1]

Oral lichen planus(OLP) is a T-cell mediated chronic inflammatory oral mucosal disease of unknown etiology.[2] OLP presents as white striations, papules, plaques, erythema, erosions or blisters affecting predominantly the buccal mucosa, tongue and gingivae.[3,4] The World Health Organization (WHO) presently classifies OLP as oral potentially malignant disorder, particularly erosive and atrophic variants.[5]

The precise cause of Oral lichen planus (OLP) is not known. Few authors suggest it to be a T- cell mediated autoimmune disease; in which the T cells trigger apoptosis of the basal cells of the oral epithelium. Others suggest the cell mediated immunity to be involved in the pathogenesis of OLP.[4]

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CD4 and CD8 T cell surface molecules play a role in T cell recognition and activation by binding to their respective class II and class I major histocompatibility complex (MHC) ligands on an antigen presenting cell (APC).[6] Effector T cells are of three functional types that detect peptide antigens derived from different types of pathogen. Peptides from intracellular pathogens that multiply in the cytoplasm are carried to the cell surface by MHC class I molecules and presented to CD8 T cells. These differentiate into cytotoxic T cells that kill infected target cells.[7]

Peptide antigens from pathogens multiplying in intracellular vesicles, and those derived from ingested extracellular bacteria and toxins, are carried to the cell surface by MHC class II molecules and presented to CD4 T cells.[7] It has been shown previously that cutaneous lichen planus is a T-cell mediated inflammatory disease with pathogenetic role of both CD8 positive cytotoxic T cells and CD4 positive helper T cells. There is a predominance of cytotoxic T cells in the dermal-epidermal infiltrate responsible for keratinocyte damage. Helper/inducer CD4 positive T cells are found in the perivascular dermal infiltrate, which may be assisting the cytotoxic cells in the keratinocyte damage.[8] In oral lichen planus, an increased distribution and

frequency of CD4 and CD8 positive T lymphocytes cells in the lamina propria predominantly in the sub-basal region has been shown.[9]
The present study was designed to assess CD4 & CD8 positive T- lymphocytes qualitatively & quantitatively and their distribution in various clinical forms of OLP and also to correlate the role of CD4 & CD8 positive T- lymphocytes in the pathogenesis and malignant potential of OLP.

MATERIAL AND METHODS

Sample Collection:

The study was conducted in the Department of Oral and Maxillofacial Pathology and Microbiology, I.T.S. Centre for Dental Studies and Research, Murad Nagar, Ghaziabad, Uttar Pradesh using the tissue specimens retrieved from the archives. 25 samples of formalin-fixed paraffin-embedded (FFPE) tissue specimens were selected from the archives of the department. A total of 10 cases of atrophic-erosive, 10 cases of reticular oral lichen planus and 5 cases of normal oral mucosa were selected. The selection criteria included OLP cases with history of occurrence of the lesion for 2-6 months (moderate disease duration). Patients with previous history of treatment for OLP were excluded from the study. All cases were reviewed and the diagnosis was confirmed according to the histopathological criteria defined by WHO (2003).

Immunohistochemistry procedure:

For immunohistochemical staining, 4µm FFPE tissue sections were deparaffinised and quenched in endogenous peroxidase enzyme for 10 min duration followed by immunostaining using the monoclonal mouse anti-human primary antibodies against CD4 & CD8 (Thermo Scientific). Heat induced epitope retrieval was done using antigen retrieval machine (Biogenex) using citrate buffer. Antigen-antibody signal amplification was achieved by using an indirect enzyme labelled method by using a 3, 3'diaminobenzidine (DAB) as the chromogen. Sections of lymph node were used as positive controls.

Immunohistochemical evaluation:

The quantitative assessment was performed by selecting 5 representative fields at high magnification (40x) for each case. Photomicrographs of each field were captured and transferred onto the computer system for analysis using a digital grid using image analysis software (Olympus Magnus MLX series).1000 mononuclear immune cells in 5 HPF in basement membrane zone were counted for each case and the total number of cells and the number of positively stained cells were recorded.
The pattern, intensity and distribution of IHC staining of all the test and control sections were evaluated using a light microscope under various magnifications (up to 40x).The staining intensity was graded into four groups: 0- No staining, + (Weak, <10% cells stained),++ (Moderate, 10-49% cells stained) and +++ (Strong, 50% or more cells stained).

RESULTS

CD4 positive T-lymphocytes and CD8 positive T-lymphocytes showed membranous or cytoplasmic staining in all the study cases. There was no difference in the distribution of the type of immune cells between reticular and atrophic-erosive OLP cases. However, CD4 positive cells were seen more predominantly in the subepithelial region while CD8 positive cells were diffusely distributed in the connective tissue in both reticular (Fig. 1,2) and atrophic-erosive variants of oral lichen planus (Fig. 3,4) study cases.

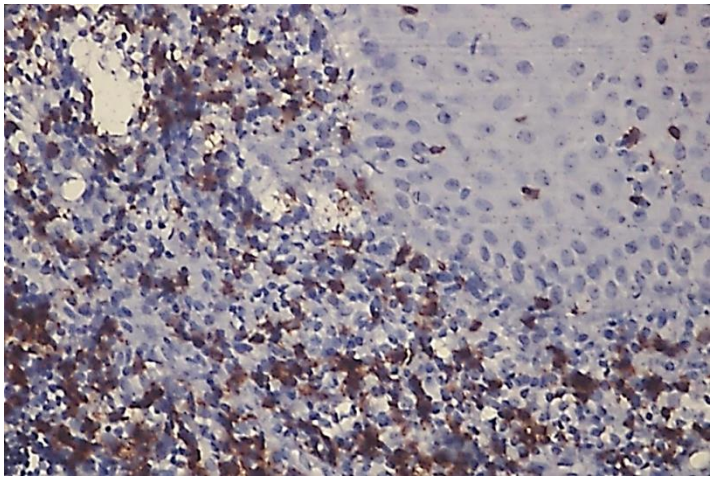


Fig. 1: Photomicrograph showing CD8 positive lymphocytes in the subepithelial region in reticular oral lichen planus (40x).

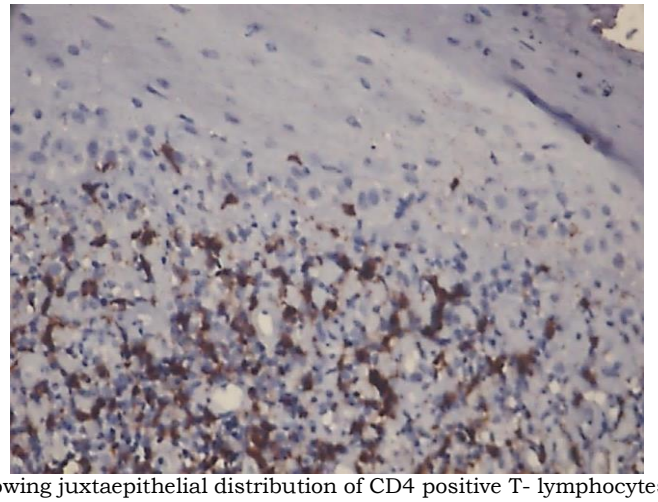


Fig. 2: Photomicrograph showing juxtaepithelial distribution of CD4 positive T- lymphocytes in reticular oral lichen planus (40x).

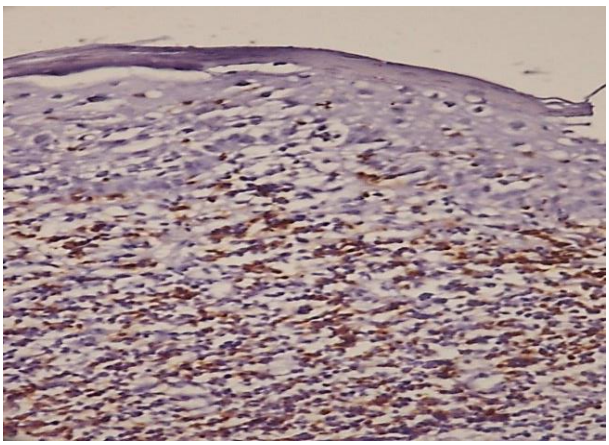


Fig. 3: Photomicrograph showing diffuse distribution of CD8 positive lymphocytes in atrophic-erosive oral lichen planus(40x).

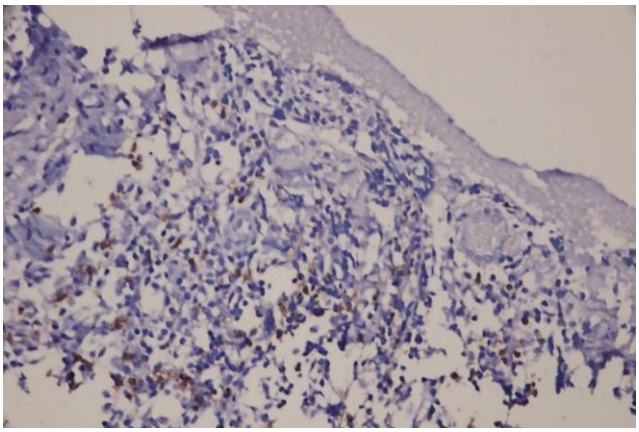
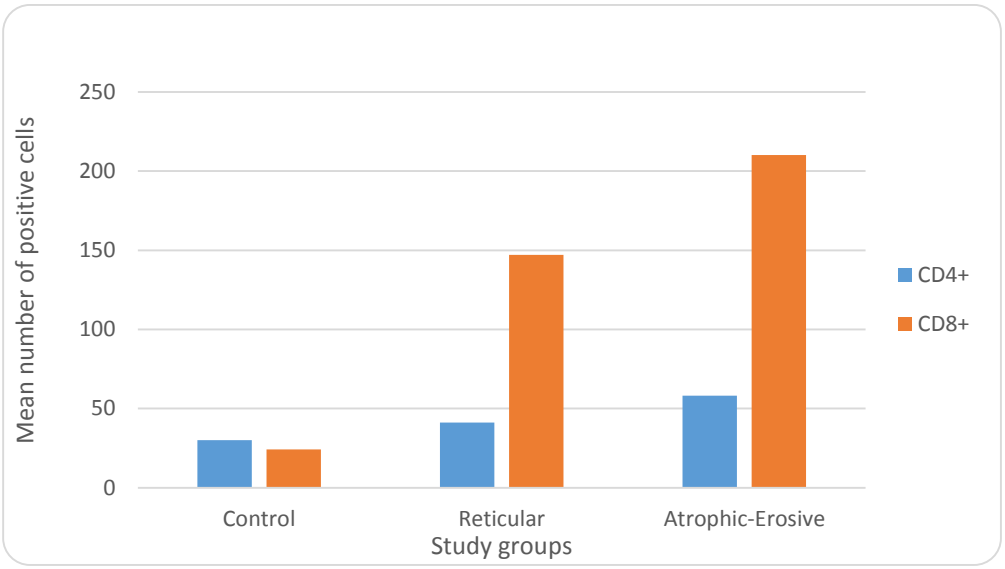


Fig. 4: Photo micrograph showing CD4 positive lymphocytes in atrophic-erosive oral lichen planus in the deeper connective tissue (10x).

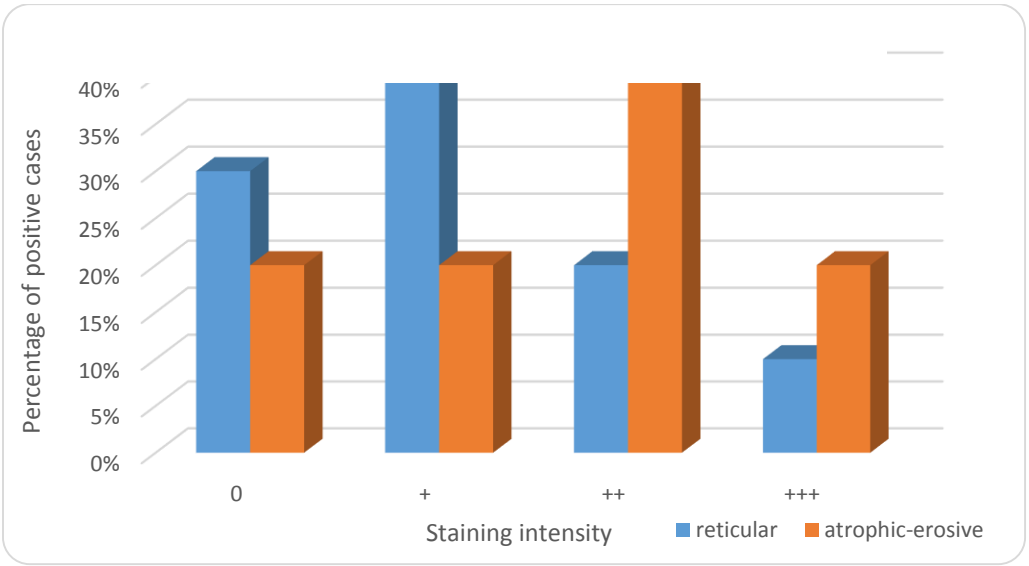
The mean number of CD4 positive cells were higher (58.20± 32.24) in atrophic-erosive in comparison to reticular lichen planus cases (41.20± 31.58) and control group (30± 6.78) (Graph1). The mean number of CD8 positive cells were also higher (210.20± 24.68) in atrophic-erosive in comparison to reticular lichen planus cases (147.10± 29.37) and control group (24.20±7.60) (Graph1). Both the observations were statistically insignificant ($p > 0.05$).

The staining intensity was assessed for CD4 positive and CD8 positive cells and it was observed that most of the study cases showed weak staining for CD4 positive cells in reticular

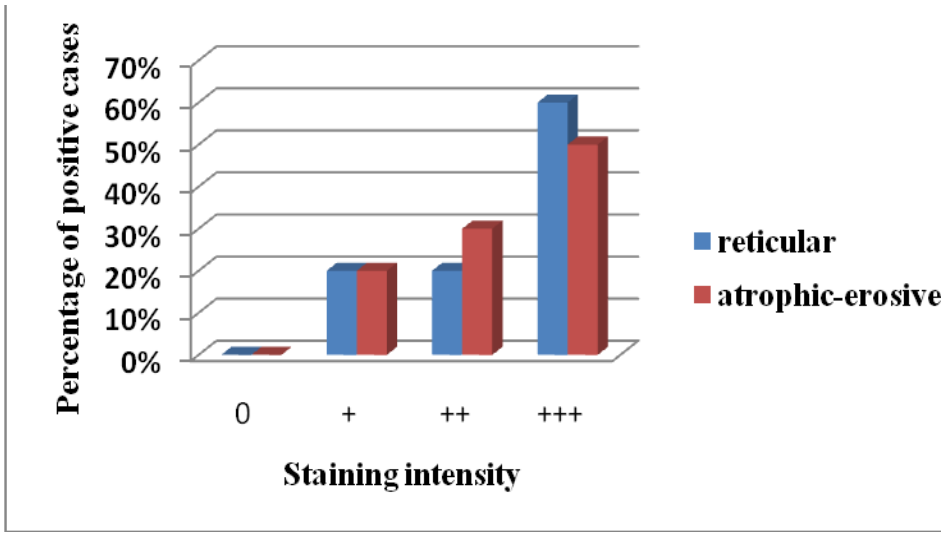
lichen planus group while predominantly moderate staining intensity was seen in atrophic lichen planus cases(Graph 2). CD8 positive lymphocytes showed stronger staining intensity in reticular as well as in atrophic erosive lichen planus study groups (Graph 3).



Graph 1: Mean number of CD4 and CD8 positive T- lymphocytes in study groups



Graph 2: Staining Intensity of CD4 positive T- lymphocytes in the Study Groups



Graph 3: Staining Intensity of CD8 positive lymphocytes in the Study Groups

DISCUSSION

Oral lichen planus (OLP) is presently considered a chronic disease of unknown etiology and with a multifactorial pathogenesis. The reticular form of lichen planus, which is the most common type, is characterized by numerous interlacing white keratotic lines or striae that produce an annular or lacy pattern. The buccal mucosa is the site most commonly involved and demonstrates striae typically in a symmetric pattern bilaterally. Other sites involved may be tongue followed by gingiva and the lips. In the erosive form of lichen planus, the central irregular ulceration is usually covered by a fibrin plaque or pseudomembrane, often surrounded by fine radiant keratinized striae with a networked appearance. In the atrophic form, diffuse red lesions are exhibited and it may resemble the combination of two clinical forms, such as the presence of white striae characteristic of the reticular type surrounded by an erythematous area.[10,11]

The modified WHO (2003) clinical criteria include bilateral presence of symmetrical lesions and white reticular lesions. The lesions may be atrophic, erosive, bullous or manifest in the form of plaque, appearing along with reticular lesions in a given area of the oral cavity. A classic case of lichen planus must satisfy the clinical criteria. Lesions that simulate a lichen planus but do not meet the modified WHO criteria are considered to be clinically compatible with lichen planus.[12]

Sinon et al confirmed the predominance of T lymphocytes over B lymphocytes, as has been previously shown by other studies (Hirota et al. 1990; Jungell et al. 1989; Walsh et al. 1990).[13-16] The present study showed significantly higher number of T lymphocytes in OLP as compared to control cases. Also, in the present study, the number of CD8 positive cells were higher than CD4 positive cells in OLP cases in all clinical variants (Graph 1). Dorrego et al[17] and Khan A et al[18] have also observed that higher number of CD8 positive T cells/ mm^2 compared to CD4 positive T cells. Contrary to this, some studies have shown a higher proportion of CD4 positive helper T lymphocytes compared to CD8 positive cells. Previous studies by Bhan AK et al[19] have related cellular distribution with disease progression. In early lesions, there was an influx of CD4 positive helper T lymphocytes whereas in cases with longer duration there was a substantial increase in CD8 positive cytotoxic T cells which were associated with membrane disruption.[16,20,21]

The present study also showed CD8 positive T-lymphocytes and CD4 positive T-lymphocytes constitute higher proportion of cellular infiltrate in atrophic-erosive lichen planus as compared to reticular lichen planus. Brant et al (2012)[12] found increased apoptosis of epithelial cells in basal and parabasal layer and number of lymphocytic infiltrate in the stroma of erosive lichen planus as compared to reticular form which contributes to decrease thickness of epithelium, facilitating erosion and ulceration corresponding to the aggressive clinical form in the former group. The author supported the above finding by stating that positive correlation between number of lymphocytes in inflammatory infiltrate and apoptosis in the epithelium in erosive OLP shows cause-effect association which seems to confirm that lymphocytes within the infiltrate are responsible for apoptosis of epithelial cells whereas minor symptoms, less inflammation and thereby less epithelial apoptosis in reticular OLP can be associated to the negative correlation between apoptosis in the inflammatory infiltrate and in the epithelium.[22]

Karatsaidise et al. (2003) proposed that reduced epithelial thickness is not related to apoptosis but it may be contributed to abnormal or premature terminal differentiation of the keratinocytes which causes sloughing off keratinocytes from the epithelial surface. This pathological change in the epithelium (reduced epithelial thickness) possibly could be correlated to the production of different cytokines and growth factors (TNF-α,IFN-γ & IL-2) by inflammatory infiltrating cells mainly lymphocytic in nature.[23]

Carewicz et al(2008)[24] showed that in initial lesions, corresponding with reticular forms of OLP, the predominant lymphocyte subset constitute CD4 positive T-lymphocytes, whereas in more advanced atrophic-erosive lesion the number of CD8 positive T-lymphocytes cells increases substantially as seen in the present study as well.

The staining intensity of CD8 positive and CD4 positive immune cells showed strong staining in OLP cases than controls in the present study. Among the OLP cases, atrophic-erosive group showed strong staining compared to reticular type and was found to be statistically significant for CD8 positive cells (Graph 3&4). Most authors support the idea that immune system allows proliferation and activation of T lymphocytes which are involved in OLP (Porter et al. 1997; Sugerman et al. 2002; Thornhill 2001; Walsh et al. 1990)[16,20,25,26] Macrophage migration inhibitory factor(MIF) released from T-cells and macrophages, suppresses the transcriptional activity of the p53 tumor suppressor protein. This along with MMP-9 (released from T-cells) and keratinocyte TGF-β1 may promote carcinogenesis in OLP. [27]

CONCLUSION

The number of CD4 positive and CD8 positive T lymphocytes were higher in OLP cases as compared to normal cases showing strong evidence of immunological mechanisms involved in the pathogenesis of OLP. Increase in CD4 and CD8 positive T lymphocytes in atrophic-erosive group in the present study explains the probable role of these subsets of immunological pathways in chronicity and malignant transformation rate of OLP.

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How to cite this Article: Juneja S, Srivastava D, Raina S, Kumar K, Shetty DC, Rathore AS. Quantitative and qualitative analysis of T- lymphocytes in varying patterns of oral lichen planus - An immunohistochemical study. J Dent Specialities,2015;3(1):29-35

Source of Support: NIL
Conflict of Interest: None Declared

Effect of multibracket orthodontic appliance on frequency and severity of enamel demineralization - A prospective study

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Received: 27-02-2015
Accepted: 25-03-2015

ABSTRACT

Objective: To evaluate the effect of comprehensive orthodontic treatment on frequency and severity of white spot lesions (WSLs).

Methods: Total 92 (M=43, F=49) subjects in the age range of 12-35 years seeking comprehensive orthodontic treatment were screened for the study. Among 92 subjects, 46 subjects (M=18, F=28) who fulfilled the selection criteria were included in the study. In 46 subjects, a total of 1026 teeth were examined for the evaluation of WSLs. The frequency and severity of WSLs were recorded on a standard proforma at the beginning (T_0) and after completion of orthodontic treatment (T_1) by direct visual assessment and by DIAGNOdent. The pre-treatment (T_0) and post-treatment (T_1) visual and DIAGNOdent scores were compared by using Wilcoxon Signed Rank test. The P-value of 0.05 was considered as the level of significance.

Results: The frequency of WSLs among subjects seeking comprehensive orthodontic treatment was increased significantly from the pre-treatment value of 65.2% to post-treatment value of 95.7% ($P < 0.001$). Of 1026 teeth examined, 107 (10.4%) teeth had white spot lesions at the beginning of orthodontic treatment and 272 (26.5%) teeth had white spot lesions at the end of orthodontic treatment ($P<0.001$). The mean DIAGNOdent score was comparable between the pre and post-treatment evaluation ($P=0.282$).

Conclusion: Treatment of malocclusion by comprehensive orthodontic treatment had a significant effect on the development and severity of white spot lesions.

INTRODUCTION

Development of white spot lesions (WSLs) around the orthodontic brackets is a common problem, jeopardizing the health and esthetics of the teeth. The frequency of WSLs in patients treated with fixed orthodontic appliances is reported to be up to 50% and these can be seen as early as 4-weeks after bracket placement.[1] The overall prevalence of WSLs among orthodontic patients varies from 0-97%.[2] There are many prophylactic measures have been introduced to prevent the enamel demineralization during multibracket appliance treatment. One of the commonly used measures for the prevention of WSLs during fixed orthodontic treatment is the use of topical fluorides.[3] However, there are differences in the frequency of WSLs development among patients to patients and from one region to another. Therefore, keeping in view, the high prevalence and incidence of white spot enamel lesions in various populations; it is necessary to estimate the effect of comprehensive orthodontic treatment in the development of such problem, so that various preventive measures can be considered. Thus, the present study was designed to assess the effect of multibracket appliance on enamel demineralization among individuals undergoing comprehensive orthodontic treatment.

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MATERIALS AND METHODS

The study was approved by the Institute Review Board (IRB No. 16/4Trg/MDS/11/16223). Total 92 (M=43, F=49) subjects in the age range of 12-25 years were initially screened for the study. Those subjects with full complement of teeth except those extracted for orthodontic treatment and 3rd molars were included for the study. Subjects having cleft lip and palate deformity or any syndrome, multiple restorations on labial surfaces and presence of enamel hypoplasia due to fluorosis were excluded from the study. Among 92 subjects, 46 subjects (M=18, F=28) fulfilled the inclusion and exclusion criteria were included in the study. After selecting a subject for the study a written understood consent was obtained and the study was performed in accordance with the Declaration of Helsinki. The frequency and severity of WSLs were recorded on a standard proforma at the beginning (T_0) and after completion of comprehensive orthodontic treatment (T_1) by direct visual assessment and by DIAGNOdent (KAVO Dental Corporation, Lake, Zurich, III).

All brackets were bonded with a Transbond XT light-cured bonding agent (3M Unitek, Monrovia, Calif). For bonding of brackets, teeth were cleaned with pumice, rinsed and dried thoroughly. The area where the bracket was to be placed was etched with a 37% orthophosphoric acid gel (3M ESPE) for 15 seconds and then was rinsed with water. After rinsing, the enamel surface was dried with compressed moisture and oil free air. A layer of Transbond XT primer was applied to the tooth and bracket mesh. Transbond XT adhesive paste

was applied to the base of the bracket and was pressed firmly onto the tooth surface. Excess adhesive was removed, and the adhesive was light-cured with the Adec LED curing unit for 20 seconds. All subjects were explained to maintain good oral hygiene during fixed orthodontic treatment and at each visit they were motivated to maintain this. All subjects were advised to brush at least 3-minutes after each meal with a fluoride-containing tooth paste (Colgate Total). No other topical fluoride application was used during the study period. During the fixed appliance orthodontic treatment, the archwire was ligated to the brackets by stainless steel ligature wire.

In 46 subjects, a total of 1026 teeth (from 1st molar on right side to the 1st molar on left side in maxillary and mandibular arch) were examined for the evaluation of WSLs. For the recording of WSLs, the tooth surface was polished by non-fluoridated pumice powder and were rinsed and dried thoroughly.

In direct visual assessment, the scoring systems proposed by Gorelick et al.[1] was followed. Various scores and criteria as suggested by Gorelick et al. are described in table-1. The DIAGNOdent was used to quantify the severity of white spot lesions according to the fluorescence. While recording with the DIAGNOdent, the conical tip of the DIAGNOdent was moved over the enamel surface from the gingival margin of the bracket base to the gingival margin of the tooth. The DIAGNOdent was calibrated for each patient on a sound enamel site (incisal one third of the maxillary central incisor), as recommended by the manufacturer). All the teeth were examined carefully with the tip of the DIAGNOdent held in contact with the tooth surface and tilted around the measuring site so that fluorescence would be collected from all direction. A maximum recording for the evaluation was recorded. Each tooth was examined twice and the mean was considered as final reading.

Table-1: The scores and criteria for recording the white spot lesions.

Score	Criteria
1	No white spots or decalcification
2	Slight white spot formation or decalcification in one area
3	Severe white spot formation or many areas of decalcification
4	Excessive white spot formation and cavitations.

STATISTICS

The statistical analysis was carried out using statistical package for social sciences (SPSS Inc., Chicago, IL, version 17.0 for Windows). Descriptive statistics was used. The pre-treatment and post-treatment visual and DIAGNODent scores were compared by using Wilcoxon Signed Rank test. The P-value of 0.05 was considered as the level of significance.

RESULTS

The mean age of the subjects at the beginning and end of the study was 17.36 ±5.70 years and 19.41 ± 5.76 years respectively. A total of 1026 teeth were examined in 46 subjects. Among 46 subjects, 30 (65.2%) subjects had one or more white spot lesions at the beginning of orthodontic treatment and 44 (95.7%) subjects had one or more white spot lesions at the end of comprehensive orthodontic treatment ($P < 0.001$). The number of teeth affected with white spot lesions before and after the comprehensive orthodontic treatment is described in table-2. Of 1026 teeth examined at the beginning of orthodontic treatment, 919 (89.6%) teeth had not any white spot lesions and only 107 (10.4%) teeth had one or more white spot lesions. At the end of orthodontic treatment, 754 (73.5%) teeth had no white spot lesions and 272 (26.5%) teeth had one or more white spot lesions. The number of teeth having one or more white spot lesions at the end of comprehensive orthodontic treatment was significantly more compared to the beginning of orthodontic treatment. ($P<0.001$) The distribution of teeth with varying severity of white spot lesions according to Gorelick's visual score before and after the orthodontic treatment is described in table-3. The mean DIAGNOdent score was changed from the pre-treatment value of 3.46±3.34 to the post-treatment value of 3.63±3.62, and the difference was comparable ($P=0.282$).

Table-2: Distribution of teeth with white spot lesions before and after orthodontic treatment.

Presence or Absence of White Spot Lesions	Before orthodontic treatment	After orthodontic treatment	Significance (P-Value)
	Number of Teeth n (%)	Number of Teeth n (%)	
ABSENT	919 (89.6 %)	754 (73.5 %)	**0.000*** **
PRESENT	107 (10.4 %)	272 (26.5 %)	
Total	1026 (100 %)	1026 (100 %)	

*** = P<0.001

Table-3: Distribution of visual scores before and after the comprehensive orthodontic treatment.

Visual Scores	Before orthodontic treatment	After orthodontic treatment	Significance (P-value)
	Number of Teeth n (%)	Number of Teeth n (%)	
1	919 (89.6%)	754 (73.5 %)	**0.000*** **
2	88 (8.6 %)	222 (21.6 %)	
3	5 (0.5 %)	24 (2.3 %)	
4	14 (1.4 %)	26 (2.5 %)	
Total	1026 (100 %)	1026 (100 %)	

*** = P<0.001

Table-4: DIAGNOdent score among the subjects prior-to and after the comprehensive orthodontic treatment.

DIAGNOdent Score	Number of Teeth	Mean ± SD	Significance P-value
Before orthodontic treatment	1026	3.46 ± 3.34	0.282^{NS}
After orthodontic treatment	1026	3.63 ± 3.62	

NS = Non-significant

DISCUSSION

White spot lesions are one of the most common adverse effects of orthodontic treatment and can have lasting negative effects on dental esthetics.[4] The overall prevalence among orthodontic patients varies from 2% to 96%[1,5-8] depending on the methods used to assess the decalcification. On visual examination we found significant increase in the frequency of WSLs following comprehensive orthodontic treatment. This could be due to the accumulation of plaque around the orthodontic attachments which resulted decalcification of enamel. However, on DIAGNODent evaluation, there was no increase in the severity of WSLs following comprehensive orthodontic treatment. The DIAGNOdent readings should be interpreted with caution because DIAGNOdent readings may be affected by stains, calculus and plaque[9] and are based on bacterial metabolites[10], which are not directly related to the problems perceived by patients or doctors.

Therefore, combined use of technology-based methods and visual assessment is the best approach for the evaluation of enamel demineralization, which was used in this study.

We found the frequency of WSLs following comprehensive orthodontic treatment as 95.7%, which was similar with the results of previous studies. Although the frequency of WSLs was very high (95.7%) at the end of comprehensive orthodontic treatment but it was only 15.9% higher compared to the frequency at the beginning of treatment. This was because 65.2% of the patients had already one or more WSLs at the beginning of comprehensive orthodontic treatment. Similar to our observation, Mizrahi[5] reported that the frequency of WSLs among patients seeking comprehensive orthodontic treatment as 72.3 % at the beginning and 84% following completion of orthodontic treatment. Julien et al.[2] also found the development of WSLs only 23.4% of the patients during their course of treatment. However, in contrast to our observation, Sagarika et al.[11] found 75.6% frequency of WSLs after orthodontic treatment compared to 15.6% in control group who had registered for orthodontic treatment.

Of 1026 teeth examined, 919 (89.6%) teeth had no WSL, 88 (8.6%) teeth had one WSL, 5 (0.5%) teeth had two or more WSLs without cavitation

and 14 (1.4%) teeth had two or more WSLs with cavitation at the beginning of orthodontic treatment. However, at the end of comprehensive orthodontic treatment, 754 (73.5%) teeth had no WSL, 222 (21.6 %) teeth had one WSL, 24 (2.3%) teeth had two or more WSLs without cavitation and 26 (2.5%) teeth had two or more WSLs with cavitation. Thus, during the comprehensive orthodontic treatment new WSLs were developed only in 165 teeth. Similar to our observation [12] examined 469 teeth for decalcification after orthodontic treatment and found that 371 (79%) teeth had no WSL, 61 (13%) had one WSL, 33 (7%) had more than one WSLs without cavitation and 4 (1%) had more than one WSLs with cavitation. When there are WSLs at the beginning of orthodontic treatment these lesions usually become more severe during the comprehensive orthodontic treatment. The presence of brackets, bands and arch wires impair oral hygiene measures and increase plaque retention sites.[13] Thus, it is more difficult to maintain adequate oral hygiene and this may explain the much stronger relationship between caries incidence in orthodontic patients than in non-orthodontic individuals.[14] As a result of increased plaque accumulation, the level of caries-inducing bacteria in the oral cavity is elevated. The consequently lower pH of the retained plaque on the enamel surfaces adjacent to orthodontic brackets hinders the remineralization process, thus resulting in decalcification. Such initial enamel decalcifications can be seen as early as 4-weeks in the absence of any fluoride supplementation after the initiation of multibracket appliance treatment.[15]

Thus, the prevention of WSLs should be one of the objectives during the comprehensive orthodontic treatment. Various measures to prevent plaque accumulation and plaque bacteria metabolic activity; and formation of fluoroapatite crystals and stimulation of remineralization should be emphasized.

CONCLUSIONS

The following conclusions were drawn from the present study.

1. The frequency of white spot lesions was increased significantly from 65.2% at the beginning of orthodontic treatment to 95.7% at the end of orthodontic treatment.
2. Comprehensive orthodontic treatment increases the severity of existing white spot lesions.

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How to cite this Article: Lone EA, Utreja AK, Singh SP, Jena AK. Effect of multibracket Orthodontic appliance on frequency and severity of enamel demineralization - A prospective study. J Dent Specialities, 2015;3(1):36-39

Source of Support: NIL
Conflict of Interest: None Declared

Contrary electrode positions and its effect on the accuracy of apex locator

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Received: 24-10-2014
Accepted: 26-03-2015

ABSTRACT

Aim: Clinically evaluate the effect of varying the conditions and the position of the contrary electrode on the accuracy of apex locators to determine the working length.

Methodology: Thirty patients requiring endodontic intervention of as many maxillary anterior teeth were randomly selected. Root ZX, a 3rd generation apex locator was used to determine the electronic working length (EWL). Three positions of the contrary electrode were evaluated Group I: held at the corner of the patient's mouth in contact with oral mucous membrane, Group II: held in the patients' dry hand, Group III: held in patients moist hands. Three consecutive readings were taken at each position and the mean calculated.

Results: The readings obtained for group II & III were analyzed against group I using Altman Criterion for Agreement Analysis. A mean difference of 0.73 and 6.52mm was observed between group I & III and between groups I & II respectively.

Conclusion: Moist hands can be an alternate placement position for the contrary electrode during EWL determination.

INTRODUCTION

Accurate determination of the root canal length is imperative for the success of endodontic therapy. Grove (1930) stated that 'the proper point to which root canals should be filled is the junction of the dentin and the cementum and that the pulp should be severed at the point of its union with the periodontal membrane' (1). The cemento dentinal junction (CDJ) is the anatomical and histological landmark where the periodontal ligament begins and the pulp ends. Root canal preparation techniques aim to make use of this potential natural barrier between the contents of the canal and the apical tissues (2). It is generally accepted that the preparation and obturation of the root canal should be at or short of the apical constriction (3). The problem clinicians often encounter is the inability to accurately identify and prepare up to this landmark. Traditional methods for establishing working length include the use of anatomical averages, digital tactile sensation, paper point and radiographs. In endodontics, the preoperative radiograph is essential to determine the presence or absence of disease, anatomy of the root canal system and to act as an initial guide for working length. Radiograph based method for working length determination has an inherent drawback of being a 2D representation of a 3D object. Moreover apical constriction is a histological landmark and hence cannot be identified on an x-ray and the apical foramen may not always correspond with the radiographic apex (lateral exit).In addition the anatomic noise, variation in the techniques', and observer's bias in radiographic interpretation can reduce the accuracy of this method. Above all,the hazard of radiation exposure always remains as a concern.

Electronic method for root length determination is an adjunct to radiographs. It was first investigated by Custer in1918 and revisited by Suzuki in 1942 who studied the flow of direct current through the teeth of dogs. Since then several advancement and modifications have led to the advent of various generations. This classification is based on the type of opposition to the current flow and the number of frequencies involved.

The first generation apex locators exhibited erroneous readings in the presence of electrolytes. This was overcome with the development of the self-calibrating Root ZX (J. Morita, Tokyo, Japan) apex locator. This is a 3rd generation EALs that uses dual-frequency and is based on comparative impedance principles that was described by Kobayashi & Sunada (6). The Root ZX mainly detects the change in electrical capacitance that occurs near the apical foramen. Intracanal, the Root ZX simultaneously measures two impedances at two frequencies (8 and 0.4kHz). A microprocessor in the device calculates the ratio of the two impedances. The quotient of the impedances is displayed on a liquid crystal display meter panel and represents the position of the instrument tip inside the canal. A number of in-vitro and in-vivo studies have reported on the accuracy and reliability of the Root ZX apex locator (7, 8).

Basically all electronic apex locators function by using the human body to complete an electrical circuit (9). One side of the apex locator's circuitry is connected to the oral mucosa through a contrary electrode (lip clip) and the other side to an endodontic file which is introduced into the root canal and advanced apically till its tip touches the periodontal tissues at the apex. This completes the electrical circuit and device indicates that the apex has been reached. Human

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body is a good conductor of electric current (11) so if the contrary electrode is placed in the hands the circuit should be completed and the apex locater should give reliable readings. Hence the aim of this clinical study was to evaluate the effect of varying the conditions and the position of the contrary electrode on the accuracy of apex locators to determine working length. The null hypothesis tested was that varying the position of the lip clip would have no effect on the accuracy of apex locators.

MATERIALS & METHOD

Thirty patients with maxillary anterior teeth indicated for root canal therapy were randomly selected to be part of the study. Informed written consent was taken. Pre-operative X-ray was taken and presence/absence of periapical radiolucency were noted .Access opening under rubber dam with a nonmetallic frame was done. A crown down technique for root canal preparation was followed. Root ZX a 3rd generation apex locator was used in this study. It was operated according to the operating manual (10). The first file which closely approximated to the apical diameter of the canal was used to determine the working length

Three positions of the contrary electrode were evaluated

Position I: Corner of the patient's mouth in contact with oral mucous membrane

Position II: Contrary electrode held in the patients' dry hand

Position III: Contrary electrode held in patients moist hands

Patient preparation:

For position II patients' were asked to hold contrary electrode with visibly dry hand.

For position III patients' were asked to hold contrary electrode with moist hand.

At position I, the file was advanced till the "apex reading" on the apex locator. Three consecutive readings at this point were taken and the mean calculated.1mm was subtracted from this reading and the instrument was set and a digital radiograph taken to correlate radiographic working length with electronic working length (_+.5mm-1mm from the radiographic apex was kept as the acceptable limit, and was taken as the final working length.)

Similarly, at position II & III three consecutive readings were taken, mean calculated, 1mm subtracted and this was taken as the final working length.

The results were tabulated and compared.

RESULTS

The final working length readings at position I was taken as the standard after verifying it with digital radiograph. The readings obtained at position II & III were also tabulated and analyzed against position I using Altman Criterion for Agreement Analysis (Table 1). Results of the study have showed that, there was a mean difference of 0.73mm (0.5- 1mm) between group I & III and an average difference of 6.52mm (5-6mm) between group I & II.

Table 1: Altman Criterion for Agreement Analysis between Different Groups with Root ZX

	r	β	$\overline{r}$	ICC	Mean Difference (mm)
Gr I - Gr II	0.78	0.94	N.S	0.82	6.52
Gr I - Gr III	0.97	0.99	N.S	0.99	0.73

r = correlation/β = regression coefficient/ $\overline{r}$ = Diff. value in methods Vs mean value of methods/N.S = non significant/ICC = Intra class corrélation

DISCUSSION

There is a general consensus that root canal procedures should be limited within the confines of the root canal (3), with the logical end-point for preparation and filling being the narrowest part of the canal. It is not possible to predictably detect the position of the apical constriction clinically, indeed, the constriction is not uniformly present, or may be irregular. Equally, it is not logical to base the end-point of root canal procedures on an arbitrary distance from the radiographic apex as the position of the apical foramen is not related to the 'apex' of the root. Electronic root canal length measuring devices offer a means of locating the most appropriate end-point for root canal procedures, albeit indirectly. The principle behind most apex locators is that tissues have certain characteristics that can be modeled by means of a combination of electrical components. Then, by measuring the electrical properties of the model (e.g. resistance, impedance) it should be possible to detect the canal terminus.

In the impedance ratio-based apex locators the AC source is a two-frequency source, i.e. it comprises two sine waves with a high and a low frequency (fH and fL respectively). The impedance of the model is measured at each frequency and the position of the file is determined from the ratio between these two impedances: ratio =Z (FH)/Z(Fl).Kobayashi & Sunada (1994) proved that the ratio had a definite value determined by the frequencies used and that the ratio indicates the location of the file tip in the canal. When the impedances to two frequencies are measured Z1 is always less than Z2 i.e. the ratio Z1:Z2 is always less than one. This is due to the electrical properties and capacitance of the canal .Since the walls of the canal has a much lower electrical capacitance than the apical foramen, the quotient of the two impedances is nearly one when the tip of the file is some distance from the apical foramen but at positions close to the canal terminus, however, the capacitive characteristic of the impedance starts to appear. The influence of the capacitance on the overall impedance is proportional to the frequency of the measurement. At high frequencies (fH) the overall

impedance value will be much lower than at low frequency (fL). That means, at the apical constriction the ratio tends to be towards a small value. This ratio is independent of the electrolyte liquid and conditions inside the canal. This is because a change in the electrolyte material will influence equally the numerator and denominator of equation and hence the final ratio will still remain constant. This concept underpins the development of the Root ZX apex locator. This fundamental operating principle could explain why there was no statistically significant difference between their ability to determine the apical constriction in roots with vital pulps versus those with necrotic pulps (8) and/or various irrigants (12).This was also the basis of our study. The role of the contrary electrode is to complete the circuit using the human body .It is usually placed at the corner of the mouth in the vestibule area to provide a moist contact which in turn minimizes contact resistance allowing efficient current flow and also since the current has to take a smaller path from the lip through the gums to the periodontal ligament, to complete the electrical circuit. The device would be sensitive to even small changes in the electrical properties of the tooth. In our study the contrary electrode was held in the hand which also served to complete the electrical circuit using the human body. When we held it in a moist hand the current had to flow through a longer electrical path, therefore the impedance Z which depends on resistance and capacitance, would now include the total resistance of the path which would be more than the previous due to the lip clip, therefore the values of resistance and capacitance will change, changing the reactance values of its capacitor Xc and hence impedance Z. But, since this device measures a ratio of Zh/Zl, any change in the numerator will also be shown in the denominator such that the ratio will be constant and we do get a clinically acceptable reading. The fact that we were getting a false reading with a dry hand means that there is already an increase of the total capacitance which is not due to the pathway but due to the conditions i.e. dry hand. The dry hand is probably acting as an insulator and behaving as a bad conductor. An insulator always has a high dielectric constant and hence there is an increase in capacitance .Even when the file is half way through the canal the increase in capacitance is considerable such that Zh/Zl quickly becomes less than one and we get a false reading which means the apex locator is reading it as the apex.

The probable advantages of the contrary electrode being held in the moist hand are no chance of getting a false reading due to the contrary electrode coming in contact with metal restoration in the mouth, sterilization would not be a critical issue since it would not come in direct contact with body fluid and it can also be used in patients with severe xerostomia where a moist oral contact would not be possible otherwise.

The purpose of this study was to present an observation which has been made during the course of this study. This needs to be further investigated by the manufacturers of (various) apex locator and scientific evidence provided, changes incorporated in the circuit of the device before it can be used for working length determination clinically. Electronic apex locators have become indispensable adjuncts to the root canal therapy. Application of rubber dam is an essential practice that helps in preventing root canal re-infection and procedural mishaps, that can sometimes be life threatening. Using an apex locator with lip clip attached under rubber dam is a cumbersome procedure.

CONCLUSION

Moist hands can be an alternate placement position for the contrary electrode during electronic working length determination.

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How to cite this Article: Logani A, Singh A, Chawla A, Kumar V, Shah N. Contrary electrode positions and its effect on the accuracy of apex locator. J Dent Specialities,2015;3(1):40-42

Source of Support: NIL
Conflict of Interest: None Declared

Survey on knowledge, attitude and practice of forensic odontology among private dental practitioners in Ghaziabad city, India

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ABSTRACT

Introduction: Forensic odontology involves application of dental sciences in the identification of deceased individuals through comparison of ante-mortem and post-mortem records**.**

Aim: To study knowledge, attitude and practice of forensic odontology among private dental practitioners in Ghaziabad city.

Material and Methods: A questionnaire based cross–sectional survey was conducted on 137 private dental practitioners in their dental clinic at Ghaziabad city**.** A 20 Item Structured questionnaire was used to assess knowledge of dentist about the significance of dental records, indicators of child abuse, dental age estimation, identification of an individual, bite marks and dentist as a witness in the court for forensic evidence. Questions regarding their attitude and practice about maintenance of dental records and source for update on recent advances in dental practice were assessed.

Results In our study only 11% B.D.S and 23% M.D.S dental practitioners maintain dental records in their clinic. 98.4% of B.D.S and 90% of M.D.S dental practitioners said that their knowledge level/ awareness regarding forensic odontology were perceived to be inadequate. 77% of B.D.S and 66% of M.D.S dental practitioners did not know the relevance of maintaining dental records for identification of criminals and dead-bodies. 96.7% of B.D.S and 95.9% M.D.S dental practitioners were not confident in handling forensic dentistry related cases.

Conclusion: Our study revealed prevalent inadequate knowledge, poor attitude and lack of practice pertaining to patient's dental record maintenance and clinical knowledge of forensic odontology among dental practitioners in Ghaziabad.

Received: 09-02-2015
Accepted: 24-03-2015

Keywords: Forensic odontology, Dental practitioners, Ghaziabad, knowledge, Attitude, Practice, Dental record.

INTRODUCTION

The word Forensic is derived from the Latin word forum, which means "court of law" and Odontology denotes study of teeth. Forensic odontology as defined by FDI is that branch of dentistry which in the interest of justice deals with the proper handling and examination of dental evidence and with the proper evaluation and presentation of dental findings.[1] Identification of an individual through dentition is not new to us. In India, first case of identification using dentition was that of king Canouj, Jayachandra Rathore in 1191, who died in war and his body was recognized by his false anterior teeth.[2]

Forensic odontology involves application of dental sciences in the identification of deceased individuals through comparison of ante-mortem and post-mortem records.[3] Maintaining the superior, comprehensive quality of ante-mortem dental records leads to quicker and easier identification of the remnants. Indian Dental Association recommends that the records, radiographs, models, photographs and clinical correspondence should be securely retained for at least the legal minimum period of five years to gratify judiciary and consumers, for protection against medical negligence.[4]

The law enforcement authorities in India usually seek the help of dental surgeons in government service rather than dental practitioners who have degrees in forensic odontology. Also there are very few qualified forensic odontologists available in India. Private dental practitioners use to examine and treat a lot of patients daily during their practice hours, thus maintaining some sort of records for certain period of time. So, with increase in road traffic accidents, crime, violence, epidemic diseases and mass catastrophe, private dental practitioners can also play an important role in solving such cases. However, Dentists often sustain a poor quality of dental record maintenance in their clinics that leads to difficulty in dental identification of their patients.[4] Dearth of data on this perspective in Ghaziabad the catchment area of I.T.S-C.D.S.R, Muradnagar directed us to conduct present cross sectional survey for assessing the knowledge, attitude and practice of the private dental practitioners regarding forensic odontology.

MATERIAL AND METHODS

After obtaining approval from Institutional authority of I.T.S-C.D.S.R, a questionnaire based

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cross–sectional survey was conducted on 137 private dental practitioners in their dental clinic at Ghaziabad city during the month of July and August 2012.

List of private dental practitioners was prepared from commercial contact directories of Ghaziabad city. Through convenient sampling 150 private dental practitioners were approached and explained about the purpose of study telephonically by calibrated investigator, 137 of them gave verbal participatory consent and fixed the schedule with investigator. A self – reported, validated pretested close-ended questionnaire in English language based on previous studies was employed after pilot survey. Questionnaire includes response elicited through multiple choices and yes/no questions. A 20 Item Structured questionnaire was used to assess the knowledge of dentist about the significance of dental records, indicators of child abuse, dental age estimation, identification of an individual, bite marks and dentist as a witness in the court for forensic evidence. Questions regarding their attitude and practice about maintenance of dental records and source for update on recent advances in dental practice were assessed. To ensure reliability of the survey, a pilot study was done on 20 dental practitioners. The Questionnaire was explained by the investigator which was filled and returned by the study subjects in 10 -12 minutes. Data entry and Descriptive Statistical analysis was done by employing SPSS version 16.0.

RESULT

Of the 137 returned questionnaire, 120 were completely filled & were included in the analysis. Among 120 dental practitioners (90 male and 30 female), 85 were B.D.S and 35 M.D.S dental practitioners. Regarding maintenance of dental records (Table No. 1), only 11% B.D.S and 23% M.D.S dental practitioners do maintain dental records at their respective clinic. Among B.D.S dental practitioners those who maintain dental records, only 46.4% of them maintained dental records for less than 2 years, 40.5% for 2-5 years and 13.1% for more than 5 years. Among M.D.S dental practitioners 22.9% maintained dental records for less than 2 years, 51.4% for 2-5 years and 25.7% for more than 5 years (Table no.2). 98.4% of B.D.S and 90% of M.D.S dental practitioners said that their knowledge level/ awareness regarding forensic odontology were perceived to be inadequate. 77% of B.D.S and 66% of M.D.S dental practitioners did not know the relevance of maintaining dental records for identification of criminals and dead-bodies. 80% B.D.S and 68% M.D.S dental practitioners were not aware that dentist can present forensic dental evidence in the court as an expert witness. 93.4% of B.D.S and 93.4% of M.D.S dental practitioners were never been called by authority/court for forensic dental evidence. 96.7% of B.D.S and 95.9% M.D.S dental practitioners were not confident in handling forensic dentistry-related cases. Only 6.6% of B.D.S and 6.6% of M.D.S dental practitioners had handled forensic dentistry related cases before.

21.7% of B.D.S dental practitioners and 31.6% of M.D.S dental practitioners said that they know they have a role in identifying deceased in the incident of mass fatality. 84.1% of B.D.S dental practitioners and 93.3% of M.D.S dental

Table No.1: Questions assessing the knowledge, attitude and practice of forensic odontology.

QUESTIONS	B.D.S		M.D.S	
	Yes	No	Yes	No
Do you maintain dental records in your clinic?	11%	89%	23%	77%
Do you know that you can present forensic dental evidence in the court as an expert witness?	20%	80%	32%	68%
Do you know the relevance of dental records in recognising the dead and accused criminal?	23%	77%	34%	66%
Do you have knowledge about bite mark patterns of teeth?	76%	24%	84%	16%
Had you been called by authority/court for forensic evidence related?	6.6%	93.4%	6.6%	93.4%
Do you think you have a crucial role in identifying deceased in the incident of mass fatality?	21.7%	78.3%	31.6%	68.4%
Are you confident in handling forensic dentistry-related cases?	3.3%	96.7%	4.1%	95.9%
Can you estimate the dental age of an individual by examining the teeth?	84.1%	15.9%	93.3%	6.7%
Do you think your present knowledge level/ awareness about forensic dentistry is adequate?	1.6%	98.4%	10%	90%
Can you identify indicators of domestic violence and child abuse?	80.3%	26.7%	82.5%	17.5%
Have you handled any forensic dentistry related cases before?	6.6%	93.4%	6.6%	93.4%
Have you been trained about forensic dentistry during your education period?	6.6%	93.4%	4.1%	95.9%
Are you a part of forensic team in your city?	0	100%	1.6%	98.4%

Table No. 2: Duration of maintenance of dental records by dental practitioners

QUESTION	Education	< 2 years	2-5 years	>5years
For how long you maintain dental records?	B.D.S M.D.S	46.4% 22.9%	40.5% 51.4%	13.1% 25.7%

Table No.3: Modes of knowledge update by dental practitioners

QUESTION	Education	Specialised P.G course	Workshops	CDE/ Conference	Journal Books Internet
How do you upgrade your knowledge related to forensic dentistry	B.D.S M.D.S	4.1% 15.0%	14.1% 22.5%	18.3% 33.6%	63.5% 28.8%

practitioners said that they can estimate the dental age of an individual by examining the teeth. 80.3% of B.D.S dental practitioners and 82.5% of M.D.S dental practitioners could identify indicators of domestic violence and child abuse. 76% of B.D.S dental practitioners and 84% of M.D.S dental practitioners were aware of bite marks pattern.

B.D.S dental practitioners upgrade their knowledge related to forensic dentistry by (Table No. 3) Journal / Books / Internet (63.5%), CDE/Conference **(**18.3%), Workshops **(**14.1%), Specialised P.G course **(**4.1%) while M.D.S dental practitioners upgrade their knowledge related to forensic dentistry through CDE/ Conference **(**33.6%), Workshops **(**22.5%), Journal / Books / Internet **(**28.8%), Specialised P.G course (15%).

Only 6.6% of B.D.S dental practitioners and 4.1% of M.D.S dental practitioners had been trained about forensic dentistry during their education period. None of the B.D.S dental practitioners were part of the forensic team of the city. Only 1.6% of M.D.S dental practitioners were part of the forensic team.

DISCUSSION

Each person is worthy enough to retain the pride of their identity after death as well. Even though there are abundant acknowledged scientific identification methods, the proficiency of forensic odontologists is still a prerequisite. Being diverse and resistant to environmental challenges, teeth are well thought out to be excellent post-mortem material for identification with enough concordant points to make a meaningful comparison.[5] Furthermore; most restorative materials used by dentist are also resistant to post mortem destruction to certain extent. [6]

Scope of forensic odontology is wide and it includes identification of suspects in criminal investigations, suspected child or adult abuse, bite marks or physical injuries, determination of age and gender of the living or deceased person, presenting forensic dental evidence as an expert witness in the court and human identification through human remains that are decomposed and mutilated in mass disasters. The fruit for success of identification lies in accessibility and precision of record compilation and maintenance.

In our study M.D.S dental practitioners presented better level of knowledge and awareness about forensic odontology than B.D.S dental practitioners. Reason could be justified as majority of B.D.S dental practitioners upgrade their knowledge related to forensic dentistry by Books and Internet while M.D.S dental practitioners upgrade their knowledge through CDE, Conferences, Journals, and Workshops which are more updated sources.

According to British Medical Association, "An expert witness is a person who is qualified by his or her knowledge or experience to give an opinion on a particular issue(s) to a court." Based on the evaluation of the dental investigations, dentist can provide his viewpoint to the lawyer to solve criminal cases. In our study majority of dental practitioners were not aware that they can present forensic dental evidence and hence they were not confident enough in handling forensic dentistry-related cases.

Dentist has a role in identifying deceased in case of mass catastrophe as they can aid in issuing death certificate which helps in claiming the insurance, settlement of property, facilitate remarriage of a surviving spouse and allows last ritual of the body. Identifying feature include displaced / rotated teeth, restorations, carious tooth, missing teeth, occupational or habit-created wear facets, fractured teeth, diastema, prosthodontic appliances, extent of shovelling of the maxillary incisors, presence and angulation of impacted teeth, dental anomalies, intrinsic staining and bone level present. Sex of a person can be identified by finding out Barr bodies and Y-chromosomes in dental pulp. However, in our study only 21.7% of B.D.S and 31.6% of M.D.S knew the role of dentist in the event of mass disaster.

There is a need for maintaining the records officially and professionally to protect against any commercial, legal, and medico-legal litigation.[7] Indian law says Under Article 51 A(h) of the Constitution of India, there is a moral

obligation on the doctor and a legal duty, to maintain and preserve medical, medico-legal, and legal documents in the best interests of social and professional justice.[4] Results of our study suggested that only few of the dental practitioners maintain records and for more than 5 years. These findings were similar when compared with findings of the study conducted by Preeti S (2011)[3] and Madhusudan Astekar (2011)[8]. Dental practitioners of our study reported that they maintain records for follow-up, reference and maintaining the patient's appointment schedule, not for sole purpose of forensic.

For age estimation, the investigator is concerned with the person's degree of maturity. Age of a child can be identified by comparing eruption of primary and permanent teeth against the person's chronological age. Eruption of third molar, periodontal disease progression, tooth wear, multiple restorations, extractions, bone pathologies and complex restorative work could provide a clue about an older individual age. These markers have an accuracy of ±10-12 years.[9] In 2009 Druid et al.[10] proposed combining aspartic acid racemization analysis and enamel uptake of Radioactive Carbon-14 studies to provide age of unidentified body cases with more useful information. In our study both B.D.S and M.D.S dental practitioners were confident enough in estimating the age of children, teenagers and adolescents but not for adults and older people.

Dental clinicians, as other healthcare professionals are at the forefront in spotting signs of violence appearing on their patients. The dentist should be aware of child, elderly or spousal abuse and bite marks when confronted with unusual oral injuries, especially in cases of persons with accompanying body injuries.[11] Abusive trauma to the face and mouth includes fractured anterior teeth, missing or displaced teeth, fractures of the maxilla and mandible, laceration of labial frenum, bruised or scarred lips, face and neck. Kenney and Clark have cited numerous researches that suggest approximately 50% of injury in child abuse cases occur in the oral and perioral region. [12] Dentist should be able to distinguish the injury caused by bites through arch alignments and specific tooth morphology. From legal point of view, matching of bite marks produced on human tissues to a suspect's dentition may enable law enforcers to implicate the suspect in the crime case. Majority of dental practitioners of our study were confident in identifying domestic violence, child abuse and bite marks among their patients, but when asked about reporting to any authority on identification of abuse, none of them had reported to any authority.

Dentists should be aware of the legal impact of such cases and should refer them to the appropriate authorities for suitable action. Photographs and radiographs of the injury or injuries are often helpful to document injuries. Some laws penalize healthcare workers by imprisonment, and/or fines, for not reporting violence manifested on their patients.[13] Reasons commonly cited for a dentist's failure to report are lack of education about the signs and symptoms of abuse and neglect, ignorance of the reporting procedure and concern about making a false accusation and disrupting the dentist's relationship with the family.[14]

CONCLUSION

The results of our study suggest that in Ghaziabad city very few practitioners maintain complete records and very few knew the duration of dental record maintenance as stated by the law, which is a minimum of seven years to a maximum of ten years. It indicates that these dentists are not at all prepared for any kind of forensic and medico legal needs, be it for cases of consumer forum, civil or criminal litigation. The overall quality of record-keeping was poor in line with the records findings of other worldwide studies. It can be improved by introducing forensic odontology as subject in dental curriculum at both undergraduates and postgraduates levels. Institutions should offer formal training in forensic odontology. Consistent upgrading knowledge of dental practitioners and students through periodic CDE Program, Workshops and Conferences is obligatory.

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How to cite this Article: Sharma A, Shokeen S, Arora R, Dhaginakatti SA. Survey on knowledge, attitude and practice forensic odontology among private dental practitioners in Ghaziabad city, India. J Dent Specialities,2015;3(1):43-47

Source of Support: NIL
Conflict of Interest: None Declared

Bond strength assessment of metal brackets bonded to porcelain fused to metal surface using different surface conditioning method

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Received: 05-02-2015
Accepted: 26-03-2015

ABSTRACT

Introduction: Bonding of orthodontic brackets to porcelain surfaces always remain a challenge to the clinicians. Various modalities have been suggested for improving the bonding of the brackets onto the porcelain surfaces however none have been conclusive. Hence the aim of the study was to compare the bond strength achieved by metal brackets bonded to porcelain fused to metal surface by different surface conditioning methods.

Material & Method: 64 porcelain fused to metal discs were used to assess the shear bond strength and surface roughness tests were used to examine the effect of 4 different surface conditioning methods: Group I: Silane coupling agent, Group II: Sandblasting (APA- Air Particle Abrasion), Group III: 9.6% Hydrofluoric acid (HFA), Group IV: Fine diamond bur for bonding metal brackets to ceramic surfaces. Metal brackets were bonded to the ceramic substrates with a light cure composite. The samples were stored in 0.9% NaCl solution for 24 hours and then thermocycled (5000 times, 5°C to 55°C, 30 seconds). Shear bond tests were performed with a universal testing machine (Instron).

Result: All shear bond strength (SBS) values in present study were above optimal range except for Group I (Silane coupling agent) and Group III (9.6% hydrofluoric acid), rendering them clinically acceptable.

Conclusion: Diamond bur and sandblasting showed the highest bond strength. Increased damage to the ceramic surfaces was noted with the use of diamond bur and sandblasting. Hence sandblasting (APA) can be clinically used as it gives acceptable results in terms of bond strength and surface roughness, but the health risks should be considered.

INTRODUCTION

With the increase in number of adult patients seeking orthodontic treatment, bonding brackets onto various types of dental restorations has become a routine dental practice. Patients are increasingly demanding dental restorations that are both aesthetic and functional. One of the materials that particularly has presented problems to both the operative dentist as well as the orthodontist is porcelain surfaces. Whether the purpose is to repair a porcelain crown or to bond a bracket to such a restoration, the difficulty that clinicians face in both situations is that the porcelain surface essentially is inert i.e., it does not bond (adhere) readily to other materials.[1]

Since glazed porcelain surfaces are not amenable to resin penetration for orthodontic bonding, mechanical or chemical pre-treatment of the surface is essential for successful direct bonding. However, as the conventional acid-etching technique is not effective in pre-treatment of non-enamel surfaces, four types of surface-conditioning techniques have been suggested:

- Roughening the porcelain surface with a diamond drill or sandpaper discs.
- Sandblasting with aluminium oxide particles (APA- Air Particle Abrasion).
- Chemical preparation with hydrofluoric acid (HFA).
- Use of silanes (gamma-methacryloxypropyl-trimethoxy silane) which provide a chemical link between porcelain and composite resin and increase the wettability of the porcelain surface.

Conflicting results exist in the literature on the effects of the above conditioning methods and various adhesives.[2]

There has been no consensus in the literature regarding the best surface conditioning method for optimum brackets-porcelain bonding. The effect of different surface treatments on the roughness of the porcelain restorations was not assessed. Hence the aim of this study was to compare the bond strength achieved by metal brackets bonded to porcelain fused to metal surface by different surface conditioning methods and evaluate the effect of surface-conditioning methods on the ceramic surfaces.

MATERIAL AND METHOD

64 porcelain fused to metal discs of standard dimension of 10mm diameter, 2mm thickness of porcelain and 0.5 mm thickness of metal casting were used. The discs were manufactured with the help of a self-made dye and Feld spathic Vita porcelain (Vita, Bad Sackingen, Germany) of desired thickness was fired on them. Later on the

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ceramic was glazed. The specimens were embedded in acrylic moulds, so that only the glazed surface of the disc remained uncovered. These acrylic templates would fit into the jig of the universal testing machine, Instron which was used to determine the shear bond strength.

The sample blocks were colour coded in 4 different colours (white, blue, orange, green) for easy differentiation of the 4 different groups and each colored group consists of 16 specimens of the discs and the respective bracket used. Each group was subjected to different surface conditioning treatment. Shear bond strength of 15 specimens in each group was assessed and 1 specimen in each group was used for assessing the surface roughness after the surface conditioning treatment using the scanning electron microscope.

In group I (white), silane was applied to specimens without any roughening procedure.

In group II (blue), Air Particle Abrasion (APA) was performed using aluminium trioxide with an air abrasion device (Microetcher II Intraoral Sandblaster, Danville Engineering), filled with 50 µm aluminium oxide particles (Danville Engineering), at a distance of approximately 10mm and a pressure of 2.5 bars for 4 seconds.

In group III (orange), porcelain surfaces were etched with 9.6 per cent HFA (Pulpdent, Watertown, Massachusetts, USA) for 2 minutes, rinsed with a water/ spray combination for 30 seconds, and dried.

In group IV (green), mechanical roughening was performed with fine diamond burs. The cylindrical diamond burs, with shaft parallel to specimens, were rotated at 40,000 rpm with water coolant.

After chemical and mechanical roughening, the specimens were washed and rinsed thoroughly to remove debris, and then air dried. Subsequently, silane was applied on the porcelain surface with a microbrush and allowed to dry for 5 minutes. A thin uniform layer of sealant was applied on the porcelain surface with a microbrush and cured for 20 seconds (Transbond XT; 3M Unitek). The light cure adhesive paste (Transbond XT; 3M Unitek) was applied to mesh of the central incisor brackets (0.018 inch slot-from Ormco, Glendora, CA, USA). The bracket base surface area was calculated using the ImageJ software (developed by National Institute of Health, Maryland, U.S.A). The bracket was then properly positioned on the ceramic and subjected to 300 g of force. The test samples were stored in 0.9% NaCl solution for 24 hours. All samples were thermocycled 5000 times between 5°C and 55°C with a dwelling time of 30 seconds.

Shear bond strength

The acrylic block with embedded porcelain disc and bonded bracket was positioned in the jig to measure the force of debonding. An occluso-gingival load was applied to the bracket, producing a shear force at the bracket-tooth interface. A computer electronically connected with the Instron test machine recorded the results of each test in megaPascals(MPa) Fig:1. Shear bond strengths was measured at a cross-head speed of 1 mm/min

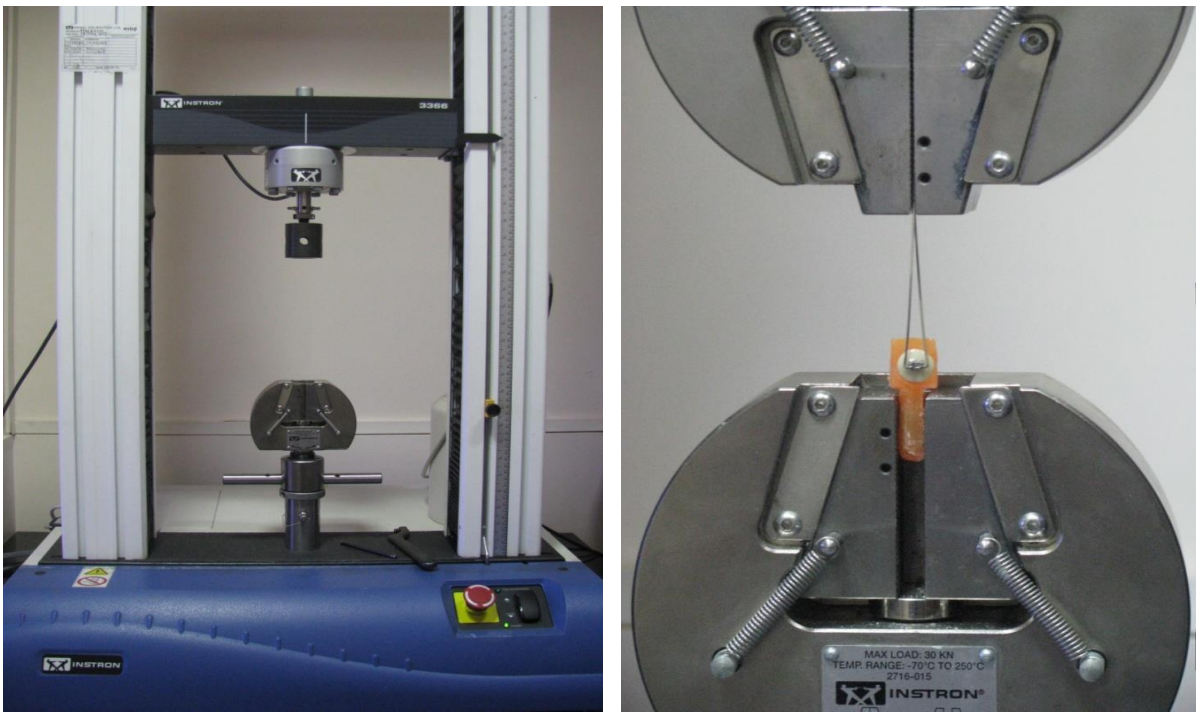

Fig: 1 Instron / Universal testing machine model no 3366 (instron corporation.) Shear bond strength testing

Scanning Electron Microscopy

To evaluate the effect of surface-conditioning methods on the ceramic surfaces, the surfaces of one specimens of each group were then conditioned with the same experimental protocol described above. One roughened specimens for each group was gold sputtered with a sputter coater and examined under a field emission scanning electron microscope (SEM, Carl Zeiss, EVO 18 Special Edition). The SEM photomicrographs were taken at 150x and 750x magnification.(Fig:2,3,4,5).

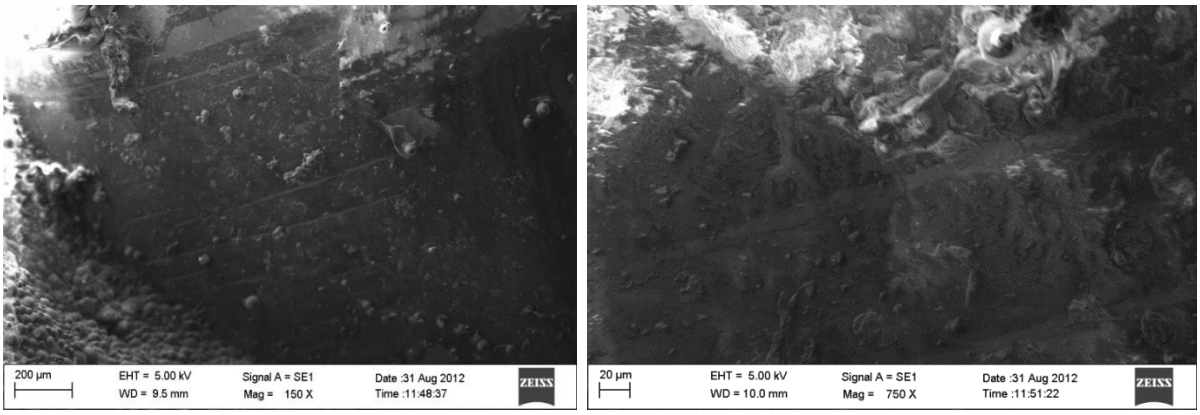

Fig: 2 Scanning electron microscopy photographs of an intact, glazed porcelain surface treated with silane at 150x, 750x showed no abrasion or peeling of the porcelain surfaces.

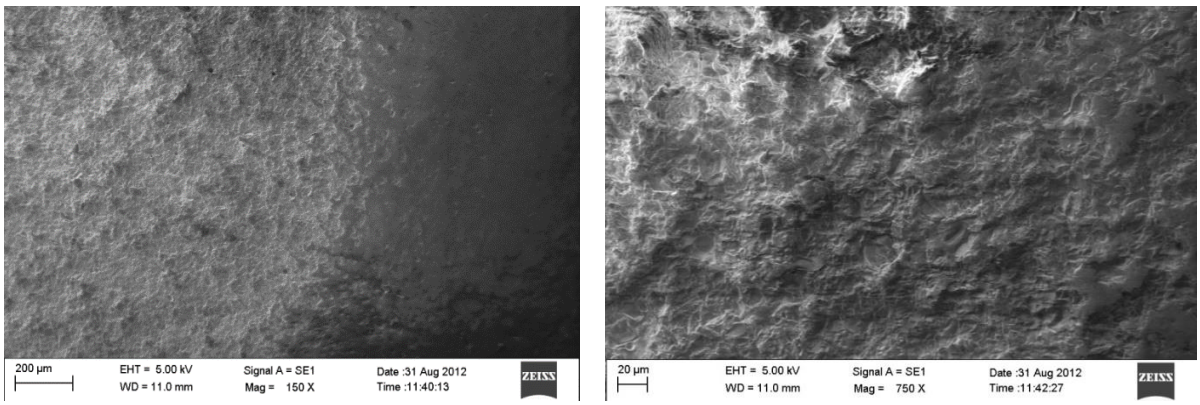

Fig: 3 Scanning electron microscopy photographs of a porcelain surface treated with sandblasting at 150x,750x showing uniform peeling with shallow undercuts on the porcelain surface

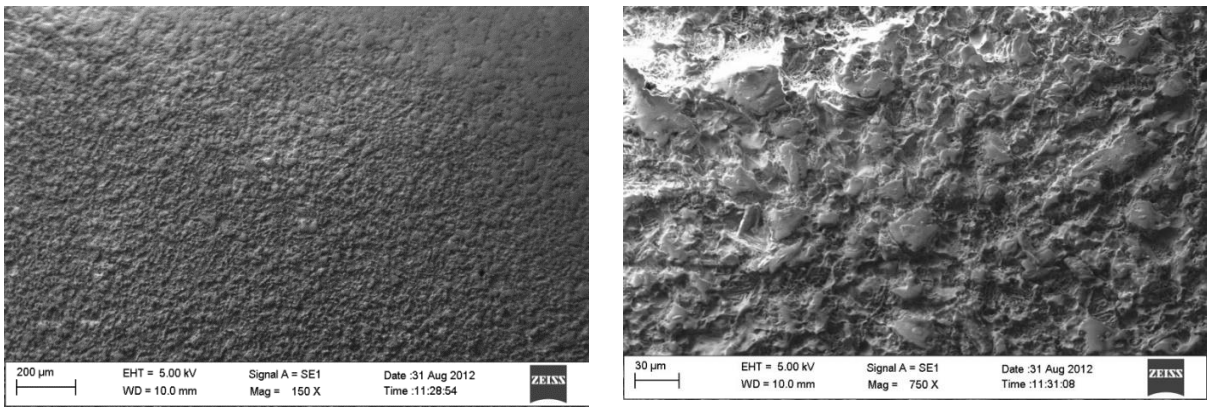

Fig: 4 Scanning electron microscopy photographs of a porcelain surface treated with hydrofluoric acid at 150x,750x showing pits with deeper undercuts and more loss of glazed surface

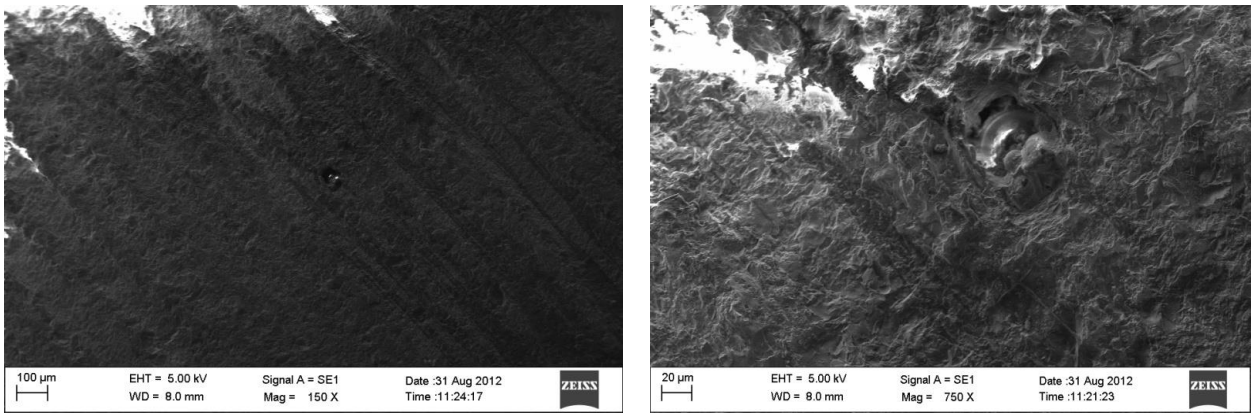

Fig: 5 Scanning electron microscopy photographs of a porcelain surface treated with diamond bur at 150x,750x showing roughened morphology- peeling and erosive appearance with deeper grooves and undercuts and loss of porcelain structure.

STATISTICAL ANALYSIS

The test statistics was performed using SPSS version 13. Descriptive statistics including the mean, standard deviation and confidence interval for mean were calculated for each group of sample tested. Analysis of variance (ANOVA) was used to determine whether significant differences existed between the various groups with significant difference. Significance of level was predetermined to p value <0.001.

The Bonferroni multiple comparison test was applied to find the group with significant difference. Significance of level was predetermined to p value <0.05.

RESULT

The mean, standard deviation and 95% confidence interval of shear bond strength value for all the groups were calculated.

Group I samples (white) , samples using silane only , showed mean, minimum and maximum bond strength of 3.7 MPa, 0.7 MPa and 7.5 MPa respectively (Table: I).

Group II samples (blue), samples roughened by sandblaster, showed mean, minimum and maximum bond strength of 10.52 MPa, 8.10 MPa and 14.56 MPa respectively (Table:I).

Group III samples (orange), samples etched with hydrofluoric acid showed mean, minimum and maximum bond strength of 5.82 MPa, 1.79 MPa and 13.19 MPa respectively (Table:I).

Group IV samples (green) showed mean, minimum and maximum bond strength of 11.81 MPa, 9.74 MPa and 15.91 MPa respectively. (Table:I)

ANOVA showed that p-value < 0.001 for comparison of all Groups suggesting that significant differences in mean bond strength existed (Table:I). The Bonferroni test showed that statistically highly significance difference existed between all the groups (Table:II). All SBS values in present study were above optimal range except for Group I (only silane) and Group III (9.6% hydrofluoric acid + silane), rendering them clinically acceptable.

Comparison of Shear bond strength

Table I: Descriptive statistics of the four groups and comparison of shear bond strength by anova tests. Significance of level was predetermined to p value <0.001.

	N	Mean	Std. Deviation	95% Confidence Interval for Mean		p value
				Lower Bound	Upper Bound	.001
Silane	15	3.7	1.9	0.7	7.5	
Hydrofluoric acid	15	5.82	2.59	1.79	13.19	hs
Sandblasting	15	10.52	3.22	8.10	14.56	
Diamond bur	15	11.81	3.43	9.74	15.91	

Stress at maximum load (MPa)

Multiple Comparisons

Table II: Multiple comparison of shear bond strength between four groups using Bonferroni test

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	p
Silane	Hydrofluoric acid	-6.104733(*)	1.808343	.008
	Sandblasting	-5.555467(*)	1.808343	.020
	Diamond bur	-5.982400(*)	1.808343	.010
Hydrofluoric acid	Silane	6.104733(*)	1.808343	.008
	Sandblasting	.549267	1.808343	1.000
	Diamond bur	.122333	1.808343	1.000
Sandblasting	Silane	5.555467(*)	1.808343	.020
	Hydrofluoric acid	-.549267	1.808343	1.000
	Diamond bur	-.426933	1.808343	1.000
Diamond bur	Silane	5.982400(*)	1.808343	.010
	Hydrofluoric acid	-.122333	1.808343	1.000
	Sandblasting	.426933	1.808343	1.000

* Significance of level was predetermined to p value <0.05.

DISCUSSION

The aim of this study was the evaluation of effectiveness of different surface-conditioning methods on shear bond strength of metal brackets bonded to porcelain fused to metal surface (feldspathic porcelain). Reynolds (1975)[3] stated that clinically adequate bond strength for a metal orthodontic bracket to enamel ranged from 6 to 8 MPa. All SBS values in present study were above optimal range except for Group I (only silane) and Group III (9.6% hydrofluoric acid + silane), rendering them clinically acceptable (Table: I).

In the present study, it was observed that the shear bond strength of Groups II and IV was above that suggested to be adequate. Group I samples, samples in which only silane was applied without any mechanical or chemical roughening got debonded with low bond strength. This could be because of high water solubility of silane. This showed that only silane cannot be used and hence it should be combined with chemical or mechanical roughening.

Chemical roughening with 9.6% HFA showed low SBS. Studies by Turk et al[4] and Sarac et al[5] showed the same. However, Kamada et al[6], Huang et al[7] and Harai et al[8] found HFA to be effective for improving both bond strengths. HFA is applied to increase micromechanical retention creating surface pits by preferential dissolution of glass phase from the ceramic matrix and to acidify the porcelain surface before silane application. The high aluminium oxide containing glaze and the increasing strength of porcelain makes its more resistant to chemical attack and reduces the effect of HFA etching.

The SBS achieved with APA was higher than that produced by HFA. However there is a disagreement concerning the effectiveness of APA with alumina in literature. Schmage et al[9], Ozcan et al[10] found APA with alumina particles to be more effective than chemical etching with HFA. Harari et al[8], Turkkahraman et al[2] and Karan et al[11] found that application of HFA was more effective than microetching with alumina.

It has been found that mechanical roughening with diamond burs and sandblasting provoked crack initiation and propagation within the ceramic. Since the crowns generally remain in the mouth after de-bonding, any damage to the ceramic surface should be avoided.[12] On the other hand, HFA has been found to be a harmful and irritating compound for soft tissues. Organosilane coupling agents are suggested to enhance bonding brackets to porcelain surfaces, but they fail to provide clinically sufficient bond strengths when used alone.[13] The result of the present study is in concordance with that of Zachrisson et al.

The SEM photomicrographs of the ceramic surface etched with 9.6% hydrofluoric acid revealed fewer pits and more loss of glazed surfaces. For the ceramic abraded with alumina, loss of glazed surface and mild roughening was seen. Uniform peeling or an erosive appearance with shallow penetrations and undercuts was observed when compared with chemical etching. The ceramic surface roughened with diamond bur showed more roughened morphology- uniform peeling or an erosive appearance with deeper grooves and additional undercuts were observed when compared to HFA and APA.(Fig:2,3,4,5).

These different microscopic appearances corroborate the SBS values. The bond strength gradually increased due to the gradual increase in roughening of the ceramic surface. Although roughening of the ceramic surface results in higher bond strength, removal of the glaze by grinding diminishes the transverse strength of the porcelain to half of that when the glaze was present. Cracks created during roughening lead to porcelain damage during debonding.

CONCLUSION

Under the conditions of this in-vitro study, it was concluded that

1. For minimal surface roughness, HFA or silica coating should be preferred as diamond bur and APA created higher surface roughness. The bond strength gradually increased due to the gradual increase in roughening of the ceramic surface
2. For optimal or higher bond strength, APA or diamond bur could be used, however use of diamond bur could lead to fracture of the ceramic surface.
3. Use of APA can be clinically recommended as it increases the bond strength with less surface damage.

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How to cite this Article: Vaishnav PD, Philip P, Shetty S, Mogra S, Batra P, Dhillon M. Bond strength assessment of metal brackets bonded to porcelain fused to metal surface using different surface conditioning method. J Dent Specialities,2015;3(1):48-53

Source of Support: NIL
Conflict of Interest: None Declared

Effect of different contaminants on the shear bond strength of a newly introduced self-etch adhesive system used with moisture protective barrier-An invitro study

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ABSTRACT

Aim and Objective: To assess and compare the shear bond strength of brackets bonded with two different self-adhesive systems with and without contamination (Water, Saliva and Blood) and to evaluate the effect of Salivatact on the shear bond strength obtained with Beauty Ortho Bond.

Material and Method: 15 premolars each (a total of 180) were bonded with Transbond XT plus, Beauty Ortho Bond and Beauty Ortho Bond with salivatact under various conditions i.e. dry, water, saliva and blood contamination. The shear bond strength and the ARI values were obtained and evaluated statistically.

Results: Transbond plus had the maximum bond strength in dry condition and when contaminated with water or saliva. The bond strength of Beauty Ortho Bond with and without salivatect was similar in dry condition and when contaminated with water or saliva.

The shear bond strength was lowest after the blood contamination in all the groups and highest for dry condition. Contamination with water and saliva resulted in similar strengths for all the groups. The bond strength achieved with all the three contaminants (water, saliva, blood) was similar when Salivatact was used.

Conclusion: Contamination decreases the bond strength for all the groups and this decrease is maximum in case of blood contamination. Bond strength of Transbond color change adhesive is higher than that of Beauty Ortho Bond under all conditions except when contaminated with blood using Salivatect. Beauty Ortho Bond using Salivatact had higher bond strength when contaminated with blood.

Received: 21-02-2015
Accepted: 28-03-2015

Keywords: Bracket bond strength, Beauty ortho bond, Blood contamination.

INTRODUCTION

Buonocore in 1955 demonstrated the increased adhesion of attachments to tooth surface by conditioning enamel surface with 85% phosphoric acid for 30 seconds.[1] This finding of Buonocore was brought into use in orthodontics by G.V. Newman in 1965 when he used epoxy resins to bond orthodontic attachments to teeth.[2] Since then various advances in bonding systems in the form of better bonding materials, increase in bond strength, different types of curing systems, decrease in curing times as well as combining the various steps of bonding have led to ease of bonding and thus their increased popularity. [3]

Conventional direct bonding of orthodontic brackets to the enamel surface involves three different agents: an enamel conditioner, a primer, and an adhesive resin. Besides being time-consuming this procedure requires a dry environment, which sometimes can be difficult to achieve. Moisture contamination is the most common reason for bond failure with composite resins and debonded brackets are inconvenient, delay treatment, require extra-appointments and might compromise treatment outcomes.[4]

Self-etching primers combine etching and priming in one single component with the advantage of saving time and reducing both the technique-sensitiveness and the chances for contamination.[5] Since these products are effective in bonding to enamel they have been used for direct bonding of orthodontic brackets.

Transbond Plus with Self-etching Primer (TPSEP, 3M Unitek, Monrovia, CA, USA) was the first self-etching primer commercialized for orthodontic purposes, and the one that has been mainly reported in the literature.[6]

Different studies have found that TPSEP can achieve adequate bond strength levels when applied to a dry enamel surface. Bond strength after saliva contamination, both before and after the application of TPSEP has also been reported in the literature.[7, 8] Beauty Ortho Bond, a newly developed light-cure orthodontic adhesive system has recently been introduced for orthodontic bonding. The manufacturers claim that Beauty Ortho Bond has a fluoride release and reabsorbing property and causes less decalcification of enamel. The material is supplied with an additional syringe of salivatect which enhances the bonding under moist conditions as it acts as a protective barrier against saliva contamination without hampering the bonding. The use of Salivatect is optional (only for cases

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prone to high saliva contamination) and does not alter the duration of light polymerization and bond strength (according to product manual).
There is a lack of orthodontic literature regarding shear bond strength of Beauty Ortho Bond when salivatact is used. Also the influence of water, saliva and blood contamination on the shear bond strength of Beauty Ortho Bond when used with and without salivatect have not been reported.

AIMS AND OBJECTIVES

The purposes of this in vitro study were:
To compare the shear bond strength of brackets bonded with two different self-adhesive systems (Transbond Self Etch Primer with Transbond Plus adhesive and Beauty Ortho Bond)
To assess the effect of different contaminants (Water, Saliva and Blood) on the bond strength of both the adhesive systems.
To evaluate the effect of Salivatact on the shear bond strength obtained with Beauty Ortho Bond with and without contamination.

MATERIALS AND METHOD

This study was conducted on 180 extracted human teeth collected from patients who had undergone extraction for orthodontic purpose. The teeth were stored in a solution of 0.1 % (wt. /vol.) thymol to prevent dehydration and bacterial growth. The buccal surfaces were cleaned and polished with non-fluoridated pumice paste applied with a rubber prophylactic cup on a slow-speed hand piece for 10 seconds, rinsed for 5 seconds and dried with oil and moisture free air spray for 5 seconds. Orthodontic stainless steel premolar brackets with .022 slot (Gemini Series, 3M Unitek) were used for this study.
The specimens were randomly divided into three groups and bonded according to one of the protocols described below. Each group had 4 sub-groups containing 15 teeth each.
Water, saliva, and blood were collected immediately before the contamination procedure. Water was taken from a water distiller machine. Saliva and blood were collected from one of the researchers. The donor was instructed to brush his teeth and refrain from eating for 1 hour so that saliva could be collected. To collect the blood, index finger was cleaned with alcohol and then punctured with a hypodermic needle.
Experimental groups were divided as follows:
Group 1- Transbond SEP with Transbond Plus adhesive was used for bonding of group 1. For group 1a the enamel surface was simultaneously etched and primed with Transbond Plus SEP, rubbed with the applicator brush for 5 seconds and then the bracket was bonded to the tooth surface using Transbond Plus color change adhesive. The specimen was light cured for 10 seconds each from mesially and distally. For subgroup 1b, 1c and 1d the tooth surface was contaminated before brackets were placed. The various contaminants used were water (1b), saliva (1c) and blood (1d). For this 0.1ml each contaminant was used with a syringe. The contaminant was just applied onto the tooth surface, air from an oil free spray was sprayed for 1 second to clear the contaminant and then the brackets were bonded to the tooth surface using Transbond Plus color change adhesive. The specimen was light cured for 10 seconds each from mesially and distally.
Group 2 - Beauty Ortho Bond adhesive was used for bonding of group 2. For group 2a the enamel surface was simultaneously etched and primed with equal mixing of primer A and primer B, rubbed with the applicator brush for 5 seconds and then the brackets were bonded to the tooth surface using Beauty Ortho Bond adhesive. The specimen was light cured for 10 seconds each from mesially and distally. For subgroup 2b, 2c and 2d the tooth surface was contaminated before brackets were placed. The various contaminants used were water (1b), saliva (1c) and blood (1d). For this 0.1ml of each contaminant was used with a syringe. The contaminant was just applied onto the tooth surface, air from an oil free spray was sprayed for 1 second to clear the contaminant and then the brackets were bonded to the tooth surface using Beauty Ortho Bond adhesive. The specimen was light cured for 10 seconds each from mesially and distally.
Group 3 - Beauty Ortho Bond adhesive was used along with Salivatact for bonding of group 3. For group 3a the enamel surface was simultaneously etched and primed with equal mixing of primer A and primer B, rubbed with the applicator brush for 5 seconds. After this salivatect was applied onto the bonding surface directly from the syringe and then the brackets were bonded to the tooth surface using Beauty Ortho Bond adhesive. The specimen was light cured for 10 seconds each from mesially and distally. For subgroup 3b, 3c and 3d the tooth surface was contaminated after application of salivatect and before brackets were placed. The various contaminants used were water (1b), saliva (1c) and blood (1d). For this 0.1ml each contaminant was used with a syringe. The contaminant was just applied over the salivatect present on the tooth surface, air from oil free spray was sprayed for 1 second to clear the contaminant and then the brackets were bonded to the tooth surface using Beauty Ortho Bond adhesive. The specimen was light cured for 10 seconds each from mesially and distally.
The specimens were then thermocycled (500×) between 5◦C and 55◦C, with a dwell time in each bath of 30 seconds and a transfer time between baths of 15 seconds. Twenty four hours after thermocycling, they were subjected to a shear load test in a Universal Testing Machine. A knife-edged shearing rod was used for the test at a

crosshead speed of 5 mm/min and a 50 kg load cell was used for the SBS test. Force was applied parallel to the tooth's surface at the bracket base-enamel interface and the shear load at the point of failure was recorded in Newton's (N).
The debonded enamel surfaces were examined with a stereomicroscope at 10 X magnification to determine the amount of composite remaining. The remaining composite was evaluated using the 4-point scale of Artun and Bergland, where 0 indicates no adhesive left on the tooth surface, implying that bond fracture occurred at the resin/enamel interface; 1 indicates that less than half the adhesive is left on the tooth surface, implying that bond fracture occurred predominantly at the resin/enamel interface; 2 indicates that more than half the adhesive is left on the tooth surface, implying that bond fracture occurred predominantly at the bracket/resin interface; and 3 indicates that all adhesive is left on the tooth surface with a distinct impression of the bracket base, implying that bond fracture occurred at the bracket/resin interface.[9]

Statistical analyses were performed. Descriptive statistics of shear bond strength (mean, standard deviation, median, minimum, maximum, and significance) were calculated for all groups. One-way analysis of variance (ANOVA) and Bonferroni tests were carried out for SBS and ARI, respectively, to determine significant differences among the groups. The statistical significance level was established at $p < .05$

RESULTS

Table 1 shows the bond strength values for each of the groups evaluated along with the intragroup statistical analysis. The shear bond strength was lowest after the blood contamination in all the groups and highest for dry condition. Contamination with water and saliva resulted in similar strengths for all the groups. The bond strength achieved with all the three contaminants (water, saliva, blood) was similar when Salivatact was used.

Table 2 shows the intergroup comparison between the various adhesive systems. Transbond plus had the maximum bond strength in dry condition and when contaminated with water or saliva. The bond strength of Beauty Ortho Bond with and without salivatact was similar in dry condition and when contaminated with water or saliva. In case of contamination with blood, Beauty Ortho Bond with salivatect had the maximum strength followed by Transbond and Beauty Ortho Bond without salivatect.

The ARI scores are used to define the site of bond failure between the enamel, the adhesive, and the bracket base through the remaining composite on the enamel surface. The mean ARI score with different contaminants are given in table 3. It was seen that Transbond plus had the highest ARI scores and Beauty Ortho Bond without Salivatact had the lowest scores. The group without contamination had increased values while those contaminated with blood had the least values. The ARI score for contamination with water and saliva were similar in all the three adhesive systems.

Table-1 Descriptive and Statistical analysis for various groups under various contaminants

	Bonding Condition n=15	Mean ± S.D. (MPa)	ANOVA	Bonferroni Multiple comparisons
Transbond	Control	14.37± 2.99	F=25.592 p<.001	**** Blood v/s Control, Water and Saliva *** Control v/s Water and Saliva *Water v/s Saliva
	Water	11.18± 2.06		
	Saliva	11.08± 2.77		
	Blood	6.81± 1.31		
Beauty Ortho Bond	Control	12.04± 1.98	F=27.991 p<.001	**** Blood v/s Control and Saliva and Control v/s Saliva *** Water v/s Control and Blood * Water v/s Saliva
	Water	8.35± 1.91		
	Saliva	9.62± 1.89		
	Blood	5.89± 1.71		
Beauty Ortho Bond with Salivatect	Control	10.25±2.32	F= 5.90 p<.01	*** Blood v/s Control * Blood v/s Water and Saliva, * Control v/s Water and Saliva * Water v/s Saliva
	Water	8.56±1.92		
	Saliva	9.45± 1.67		
	Blood	7.77±1.34		

Significance * p>0.05. ** p < 0.05, *** p < 0.01, **** p < 0.001

Table-2 Descriptive and Statistical analysis of intergroup comparison between the various adhesive systems

	Adhesive System	Mean ± S.D (MPa)	ANOVA	Bonferroni Multiple comparisons
Control	Transbond	14.37± 2.99	F=10.519 p <.001	** Transbond v/s Beauty bond **** Transbond v/s Beauty bond+ salivatect * Beauty bond v/s Beauty bond + salivatect
	Beauty Ortho Bond	12.04± 1.98		
	Beauty Ortho Bond with Salivatect	10.25±2.32		
Water	Transbond	11.18± 2.06	F=9.677 p<.001	***Transbond v/s Beauty bond ***Transbond v/s Beauty bond + salivatect * Beauty bond v/s Beauty bond + salivatect
	Beauty Ortho Bond	8.35± 1.91		
	Beauty Ortho Bond with Salivatect	8.56±1.92		
Saliva	Transbond	11.08± 2.77	F=2.583 p >.05	* Transbond v/s Beauty bond * Transbond v/s Beauty bond + salivatect * Beauty bond v/s Beauty bond + salivatect
	Beauty Ortho Bond	9.62± 1.89		
	Beauty Ortho Bond with Salivatect	9.45± 1.67		
Blood	Transbond	6.81± 1.31	F= 6.171 p<.01	* Transbond v/s Beauty bond * Transbond v/s Beauty bond + salivatect *** Beauty bond v/s Beauty bond + salivatect
	Beauty Ortho Bond	5.89± 1.71		
	Beauty Ortho Bond with Salivatect	7.77±1.34		

Table-3 Descriptive analysis of ARI scores

	Transbond Plus	Beauty Ortho Bond	Beauty Ortho Bond with Salivatect	**Mean Score**
Control	2.33	1.87	1.87	**2.02**
Water	1.80	1.06	1.26	**1.37**
Saliva	2.13	1.06	1.33	**1.51**
Blood	1.26	0.73	0.80	**0.93**
Mean Score	**1.88**	**1.18**	**1.31**	**1.45**

DISCUSSION

The direct bonding of orthodontic brackets has revolutionized and improved the clinical practice of orthodontics.[10] Traditionally, the use of acid etchants followed by a primer was an essential part of the bonding procedure of composite adhesives to allow good wetting and penetration of the sealant into the enamel surface.[11] The use of the new self-etch primers simplifies the clinical handling of adhesive systems by combining the etchant and the primer in one application.[12,13] A self-etching primer consists of acidic adhesive monomer, deionized water, activator, and stabilizer.[14] The bonding performance of an adhesive monomer can be mainly influenced by its hydrophilic acid moieties (i.e, carboxylic acid, phosphoric acid, and phosphoric acid moieties). When enamel is treated with these acidic monomers, the hydroxyapatite of enamel is demineralized, and the pH of the monomer is neutralized.[15] During the etching phase, the adhesive monomer penetrates to the etched tooth surface; then the hydrogen ions released by hydroxyapatite crystals are chelated in the primer, resulting in microlinkage to the hydroxyapatite.[16] The etching performance of self-etching primer is weaker than that of 37% phosphoric acid etching. As a result, the self-etching primer shows a more conservative etch pattern but has fewer adhesive penetrations, leading to lower bond strength.[17]

Transbond self-etch primer was one of the first self-etching primer commercialized for orthodontic purposes and a large number of studies have been reported on it.[6,7,18] Different studies have found that it can achieve adequate bond strength levels when applied to a dry enamel surface.[4-6] Bond strength after saliva contamination, both before and after the application of SEP has also been reported in the literature and various studies have given different results. Contamination after the self-etching primer resulted in a significantly lower bond strength.[2-4] However, when saliva was applied before the primer, no significant differences were found.[5]

One of the major problems associated with bonding in orthodontics is the amount of demineralization that takes place below and at

the margins of the bracket base. Beauty Ortho Bond is a newly developed light-cure orthodontic adhesive system which is a member of the Giomer family with surface pre-reacted glass ionomer (S-PRG) fillers to ensure fluoride release and recharge. The S-PRG fillers in the Beauty Ortho Bond paste have the property of releasing/recharging fluoride ions so as to help in remineralization of the tooth structure.

In case of Transbond SEP simultaneous etching and priming of the tooth occurs when phosphoric acid and a methacrylate group are combined to generate a methacrylated phosphoric acid ester, which is then applied onto the tooth. In case of Beauty Ortho Bond the manufacturer also claims that the mild self-etching HEMA-free primer of Beauty Ortho Bond causes minimal demineralization.

According to the manufacturer bonding is enhanced with the use of Salivatact under moist conditions as it acts as a protective barrier against saliva contamination without hampering the bonding. The composition of salivatact is not very clear but it forms a non-reactive layer over the etched area protecting it from further contamination.

The results that were achieved in the present study indicate that both Transbond SEP and Beauty bond provide adequate bond strength in dry conditions while the bond strength decreased in contaminated state. The decrease in bond strength was similar for both water and saliva while it was maximum when contaminated with blood. When Beauty Ortho Bond was used with salivatect there was adequate bond strength in dry conditions and the decrease in bond strength in contaminated conditions was less than when salivatact was not used.

Santos et al [6] have reported that there are different degrees of interference caused by water, saliva, and blood on bonding procedures due to the differing compositions of the substances. They reported that Saliva is more complex than water, and the difference in type and amount of inorganic and organic substances in blood makes it a greater mechanical barrier than saliva. Thus, it is reasonable that even with a hydrophilic bond system, blood interfered the most with SBS and was followed (in interference intensity) by water and saliva.

Shear bond experiments that tested similar materials under various enamel surface conditions have produced differing results; this may be the result of a number of other variables, such as thermocycling tests, shear bond machines, direction of the force used to debond the brackets, cross head speed, substrate, type of brackets, absence of standardization for applied moisture, the quantity and the application of different products, or other small variations in the materials and methods used.

In the orthodontic clinical routine it is more important to achieve adequate bond strength that allows for safe debonding than to obtain the greatest possible bond strength. Thus, ARI scores are used to define the site of bond failure between the enamel, the adhesive, and the bracket base through the remaining composite on the enamel surface. In orthodontic bond strength testing, cohesive fractures in the composite (ARI score 3) reflect the internal strength of the composite rather than the actual adhesion to the surface under study.

In this experiment, control group produced similar ARI scores. Under dry conditions, most of the adhesive remained on the surface of the teeth after debonding, indicating failure at the bracket adhesive interface. In case of contamination more of debonding occurred at tooth interface.

CONCLUSIONS

All the materials showed maximum Shear bond strength under dry conditions. It was found that contamination decreases the bond strength for all the groups and this decrease was maximum in case of contamination with blood. Shear bond strength of Transbond color change adhesive/Transbond self-etch primer was higher than that of Beauty Ortho Bond under all conditions except when contaminated with blood using Salivatect. Beauty Ortho bond with or without salivatect shows no significant difference in shear bond strength except when contamination was done with blood in which case Beauty Ortho Bond using Salivatect had higher bond strength.

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How to cite this Article: Author Name: Kumar P, Sharma R, Saroha K, Sharma P**,** Singh V. Effect of different contaminants on the shear bond strength of a newly introduced self-etch adhesive system used with moisture protective barrier. - An invitro study. J Dent Specialities,2015;3(1):54-59

Source of Support: NIL
Conflict of Interest: None Declared

Efficacy of topical Tacrolimus in the treatment of oral lichen planus

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Received: 02-03-2015
Accepted: 26-03-2015

ABSTRACT

Introduction: Oral lichen planus (OLP) is a common benign inflammatory disease affecting mainly middle-aged and elderly people. Various studies have found topical Tacrolimus to be effective in the treatment of OLP and some have also reported a better initial therapeutic response than Triamcinolone. The present study evaluated the efficacy of topical Tacrolimus (0.1%w/v) prescribed for 6 months in the treatment of OLP in Indian population, and also evaluated the relapses after cessation of therapy.

Methods: 35 patients of symptomatic OLP were identified from retrospective review of medical records. All these patients were prescribed Tacrolimus Ointment (0.1%w/v) to be applied 3 times a day for 6 months period. A survey was mailed to all patients to assess the response of therapy to Tacrolimus, continuous use of ointment, adverse effects (if any), and relapse after cessation of therapy. Surveys were completed a mean 9.2 months after initiating the treatment. 81% patients had significant symptomatic improvement with use of topical Tacrolimus Ointment, whereas 84% patients reported lesion clearance/significant reduction. 43% patients reported relapse after cessation of therapy and relapse rate could have been greater with longer follow-up period.

Conclusion: Within limitations of this study, it can be concluded that topical Tacrolimus (0.1%w/v) is safe and effective for the treatment of Oral Lichen Planus, but high relapse rate after cessation of therapy makes its treatment difficult.

Keywords: Tacrolimus, Oral lichen planus, Survey, Inflammatory disease.

INTRODUCTION

Oral lichen planus (OLP) is a common benign inflammatory disease affecting mainly middle-aged and elderly people.[1] Oral Lichen Planus most commonly produces symptoms of burning sensation while eating and interferes with patients oral hygiene regimen. Sometimes such patients are not able to tolerate slightest amount of spices in their food. The prevalence of OLP varies from 0.1% to about 4% depending on the population sampled.[2-3] The clinical diagnosis of OLP can be done on basis of characteristic clinical findings and history and can be confirmed by histopathological examination.

Six different clinical forms of OLP have been described by Andreason - reticular, papular, plaque, atrophic, erosive, and bullous.[4] The most form of OLP is reticular with the characteristic Wickham's striae, but patients with reticular lesions are commonly asymptomatic. Patients with atrophic (erythematous) or erosive (ulcerative) OLP are often associated with symptoms like burning sensation and pain. Although the etiology and pathogenesis of OLP are not fully understood, oral lichen planus has been associa ted with multiple disease processes and agents, such as viral and bacterial infections, autoimmune diseases, medications, vaccinations and dental restorative materials.[5] In various studies in has been established that OLP represents a cell-mediated immune response with the infiltrating cell population composed of both T4 and T8 lymphocytes.[6]

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Various treatments have been used for OLP but use of topical corticosteroids like Triamcinolone is still most commonly used first line therapy. Although topical corticosteroids are effective in relieving the symptoms, some cases are resistant to the treatment with such drugs. Moreover, relapses are common on cessation of therapy[7] which makes treatment of OLP challenging.

Tacrolimus is an immunosuppressive drug used mainly after allogeneic organ transplant to reduce the activity of the patient's immune system. It is also used in a topical preparation in the treatment of atopic dermatitis and other dermatologic lesions. Various studies have found topical Tacrolimus to be effective in the treatment of OLP and some have also reported a better initial therapeutic response than Triamcinolone.[7-8] But studies evaluating the efficacy of topical Tacrolimus in Indian population especially over long periods, are scarce.

The present study evaluated the efficacy of topical Tacrolimus (0.1%w/v) prescribed for 6 months in the treatment of OLP in Indian population, and also evaluated the relapses after cessation of therapy.

MATERIALS AND METHODS

35 patients of histopathologically confirmed, symptomatic erosive type of OLP were identified from records of Dental Department, VMMC & Safdarjang Hospital. All these patients were prescribed Tacrolimus Ointment (0.1%w/v) to be applied 3 times a day for 6 months period. Patient related data and treatment given was obtained from retrospective review of medical records. Patients who had any established medical

condition or received any previous treatment for OLP, were not included in this study. A survey was mailed to all patients to assess the response of therapy to Tacrolimus, continuous use of ointment, adverse effects (if any), and relapse after cessation of therapy. (Table 1)

Table 1 – A sample of Survey mailed to patients

CHARACTERISTIC	RESPONSE(Tick the appropriate circle)
Whether used ointment 3 times a day regularly	Yes ◯ No ◯
Symptoms	Totally alleviated ◯ Much better ◯ Slightly better ◯ Same ◯
Lesion appearance	Not visible ◯ Much reduced ◯ Somewhat reduced ◯ No Change ◯
Time taken for improvement	_____
Adverse effects	_____
Whether symptoms/lesion reappeared after stopping the treatment	Yes ◯ No ◯

RESULTS

35 patients who were prescribed topical Tacrolimus Ointment (0.1%w/v) were mailed the surveys. Out of 35 patients, 2 did not mail back the surveys, and 4 patients responded that they did not use the ointment regularly. The results of this study are from remaining 29 patients who used the medicine regularly and mailed back the surveys.

The patient data are summarized in Table 2. The mean age of 29 patients included in the study was 47.2 years. 31% patients were male and 69% were female. Most common symptoms reported by patients were burning sensation/irritation at the site of lesion (69%), followed by difficulty in eating various foods (28%), difficulty in performing and maintaining oral hygiene (24%), and pain (17%). Most common location of OLP was Buccal mucosa (27%).

Table 2 – Patient data (n = 29)

CHARACTERISTIC	Number	Percentage
Sex		
Male	9	31
Female	20	69
Symptoms		
Burning	20	69
sensation/irritation	5	17
Pain	7	24
Difficulty in brushing	8	28
Difficulty in eating		
foods		
Location		
Buccal mucosa	19	66
Labial mucosa	2	7
Gingiva	8	27

Patients' responses to survey are summarized in Table 3. Surveys were completed a mean 9.2 months after initiating the treatment (range 45 days to 347 days), whereas Tacrolimus Ointment (0.1%w/v) was prescribed for 6 months period. 9% patients reported that their symptoms were totally alleviated whereas 72% patients said that symptoms were much better. Therefore 81% patients had significant symptomatic improvement with use of topical Tacrolimus Ointment (0.1%w/v). 11% patients reported that symptoms were somewhat reduced, whereas 5% had no change in symptoms. Mean time taken for improvement was 1.2 months.

Table 3 – Patient response (n = 29)

CHARACTERISTIC	RESPONSE	Percentage
Whether used ointment 3 times a day regularly	Yes	100
	No	0
Symptoms	Totally alleviated	9
	Much better	72
	Slightly better	12
	Same	7
Lesion appearance	Not visible	8
	Much reduced	76
	Somewhat reduced	11
	No Change	5
Time taken for improvement	Mean – 1.2 months	
Adverse effects	Burning/irritation	18
	Tingling	3
	None	79
Whether symptoms/lesion reappeared after stopping the treatment	Yes	43
	No	57

Majority of patients wrote that lesions were much reduced (76%), whereas 8% said that lesions were not visible at all. 11% patients had lesions somewhat reduced and 5% patients had no change in appearance of lesion. Most common adverse effect was transient burning sensation at the site of application (18%). The recurrence of symptoms/lesions after cessation of treatment was reported by 43% patients. Clinical findings during follow-up visits were available for 11 out of 29 patients (38%), and these findings co-related to the responses filled by patients in the surveys.

DISCUSSION

Tacrolimus is an immunosuppressive macrolide drug produced by Streptomyces tsukubaensis and used to prevent transplant rejection.[9] Topical Tacrolimus (0.1%w/v) has been reported to be effective and safe for the treatment of OLP by various investigators.[7-9] It has been found to be an effective means of controlling the symptoms and signs of erosive or ulcerative oral lichen planus and had no notable adverse effects over a mean duration of application of 19.8 months.[10]

Cell-mediated immunity seems to play a critical role in the pathogenesis of lichen planus.[8] Although the specific antigens responsible for the activation of T-cell has not been identified, studies have demonstrated the interaction of T-cells and mast cells in a cyclical nature via the production of cytokines, such as RANTES (regulated on activation, normal T-cell expressed, and secreted) and TNF-α, which may explain the chronic nature of this disease.[11] Although its exact mechanism of action in OLP remains unknown, topical tacrolimus was shown to inhibit T-lymphocyte activation by inhibiting the phosphatase activity of calcineurin. Without calcineurin to dephosphorylate the nuclear factor of activated T cells, gene transcription for lymphokines, IL-2, and interferon-γ is inhibited leading to a decrease in the number of lymphocytes.[12]

In results of our study, OLP was more common in females (69%) and the most common location was buccal mucosa (66%). Topical Tacrolimus Ointment (0.1%w/v) was effective and safe in most of the patients, 81% patients experienced significant symptomatic relief and 84% patients reported lesion clearance/significant reduction. Mean time for response was 1.2 months. Only 5 % patients reported no change in their lesion.

Most common adverse effect reported in our study by the patients was burning/irritation at site of application, which is consistent with the findings from other studies.[9-10] 43% patients reported relapse after cessation of therapy, which is in line with previous studies and shows that although Topical Tacrolimus is effective in

controlling the disease, it rarely results in complete remission of OLP.[9, 12-16] Surveys were completed a mean 9.2 months after initiating the 6 month treatment, and relapse rate could have been greater with the longer follow-up period.

Though many studies have evaluated the efficacy of topical Tacrolimus in treatment of OLP, the studies in Indian population are very scarce. Our study evaluated the efficacy of topical Tacrolimus in Indian population through retrospective review of patient records and is therefore subject to recall bias. Many patients live far from hospital and find it difficult to turn-up for regular clinical follow-up visits. In our study we were able to find clinical records of follow-up visits for only 38% of patients, and thus the drop-out rates in long term clinical studies are very high. Clinical findings during follow-up visits were available for of 38% patients, and these co-related with the responses filled in the surveys. Mailed survey has been used previously in some studies and was found to be standard and objective method to follow-up with patients of chronic diseases requiring long term therapies.[17]

Within limitations of this study, it can be concluded that topical Tacrolimus (0.1%w/v) is safe and effective for the treatment of Oral Lichen Planus.

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How to cite this Article: Jain A, Kabi D. Efficacy of Topical Tacrolimus in the treatment of Oral Lichen Planus. J Dent Specialities,2015;3(1):60-63

Source of Support: NIL
Conflict of Interest: None Declared

3-D locking titanium miniplates in management of mandibular fracture: A prospective clinical study

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ABSTRACT

Purpose: The aim of this follow up clinical study was to evaluate the effectiveness of 2mm, 3-dimentional locking titanium miniplates.

Patients and Method: A prospective randomized clinical trial was carried out on 10 patients with mandibular fractures. The patients were evaluated for the operating time, clinical assessment of mobility after fixation, occlusion, adequacy of reduction on post-operative radiograph and any surgical complications. The statistical analysis was carried out in SPSS software.

Results: In 10 patients, 9(90%) were males and 1(10%) were females with a mean age of 28.75 years. Road traffic accident (RTA) was the etiological factor in 7(70%), inter-personal violence in 2 (20%) and fall in 1(10%) patient. The average intra-operative time was 40.10 min locking plates. This was found to be statistically significant when compared to the intra-operative time of non-locking plates in the literature. Bite force was measured in kilogram/cm^2 using indigenously designed bite force measurement device. All the measurements were compared to the control group who did not sustain mandible fracture. At third month it was found that there was no significant difference in the bite between locking plates and control group. On examination satisfactory postoperative functional occlusion was found to be 100% in locking plates.

Conclusions: The results obtained suggest that 3-D locking plate/screw system fulfill the treatment goals of adequate reduction, fixation and stabilization of fracture of mandible. 3-D locking plating system adequately reduces the fracture without much need for adaptation and hence reduces the intra-operative time.

Received: 10-02-2015
Accepted: 26-03-2015

Keywords: 3-D locking miniplate, Mandibular fracture.

INTRODUCTION

The modalities for the treatment of fractures of the mandible have been in a constant state of evolution. Over the years, the management of trauma has evolved from various forms of splinting circum mandibular wiring, extra oral pins, semi rigid fixation and trans-osseous wiring. This was followed by rigid fixation technique and more lately has given way to semi-rigid fixation with miniplates (Champy.M.et al). The currently used conventional miniplates technique requires maxillomandibular fixation for a short period and unable to render three dimensional stability at the fracture site. The three dimensional (3-D) miniplate system is one of the recent internal rigid fixations for the maxillomandibular surgery in years.[1]

Research continues to focus on size, shape, number and mechanics of plate/screw systems to improve surgical outcomes. Farmand developed 3-D plate with quadrangular design by joining two miniplates with interlocking crossbars. The basic concept of 3-D plate is the stability in three dimensions.

The stability is achieved by its configuration not by thickness or length. One of the advantage of 3-D plates is the simultaneous stabilization of the tension & compression zones, making the 3-D plate a time saving alternative to conventional bone plate.[2] The locking plating system has been developed and popularized by AO/ASIF to obviate the main disadvantage of conventional plate system, which requires the plate to be perfectly adapted to the underlying bone to avoid gaping of the fracture and associated instability. This bone-plate system acts as an internal–external fixator, which results in better distribution of the load and prevents load concentration on a single screw, thus decreasing the risk of a screw's loosening and stripping. Moreover, because anatomic adaptation of the plate to the underlying bone contour is not crucial, there are theoretically a fewer interferences with the adjacent vascular supply.[3] The first biomechanical comparison of locking plates to appear in the maxillofacial surgical literature was made by Gutwald in 1999; he concluded that a higher stability was achieved with the locking plates.[4]

This study was designed to evaluate the treatment outcome of 3-D locking titanium plate in mandibular osteosynthesis.

MATERIALS AND METHOD

The study was a randomized prospective study conducted on patients reporting to Department of Oral and Maxillofacial Surgery, I.T.S Dental College and Research centre, Muradnagar, Ghaziabad from November 2012 to April 2014 with definitive diagnosis of mandibular fractures. The patients were selected based on following inclusion criteria: (a) mandibular fractures in

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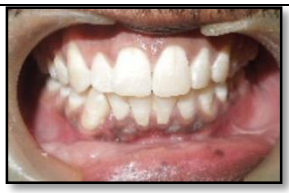
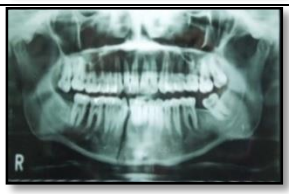
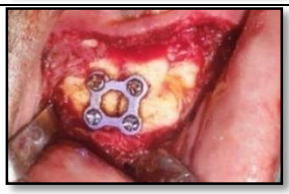
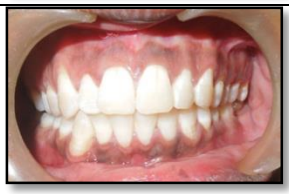
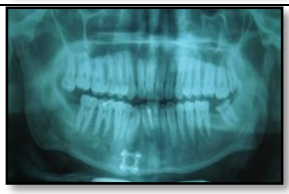
patients between 15 – 65yrs (b) patients willing for open reduction and internal fixation of mandibular fracture and provided informed consent for the procedure (c) patients who are deemed fit for surgery in general anesthesia (G.A.) by anesthesiologist following pre anesthetic evaluation (d) isolated fracture. The exclusion criteria were: (a) mandibular fracture in patients below 15yrs and above 65yrs (b) mandibular fracture in edentulous patient (c) pregnant patients. The study was approved by local ethical committee, and informed consent was obtained from the patients before their inclusion in the study. The present study was conducted on 10 patients (9 male and 1 female) having fractured mandible. The patients were treated with open reduction and internal fixation (ORIF) using 3-D locking plates. The 3-D locking titanium miniplate used in the study were four hole square / six hole rectangular miniplate with 2.0 mm diameter hole and 1.0 mm thickness (Fig. 1-5).

The parameters like operating time, clinical assessment of mobility after fixation, biting force, adequacy of reduction on postoperative radiograph, and any post-surgical complications were assessed. Following postoperative complications were evaluated; wound dehiscence, malocclusion, damage to roots by screws, post-operative neurosensory deficit, infection at the site, implant failure, implant palpability, nonunion and malunion.

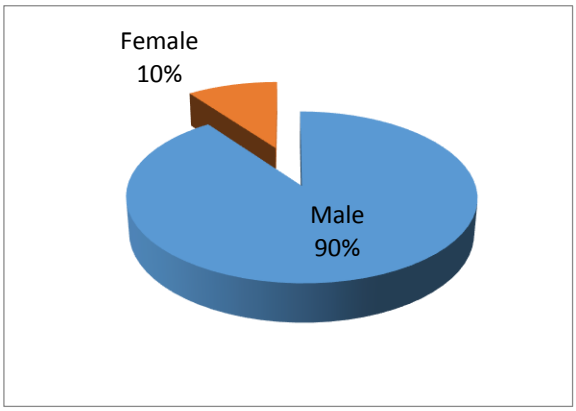
All the patients were followed for 6months postoperatively. The evaluation was done at first week, first month, third month and sixth month. Bite force was measured in kilogram/cm^2 using indigenously designed bite force measurement device. The measurements were taken at second week, fourth week, third month and sixth month postoperatively. Bite forces were measured at the incisor and right and left molar region. All the measurements were compared to the control group who did not sustain mandible fracture.

	Fig: 1 Preoperative photograph of patient with right parasymphysis fracture showing deranged occlusion
	Fig: 2 Preoperative OPG show right parasymphysis fracture
	Fig: 3 Intraoperative photograph of patient showing reduction and fixation of right parasymphysis fracture site using 2.0-mm, 6-hole, 3-D locking plate via intraoral degolving incision
	Fig: 4 Postoperative photograph of patient with right parasymphysis fracture showing occlusion
	Fig: 5 Postoperative OPG showing reduction and fixation of right parasymphysis fracture with 2.0-mm, 6-hole, 3-D locking plate

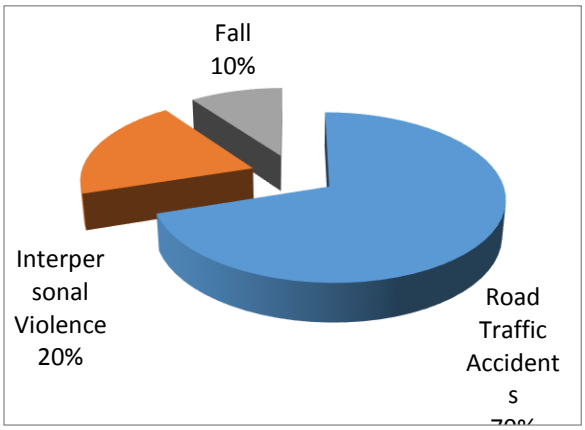
RESULTS

The mean age of the patient included in the present study was 28.75 years ranging from 18 to 58 years (Table 1). The main etiological factor of trauma was road traffic accident (RTA) in 7(70%), inter-personal violence in 2 (20%) and fall in 1(10%) of the patients (Pie chart 2). Duration of surgery was measured from the time of incision till the closure of wound. The average intra-operative time was 40.10 min locking plates. Adequacy of fracture fixation was checked immediately after fixation by clinical

manipulations in three dimensions. Functional occlusion was restored in all the cases. Minor occlusal discrepancy was seen in one patient which was managed by selective grinding. The bite force was improved significantly at sixth week and third month post-operative follow up period in all the sites. At third month it was found that there was no significant difference in bite force between locking plates and control group (Bar graph 1).



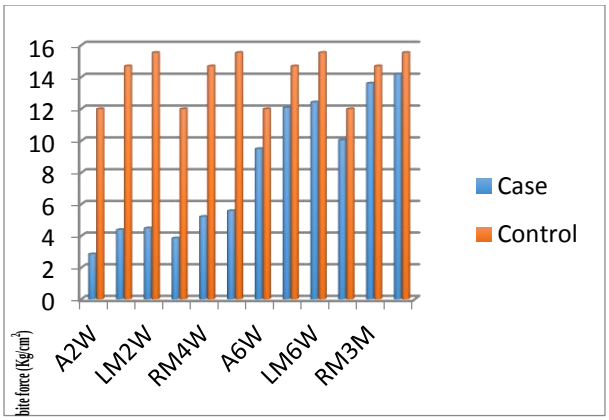
Pie chart 1: Gender Distribution



Pie chart 2: Etiological Distribution

Table 1: Age distribution of fracture patients

Age range (years)	Number of patients	Percentage
<20	1	10%
21-30	5	50%
31-40	2	20%
41-50	1	10%
>50	1	10%
Total	10	100%



Bar graph1: showing comparison of bite force (Kg/cm^2) between both the case and control group at 2 week, 4 week 6 week and 6 months postoperative interval

DISCUSSION

Farmand et al 1992, developed the concept of 3-D miniplate. The advantage of 3-D plate is the simultaneous stabilization of both superior & inferior borders makes a time saving alternative to conventional miniplate. The main disadvantage of the 3-D plate system is that precise adaptation to the underlying bone, interference with the perfusion of bone underlying the plate. The locking plate/screw system was initially developed by Raveh et al. In the mid-1980s, the principles of external fixation devices were incorporated into a bone plate. These plates achieve stability by locking the screw into the plate and have been shown to enhance fixation stability.[5]

Locking plate/screw systems do have certain advantages over conventional plates and screw. Theoretical advantages proposed include: less screw loosening, greater stability across the fracture site, less precision required in plate adaptation because of the internal-external fixator, less alteration in osseous or occlusal relationship upon screw tightening and no need for a friction lock between plate and bone for stability, resulting in decreased pressure transmitted to the underlying bone. [6,7] Michlet & Champy study was based on two dimensional models which took only bending & torsional forces into account and sometimes necessitate placement of two plates at angle/symphyseal region. Another study reveals that at a given point in fracture site three forces acting on mandible namely bending, torsional and shear.[8] Thus three dimensional miniplate was evolved by joining two miniplates with interconnecting vertical crossbars.[9] In symphysis and parasymphysis regions, 3-D plating system uses lesser foreign material than the conventional miniplates using Champy's principle. Thus our study suggest that 3-D plating system offers advantages over conventional miniplates as it uses lesser foreign

material, reduces the operation time and overall cost of the treatment.[10]

The absence of major complications found in this study corroborates the two main biological and mechanical advantages reported by experimental studies on locking plates, which allow for more rapid and undisturbed bone healing and decreased risk of delayed union, nonunion, or infection. First, the absence of pressure under the plate prevents the cortical blood supply from being disrupted and allows periosteum growth under the plate. Second, stress shielding below the plate is eliminated, which prevents chronic inflammation and subsequent bone necrosis.[3,11]

In the present study we experienced that for fixation of fractures of mandible 3-D locking titanium miniplate has advantages, as precise adaptation of plate is not required thus reducing the operative time and chances of screw loosening. The only disadvantage of the locking system is cost and minor addition to instrument armamentarium. Drill guide is required for central and perpendicular placement of hole.[2]

CONCLUSIONS

To achieve early functional mobility with assured stability in case of mandibular fractures, our findings recommend the use of 3-D locking plate as precise adaptation of 3-D locking plates is not required and does not affect their mechanical behavior. Therefore plate placement becomes easier and less time consuming, though a more extensive study with more number of patients and longer period of follow up is required.

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How to cite this Article: Yadav S, Agarwal A, Singh S, Kumar S, Anand KR, Chhabra V. 3-D locking titanium miniplates in management of mandibular fracture: A prospective clinical study. J Dent Specialities,2015;3(1):64-67

Source of Support: NIL
Conflict of Interest: None Declared

Co-relation of clinical and histologic grade with soft palate morphology in oral submucous fibrosis patients: A histologic and cephalometric study

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Received: 02-03-2015
Accepted: 29-03-2015

ABSTRACT

Introduction: Oral submucous fibrosis (OSMF) is a chronic progressive precancerous condition with an alarming prevalence in India. Prevention and early diagnosis of this condition can not only nip it in the bud, but also curb the menace of malignant transformation of this disease. OSMF is believed to produce fibrotic changes beginning in the soft palate and faucial pillars, progressing anteriorly in the oral cavity.

Aim: The present study was carried out to evaluate and correlate the morphology of soft palate in Oral submucous fibrosis (OSMF) patients to the clinical and histopathologic grade, using digital lateral cephalogram.

Method: A total of 80 patients (40 OSMF and 40 Control) were evaluated for soft palatal morphology. The antero-posterior and supero-inferior dimensions of soft palate were measured on digital lateral cephalogram, categorized as Type 1 to Type 6 and were then compared to clinical and histopathologic grade.

Results: In our study, Type 1 (leaf-shaped) soft palate was found to be the most common followed by Type 6 (crook-shaped) and Type 3 (butt-like) varieties.

Conclusion: The study observed that there was gradual reduction in antero-posterior length of soft palate in OSMF patients and with advancing OSMF, an increasing incidence of Type 6 soft palate was seen.

Keywords: Oral Submucous Fibrosis, Diagnosis, Pathology, Radiography, Anatomy and Histology.

INTRODUCTION

In 1952, Schwartz described five Indian women from Kenya with a condition of the oral mucosa including the palate and pillars of the fauces, which he called "atrophia idiopathica (tropica) mucosae oris", which was later termed as 'Oral Submucous fibrosis' (OSMF)[1].

Occasionally it is preceded by and/or associated with vesicle formation [2] and is always associated with a juxta-epithelial inflammatory reaction followed by progressive hyalinization of the lamina propria.[3] The later subepithelial myofibrosis leads to stiffness of the oral mucosa and deeper tissues with progressive limitation in opening of the mouth and protrusion of the tongue, thus causing difficulty in eating, swallowing and phonation [4].

The fibrosis of the mucosa over and around the uvula leads to certain characteristic abnormalities in the uvula, such as forward pointing uvula or a vanishing uvula[5].

According to Joshi (1953), involvement of the soft palate and faucial pillars is perhaps the earliest feature to develop in the natural course of OSMF[6].

Haider et al who studied the clinical and functional staging in 228 OSMF patients concluded that the bands formed initially in the fauces, followed by buccal and labial areas, with an approximate incidence as follows: [7]

Soft palate (91.4%), buccal mucosa (72.4%), retro-molar region (70.7%) and tongue (8.6%)[8].

Thus, since the soft palate is the first tissue to be affected in OSMF, there is a need to analyze its morphology in OSMF patients.

Cephalometric analysis is one of the most commonly accepted techniques for evaluating the soft palate [9,10,11] and is less expensive, more useful, easily achieved with reduced radiation, and correlates with other investigations such as computed tomography[12].

So the present study was carried out to evaluate and correlate the morphology of soft palate in OSMF patients to histopathologic grade using digital lateral cephalogram in order to propose a novel radiographic soft palatal classification system for OSMF, thus eliminating need for biopsy in medically compromised patients.

MATERIALS AND METHODS

A cross-sectional study was performed, comprising of 80 patients, 40 patients belonging to study group (OSMF patients) and 40 disease-free individuals in control group. As per the National Council on Radiation Protection Report, 2003, the effective radiation dose from a lateral cephalogram viz. 3-6μSv, falls under the category of negligible individual dose (up to 10μSv) and is far below the annual dose relative to stochastic effects (up to 5000 μSv) [13]. Based on the above facts, the ethical committee deemed the potential benefits of the study as outweighing the associated risks.

Patients showing symptoms and signs of OSMF were selected while patients with known history

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of surgery of palate, cleft lip and palate, scleroderma patients were excluded.

The patients were first examined clinically for mouth opening, tongue protrusion, blanching and palpable vertical fibrous bands, ulcerations, vesicles, burning sensation, difficulty in swallowing, extraoral pouching and inability to blow mouth.

After obtaining written informed consent, patient/ control group participant was positioned in the cephalostat with Frankfurt horizontal plane parallel to the floor. With upper and lower teeth in centric occlusion, with oropharyngeal musculature relaxed, digital lateral cephalogram was shot using Sirona Orthophos XG. Antero-posterior and supero-inferior dimensions as well as morphology of soft palate were analyzed from the cephalograms. The length of the soft palate was evaluated by measuring the linear distance from the posterior nasal spine (PNS) to the tip of the uvula of the resting soft palate. Supero-inferior dimension of soft palate was measured at the thickest area of soft palate. Morphology of soft palates was classified based on their morphology according to You et al. (2008) [14] as Types: 1 (leaf-shaped), 2 (rat-tail shaped), 3 (butt-like), 4 (straight line), 5 (S-shaped) and 6 (crook shaped) (Fig. 1). After written informed consent, punch biopsy was taken from either right or left buccal mucosa and the formalin fixed tissue was processed to prepare paraffin embedded sections and stained with H & E stain. The tissue was histopathologically evaluated for status of epithelium, degree of subepithelial fibrosis, muscle status and vasculature.

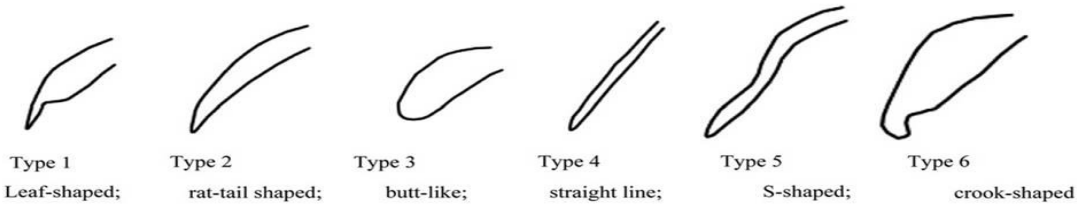

Fig. 1: Schematic representation of different types of soft palates in normal patients according to You et. al. classification(2008).

Khanna JN and Andrade NN (1995) classification was used in the study for clinical and histopathological grading in OSMF patients[15].

Results: In the OSMF group, 25 patients belonged to Clinical stage III, 10 patients were classified as Stage II clinically while 5 patients belonged to Clinical stage IVA. No patient having Clinical stage I OSMF was observed in the study group. (Refer Table 1)

Table 1: Distribution of OSMF Patients as Per Histopathologic and Clinical Stages

HISTOPATHOLOGIC GRADE	**NO. OF OSMF PATIENTS (TOTAL = 40)**
GRADE I	3
GRADE II	15
GRADE III	21
GRADE IVA	1
CLINICAL STAGE	**NO. OF OSMF PATIENTS (TOTAL = 40)**
STAGE I	0
STAGE II	10
STAGE III	25
STAGE IVA	5

In the OSMF group, 22 patients (55%) showed Type 1 soft palate (Fig. 2), 7 patients (17.5%) showed Type 3 soft palate (Fig. 3), 9 patients (22.5%) showed Type 6 soft palate (Fig. 4) while 1

patient each (2.5%) showed Type 4 and 5 soft palates respectively. No patients having Type 2 soft palatal morphology were observed in the Study group.

In the Control group, 34 patients (85%) had Type 1 soft palate, 2 patients (5%) had Type 3 soft palate while 1 patient each had Type 2, 4, 5 and 6 soft palatal morphologies respectively. (Refer Table 2)

Table 2: Distribution of Soft Palatal Types in Study Group and Control Group

TYPE OF SOFT PALATE	1	2	3	4	5	6	
OSMF	22	0	7	1	1	9	TOTAL:40
CONTROL	34	1	2	1	1	1	TOTAL:40

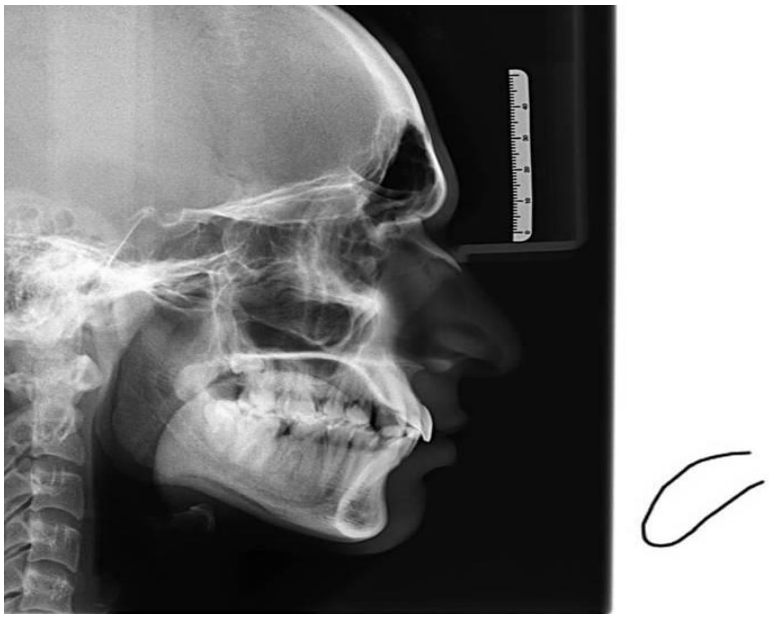

Fig. 2: Type 6 soft palate (Crook-shaped)

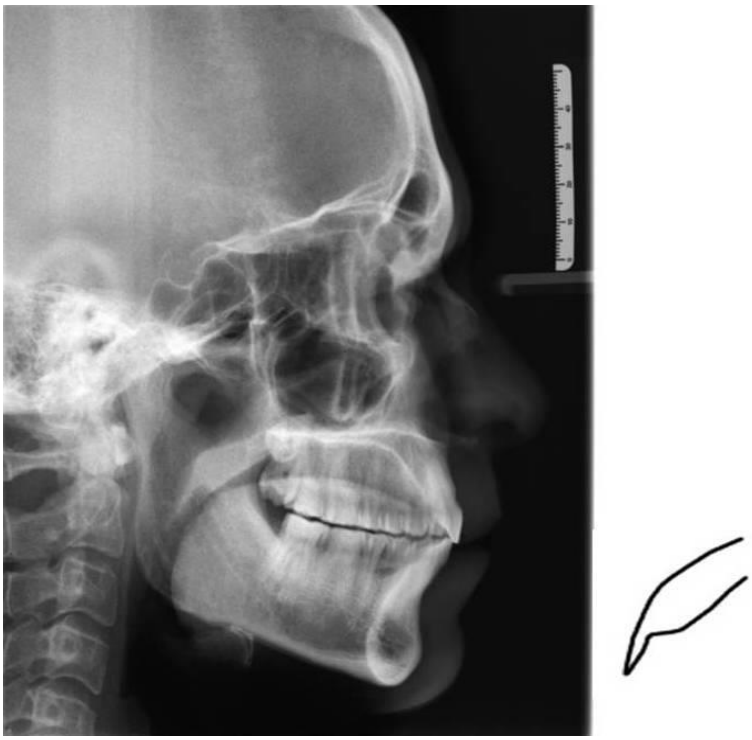

Fig. 3: Type 3 soft palate (Butt-shaped)

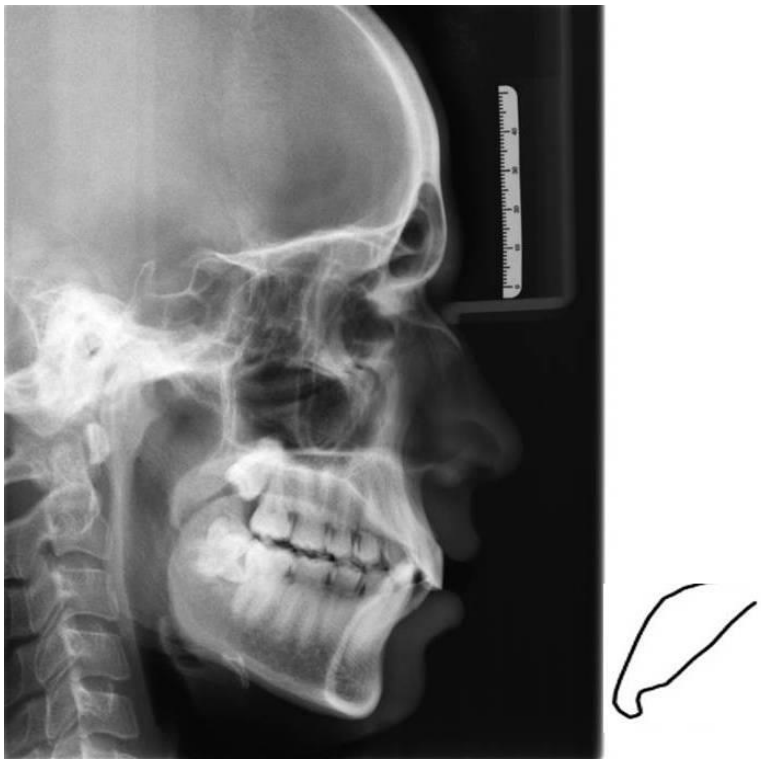

Fig. 4: Type 1 soft palate (Leaf-shaped)

The distribution of types of soft palatal morphologies in different clinical and histologic grades of OSMF was tabulated. (Refer Table 3, 4)

Table 3: Distribution of Type of Soft Palate in Different Clinical Stages of OSMF

STAGE	I	II	III	IVA	TOTAL
TYPE 1	0	10	11	1	22/40
TYPE 2	0	0	0	0	0/40
TYPE 3	0	0	7	0	7/40
TYPE 4	0	0	1	0	1/40
TYPE 5	0	0	1	0	1/40
TYPE 6	0	0	5	4	9/40

With advancing clinical stage of OSMF, an increasing incidence of Type 6 soft palate was seen.

Table 4: Distribution of Type of Soft Palate in Different Histologic Grades of OSMF

GRADE	I	II	III	IVA	TOTAL
TYPE 1	6	13	3	0	22/40
TYPE 2	0	0	0	0	0/40
TYPE 3	0	1	6	0	7/40
TYPE 4	0	0	1	0	1/40
TYPE 5	0	0	1	0	1/40
TYPE 6	0	1	7	1	9/40

With advancing histologic grade of OSMF, an increasing incidence of Type 6 soft palate was seen.

Lengths of soft palate in A-P and S-I dimensions were measured on lateral cephalograms. The mean lengths of soft palate (A-P and S-I) and respective soft palatal morphological types of Study group Vs. Control group were tabulated (Refer Table 5, 6). The antero-posterior and supero-inferior dimensions of soft palate were compared to the clinical and histologic grade in every patient, as well as to the type of soft palate observed radiographically, thus delivering a comprehensive clinical, histologic and radiographic analysis. (Refer Table 7, 8)

Table 5: A-P and S-I Dimensions of Soft Palate in Study Group and Control Group

TYPE OF SOFT PALATE	**MEAN A-P DIMENSIONS (in mm)**		**MEAN S-I DIMENSIONS (in mm)**	
	OSMF	**CONTROL**	**OSMF**	**CONTROL**
TYPE 1	28.05	35.51	11.77	11.01
TYPE 2	--	36	--	8.5
TYPE 3	24.29	31.25	12.29	11.5
TYPE 4	25	35	13	7
TYPE 5	26	31	11	9.5
TYPE 6	23.33	34	10.88	10

As observed in the table, OSMF subjects show reduced antero-posterior and increased supero-inferior dimensions of soft palate on lateral cephalogram with progression of OSMF.

Table 6: Correlation of Radiographic Length and Type of Soft Palate in Study Group and Control Group

PARAMETER	STUDY	MEAN (in mm)	MEDIAN	P VALUE	STATISTICAL SIGNIFICANCE
TYPE OF SOFT PALATE (MANN-WHITNEY TEST)	OSMF	2.650	1.000	0.0118	Significant
	CONTROL	1.425	1.000		
A-P LENGTH (UNPAIRED T-TEST)	OSMF	26.375	26.000	<0.0001	Significant
	CONTROL	35.150	35.500		
S-I LENGTH (UNPAIRED T-TEST)	OSMF	11.600	11.750	0.0138	Significant
	CONTROL	10.813	11.000		

Table 7: Correlation of A-P Dimensions with Clinical/Histologic/Radiographic Parameters

PARAMETER (WILCOXON MATCHED-PAIRS SIGNED-RANKS TEST)	MEAN (in mm)	MEDIAN	P VALUE	STATISTICAL SIGNIFICANCE
A-P LENGTH	26.375	26.000	< 0.0001	Significant
CLINICAL STAGE	2.875	3.000		
A-P LENGTH	26.375	26.000	< 0.0001	Significant
HISTOLOGIC GRADE	2.500	3.000		
A-P LENGTH	26.375	26.000	< 0.0001	Significant
TYPE OF SOFT PALATE	2.650	1.000		

Table 8: Correlation of S-I Dimensions with Clinical/Histologic/Radiographic Parameters

PARAMETER (WILCOXON MATCHED-PAIRS SIGNED-RANKS TEST)	MEAN (in mm)	MEDIAN	P VALUE	STATISTICAL SIGNIFICANCE
S-I LENGTH	11.600	11.750	< 0.0001	Significant
CLINICAL STAGE	2.875	3.000		
S-I LENGTH	11.600	11.750	< 0.0001	Significant
HISTOLOGIC GRADE	2.500	3.000		
S-I LENGTH	11.600	11.750	< 0.0001	Significant
TYPE OF SOFT PALATE	2.650	1.000		

In our study, Type 1 (leaf-shaped) soft palate was found to be the most common (55%) followed by Type 6 (crook-shaped) viz. 22.5 % and Type 3 (butt-like) viz. 17.5%. (Ref. Table 2)

The mean values of all dimensions for Clinical stage, Histopathologic grade and Type of soft palate was calculated by addition of all the measurements divided by number of cases in each type.

In the OSMF group, the mean length of the soft palate antero-posteriorly was 28.05mm for Type 1, 24.29mm for Type 3, 25mm for Type 4, 26mm for Type 5 and 23.33mm for Type 6 variety with the corresponding values in Control group being 35.51mm, 31.25mm, 35mm, 31mm and 34mm, indicating shortening of length with shift in the type of soft palate corresponding to worsening of the disease state. The mean soft palatal length supero-inferiorly was 11.77mm for Type 1, 12.29mm for Type 3, 13mm for Type 4, 11mm for Type 5 and 10.88mm for Type 6 variety, with the corresponding values in Control group being 11.01mm, 11.5mm, 7mm, 9.5mm and 10mm, thus giving variable results. (Refer Table 5)

Histopathologically, 21 out of 40 OSMF patients were classified as having Grade III OSMF, 15 patients as Grade II, 3 patients as Grade I and 1 patient as Grade IVA (Refer Table 1)

The only patient showing Grade IVA OSMF histopathologically, had 14mm antero-posterior soft palatal length, 10mm supero-inferior soft palatal length and belonged to Stage IVA clinical stage as per Khanna and Andrade classification (1995).

DISCUSSION

The palatine uvula, usually referred to as simply the uvula is a conical projection from the posterior edge of the middle of the soft palate, composed of connective tissue containing a number of racemose glands, and some muscular fibers (musculus uvulae). The musculus uvulae, which lies entirely within the uvula, shortens and broadens the uvula. This changes the contour of the posterior part of the soft palate[16, 17]. Morphometric assessment of the nasopharynx or the configuration of adjacent structures can be defined in terms of depth and height in the median sagittal plane on lateral cephalogram[18]. The present study is undertaken to study the morphology of soft palate in OSMF patients using radiographs and correlating the same to clinical and histologic grade respectively.

Cephalometry is a relatively inexpensive method and permits a good assessment of the soft tissue elements that defines the soft palate and its surrounding structures[18]. Although histological analysis of haemotoxylin and eosin (H & E)–stained tissue sections remains the mainstay in the diagnosis of OSMF, radiographic evaluation can be considered a powerful tool for the same.

Lateral cephalograms can be used as an adjunct to conventional biopsy, and may eliminate the need for biopsy in cases of mass screening camps, medically compromised patients, cross-sectional community studies and patients with drastically reduced mouth opening.

This study can aid to observe the extent of disease progress, to devise a comprehensive treatment plan with regards to the morphological and anatomic corrections of the soft palate, post-surgical speech therapy and treatment of associated dysphagia.

A morphological classification of soft palate in normal individuals was proposed by You et al. (2008) [14].

Knowledge about the varied morphological pattern of soft palate in OSMF patients can give us a clear understanding about disease progress in oropharyngeal region. Thorough understanding and knowledge of associated changes will help the maxillofacial surgeon in successful structural and functional corrections associated with this disorder[8].

To our knowledge, ours is the first study comparing the clinical, histologic and radiographic aspects in OSMF patients.

In our study group, maximum patients demonstrated a Type 1 soft palatal morphology, even though statistically significant difference in the antero-posterior and supero-inferior dimensions was observed, when compared to control group.

After Type 1, maximum incidence of Type 6 followed by Type 3 and Type 2 soft palatal morphology was seen in the study group.

The anterior-posterior dimensions were the least for Type 6 soft palate and maximum for Types 1 and 2, shorter dimensions were seen with worsening of the disease status while the superior-inferior dimensions were least for Type 6 and maximum for Type 4 soft palate. Both A-P and S-I values showed significant correlation with Clinical stage, Histologic grade and Type of soft palate.

The difference in the antero-posterior and supero-inferior dimensions between OSMF and Control patients was statistically significant, indicating the severity of fibrotic changes involving soft palate observed in this disease.

In our sample size, 15 out of 40 (37.5%) OSMF patients did not show correlation between clinical staging and histopathologic grading. This non-correlation can be attributed to differential fibrosis, with more posterior bands causing further limitation of mouth opening. It is in cases like these, that radiographic evaluation can be used as an adjunct, for a more definitive diagnosis and an appropriate treatment plan.

We also observed in our study that OSMF patients having an A-P length of >35mm radiographically, fell in the category of Grade I OSMF histopathologically. Similarly, an A-P length in the range of 26-35mm corresponded with Grade II OSMF, 15 -25mm corresponded with Grade III OSMF and <15mm A-P length corresponded with Grade IVA OSMF histopathologically. S-I length gave variable results in this regard. These observations, if validated using a larger sample size, can aid in serving as an independent diagnostic paradigm in the near future.

CONCLUSION

We observed that, as OSMF progressed to advanced stages, increased incidence of Type 3 and Type 6 variety of soft palate on lateral cephalogram was seen.

A gradual reduction in A-P length and increase in S-I length was observed, suggesting that soft palate becomes shorter and thicker with advancing stage. But, the results were more pronounced in the antero-posterior direction than in supero-inferior direction.

In our study, the mean length of the soft palate antero-posteriorly in OSMF patients was significantly less than the corresponding value in control subjects signifying the fibrotic changes occurring leading to a shrunken uvula.

To conclude, the measurements noted with regards to the A-P and S-I length radiographically were seen to correlate with the OSMF grade histopathologically, which could be utilized as a non-invasive predictor of OSMF grade and can be especially useful for patients who are deemed medically unfit to undergo biopsy. These observations have scope for validation using a larger sample size.

ACKNOWLEDGEMENTS

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How to cite this Article: Tekchandani V, Thakur M, Palve D, Mohale D, Gupta R. Co-relation of clinical and histologic grade with soft palate morphology in oral submucous fibrosis patients: A histologic and cephalometric study. J Dent Specialities,2015;3(1):68-75

Source of Support: NIL
Conflict of Interest: None Declared

Pedicle flap design- A newer technique in mandibular third molar surgery for reduction of post-operative complications

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ABSTRACT

Purpose: The aim of this study was to investigate the effects of a new flap design, the pedicle flap used for the removal of mandibular third molars on postoperative morbidity.

Materials and Method: 10 patients with partially erupted mandibular third molar were studied. Swelling, pain, trismus, dry socket and wound dehiscence measures were recorded on days 2 and 7. Data were analysed using the t-independent test and Fischer's exact test.

Results: Facial swelling, pain, restricted mouth opening was seen in the postoperative period. Wound dehiscence was seen in only 1 patient and no incidence of dry socket was noted.

Conclusion: Pedicle flap design has led to better wound healing and lesser incidence of dry socket.

Received: 13-01-2015
Accepted: 28-03-2015

Keywords: Impacted mandibular third molar, Pedicle flap, Pain, Swelling, Trismus, Dry socket, Wound dehiscence.

INTRODUCTION

Third molars are the most likely teeth to be impacted with around 33% of the population having at least one impaction. Studies have showed mandibular third molar impaction occurring with higher incidence over other teeth. This impaction is probably the result of both genetic and environmental factors. A variety of pathoses are related to an impacted third molar. From prophylactic measures to large osteolytic lesions, there are various indications for its removal. Because of its prevalence, thus removal of third molar is one of the most frequent surgical procedures in the oral cavity.[1,2] Removal of third molar involves manipulation of both soft and hard tissue, so it is often attended by complications which are distressing to patients. The adverse effects of the third molar surgery in the quality of life have been reported to show a three-fold increase in patients who experience pain, trismus and swelling alone or in combination compared to those who were asymptomatic.[3] The common complications of lower third molar surgery are pain, trismus, dry socket, swelling, nerve damage, wound infection and delayed onset wound infection which occurs after suture removal, periodontal pocket formation, loss of connective tissue attachment or bone loss on the distal aspect of second molar. Wound dehiscence is another common complication of third molar removal. Dehiscence potentially prolongs the time of healing and may lead to a longer period of discomfort and continuous pain and could cause the development of alveolar osteitis and compromised periodontal status of the adjacent second molar.[2] Complication of wound dehiscence is seen with routinely used flap design, the Ward's incision. Because incision is given at the site of bone removal, the incidence of wound dehiscence is more and thus chances of infection are increased. To mask these demerits, the buccal envelope flap is alternatively used. An even newer flap design, the pedicle flap, has come up which has the advantage of better wound closure resulting in lesser incidence of wound dehiscence and dry socket.[4]

A pedicle flap design as described by Goldsmith S, De Silva R, and Tong D, Lowe R (2012) incorporates a distal incision which allows soft tissue advancement and rotation to achieve complete closure of the surgical site over sound bone. This promotes healing by primary intention, minimizes wound dehiscence, loss of the coagulum or exposure of the alveolar bone thus decreasing the risk of dry socket.

The aim of this study was to evaluate the effects of a pedicle flap design as described by Goldsmith S, De Silva R, Tong D, Lowe R (2012)[4] with severity of common acute postoperative sequelae associated with lower third molar tooth removal.

The present study was conducted in the Department of Oral and Maxillofacial Surgery & Oral Implantology, I.T.S Centre for Dental Studies and Research, Muradnagar, Ghaziabad. The study was undertaken for a period of 1 year from September 2012 till September 2013. The sample size of the study was determined by suitable professional software, using data from a previously conducted similar study. The standard deviation was set as 1.92, and expected mean difference of variables was set as 0.84. The level of significance i.e. α – error was 5%, power was 80% and the confidence interval was 95%. On calculation we had found a minimum sample size of 7 patients. We took 10 patients in the present study. The study was approved by the ethical

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committee of the institution as well as by the institutional reviewer board. A total of one hundred and eight patients within the age range of 18-40 years who reported to the Department of Oral & Maxillofacial Surgery requiring surgical removal of partially erupted mandibular third molars were evaluated. Routine blood investigations were done for all patients. Orthopantomographic radiographs and intra oral periapical radiographs were obtained to ensure the similarity of the type of impaction. The inclusion and exclusion criteria for the present study were defined as follows-

INCLUSION CRITERIA

1. All the patients in the age group between 18-40 years and in good health.
2. Patients requiring surgical removal of impacted mandibular third molars and who willingly took part in study.

EXCLUSION CRITERIA

1. Patients who were allergic to any of the local anesthetic solutions and / or allergic to medications prescribed in the study.
2. Pregnant and lactating female patients.
3. Medically compromised patients (ASA III and ASA IV). 61
4. Patients who took antibiotics / anti-inflammatory drugs 3 weeks prior to surgery.

METHOD OF STUDY

All the patients underwent a thorough medical and dental evaluation including history of allergy to any drug. Routine blood investigations were carried out prior to the surgery. Only the patients who were categorized as ASA I and ASA II were included in the study. All the patients were explained in detail about the study, its parameters and complications which may occur. A signed written informed consent was obtained from each of the included patients in presence of independent witnesses. Age and sex of the patients were noted. Based on orthopantomogram and intra-oral periapical radiographs, the type of impaction as classified by Pell GJ, Gregory BT (1933), Winter GB (1926), Pederson's difficulty index, root pattern of the third molar and proximity to inferior alveolar canal were noted.

The data recorded preoperatively for every patient included in the study were the facial dimensions measured preoperatively by means of suture material and/ or measuring tape. Four points were marked on the face: at the corner of mouth, at the tragus of ear, at the outer canthus of eye and at the angle of Mandible. The distance from the corner of the mouth to the intertragic notch was denoted as A-B following the bulge of the cheek, and the distance from the outer canthus of the eye to the angle of the mandible was denoted as C-D and measured on a millimeter scale. Pre-operative mouth opening was evaluated by measuring the inter-incisal opening between the mesio-incisal edges of the right maxillary and mandibular central incisors. The maximum opening of the jaws were recorded by a pair of graduated Vernier calipers preoperatively. All the patients were operated under local anesthesia. Lignocaine 2% with 1:200000 adrenaline was used for inferior alveolar nerve block along with long buccal nerve block and lingual nerve block. Surgical extraction of mandibular third molar was done using a pedicle flap design as described by Goldsmith S, De Silva R, Tong D, Lowe R (2012).[4]

After nerve block was given, an incision was placed in the buccal gingival sulcus from the mesio-buccal line angle of the first molar to the most distal visible aspect of the third molar. The releasing incision then extended distally 1 cm up the external oblique ridge as in buccal envelope incision (Fig.1). A lingual flap was reflected in the subperiosteal plane irrespective of the flap design and lingual nerve protected using a Howarth's retractor. A large round 40 surgical bur (No 8) with copious irrigation was used to remove bone superior, distal and buccal to the crown of the third molar. A fissure bur was used to section the tooth if required. The tooth was then elevated and delivered and the dental follicle removed. Sterile saline irrigation of the socket was done to remove debris. After removal of the third molar, from the distal aspect of the incision that was given on the external oblique ridge was curved towards the buccal sulcus (Fig. 2). This tongue shaped flap is then pulled and rotated over the extracted socket allowing primary closure over sound bone.[4] (Fig. 3). Interrupted sutures with 3-0 black braided silk were placed to stabilize the flap and close extraction site to desired degree. Haemostasis was achieved prior to flap closure.

Data collection and Statistical analysis

The patients were recalled on the second (48 hours after surgery) and seventh post-operative days for follow-up and the following parameters were assessed. Postoperative pain were measured on a 100mm long Pain Numeric Rating Scale (Fig.-2), which was marked by the patient himself/herself, as per the pain experienced by the patient. Three readings for pain were recorded and the mean was derived. The facial dimensions were measured postoperatively in the similar manner as taken preoperatively. A-B and C-D were measured thrice and their mean derived. The difference between each postoperative measurement and the baseline indicated the facial swelling for that day. To eliminate observer bias only one observer measured the swelling in all patients. Mouth opening was evaluated in the same way as in the preoperative period and the mean derived. The difference between each postoperative measurement and the preoperative measurement indicated the trismus for that day.

The presence of dry socket was assessed based on the following criteria:
a. Symptoms which start between 1-3 days after extraction.
b. Loss of blood clot from the socket.
c. Severe pain irradiating from empty socket, normally to the ipsilateral ear and temporal lobe.
d. Foul odor.
e. Regional lymphadenopathy may occur.
f. Bony socket bare of granulation tissue.

Apart from these parameters the extracted sites were evaluated for inflammation, wound dehiscence, breaking of sutures and infection. On the seventh post-operative follow up day, intra oral sutures of the patients were removed and the patients questioned regarding any other related complaints.

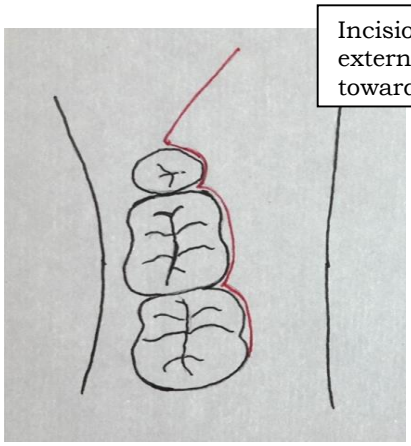

Fig.-1: Buccal envelope incision

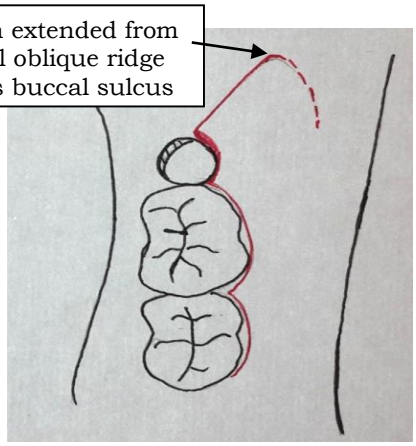

Fig.-2: Extention towards buccal sulcus

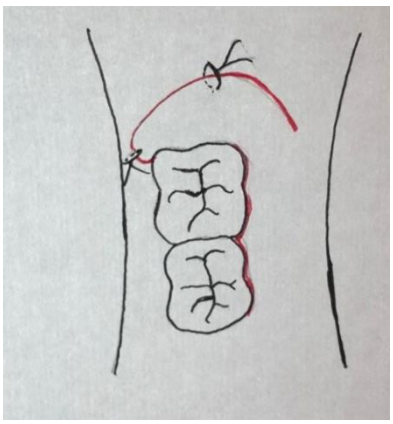

Fig.-3: Rotational flap closed over socket

RESULTS

The mean value of pain scores (in NRS) on the second post-operative day was M=3.24, SD= 1.665, SE= 0.333 and on the seventh post-operative day was M= 1.20, SD= 1.000, SE= 0.200. The measurement of post-operative facial dimension was more on the 2nd post-operative day than the 7th post-operative day. By the seventh post-operative day, the facial dimension values reduced to near the pre-operative value.Table-2 The mean value of facial dimension AB on the pre-operative day was M = 11.0184, SD = 0.62473, SE = 0.2495, on the second post-operative day was M = 11.4632, SD = 0.61252, SE = 0.12250 and on the seventh post-operative day was M = 11.0436, SD = 0.64866, SE = 0.12973. The mean value of facial dimension CD on the pre-operative day was M = 10.0016, SD = 0.68335, SE = 0.13667, on the second post-operative day was M = 10.4828, SD = 0.78136, SE = 0.15627 and on the seventh post-operative day was M = 10.0576, SD = 0.67397, SE = 0.13479.

The mean value of amount of swelling between second post-operative day and pre-operative day at horizontal axis AB was M = -0.4448, SD = 0.31095, SE = 0.06219, between seventh post-operative day and preoperative day was M = -0.0252, SD = 0.20170, SE = 0.04034 and between second and seventh post-operative day was M = 0.4196, SD = 0.27766, SE = 0.05553.

Again the mean value of swelling at vertical axis CD between preoperative and second post-operative day was M = 0.4812, SD = 0.40417, SE = 0.08083, between seventh day and pre-operative day was M = -0.0560, SD =0.20351, SE = 0.04070, between second and seventh post-operative day was M = 0.4252, SD = 0.33009, SE = 0.06602. The mean value of mouth opening (in centimeters) on the pre-operative day was M=4.2340, SD=0.75907, SE=0.5181, on the second day was M=2.6016, SD=0.74251, SE=0.14850 and on the seventh post-operative day was M=3.5544, SD= 0.62323, SE= 0.12465.Table-3

No occurrence of dry socket was seen and only 1 (12%) dehiscence has been noticed in one patient where pedicle flaps were used.

Table 1: Distribution of Mean ± Standard Deviation of Pain

Pain	Mean ± Standard Deviation	Sandard Error Mean
Post-operative second day	3.24 ± 1.665	0.333
Post-operative seventh day	1.20 ± 1.000	0.200

Table-2: Distribution of Mean ± Standard Deviation of Swelling
FDAB- Facial Dimension at horizontal axis AB.
FDCD- Facial Dimension at vertical axis CD

Facial Dimension	Mean ± Std. Deviation	Std. Error Mean
Preoperative FDAB	11.0184 ± .62473	0.12495
Preoperative FDCD	10.0016 ± .68335	0.13667
Postoperative Second day FDAB	11.4632 ± .61252	0.12250
Postoperative Second day FDCD	10.4828 ± .78136	0.15627
Postoperative Seventh day FDAB	11.0436 ± .64866	0.12973
Postoperative Seventh day FDCD	10.0576 ± .67397	0.13479

Table 3: Distribution Mouth Opening (inter-incisal distance)

Mouth Opening (inter-incisal distance)	Mean ±Std. Deviation	Std. Error Mean
Pre-operative	4.2340 ± 0.75907	0.15181
Post-operative 2nd day	2.6016 ± 0.74251	0.14850
Post-operative 7th day	3.5544 ± 0.62323	0.12465

DISCUSSION

Surgical removal of an impacted mandibular third molar is one of the most frequently performed minor oral surgical procedures and demands sound understanding of surgical principles to perform it as atraumatically as possible.1-6 Incisions are placed to gain access to the surgical site for adequate accessibility to perform a clean surgical procedure and for proper visibility of the surgical field. Different designs for the raising of a mucoperiosteal flap to expose an impacted lower third molar have been advocated by various authors, the most common designs being the modified triangle flap and the envelope flap.[1-4]

The presence of various important anatomical structures in the adjacent area around the surgical site has made many surgeons to design an incision, ranging from envelope (Koener's) incision, triangular (Ward's) incision, and its modification, L shaped incision, bayonet shaped incision, comma incision, and —S shaped incision,[4,5] which would allow proper access and visibility with consideration and protection of the vital anatomical structures. Despite various flap designs in the literature, none of the designs has fulfilled the requirements of an ideal flap for the third molar surgery in order to overcome the various post-operative complications like pain, trismus, swelling, hematoma, periodontal problems distal to the second molar, nerve damage, alveolar osteitis, and wound dehiscence. We agree with Jakse, et al.[6] that flap design influences primary wound healing after third molar surgery. These complications are the routine sequel due to inflammation as a result of surgery. A major cause of third molar surgical trauma occurs when raising a mucoperiosteal flap to adequately visualize and gain access to the tooth. We have evaluated the effects of this new technique when applied to third molar surgery on post-operative sequelae.

Wound dehiscence is another common post-operative problem related to flap designs. A dehiscence makes hygiene more difficult and requires intense follow up treatment (i.e. frequent irrigation and possible local medication). There is also a chance for longer lasting discomfort caused by the hypersensitivity in the area of the distally exposed root surface of the second molar. Alveolar osteitis and soft tissue abscess are more severe complication that is possible.[6]

To overcome possible disadvantages of flap designs, various authors advocate primary wound closure after lower third molar extraction to allow faster mucosal healing and greater promotion of bone regeneration. The pedicle flap design used in this study which was described by Goldsmith et al[4] incorporates a distal incision which allows soft tissue advancement and rotation to achieve complete closure of the surgical site over sound bone, potentially enhancing healing by primary intention and minimizing wound dehiscence, loss of the coagulum or exposure of the alveolar bone thus decreasing the risk of developing alveolar osteitis. Like with other flap designs, the common post-operative sequelae of facial swelling, restricted mouth opening and pain was also seen with the pedicle flap design. However in terms of wound healing, this flap design was advantageous over other flap designs as only one patient developed dehiscence on the fifth day. And no patient came with the occurrence of dry socket. Therefore, this new flap design has showed better wound closure and healing in the post-operative period and thus no occurrence of dry socket was seen.

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How to cite this Article: Choudhury R, Kukreja P, Kumar K, Bhatnagar A, Anand KR, Chhabra V. Pedicle flap design- A newer technique in mandibular third molar surgery for reduction of post-operative complications. J Dent Specialities,2015;3(1):76-80

Source of Support: NIL
Conflict of Interest: None Declared

A comparative evaluation of three different techniques for single step border molding

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Received: 13-01-2015
Accepted: 20-03-2015

ABSTRACT

Statement of the Problem: *Border molding is one of the important biologic factors required to provide optimal retention of the denture by creating a peripheral seal.*
Purpose: *Previous studies have evaluated different materials individually for the purpose of border molding. The literature does not report about comparative evaluation of the efficiency of different materials for the purpose of one step border molding. This clinical study compares and evaluates the effectiveness of different materials for the purpose of one step border molding.*
Aims: *To evaluate and compare the effectiveness of different materials for the purpose of one step border molding.*
Methods and Material: *One step Border molding was completed for each subject by manual manipulation of the soft tissues adjacent to the tray borders using three different materials -1) Low fusing Impression Compound Type I b, 2) Heavy bodied Elastomeric Material : Polyvinyl Siloxane and 3) Modified Zinc Oxide Eugenol Impression Paste. Three examiners evaluated the border molding based on tissue contact, tissue displacement, bond to the tray and overall peripheral seal. Each criteria was scored on a scale of 1-5, with score 1 as bad while score 5 was considered excellent. The average of the score recorded by the three examiners for each criteria was considered.*
Results: *Heavy Bodied Elastomeric Material- Polyvinyl siloxane has the best efficiency, while Low fusing Impression Compound Type I a had the least efficiency amongst the three when used for the purpose of border molding.*
Conclusions: *One step border molding is an viable and advantageous alternative to conventional border molding (sectional border molding) as it results in reduction of chairside time, less discomfort for the patient and less efforts for the dentist.*

INTRODUCTION

Border molding is the shaping of the border areas of an impression material by functional or manual manipulation of the soft tissue adjacent to the borders to duplicate the contour and size of the vestibule.[1]

Peripheral seal is established when denture borders contact with the underlying or adjacent tissues and prevent passage of air or other substances. It is one of the important biologic factors that will provide optimal retention of the denture. Retention provides psychologic comfort to the patient and contributes dramatically to patient acceptance of the finished prosthesis.[2]

The original material used for this purpose was modelling compound, which was introduced in 1907 by the Green brothers.[3] Modelling compound is very advantageous as the material softens easily, but is quite hard at mouth or room temperature.

Peripheral areas can be molded with the least possibility of distortion or breakage of the previously completed section. Corrections or additions of the earlier molded segments can be easily accomplished. For these reasons modelling compound is still effectively used today by many dentists, and is the material of choice for teaching.[3]

The technique of using impression compound for border molding is usually divided into steps where sections of the borders are molded in separate applications. This is called as the sectional technique of border molding.

The technique for border molding taught at the University of Washington before 1976 required a minimum of 24 insertions of the trays, eight for the maxillary and16 for the mandibular, provided proper extensions were secured on the first insertion for each section.[3] Woelfel[4] and associates determined that seven dentists required an average of 17 insertions to secure a final maxillary impression on the same patient when utilizing modelling compound for border molding and impression plaster for the final impression.[4]

However, the technique of using modelling compound is difficult because the softened compound must be placed into the mouth without touching the lips, cheeks, or ridge.[3] It retains its flow for a short period of time. Therefore delay in seating the tray may lower the temperature and will often result in overextended borders. Also there is a high possibility of propagation of errors caused by discrepancy in one section affecting the border contours in subsequent sections.

An increase in the number of insertions makes the technique tedious and difficult.[3] It would be desirable if large areas or even the entire custom

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tray could be border molded with one insertion. This would result in reduction of chair side time, less discomfort for the patient and less efforts by the dentist. The technique which will allow simultaneous moldings of all borders is called one step technique having two general advantages. These are - 1) the number of insertions of the trays for border molding are reduced to one, and 2) Development of all borders simultaneously avoids propagation of errors.[5] The requirements of a material to be used for simultaneous molding of all borders are that it should (a) Have sufficient body to allow it to remain in position on the borders during loading of the tray,(b) Allow some preshaping of the form of the borders without adhering to the fingers, (c) Have a setting time of 3 to 5 minutes, (d) Retain adequate flow while seating in the mouth, (e) Allows finger placement of the material into deficient parts after seating the tray,(f) Does not cause excessive displacement of the tissues of the vestibule, (g) Be readily trimmed and shaped so that excess material can be carved and the borders shaped before the final impression is made.(h) Be sufficiently rigid after setting and trimming so that the final impression material will not crack or craze.[5] Previous studies have evaluated these materials individually for the purpose of border molding.[3,6,7] The literature does not report about comparative evaluation of the efficiency of different materials for the purpose of one step border molding.

This clinical study compares and evaluates the effectiveness of different materials for the purpose of one step border molding.

MATERIALS AND METHODS

Materials:

1. Low fusing impression compound
2. Type I b Modified Zinc Oxide Eugenol Impression Paste
3. Heavy body Elastomeric Material – Polyvinyl Siloxane

Methodology:

a. Inclusion and exclusion criteria: Subjects who presented with a well healed maxillary ridge with history of extraction six to twelve months ago, with U or V shaped arch form with normal depth of the palatal vault were included. Subjects who were old denture wearers or gave a history of pre prosthetic surgery or presence of undercuts or osseous defects (eg- tori) or any other anomalies were excluded. Patients were informed about the procedure and a written informed consent was signed by them.

b. Primary impression: Preliminary impressions were made in medium fusing impression compound type I a. Impression was beaded, boxed and poured with vacuum mixed dental plaster type II.

c. Fabrication of custom trays: Based on the principles of selective pressure technique spacer wax was adapted on the primary cast. Three Custom trays were fabricated in self cure acrylic/tray compound such that the tray extensions were 2mm short of the sulcus depth with tissue stops placed in the canine and first molar regions bilaterally. The trays were checked intra orally for each subject and adjusted for clearance in the vestibular region.

d. One step border molding: One step border molding was completed for each subject using the three different materials namely low fusing impression compound type i b, heavy bodied elastomeric material: polyvinyl siloxane and modified zinc oxide eugenol impression paste. For each subject, border molding using the three different materials was carried out at a gap of 48hours between two successive materials.

1. One step border molding using low fusing impression compound type i b: low fusing impression compound type i b available in the form of stick was finely powdered using a mortar and pestle. A 5cc syringe was then filled with the powdered compound. The compound was then softened by placing the syringe into a water bath with temperature maintained at 80^{O}C.[6] The softened compound was then syringed onto the borders of the tray .Border molding was accomplished by manual manipulation of the soft tissue adjacent to the borders to duplicate the contour and size of the vestibule.[Fig.1]

Fig.1: Border molding using low fusing impression compound type i b

2. One step border molding using heavy bodied elastomeric material - polyvinyl siloxane: heavy bodied elastomeric material - polyvinyl siloxane was used for border molding in this technique. The tray borders were coated with tray adhesive. The material was extruded onto the tray borders using a dispensing gun. Border molding was accomplished by manual manipulation as described in the method above. [Fig.2]

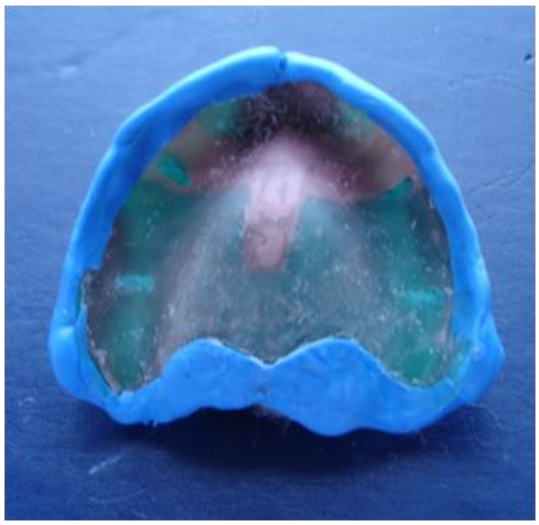

Fig.2: One step border molding using heavy bodied elastomeric material - polyvinyl siloxane

Fig. 3: One step border molding using modified zinc oxide eugenol impression paste

3. One step border molding using modified zinc oxide eugenol impression paste: modified zinc oxide impression paste was used for border molding. The filler content was increased to add to the bulk of the paste and amount of catalyst was also increased to allow faster setting of the material. The base paste and the catalyst paste were dispensed onto a glass slab and mixed with a spatula. The mixed paste was then loaded into a 5 cc syringe and syringed onto the tray borders and border molding was accomplished by manual manipulation as described earlier.[Fig.3]

e. Evaluation based on the aforementioned criteria: Three experienced prosthodontists evaluated the border molding based on the aforementioned criteria. Each criteria was scored on a scale of 1-5, with score 1 as bad while score 5 was considered excellent. The average of the score recorded by the three examiners for each criteria was considered. Criteria for evaluation included tissue contact, Tissue displacement, Bond to the tray and overall peripheral seal.

RESULTS

1. One step border molding using low fusing impression compound type I b (Table 1)

Table 1: One step border molding using low fusing impression compound type I b

Patient number	1	2	3	4	5	6	7	8	9	10	**Average score**
Evaluation Criteria Tissue contact	2	3	2	3	3	3	2	2	2	2	2.4
Bond to the tray	2	1	1	2	2	1	1	1	2	1	1.4
Tissue displacement	1	1	1	2	1	1	1	1	1	2	1.2
Overall peripheral seal	2	3	2	3	2	2	2	2	2	3	1.3

2. One step border molding using heavy bodied elastomeric material – polyvinyl siloxane (table 2)

Table 2: One step border molding using heavy bodied elastomeric material – polyvinyl siloxane

Patient number	1	2	3	4	5	6	7	8	9	10	**Average score**
Evaluation Criteria Tissue contact	3	3	3	4	3	3	3	3	3	4	3.2
Bond to the tray	4	4	4	4	4	4	3	3	4	4	3.8
Tissue displacement	3	3	4	4	4	3	4	3	4	3	3.5
Overall peripheral seal	4	4	4	3	4	3	3	4	4	3	3.6

3. One step border molding using modified zinc oxide eugenol impression paste (table 3)
The average results for the 3 materials are as shown in (table 4) and is represented as seen in (fig.4).

Table 3: One step border molding using modified zinc oxide eugenol impression paste

Patient number	1	2	3	4	5	6	7	8	9	10	**Average score**
Evaluation Criteria											
Tissue contact	3	3	4	3	3	3	3	2	3	2	2.7
Bond to the tray	2	3	2	3	2	2	2	2	3	2	2.3
Tissue displacement	4	4	4	3	4	3	3	3	3	4	3.2
Overall peripheral seal	3	3	3	3	3	3	2	3	3	2	2.8

Table 4: Average result for the three materials

Materials	**Low Fusing**	**Elastomeric**	**ZOE**
Tissue contact	2.4	3.2	2.7
Bond to the tray	1.4	3.8	2.3
Tissue Displacement	1.2	3.5	3.2
Overall peripheral seal	2.3	3.6	2.8

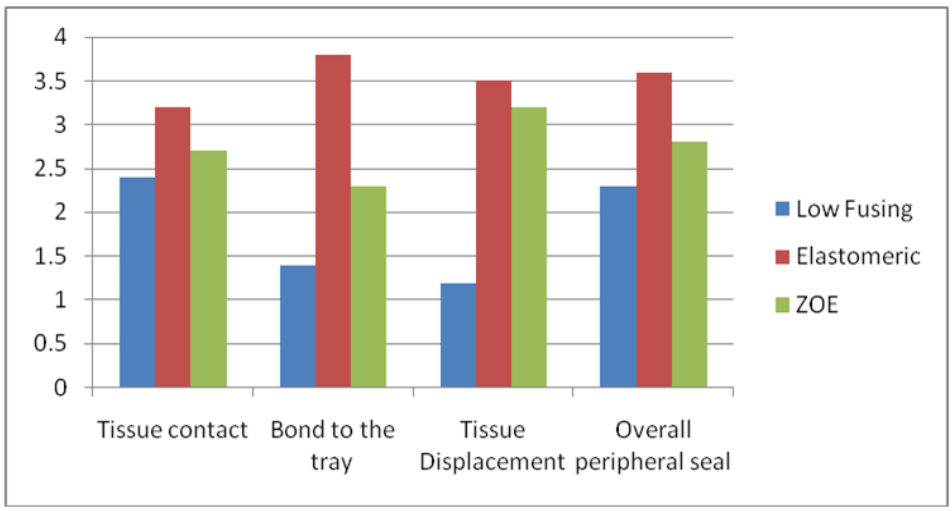

Fig.4: Graph showing results for the 3 methods used

DISCUSSION

Patients were selected according to the inclusion and exclusion criteria to obtain an ideal/optimal situation for single step border molding and eliminate any bias in evaluation and comparison due to presence of any unfavorable anatomical morphology.(eg-under cut or osseous defect)

Conventionally borders are molded using the sectional technique. Increased number of insertions makes such a technique quite tedious and difficult.[3] Also propagation of errors caused by discrepancy in one section can affect the border contours in subsequent section. Hence it would be desirable if large areas or even the entire custom tray could be border molded with one insertion. This would be advantageous in day to day practice as it results in reduction of chair side time, less discomfort for the patient and less efforts for the dentist.[5] One step Border molding should be carried out as a viable alternative to conventional border molding (sectional technique). Low fusing impression compound type I b, high viscosity elastomeric material and modified zinc oxide eugenol impression paste were used as these materials are commonly available in a daily/ day to day practice and can be used easily to carry out one step border molding. Low Fusing Impression compound type I b had the lowest efficiency as it is highly viscous when softened and it retains flow for a short time once displaced. In case of delay in seating the tray the compound cools and flow ceases resulting in inaccurate molding. Its use to a large extent is dependent on the operator.

Heavy bodied Elastomeric Material - Polyvinyl Siloxane had the best efficiency amongst the three as it has ease of manipulation, good initial flow, sets rigid and good working time required for simultaneous border molding.[5,6]

CONCLUSIONS

Within the limitations of this study, the following conclusions are drawn

1. One step border molding is a viable and advantageous alternative to conventional border molding (sectional border molding) as it results in reduction of chair side time, less discomfort for the patient and less efforts for the dentist.
2. One step border molding can be accomplished using the three routinely available materials i.e-using low fusing impression compound type i b, heavy bodied elastomeric material: polyvinyl siloxane and modified zinc oxide eugenol impression paste.
3. Heavy Bodied Elastomeric Material- Polyvinyl siloxane proved to be most efficient amongst the three when used for the purpose of border molding.

A study needs to be conducted on a larger sample size and it is needed to apply the techniques in patients with different clinical conditions.

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How to cite this Article: Kheur M, Jambhekar S, Sethi T, Kheur S. A comparative evaluation of three different techniques for single step border molding. J Dent Specialities,2015;3(1):81-85

Source of Support: NIL
Conflict of Interest: None Declared

Changing trends in dental education - Paradigm shift

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ABSTRACT

Current training in dental education in India is mostly traditional. The method followed all over is predominantly didactic i.e. lectures and laboratories for skills and clinical training. It is time to introspect and analyze the reasons our graduates are appearing for entrance examinations and repeating their graduation in various parts of the world. We need to assess our training program and see if it meets the needs of students and community; to see how it matches to the various dental training programs globally. Our fraternity has to be aware of the global changes that have occurred in the field of education. This will enable them to improve, innovate and strengthen their skills and the program. There are many challenges facing us. They range from teaching learning methods, curriculum innovations, assessment techniques and improving attitudes and communication skills. This article will be a preliminary article on dental education in India and a series of articles will follow to address some important and pressing issues.

Received: 24-02-2015
Accepted: 28-03-2015

Keywords: Dental education, competency, Teaching learning methods, Assessment methods, Competency based education.

INTRODUCTION

In response to myriad changes such as changing social determinants of health, resource constraints, exponential rise in technology and increase in health care, dental education has also changed. In essence, over the last century, dental education has evolved from a self-taught and self-proclaimed "profession" to an actual one with formal education and recognized competencies. During this evolution, the issues of dentistry's relationship with medicine, the movement toward lifelong learning, critical thinking, and discovery culminating in an evidence-based approach to education and clinical practice have taken center stage.[1]

Many academicians and educators have been voicing their dissatisfaction with the quality of recent graduates. On the other hand, it is a serious challenge to improve the level of student satisfaction with the curriculum and learning environment.[2] It is imperative that the skills and roles of today's dentists be aligned to meet the needs of the society and be effective so as to ensure that high quality dental care is available to all.

There is a high level of unmet demands for oral health care in our country.[3] The need of the hour is to ensure oral health care services to all and improvising the level of oral health care services by empowering dental graduates with knowledge, skills and attitude required. To achieve this we need to look at some crucial factors.

Teaching learning methods

The process of education requires a holistic approach comprising of teaching, learning and assessment. Knowledge, communication, critical appraisal skills, attitudes, behaviours and performance related to the practice of evidence-based oral health care play vital role in the practice of evidence based dentistry.[4]

Globally different schools of thought have emerged. Problem based learning was considered to be flagship of all learning methods. In problem based learning, learning is achieved through challenging, open ended problems with a change in focus from teachers and teaching, as in conventional programs, to learners and learning. Some regard problem based learning as resource intensive and not displaying cost efficiency. This gave rise to the concept of case based learning. Although problem based learning and case based learning share some common goals, case based format requires students to recall previously covered materials to solve cases which are based on clinical practice.[5]

Outcome based curriculum, especially competence based are being implemented in all parts of the world. Outcome-based education is similar to competency-based education. It focuses on learning outcomes and not on learning objectives. Competence in dental education is a lifelong process nurtured with years of practice and reflection. Competency based learning consists of clearly specified outcomes of learning, as against the traditional approach, which was mainly discipline-based.[4]

In inquiry-based teaching-learning (IBTL), there is greater emphasis on the process of learning and development of sciences as inquiry. Inquiry-based teaching-learning is an open ended and adaptive process of learning.[6]

The ultimate goal of education is to train students with appropriate learning strategies and intellectual tools thus empowering them with knowledge, skills and attitudes that will serve the community.

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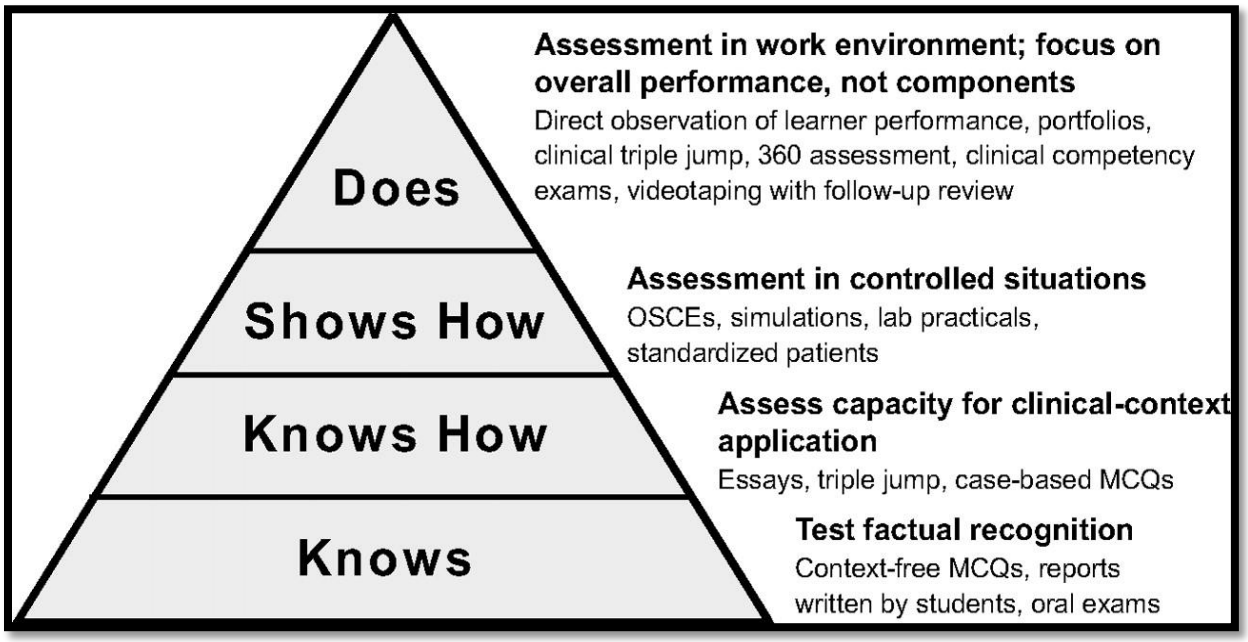
Innovative assessment methods

In dental education alternative methods for assessment of student performance have tended to emerge as more innovative teaching methodologies have opened doors to new thinking about educational process[4].

The pyramid by George Miller helps in understanding of important concepts related to assessment in medical and health professions education[7].

Miller's pyramid for assessing clinical competence



Barriers to improvisation of indian dental education

Lack of accreditation and licensure system, differences in dental education models, curricula and competencies, the slow implementation of technological advances by dental institutions are all barriers that limit improvisation of dental education system in India. There is also evidence that many dental colleges are short on well trained faculty. Indeed, the rapid growth in the student body and in the number of dental colleges of the type seen in India is highly likely to result in shortage of qualified faculty.[3] Qualified faculty empowered to train dental graduates with innovative teaching learning methods is the need of the hour.

Paradigm shift

Traditionally, teaching learning method predominantly consisted of didactic lectures with minimum participation of and interaction with students which only encouraged rote learning. Little opportunity is given for students to acquire a sense of "connectedness" between biomedical science courses, generally completed during their first two years, and clinical experiences required for graduation and practise thereafter. Although integration of science with clinical practice is a key objective of any dental curriculum, students often perceive that the mantra of survival in school is to pass the courses by rote memorization and to discover the relevance of this material in actual practice. The current practises and attitudes of students as well as faculty need to be changed and a shift is required towards evidence based dentistry with early clinical exposure. As the dental curriculum shifts from primarily lectures in the first year to clinical training in later years, a new learning environment needs to be created[2].

CONCLUSION

The disease patterns and demographics are changing, but diversity in dental education remains stagnant. Basic and clinical sciences are still not integrated. Knowledge and technology is exploding and to keep pace with it education system needs to revolutionise[1]. We are moving towards a new health care system and thus competencies for clinical practice need to be redefined. Research, critical thinking, and scientific method need to be woven into the fabric of education and clinical practice. Transfer of scientific discovery to education and practice is too laid back which needs to change[8]. The future of dentistry depends on the production of educationally qualified, culturally competent, and ethical dentists who are grounded in expert technical skills and sound medical knowledge.

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How to cite this Article: *Nagda SJ.* Changing trends in dental education - Paradigm Shift. J Dent Specialities, 2015;3(1):86-88

Source of Support: NIL
Conflict of Interest: None Declared

Role of forensic odontology in disaster victim identification in the Indian context

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ABSTRACT

Proper identification of the dead in disasters is an essential component of ensuring closure to surviving family, while also addressing legal issues pertaining to insurance and inheritance claims. The use of the dentition is considered integral to the process and methods of identification, and is standard procedure around the world. However it is seldom applied in the Indian context, which still relies more on unscientific methods such as visual identification and personal property. The Disaster Management Act of 2005 also has no reference to the use of scientific methods of post-mortem identification. This is reflected in several recent disasters—both accidental and natural—wherein bodies were not identified thoroughly, contributing to misidentification. Dentists are willing to assist in the identification process and it is for the government and local administrations to make the most of such services by passing regulations that ensure the use of teeth in post-mortem identification.

Received: 17-02-2015
Accepted: 26-03-2015

Key terms: Disasters, Forensic dentistry, Post-mortem dental identification, India, Dental records

Forensic odontology is the branch of dentistry that deals with the law. The specialty's application is primarily in identification of post-mortem remains by the careful examination of teeth, identification of perpetrators of sex crimes from analyzing bite marks, and estimation of age from dental radiographs. However, the very existence of forensic odontology today owes, perhaps, to the application of the dentition in the identification of burned human remains following two disasters of late nineteenth century in Europe. The first occurred in 1881 when the ring theatre in Vienna, Austria, was destroyed during a performance with 449 casualties; 284 among the dead were identified and here, "a medical practitioner used dental data in his investigation" (p. 296).[1] The second—the Charity Bazaar fire in Paris in May 1897—resulted in 126 deaths. In both tragedies, dental features were used in post-mortem identification. In the latter, relatives identified many bodies, however, on the day following the disaster, 30 unidentified bodies remained. Several of the victims were Countesses, Duchesses and other ladies from the 'high society' of the day who could afford quality dental care and treatment available at the time.[2] The treating dentists were called in and "all 30 bodies were eventually identified thanks to meticulous dental record keeping of amalgam fillings, gold repairs, crowns and evidence of extraction spaces noted in the mandibles and maxillae of the victims" (p. 129).[2] According to Harvey,[3] one of the dentists who assisted the identifications in Paris was a Cuban named Oscar Amoedo (who was working as a Professor at the Dental School in Paris University). Amoedo later that year wrote an article that described the techniques used in the post-mortem dental identification process and proposed a methodology that could be used in similar procedures in the future. This perhaps was a precursor to his work entitled "L'Art dentaire en médicine légale" which he authored in 1898—a seminal work that inspired modern forensic dentistry.

Forensic odontology is today integral to the identification protocols in several countries, and the dentition is one of three essential methods of disaster victim identification (the other two being fingerprints and DNA). Despite such importance being placed on post-mortem dental identification, the practice is still rare in India. Part of the reason may be a greater reliance on post-mortem visual identification methods, use of personal effects (such as clothing and jewellery), fingerprints and DNA. A popular belief is also that an absence of dental identification owes to the lack of availability of dental treatment (ante-mortem) records for use in comparison with the post-mortem dental data.[4] However, a recent survey reveals that 86% of dentists in India maintain records;[5] hence, it is probably an absence of government regulations necessitating use of post-mortem dental identification, and perhaps a degree of apathy from certain local agencies (such as some district administrations) responsible for identification in mass disasters that continues to deny the routine and compulsory application of this important tool.

Hence, it is unsurprising that the use of post-mortem dental identification in disasters in India is relatively sparse in spite of numerous examples of natural (Fig. 1), accidental or man-made disasters such as floods, tsunami, earthquake,

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train and bus accidents, airplane crashes, and terrorist attacks. In fact, neither the Disaster Management Act of 2005 nor the National Policy on Disaster Management of 2009 have any reference to identification of post-mortem human remains, further undermining the prospects of using scientific methods of identification in such situations.

Fig 1: More than 600 skulls were recovered in the village of Annigeri near Dharwad in Karnataka in 2010. The skulls were dated as being ~200 years old—all victims of a 1790 famine in the region. This is a rare example where the District Commissioner's Office and State Archaeological Department formally asked for teeth to be used in estimating age-at-death and sex of the post-mortem remains, which contributed to solving the mystery in the case.

Therefore, use of dental records for comparison with dentitions of victims of disasters is, at best, incidental in nature. For example, in the Air India Express flight IX-812 crash of May 2010 in Mangaluru, Karnataka, barely one or two bodies were identified using dental status—although a forensic dental specialist volunteered services in identification, the local authorities made scant use of the same; the legal heirs of the victims not providing ante mortem dental records at the time of the identification parade,[6] perhaps, also contributed to the deficiency. In general, the approach and prevailing attitudes of the next of kin of deceased and district authorities to identification in this disaster, as detailed in Menezes et al.,[6] did not help. Similarly, in the December 2004 tsunami, despite death occurring in the thousands, and in spite of senior dentists meeting State administrators at the highest echelons of power in Chennai, nothing fruitful materialised insofar as application of dental methods in identification was concerned.

The inadequate use of the dentition in disaster victim identification is also reflected in a relative lack of literature, specifically case reports, in India—one body (out of 25, constituting 4%) identified by a dental bridge in Gupta et al.[7] is a rare exception. Therefore, one wonders with a degree of scepticism what the future holds in the area. There is hope, however: Clauses 36(f)(i) and 39(f)(i) of the Disaster Management Act, 2005, do state that it is the responsibility of the State and Central Governments of India to draw up "mitigation, preparedness and response plans, capacity-building, data collection and identification and training of personnel in relation to disaster management", and clauses 36(h) and 39(i) which states that such other actions as may

be necessary for disaster management should be taken, thereby keeping the option open for use of post-mortem dental identification methods.

Dentists, for their part, certainly have shown willingness and enthusiasm in helping in the identification process in disasters—for example, 3.5% percent of surveyed dentists in India said that they had contributed to identification of victims in disasters while 91.9% of dentists were willing to share records for the purpose of identification of victims in disasters, if approached.[5] Moreover, enhanced record-keeping in the wake of recent Dental Council of India regulations that require the compulsory maintenance of dental records for a period of at least three years from the date of commencement of treatment (Gazette of India—Extraordinary, Part III, Section 4, No. 191, New Delhi, 27 June 2014) can contribute to post-mortem dental identification. Furthermore, education on the importance of post-mortem dental identification, particularly in the wake of examples of misidentification in recent disasters,[4] can compel authorities to encourage application of scientific methods such as teeth, and be more cautious in premature declaration of identification results based purely on personal property and such unscientific methods. To prevent the embarrassment of misidentification that concerned government agencies incur, not to mention the emotional trauma caused to relatives to whom wrong bodies are handed over, the following suggestions are made along the lines of Nandineni et al.[4] and Menezes et al.,[6] but with an emphasis on dental identification:

- Procedures for identification of victims in disasters based on dental methods must be included as standard operating protocols in disaster management plans
- The National Disaster Management Authority (NDMA) must identify and include a core group of dentists who are qualified/experienced in procedures related to post-mortem dental identification in general, and disaster victim identification in particular
- Dental radiographs (preferably orthopantomograms) of all Indian citizens applying for a passport must be made mandatory and be archived by/with the NDMA for easy retrieval for comparison with post-mortem remains of victims in disasters
- Victims' remains must be released to families only after confirmative identification using one of the three scientifically accepted methods, viz., fingerprints, DNA, and dental.

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How to cite this Article: Acharya AB. Role of forensic odontology in disaster victim identification in the Indian context. J Dent Specialities, 2015;3(1):89-91

Source of Support: NIL
Conflict of Interest: None Declared

Ackerman's tumor of the oral cavity: A study of four cases with its conglomerate appearance

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Received: 06-02-2015
Accepted: 20-03-2015

ABSTRACT

Oral verrucous carcinoma was first recognized by Ackerman in 1948 as a distinct entity. Although it occurs at various anatomic sites, most intraoral cases involve buccal mucosa, alveolar mucosa and gingiva. The purpose of this article is to describe four cases of verrucous hyperplasia and carcinoma with special emphasis on various clinical presentation and the most predilection sites.

Verrucous hyperplasia and verrucous carcinoma may not be distinguished clinically or may coexist, resulting in diagnostic difficulties. It should be born in mind that leukoplakic lesions may transform into verrucous carcinoma or squamous cell carcinoma, so all such pre-cancerous lesions should be scrutinized conscientiously. Thus, it is amenability of both the oral physicians and histopathologists to be scrupulous about warty and exophytic lesions.

INTRODUCTION

Oral verrucous carcinoma is a special form of well-differentiated squamous cell carcinoma with specific clinical and histological features. It is a rare tumor first described by Lauren V. Ackerman in 1948.[1] Various names are used in the literature to describe this entity, including verrucous carcinoma (upper aerodigestive tract), Ackerman's tumor, Buschke-Loewenstein tumor, florid oral papillomatosis, on the genitalia (condyloma acuminatum), or on extremities (carcinoma cuniculatum).[2] The oral cavity is the most common site of occurrence. The most common sites of oral mucosal involvement include the buccal mucosa, followed by the mandibular alveolar crest, gingiva, and tongue. In addition, it is known to occur in the larynx, pyriform sinus, esophagus, nasal cavity and paranasal sinuses, external auditory meatus, lacrimal duct, skin, scrotum, penis, vulva, vagina, uterine cervix, perineum, and the leg.[3] The tumor grows slowly, locally invasive and nonmetastasizing behavior. It appears as a painless, thick white plaque resembling exophytic cauliflower like growth with keratin plugging.

Shear and Pindborg[4] first described verrucous hyperplasia, a potentially malignant disorder presenting as a verrucous or exophytic growth characterized by keratosis and/or varying grades of dysplasia and lack of invasive growth. Verrucous hyperplasia is a histopathological entity with clinical features that may be indistinguishable from a verrucous carcinoma. It has been considered an antecedent stage or early form of verrucous carcinoma and is believed to have the same biological potential. The purpose of this article is to describe four cases of verrucous hyperplasia and carcinoma with special emphasis on various clinical presentations and the most common predilection sites.

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CASE SERIES

CASE 1: A 65 year old male patient presented with an exophytic growth on lower alveolar ridge, since 2 years. History revealed that the patient was a chronic smoker with the habit of smoking 10 bidis/day since 38 years. On clinical examination, there was an exophytic finger like growth present on lower alveolar ridge i.r.t edentulous region 31,32,41,42. The growth was measuring around 1.5X1 cm. in its greatest dimension. The growth was light pink in color and had finger like blunt projections. On palpation, the growth was non-friable, non-tender, with well-defined raised margins and no infiltrative induration. Submental lymph nodes were not palpable. In the immediate vicinity, non-scrapable white plaque like lesion was present suggestive of homogenous leukoplakia transforming into verrucous hyperplasia.(Fig. 1)

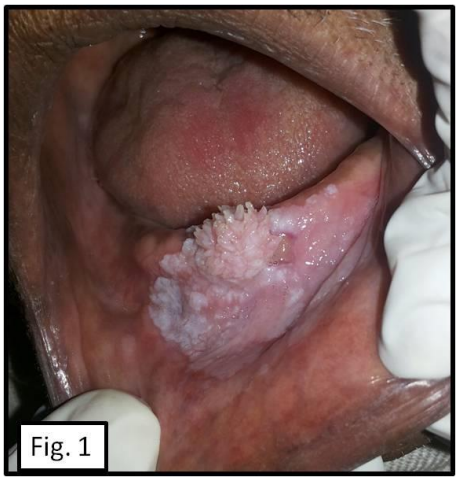

Fig. 1: Intraoral aspect showing exophytic mass involving lower anterior alveolar ridge.

CASE 2: A 54 year old male patient reported to the department of Oral Medicine and Radiology with the complaint of growth on left anterior buccal mucosa since 6 months. History revealed that the patient was a chronic bidi smoker with the frequency of 20 bidis/ day since 25 years. Intra-oral examination showed a well-defined growth present on left retrocommisure measuring around 1x1 cm in its greatest dimension and 2-3 mm raised above the mucosal surface. On palpation, the growth had small blunt finger like projections, was non-tender with well-defined margins and no induration could be appreciated. On the posterior extent of the growth, non-scrapable white plaque like lesion was present giving the corrugated appearance of the surrounding mucosa along with diffuse hypermelanin pigmentation. The features were consistent with concomitant occurrence of homogenous leukoplakia and verrucous hyperplasia.(Fig. 2)

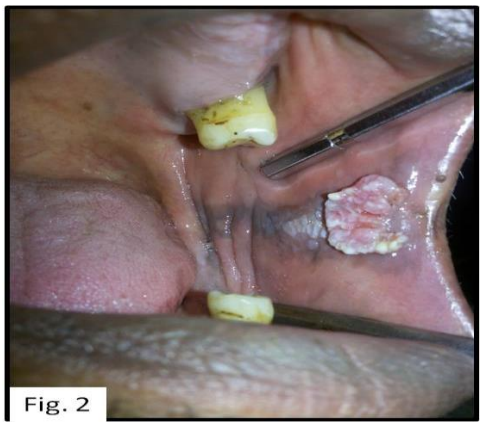

Fig. 2: Intraoral aspect showing exophytic growth with concomitant occurrence of homogenous leukoplakia in right retrocomissure.

CASE 3: A 58 year old female patient complained of the large growth on right anterior buccal mucosa since 10 months. She was a chronic smoker with the frequency of 40 bidis/day since 32 years. Intraoral examination revealed pebbly growth covering entire right buccal mucosa. It measured around 4x3.5 cms in its longest diameter and was 4-5 mm raised above the mucosal surface. The surface of the growth had pebbly appearance along with small blunt finger like projections extending outward. It was light pink to white in color. The antero-posterior extent of the growth was from right retrocommisure to the posterior buccal mucosa. On palpation, the growth had ill-defined margins, rough texture, slightly tender and induration. The anterior extent of the growth was projecting 1 cm outward from the anterior buccal mucosa and was tan brown to black in color. These features were consistent with the diagnosis of verrucous carcinoma.(Fig. 3a,3b)

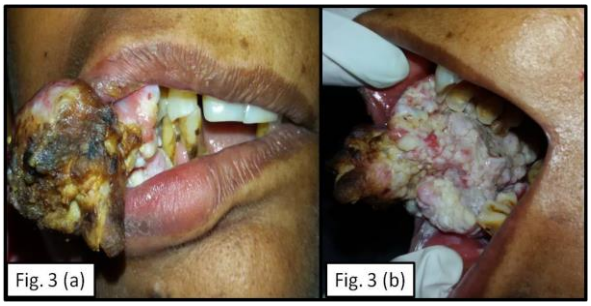

Fig. 3(a): Extraoral aspect of the anterior extent of exophyticgrowth projecting outwardly from anterior buccal mucosa with tan brown to black in color
Fig. 3(b): Intraoral examination showing pebbly appearance along with small blunt finger like projections extending outwardly entire right buccal mucosa.

CASE 4: A 50 year old female patient with a low socio economic status residing in a remote rural area and working on a daily wage, reported with chief complaint of growth on palate since 3 months. Patient noticed a tea burn like ulcer in the anterior palate region 18 months back for which she got treated by various doctors without any healing. 12 months before she had undergone biopsy from the palate, reports were not conclusive. Since then it has gradually grown to attain the present dimension. She is a chronic tobacco user 3-4 times/day since last 20 years. She got extraction of upper right lateral incisor due to mobility, 3 months back after which the ulcero-proliferative growth in anterior palate started growing rapidly. On intraoral examination the exophytic growth was covering entire palate till junction of hard and soft palate, laterally extending between the molars and appearing on the buccal gingiva.(Fig. 4a,4b)

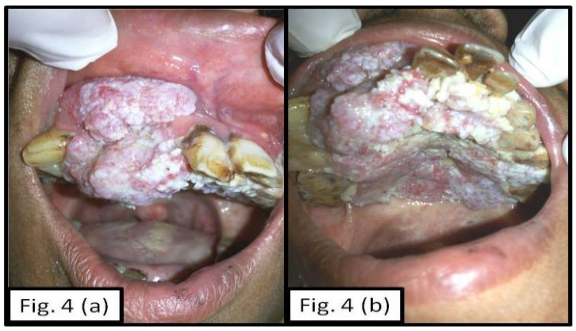

Fig. 4 (a): Intra oral examination showing the exophytic growth covering anterior alveolus.
Fig. 4 (b): Intra oral examination showing the exophytic growth covering entire palate.

The larger mass was present in anterior alveolus measuring about 3x4cm with grade III mobility of anteriors. There was no sign of sinusitis or pharyngeal bleeding, but she had frequent history of bleeding from anterior mass. Neurosensory deficit for nasopalatine and greater palatine nerve could not be assessed. Radiographs and CT

Table 1: Summary of 4 patients with exophytic lesions

S. no	Sex	Age	Site	Habit	Presentation
1.	Male	65	Lower alveolar ridge	Bidi Smoker	Exophytic growth
2.	Male	54	Left anterior buccal mucosa	Bidi smoker	Exophytic growth
3.	Female	58	Right anterior buccal mucosa	Bidi smoker	Pebbly surface with exophytic growth
4.	Female	50	Anterior marginal gingiva, Palate	Tobacco user	Extensive exophytic growth

examination revealed extensive soft tissue thickening in entire palate with generalized alveolar bone resorption and evidence of extension into left nasal cavity and maxillary sinus. There was left submandibular lymphadenopathy measuring 1cm in diameter. These features were indicative of extensive verrucous hyperplasia with possible malignant transformation.

RESULTS

All the patients were diagnosed with verrucous carcinoma following excisional biopsy. One patient was diagnosed with verrucous hyperplasia and another with verrucous keratosis in their initial histological findings. Mandibular, posterior alveolar crest, and retromolar trigone were the most affected sites (41.6%), followed by the buccal mucosa (16.6%), the palate (16.6%), the floor of the mouth (16.6%), and the lip (8.3%). No patients had evidence of recurrence after treatment.

DISCUSSION

Verrucous carcinoma was considered as slow-growing, exophytic, well-demarcated, hyperkeratotic lesions.[5,6] They are typically present as extensive, white, warty lesions. In our case series, all the patients had a similar clinical presentation.

Oral verrucous carcinoma traditionally occurs more commonly in older males, above sixth decade. In our series of cases we observed similar demographics wherein the male patients were more preponderant and the mean age at presentation was between the fifth and sixth decade.[7]The reasons accredited could be primal attainment of the disparate habits, frequency and nature of the habits. Although there is a striking male preponderance to OVC, there are studies where equal sex distribution and female predominance has been demonstrated.[8] This finding was consistent in our series of cases.

According to the study done by Shear and Pindborg[4] the most common location was gingiva and alveolar ridge. These sites were in correlation with the site to quid placement. However, in the current literature buccal mucosa was the most affected site that was reported by Yeh[9]. In our case series, two patients had lesions on buccal mucosa, one patient had lesion on lower alveolar ridge, while another patient had lesion on palate and marginal gingiva. This was consistent with the previous literature.

Various etiologies of verrucous carcinoma have been postulated. Human papillomavirus (HPV) was considered as one of the causative factors.[7] Smoking is also associated with development of verrucous carcinoma.[10] In our case series, four patients (Case 1, 2, 3, 4) had the habit of bidi smoking and there was also occurrence of verrucous carcinoma. Tobacco chewing is also a significant factor in the development of this lesion.[11] In our study, there was one patient (Case 4) who had this lesion related to habit of tobacco usage. Verrucous hyperplasia and verrucous carcinoma are indistinguishable entity. Both lesions closely resemble each other clinically and pathologically The most reliable way to separate both the entities, is that in verrucous hyperplasia there is exophytic growth pattern while in verrucous carcinoma there is combined exophytic and endophytic growth pattern recognized on routine haematoxylin-eosin stained tissue sections. Verrucous hyperplasia does not extend into deeper tissues i.e it is superficial to the normal epithelium while verrucous carcinoma extends more deeply.[12,13] The association of these entities with leukoplakia is significant, as untreated leukoplakia progresses into verrucous hyperplasia/ verrucous carcinoma. Similarly in our series of cases two patients (Case 1 & Case 2) had verrucous hyperplasia accompanied by leukoplakia in the vicinity.

Regional lymph nodes are often tender and enlarged, because of inflammatory component, resembling malignant tumor.[14] On the contrary, only one of the patient (Case 4) had enlarged lymph nodes while in rest of the patients lymph nodes were not affected. Surgery is considered the elementary mode of treatment for verrucous carcinoma. Radiation therapy alone or in conjunction with surgery is seldom being performed. Whenever surgery is contraindicated, other treatment modalities like cytostatic drugs are often preferred.

CONCLUSION

Verrucous hyperplasia, verrucous keratosis, and verrucous carcinoma may not be distinguished clinically or may coexist, resulting in diagnostic difficulties. It should be kept in mind that verrucous hyperplasia may also develop from leukoplakic lesions, and it may transform into verrucous carcinoma or squamous-cell carcinoma, acting as a potential precancerous lesion.

The purpose of this article is to describe four cases of verrucous hyperplasia and carcinoma with special emphasis on various clinical presentation and the most predilection sites. Verrucous hyperplasia and verrucous carcinoma may not be demarcated clinically. Leukoplakic lesions may transform into verrucous carcinoma or squamous cell carcinoma, so all such pre-cancerous lesions should be scrutinized conscientiously. Thus, it is amenability of both the oral physicians and histopathologists to be scrupulous about warty and exophytic lesions.

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How to cite this Article: Gupta S, Kumar K, Raviprakash SM, Arunkumar KV. Ackerman's tumor of the oral cavity: A study of four cases with its conglomerate appearance. J Dent Specialities,2015;3(1):92-95

Source of Support: NIL
Conflict of Interest: None Declared

Oral manifestations of hepatitis B and C: A case series with review of literature

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Received: 03-12-2014
Accepted: 28-03-2015

ABSTRACT

Viral hepatitis is one of the most common liver disorders and is a major public health problem occurring in almost all areas of the world. Occurrence of hepatitis B and C can lead to complications due to liver dysfunction, immune complex disorders, chronic liver failure, and certain extra hepatic manifestations that can seriously affect the patient's quality of life. Awareness and recognition of these oral manifestations are of particular importance for the oral physician to facilitate early diagnosis and treatment and to take suitable measures to prevent transmission of infection.

Keywords: Hepatitis B, Hepatitis C, Oral manifestations

INTRODUCTION

Viral hepatitis is one of the most common liver disorders and is a major public health problem occurring in almost all areas of the world. The most common types of hepatitis are hepatitis A, B, C, D, E, and G. Hepatitis B Virus (HBV) and Hepatitis C Virus (HCV) infections are serious health problems that can lead to permanent liver damage and even death, and can have consequences in form of psychological and occupational diseases which can seriously affect the quality of life.[1,2]

Although HBV and HCV primarily affect hepatocytes, it has also been shown to cause complications in other organs also, which are nonspecific for HBV and HCV infection.

The pathophysiology of these associated symptoms is mainly based on immune complex reactions that occur in the skin, joints, muscles and kidneys leading to systemic lupus erythematosus, polyarteritis nodosa, lichenoid reactions and manifestations related to liver dysfunction namely bleeding disorders, jaundice, skin rashes, foetor hepaticus. In oral cavity, manifestations like bleeding gums, cheilitis, smooth tongue, xerostomia, bruxism, sialadenitis and oral lichen planus are seen commonly.[4]

Awareness and recognition of these oral manifestations are of particular importance for the oral physician to facilitate early diagnosis and treatment and to take suitable measures to prevent transmission of infection.

We report here 3 cases of hepatitis with oral bleeding, reticular lichen planus and erosive lichen planus.

CASE 1: A 40 years old female reported to the Department of Oral Medicine and Radiology with chief complaint of bleeding gums since 15-20 days. History of present illness revealed that the problem was present since 5 -6 years and increased in severity with time. Since 15-20 days spontaneous bleeding from gums was noticed. Her medical history revealed hepatomegaly and related medication since 8 years, hepatitis B since 1 year and liver failure diagnosed 1 month back. Patient was chronic alcoholic and chronic bidi smoker since past 15 years, left alcohol 8 years back because of liver problems. On extraoral examination, patient was ectomorphic with evident abdominal swelling. There was paleness on nose, face and sclera. Angular chelitis was present with encrustations on lower lip. Intraorally, there was paleness of buccal and palatal mucosa including the floor of the mouth with presence of petechie on palate. The tongue was partially bald. Gingiva was soft, friable, edematous with spontaneous bleeding along with generalised recession and mobility of teeth.(Fig.1,2) Blood picture revealed anaemia, relative leukopenia with raised eosinophil and monocyte count (27 and 10 respectively) and thrombocytopenia (<100,000 platelets/μL). ESR was 25 mm/hr, bleeding time 2 min and clotting time was found to be 15 min. Hence, provisional diagnosis of spontaneous bleeding secondary to liver dysfunction was given. Patient was advised chlorhexidine mouthwash along with gum astringent for symptomatic relief and was referred to physician for treatment.

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Fig.1: A 40 years old female with angular chelitis and spontaneous bleeding from lips.

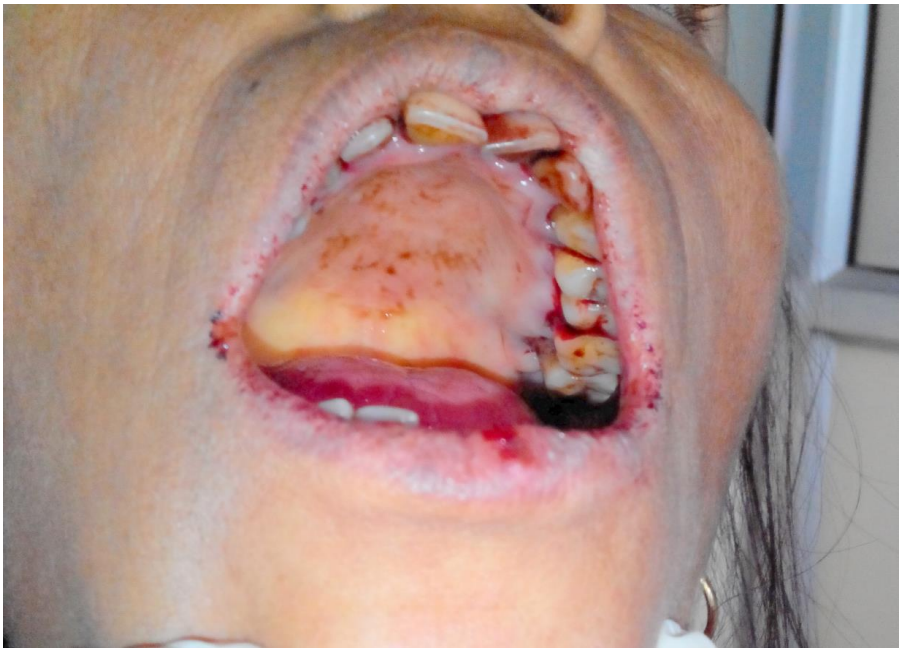

Fig. 2: Presenting pale gingiva with palatal petechial.

CASE 2:

A 38 years old female patient reported to the Department with chief complaint of burning sensation on cheeks present since 4-5 months. Burning sensation was present on intake of hot and spicy food. Medical history revealed hepatitis C since 2 years and patient was on medication. Intraoral examination revealed white, striated lesion on right and left post buccal mucosa which was irregular in shape, rough, non-scrapable and non-tender on palpation. (Fig.3) Hence, a provisional diagnosis of symptomatic reticular lichen planus was given. Topical anaesthetic was prescribed for symptomatic relief. Burning sensation was reduced from 9 to 4 on VAS scale after 1 month. The patient is presently under follow up.

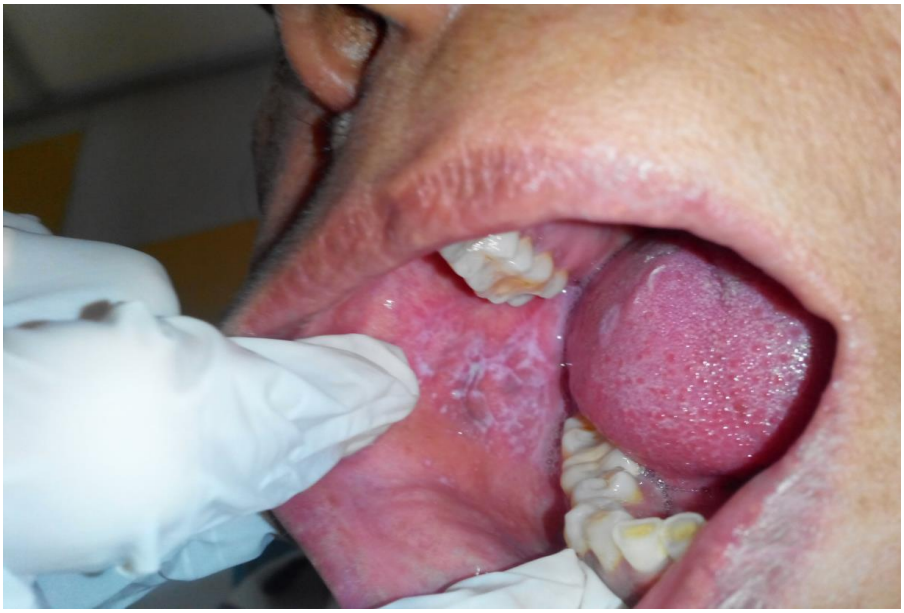

Fig. 3: Presenting white striated lesion on left posterior buccal mucosa

Case 3:

A 29 year old patient male reported to the Department with a chief complaint of long standing ulcers in the mouth since three to four months. The ulcers started spontaneously on right cheek and gradually increased in size. Medical history revealed hepatitis C which was confirmed 8 months back. On examination, there were irregular erythematous areas present bilaterally on buccal mucosa and labial mucosa with surrounding white striations.(Fig.4) On the basis of clinical features, a provisional diagnosis of erosive lichen planus was given. The patient was posted for biopsy, however due to reduced platelet count (<100,000 platelets/μL) and high bleeding time (6 min 30 sec) and clotting time (12 min 15 sec), the biopsy was postponed and the patient was referred to physician. For symptomatic relief, the patient was given benzydamine mouthwash and anaesthetic gel. On follow up after 15 days, patient reported gradual decrease in symptoms.

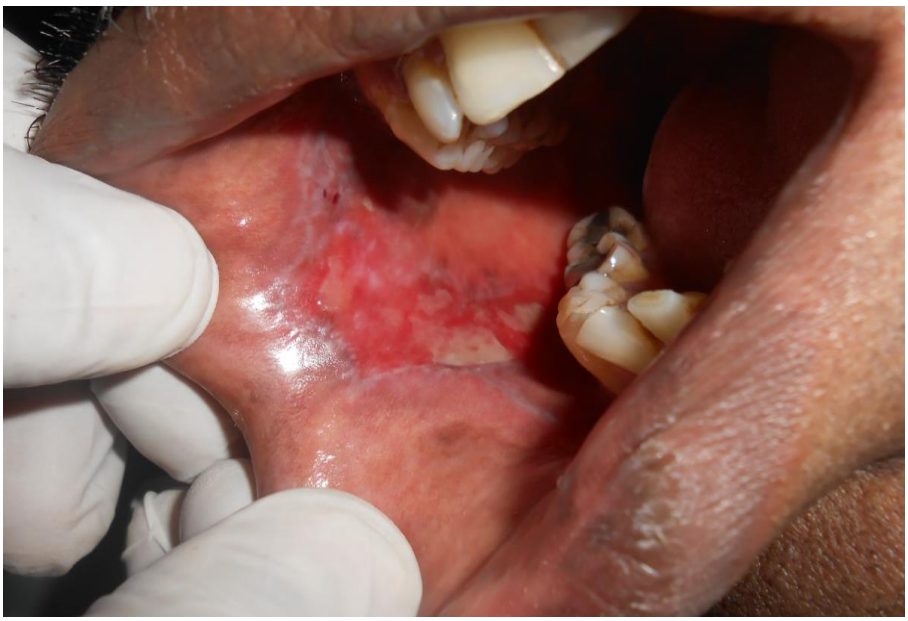

Fig. 4: Fig. presenting irregular erythematous areas with peripheral white striations present on right buccal mucosa

Discussion and review of literature:

The liver plays important role in maintaining body's internal milieu. Liver diseases can be classified as infectious like hepatitis A, B, C, D and E or non-infectious which can be caused

substance abuse such as alcohol and drugs like paracetamol, methotrexate.[3,5]

Hepatitis B, also known as serum hepatitis, is a worldwide health problem with an estimated 400 million HBV carriers.[6] It has been reported that 1.53% of all patients reporting to the dental clinics are HBV carriers.[7] The mode of transmission is mainly through sexual contact, blood transfusions and intravenous drug abuse. An important consideration among dental professionals is the risk of percutaneous transmission through cuts or punctures with infected instruments from HBV-positive patients or absorption through the mucosal surfaces like eyes and oral cavity.[8] Over 50% of all infections are subclinical and are not associated with jaundice. Approximately 90% of all HBV-infected adults show complete healing, but 5-10% develop chronic hepatitis with complications in the form of cirrhosis and hepatocellular carcinoma, resulting in death due to liver failure.[5]

Hepatitis C virus infection is one of the main causes of chronic liver disease and liver-related morbidity and mortality worldwide. Viral transmission is mainly through the parenteral route via transfusion of blood, percutaneous exposure through contaminated instruments or occupational exposure to blood.[9,10] The individuals at greatest risk are hemophiliacs, dialysis patients, drug abusers and health professionals.[2] The incubation period is long (up to 3 months) and 85% of all patients with HCV infection develop chronic hepatitis. Most subjects remain relatively asymptomatic during the first two decades after infection with the virus.[11,12]

Oral manifestations:

Various studies have shown the presence of oral lesions in hepatitis patients. The association of oral lichen planus and HCV is well documented in literature. In a study, patients with periodontal disease showed a higher detectability rate of Hepatitis B surface antigen HBsAg, Hepatitis B core antigen antiHBc, antiHCV in whole unstimulated saliva than in the controls and there by suggesting a possible association between hepatitis and oral lesions.[13]

Oral health:

Certain lesions in the oral cavity may be primarily related to dysfunction of the hepatocyte. There may be extraoral and/or intraoral petechiae and eccyhmoses, gingival hemorrhage due to the deficient clotting factors associated with malfunctioning hepatocytes and thrombocytopenia. Additional oral findings like pallor, angular cheilitis and glossitis can include manifestations of malnutrition such as vitamin deficiencies and anemia. Additionally, the sweet ketone breath, indicative of liver gluconeogenesis, can raise the suspicion of hepatotoxicity.[14]

Xerostomia:

Dryness of mouth results as an adverse effect of medications taken and may be related to virus associated salivary gland changes. It increases patient vulnerability to caries and oral soft tissue disorders which, in combination with deficient hygiene, in turn facilitate the development of candidiasis.[10]

Oral lichen planus:

In a Turkish study, a high prevalence of oral lichen planus in HBsAg positive patients was found.[15] However, many studies and reports have suggested the role of HCV as a possible etiology. Virus replication may be associated with the oral epithelium and thus contributes directly to the development of lesions, or otherwise high mutation rate of the virus may result in repeated activation of immune cells, increasing the probability of cross-reactions and consequently the risk of autoimmune disease.[16]

Olma D et al suggested a correlation between the drugs and interferons used for the treatment of hepatitis C in causing lichenoid type reaction.[17] The epidemiological relationship between OLP and hepatitis C has been reported notably in the erosive type by Carrzo et al[18]. In a meta-analysis, the overall risk for OLP among anti-HCV positive subjects was significantly higher than controls.[19] In a cross sectional study Paraschiv C et al found that the prevalence of lichen planus, sialadenitis and abnormal salivary secretion was higher in patients with HCV infection than in patients with chronic hepatitis B.[20] All these studies suggest that the patients with HCV should undergo periodic oral examinations and patients with OLP should undergo regular screening tests for HCV infection.

Salivary gland disorders and hepatitis:

HCV is sialotrophic virus. HCV infected patients may frequently have histological signs of Sjogren like sialadenitis with mild or even absent clinical symptoms. However, the role of HCV in pathogenesis of Sjogren Syndrome (SS) development and the characteristics distinguishing classic SS from HCV-related sialadenitis are still an issue.[9] Haddad et al found SS histological changes in the salivary glands in 57% of HCV- associated chronic liver disease patients. Grossman et al detected HCV RNA in the saliva of 40.0% patients and in 18.5% salivary glands.[22]

Oral Cancer:

Although there is no evidence to confirm oral cancer as an EHM of HBV/HCV, there are studies showing that HCV is very likely to be involved in the development of oral cancer. Su et al in a nationwide, population-based, cohort study found a significant correlation between HCV and oral cavity cancer and suggested that HCV but not HBV infection is a risk factor for oral cavity

cancer.[23] Similar findings were shown in a study in Japan, which showed the observable high levels of HBV surface antigen in patients with benign oral tumors, but not in oral cavity cancer patients requiring dental surgery.[24] The probable cause of more extrahepatic manifestations related to HCV can be because of its lymphotrophic character.[25] A study conducted in New Orleans reported that 21.2% of 99 patients with squamous cell carcinoma of the head and neck were co-infected with HCV.[26]

Dental Management:

The most frequent problems associated with liver disease in clinical practice refer to the risk of cross infection on the part of the dental professionals and patients, the risk of excessive bleeding in patients with severe liver disease, and alterations in the metabolism of certain drugs which increase the risk of toxicity.[27] Strict sterilization measures are therefore required. A detailed clinical history is essential in order to identify possible risks, together with a thorough oral examination. Inter-consultation with the patient physician is advisable in order to establish a safe and adequate treatment plan, considering the degree of liver functional impairment involved. Whenever possible, the hepatitis antigen status of the patient should be determined. In case of parenteral exposure to hepatitis virus-positive antigens, hepatitis B immunization status and post-immunization titre should be checked for. Anti-hepatitis B immunoglobulin may be given if needed. [3]

If invasive measures are required, prior coagulation and hemostasis tests are required. In the case where altered test values are detected, the hematologist or liver specialist should be consulted, with the postponement of elective treatment. Any emergency treatment should be provided in the hospital setting only.

The administration of certain drugs like mild analgesics, antibiotics and local anesthetics is generally well tolerated by patients with mild to moderate liver dysfunction, though modifications may be necessary in patients with advanced stage liver disease. Hence, drugs metabolized in the liver may have to be used with caution or with altered doses. OLP should be differentiated from oral lichenoid lesions, which share similar clinical and histological features. Oral Lichenoid lesions differ from OLP by having a known cause that may be either local like amalgam restorations, or systemic like drugs. Furthermore, preventive oral hygiene measures should be followed. For symptomatic relief in oral lesions, topical analgesics and anaesthetics, and gum astringents can be used.[24]

CONCLUSION

Hepatitis has always been a major health problem. Role of oral physician cannot be ignored in the asymptomatic/carrier cases where oral cavity is first to manifest certain changes leading to diagnosis of the condition. On the other hand, dental treatment of patients with known chronic hepatitis is associated with certain risk factors pertaining to presence of leucopenia, thrombocytopenia and liver dysfunction which can be life threatening to the patient, if the complications of chronic infection are not anticipated during treatment planning. Hence a thorough knowledge about hepatitis, its oral manifestations and associated complications of dental treatment is mandatory for the benefit of both patient and dental surgeon.

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How to cite this Article: Bagewadi SB, Arora MP, Mody BM, Krishnamoorthy B, Baduni A. Oral manifestations of hepatitis B and C: A case series with review of literature. J Dent Specialities, 2015;3(1):96-101

Source of Support: NIL
Conflict of Interest: None Declared

Acoustic pharyngometry: An objective assessment tool for determining pharyngeal airway

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Received: 16-02-2015
Accepted: 28-03-2015

ABSTRACT

The interest in studying the upper airway has always been there in orthodontics. Acoustic Pharyngometry is a relatively new technique in this field which measures the upper airway precisely. The technique is based on acoustic reflection technology. Sound waves are projected down the airway and reflected back out in such a way that the Pharyngometry software can analyze and quantify changes in the airway cross sectional area. It is an easy and quick technique that measures patient's pharyngeal airway size and patency from the oropharyngeal junction to the glottis. The technique is useful in screening of patients having higher risk for sleep disordered breathing, establishing candidacy for mandibular advancement device and accurate bite recording/ titration of the appliance and also for planning surgical intervention. The aim of this article is to sensitize orthodontic professionals about this technique and to discuss the basic procedural methodology along with its clinical usefulness.

Keywords: Acoustic Pharyngometry, Acoustic Reflection, Obstructive sleep apnea

INTRODUCTION

- Certain craniofacial features are known to have increased predilection for airway collapsibility leading to sleep disordered breathing like snoring and obstructive sleep apnea (OSA). Some of these risk factors are[1]:Narrow upper airway, especially at the level of the soft palate and the base of the tongue
- Relative mandibular retrognathism and Increased hyoid distance
- Decrease in posterior airway space
- Increased tongue volume, and
- Enlargement of the palatine or adenoidal tissues

It is important to correctly identify these cases so that right kind of orthodontic treatment can be instituted to address the decreased airway dimensions. Lateral cephalometry is routinely used diagnostic tool in orthodontics for diagnosis and treatment planning. Though it helps in analyzing the airway dimensions but fails to estimate it in three dimensional proportions.[2] It can measure the airway in anteroposterior dimension but not in the transverse. Gold standard for upper airway imaging is MRI; however it is not cost effective.

Recently acoustic Pharyngometry has been introduced in clinical practice for orthodontists and otorhinolaryngologists for evaluation of oropharyngeal & hypopharyngeal airway. It is a non-invasive procedure based on acoustic reflection technology, similar to the ship's sonar.[3] Sound waves are projected down the airway and reflected back out in such a way that the Pharyngometer software can analyze and quantify changes in the airway cross sectional area. It allows users to quickly and easily measure patient's pharyngeal airway size and patency from the oropharyngeal junction to the glottis. In this case series three such cases were evaluated for pharyngeal airway size and volume with different treatment implications.

CASE 1: A 52 year old male, a suspected case of OSA was referred to orthodontic clinic from department of pulmonary medicine for evaluation of pharyngeal airway. The patient gave a positive history of loud snoring, sense of choking and restless sleep. He also reported excessive day time sleepiness and fatigue. Acoustic Pharyngometry was done and the results showed a mean pharyngeal airway area of 2.35 cm^2 and a minimum of 1.45 cm^2 which meant that the airway was reduced. Test was repeated with a mandibular advancement of 6 mm and 4 mm vertical opening which showed significant airway improvement on pharyngogram (Fig 1). The patient was advised for polysomnography and the results showed AHI index of 56.7 (severe OSA) which confirmed our findings.

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Fig 1: Case 1 Pharyngogram- trial 1 showing initial airway and trial 4 after advancement

CASE 2: A 58 year old male patient was referred from a general dentist as a suspected case of OSA and for considering him for oral appliance therapy. Pharyngometry was carried out and the mean airway was 2.48 cm^2 and minimum airway was 1.91 cm^2. To know the candidacy for oral appliance therapy the test was repeated with various combinations of mandibular advancement and vertical opening. The best airway increase was seen after 6 mm of mandibular advancement but this increase in pharyngeal airway was very small (Fig 2). The patient was further advised polysomnography and was referred to otorhinolaryngologist for feasibility of surgical management/ continuous positive airway pressure therapy.

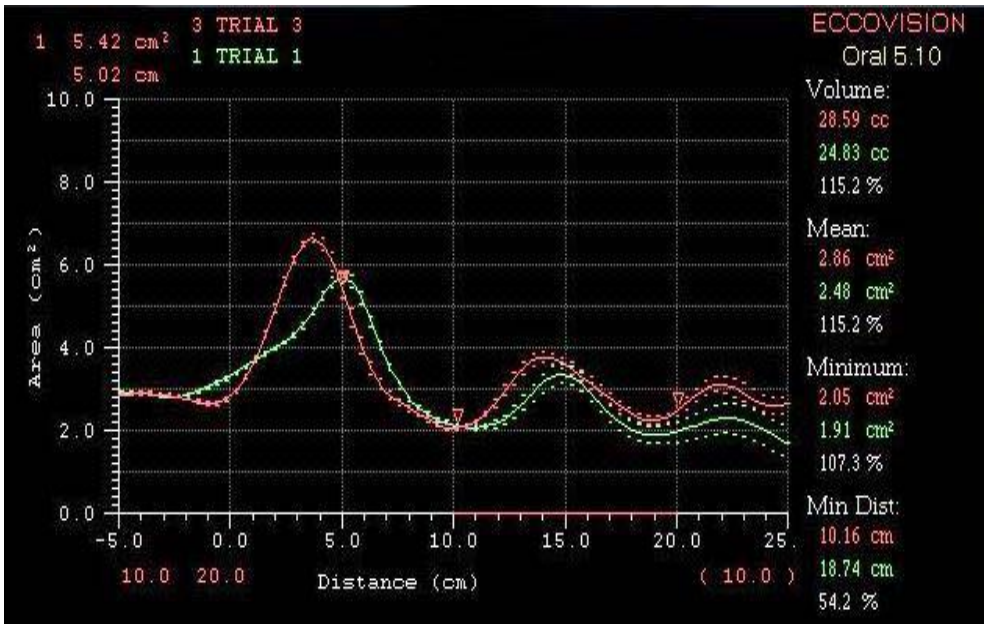

Fig 2: Case 2 Pharyngogram- trial 1 initial airway value and trial 3 after advancement

CASE 3: A 15 year old female was diagnosed as a case of angles class II div 1 malocclusion with class II skeletal jaw relationship. Her airway was evaluated with acoustic pharyngometry which showed a mean area of 1.92 cm^2 and a minimum airway of 1.28 cm^2. The case was then treated with fixed functional appliance therapy and her airway was again measured. The airway showed an improvement in the mean airway area to 2.46 cm^2 and the minimum airway was 1.79 cm^2 on this second measurement (Fig. 3).

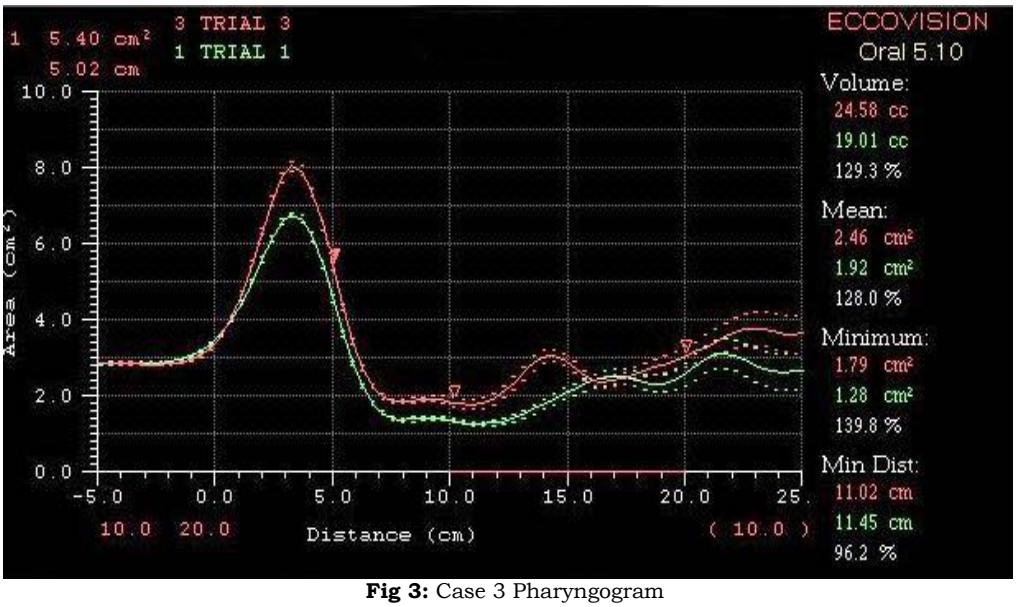

Fig 3: Case 3 Pharyngogram

DISCUSSION

The "Eccovision" acoustic pharyngometer from sleep group solutions is being used widely for evaluating pharyngeal airway (Fig. 4). It utilizes AR technology to assess cross-sectional area and volume from the oral cavity through the hypopharynx by calculating changes in acoustic impedance that occur with cross-sectional changes along the airway. It has a wave tube connected to a processor and the other end of this wave tube terminates in a narrow neck to which a mouthpiece is attached. The mouthpiece is made of rubber and is placed against the teeth with the lips covering the flange to form an acoustic seal.[4-6]

Fig 4: Acoustic Pharyngometer

Pharyngometry Procedure

Patient should be relaxed, comfortable and seated on straight back chair looking forward at a fixed point during the exam (Fig 5). The wave tube, which should always be horizontal, is placed close to the mouth. The patient closes his mouth over this tube during the examination, avoiding sound wave loss. The patient is guided not to move, to maintain head still, and to slowly breathe through their mouth. Nasal breathing should be avoided as the opening of the velopharyngeal space during nasal breathing increases the calculated volume. The nostrils should be compressed externally throughout the exam. It is important that flexion of the neck or elevation of the shoulders should be avoided as it may compress the pharynx and decrease its cross-section resulting in reduced measurements.[5] The common source of erroneous readings could be:

- Change of head position in relation to cervical spine (extension or flexion).
- Shoulder position.
- Uncontrolled tongue position.
- Malpositioning of wave tube.
- Patient awareness of his or her breath or an excited patient with a change in respiratory rate and volume.

Fig 5: Pharyngometry procedure

Pharyngogram

The shape of the pharyngogram is directly related to the anatomy of the oral and pharyngeal cavities. Airway is described on the normal pharyngogram, where the x-axis is the airway distance (calculated in cm) and the y-axis is the

airway area (calculated in cm^2). Pharyngogram is divided into three regions (Fig. 6):

1) “Oral region” from the incisors to the soft palate
2) “Pharyngeal region” from the soft palate to the hypopharynx
3) “Laryngeal region”

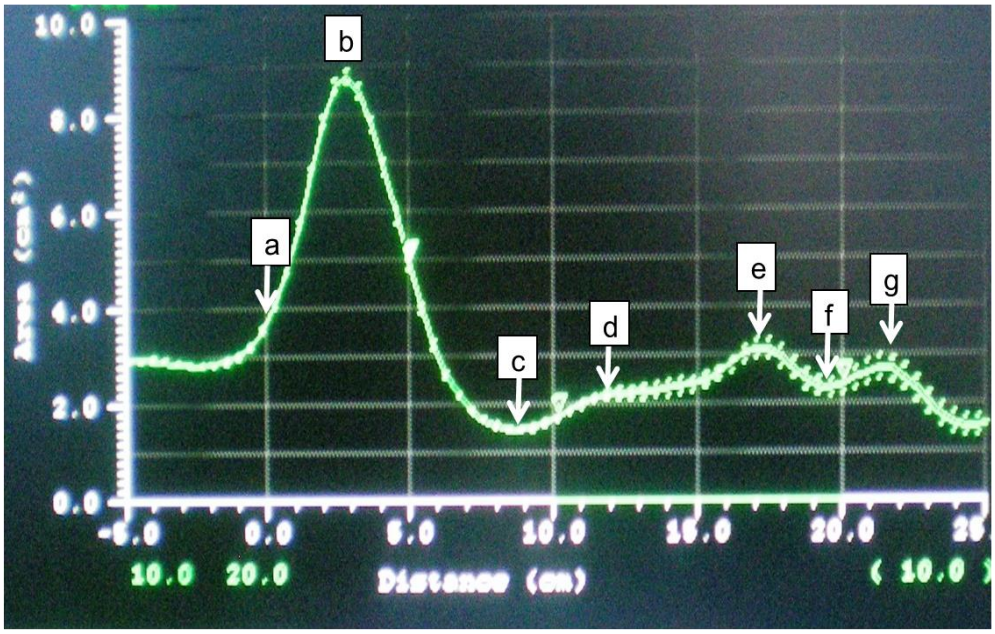

Fig 6: Pharyngogram

The distance zero on the graph is the end piece of the tube placed over the incisors. The first wave originates from this point and indicates the beginning of the mouth (a); peak of this wave (b) indicates the maximum area of the oral cavity. The first wave amplitude identifies the volume of the oral cavity. Patients with macroglossia have a significant wave I amplitude reduction .This is an important sign indicative of enlarged tongue as currently there are few objective and specific signs of increased tongue size. The curve then shows a deflection reaching a minimal area which is mostly at a distance between5 to 8 cm (c), and represents the anterior margin of the soft palate (oropharyngeal junction). The curve on the graph begins to move up reaching its peak (e) at hypopharynx. This region of wave segment between (c) and (e) shows a small secondary peak (d) and represents the posterior oropharynx, which is usually not visible. The distal deepest curvature on the pharyngogram (f) is the glottic region which is followed by an area (g) that shows subglottic expansion.[3, 4]

Acoustic Reflection

A number of investigators have studied the pharyngeal airway in the past using acoustic reflection (AR). The technique for evaluating the airway with AR was first demonstrated by Jackson et al over 37 years ago in animal model.[7] Fredberg and coworkers compared airway measurements obtained from radiographic projections of the trachea with those obtained by AR in six subjects.[8] In another study Brooks, et al. also found an accurate and reproducible result in measuring airway dimensions using the same technique.[9] In a subsequent study, D'Urzo and coworkers demonstrated excellent agreement between glottic area measurements of pharyngeal cross sectional area measured acoustically as compared to those obtained through computed tomography.[10] Marshall et al. acoustically evaluated the pharyngeal dimensions of 10 normal human subjects using room air rather than helium/oxygen gas and compared these measurements to those obtained through MRI.[11] Kamal investigated 350 normal adult subjects using the latest version of the pharyngometer, and found a mean pharyngeal area of 3.194 cm^2 in males and a mean of 2.814cm^2 in females. The coefficient of variation for intra-subject pharyngeal volume was 5 to 7%.[4] In another study, Kamal examined 50 snorers using AR and concluded significant correlation between apnea index and pharyngeal area which further adds to the scope of pharyngometry in assessing the pharyngeal airway in patients with obstructive sleep apnea.[5]

A recent study using AR evaluated the correlation between the severity of obstructive sleep apnea and primary hypertension and concluded that severity of obstructive sleep apnea (OSA) can be determined objectively by this technique and blood pressure in the OSA patients might gradually decrease after uvulopalatopharyngoplasty.[12]

Clinical Usefulness.[13]

1. Patient screening

AR can establish the pharyngeal characteristics of individuals in the general population and may be in high-risk groups which help in identifying those who require further evaluation through polysomnography, ultimately reducing the burden on current medical facilities.

2. Positional Therapy Evaluation

AR has been used to evaluate airway response to positional therapy. AR is used to assess the effect

of head extension through cervical repositioning on airway caliber.

3. Surgery Candidacy

The preoperative investigation of upper airway is necessary in order to establish candidacy for uvulopalatopharyngoplasty. Although site of airway closure is impossible to demonstrate in the awake patient using AR, it precisely describes the cross-sectional area and abnormal upper airway narrowing caudal to the velopharynx. AR has also been used to evaluate upper airway function in awake OSA patients both before and after weight loss.

4. Candidacy for mandibular advancement device (MAD) for OSA and non-apneic snoring

AR has been used to evaluate hypopharyngeal changes produced by mandibular advancement in the awake patient. Following advancement, no change in volume is 95% predictive of failure and an increase in volume by 60% is predictive of a successful treatment outcome.

5. Accurate bite recording factoring in precise vertical opening and sagittal advancement

With the help of bite jigs which give an accurate vertical opening and advancement, it is possible to access the outcome of oral appliance therapy and correct construction of bite.

6. Titration of mandibular advancement device

As per current protocol, the mandibular advancement should be done until subjective relief of symptoms and then verified objectively through standard polysomnography. Inaccurate mandibular advancement may lead to increased patient discomfort and ultimately lower compliance to therapy. Acoustic evaluation of the airway's response to mandibular manipulation with the MAD in place helps in its titration, thus results in the most ideal management of the airway. This would help to minimize the possibility of inadvertent advancement past the ideal point of effectiveness into a position that would unnecessarily strain the masticatory and cervical muscles and/or reduce the effectiveness of the MAD.

Advantages.[13]

1. AR accurately evaluates the airway in three dimensions which, allows for correct recording of caliber and volume over a given length of airway.
2. It is non-invasive, accurate, reproducible, quick and Inexpensive.
3. It is possible to take readings at 0.2 second intervals which allows for dynamic assessment of the airway.

Limitations.[13]

It cannot distinguish airway narrowing caused by impingement of surrounding tissues from reduced neuromuscular compensation.

1 Acoustic pharyngometry provides no information regarding nasopharyngeal dimensions, which may be a relevant region for collapse in many patients with OSA.

2 Does not provide high resolution anatomic representation of the airway or soft-tissue structures.

3 The conventional AR technique cannot be used during sleep.

CONCLUSION

The acoustic reflection technique is being used to assess pharyngeal cross-sectional area for the past few decades. The technique has been previously applied to study the pharynx, glottis, and trachea in humans in vivo. The technique has been validated against computed tomography scans and in experimental models. Moreover the test is quick and gives an accurate size and volume of airway. More reliable and repeatable results can be achieved with this technique, if a standard operating protocol is utilized and maintained.

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How to cite this Article: Kumar S, Jayan B, Bansal AK. Acoustic pharyngometry: An objective assessment tool for determining pharyngeal airway. J Dent Specialities, 2015;3(1):102-108

Source of Support: NIL
Conflict of Interest: None Declared

Fluid retained denture a relief for flabby ridge: A case report

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ABSTRACT

Resorption of alveolar ridges is a dynamic process. It is a continuous process, with varying rates in individual at different times. Due to residual ridge resorption, complete denture prosthesis seldom remains in close adaptation to underlying soft tissues, causing tissue irritation and alteration in underlying mucosa. Denture base have to be flexible to adapt underlying mucosa, and rigid to withstand masticatory forces. Also the incorrect tooth placement and arbitrary shaping of the polished surfaces also questions the success of prosthesis, which can be managed by using neutral zone concept. This case report presents the use neutral zone for atrophic mandibular ridge and fluid retained denture for flabby tissue in anterior maxillary arch.

Received: 02-03-2015
Accepted: 26-03-2015

Keywords: Flabby tissue, Neutral zone, Liquid supported denture

INTRODUCTION

Resorption of alveolar ridges is a dynamic process. It is a continuous process, with varying rates in individual at different times.[1] Due to residual ridge resorption, complete denture prosthesis seldom remains in close adaptation to underlying soft tissues, causing tissue irritation and alteration in underlying mucosa.[2] Several materials have been introduced including soft liners, tissue conditioners for the application on tissue side of dentures in cases with atrophic alveolar ridges, flabby ridges, and diabetes, since 1961, when Chase introduced the use of elastic impression material to relieve tissue soreness.[3]
Denture base have to be flexible to adapt underlying mucosa, and rigid to withstand masticatory forces.[4] Also the incorrect tooth placement and arbitrary shaping of the polished surfaces also questions the success of prosthesis, which can be managed by using neutral zone concept. This case report presents the use neutral zone for atrophic mandibular ridge and fluid retained denture for flabby tissue in anterior maxillary arch.

CASE REPORT

A 65 year old male patient reported to I.T.S dental college, hospital & research Centre greater Noida. Patient was a complete denture wearer from past 8 years, having chief complaint of poorly fitting dentures. On examination, it revealed flabby tissue in anterior maxillary arch with points of tissue irritation, and atrophic mandibular ridge. Patient was advised to discontinue old dentures and massage the abused tissue with Dologel-CT for 5 days. It was decided to make fluid retained maxillary complete denture, and conventional mandibular dentures with neutral zone concept to provide good stability.
Primary impression of maxillary arch was made in irreversible hydrocolloid material, for mandibular arch it was obtained by using Mc-Cords technique[5] by mixing 7 parts of green stick compound and 3 parts of impression compound. Special trays were fabricated using full spacer design and border moulding was performed using low fusing green stick compound. Wash impression with zinc oxide eugenol for mandibular arch (Fig.1) and firm mucosa of maxillary arch was made. Flabby area was marked with indelible pencil over the maxillary ridge and it was transferred over special tray, and a window was created after trimming out the marked area (Fig. 2) Flabby tissue was recorded in non-displaced form by painting quick setting impression plaster over it (liddelow technique[6]) (Fig.3). After complete setting impression was removed from mouth and poured with dental stone (type III).
Jaw relation was recorded; face bow transfer was done and mounted on semi adjustable articulator (Hanau, Wide View). Impression compound was adapted over the mandibular record base for neutral zone record, this was placed in patient's mouth and patient was instructed to perform various movements such as puckering of lips, whistling, swallowing, smiling (Fig. 4). Neutral zone record obtained was indexed in putty (Fig. 5). Wax was allowed to flow in the index replacing impression compound (Fig. 6). Teeth arrangement was done and tried in patient's mouth. Impression of polished surface for mandibular denture was made by applying light body silicone impression material after removing wax apical to teeth surface (Fig. 7). Patient once again asked to perform similar movements of puckering lips, smiling etc. After obtaining master cast a 1.5mm thick soft and flexible vacuum heat pressed polyethylene sheet was adapted over it 2mm short of sulcus using

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vacuum forming machine (Fig. 8). This sheet will kept aside to be used as temporary sheet later. Dentures were flasked in conventional manner. Dewaxing was carried out. Mandibular denture was packed heat cured acrylic resin and cured in conventional manner. Petroleum jelly was applied over the adapted temporary sheet and it placed back on maxillary master cast, followed by packing and curing for maxillary denture. Finishing and polishing was done and dentures were inserted in patient's mouth. (Fig. 9) After 1-2 weeks Silicone impression putty of tissue side of maxillary denture was made and the cast was obtained (Fig. 10). Junction of acrylic and soft sheet was marked on the cast. Another sheet of 0.5mm thickness was adapted over this cast (Fig. 11). Earlier adapted sheet of 1.5mm thickness was carefully separated from denture and latter is adapted to create a space of 1.0mm for liquid. The junction of the sheet and the acrylic was carefully sealed with the help of light cure acrylic. Two holes were made in the distobuccal region on maxillary denture and glycerin was injected through these inlets (Fig. 12). They were closed with light cure acrylic resin. Denture was checked for any sharp points, roughness and leakage. Follow up of patient was done after 24hours to check for any soreness.

Fig. 1: Final impression for mandibular arch

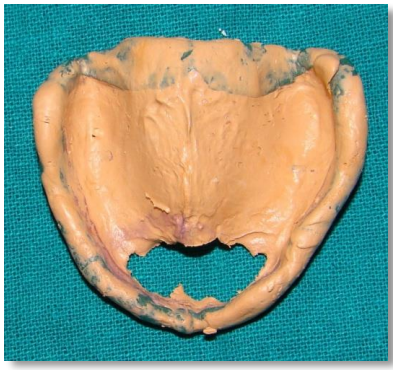

Fig. 2: Window created for flabby tissue

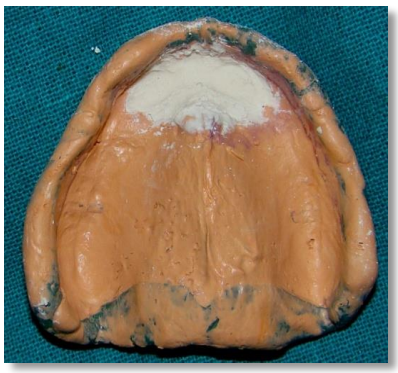

Fig. 3: Final impression of maxillary arch

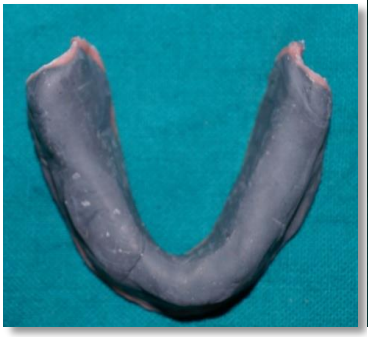

Fig. 4: Neutral zone record

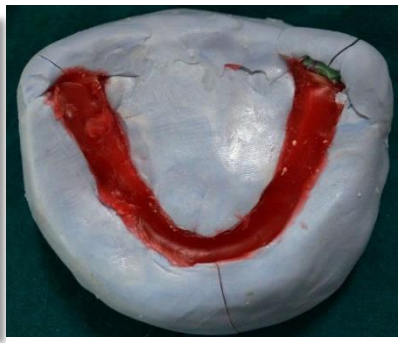

Fig. 5: Putty index

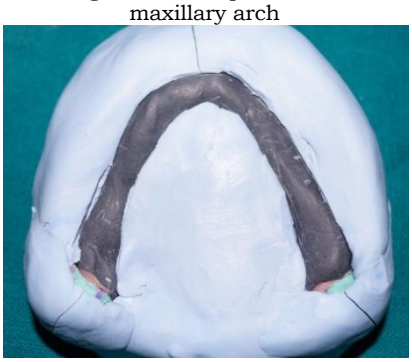

Fig. 6: Wax replacing impression compound

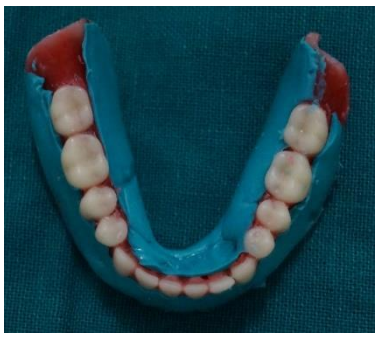

Fig. 7: Impression of polished surface

Fig. 8: 1.5mm bioplast sheet adaptation

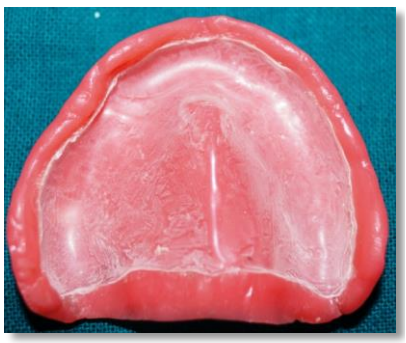

Fig. 9: Denture with 1.5mm sheet

Fig. 10: Silicone impression of tissue side

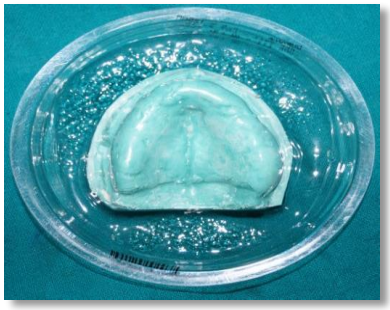

Fig. 11: Adapting 0.5mm bioplast sheet

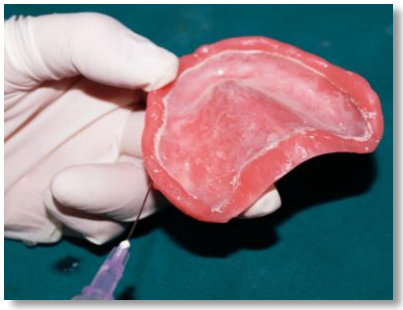

Fig. 12: Injecting glycerin

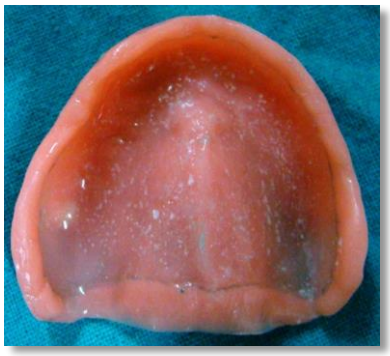

Fig. 13: Maxillary final impression

DISCUSSION

The design of fluid retained denture incorporates both the plastic and elastic properties. The flexible nature of polyethylene sheet aids in the adaptation of the denture over the flabby tissue, moreover, it is acting as soft liner at rest to prevent tissue soreness. Denture is rigid enough to support teeth.[7] Liquid used is nontoxic, odorless, having good biocompatibility. It also has good thermal stability, moisture repellency, and low surface tension and vapour pressure.[8]

The "neutral zone" technique is an important procedure in the complete denture prosthesis, especially for atrophic ridges where locations of anterior and posterior denture tooth positions are difficult to determine. Added advantage of locating neutral zone is to neutralize the forces of musculature. It also helps in decreasing the denture bearing area, buccally and labially.

CONCLUSION

A flabby ridge and atrophic ridge poses a great challenge to denture stability and retention. Fluid retained denture is a unique design for denture fabrication in cases where surgical removal of the flabby tissue cannot be achieved. Concept of neutral zone harmonizes the balance between teeth and musculature, because the patient functionally molds the mandibular rim into the area of the neutral zone, a more stable record base is created.

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How to cite this Article: Deol S, Pathak S, Arora A. Fluid retained denture a relief for flabby ridge: A case report. J Dent Specialities, 2015;3(1):109-111

Source of Support: NIL
Conflict of Interest: None Declared

Fighting five categories of enlargement...from big gums to big smile - A case series

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ABSTRACT

Introduction: Enlarged Gingiva is one of the prime concerns for both dentists and patients causing esthetic and functional problems. The treatment is based on the understanding of cause and underlying pathologic changes, be it inflammatory, pharmacologically induced, associated with systemic diseases, neoplastic, iatrogenic or idiopathic.

Objective: To provide minimally invasive periodontal therapy to patients presenting with gingival overgrowth of five different etiological backgrounds.

Materials and Methods: Patients with gingival overgrowths reported to the Department of Periodontology and Oral Implantology, ITS-CDSR, Muradnagar, Ghaziabad. Based on the individual history, the patients were categorized under five sections. First was inflammatory due to local deposits, Second was drug induced (phenytoin and amlodipine), Third was iatrogenic in patient undergoing orthodontic treatment, Fourth idiopathic and Fifth Miscellaneous in which patient himself wanted gingival correction because of esthetic concerns. Different treatment strategies were advocated depending upon the history, clinical examination and medical consent.

Results: All patients were successfully treated with full mouth scaling, root planing and surgical therapy. Full mouth gingivectomy and gingivoplasty was conducted one week apart, one quadrant each week with scalpel, electro cautery and LASER depending upon the patient's requirement.

Conclusion: This case series emphasizes on the different types of gingival enlargement based on the etiology and highlights different treatment modalities advocated to manage such cases.

Received: 18-02-2015
Accepted: 28-03-2015

Keywords: Gingival enlargement, Drug induced gingival overgrowth (DIGO), Gingivectomy, Phenytoin, Amlodipine, idiopathic, iatrogenic.

INTRODUCTION

Gingival enlargement is an abnormal growth of the periodontal tissue. Enlarged gingiva is one of the prime concerns for both dentists and patients causing esthetic and functional problems. Several causes of gingival enlargement are known, and the most recognized is drug-induced gingival enlargement (GE). A vast array of drugs have been in use for the alleviation of human afflictions. Although these prescribed medications benefit the overall health of the patient, they also led to the discovery of maladies that adversely affect the gingival tissues.[1] The pharmacological agents mainly associated with gingival overgrowth are anticonvulsants (phenytoin, sodium valproate, phenobarbital, vigabatrin), immunosuppressant drug (cyclosporine used to reduce organ transplant rejection) and a group of antihypertensive drugs like calcium channel blockers(nifedipine, amlodipine, verapamil, diltiazam). Other drugs like antibiotics (erythromycin) and hormones, have also been associated with this side effect.[2]

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Gingival fibromatosis (GF) is a heterogeneous group of disorders characterized by progressive enlargement of the gingiva caused by an increase in submucosal connective tissue elements. The etiology and pathogenesis of gingival hyperplasia are still not well established. However, the most common cause of gingival fibromatosis is genetic inheritance while others may be idiopathic.[3] Gingival hyperplasia may also result as an inflammatory response to dental plaque. In some rare instances, benign and malignant neoplasms may cause enlargement of the tissues.[4]

The treatment is based on the understanding of cause and underlying pathologic changes, be it inflammatory, pharmacologically induced, associated with systemic diseases, neoplastic, iatrogenic or idiopathic. Thus, the aim of this case series is to provide minimally invasive periodontal therapy to patient's presenting with gingival overgrowth of five different etiological backgrounds.

CASE 1

A 20 year old male patient reported to the Department of Periodontology, I.T.S-CDSR, Muradnagar, with a chief complaint of swollen and bleeding gums since 6-7 months. Medical history was non-contributory. On clinical examination the gingiva appeared to be soft and oedematous with rolled out margins covering cervical third of the crown with subgingival

calculus deposits and gingiva had tendency to bleed on slight provocation. Diagnosis of chronic inflammatory enlargement was made. Patient was subjected to Phase 1 Therapy including thorough scaling and root planning and oral hygiene instructions were re-inforced. After four weeks the gingival inflammation subsided and it became firm with residual enlargement in the cervical one-third of crown of mandibular anteriors (Fig.1a). Thus external bevel gingivectomy was planned. Briefly, after marking the bleeding points external bevel incision was given with the help of scalpel and gingivectomy knives and the gingival margins were contoured (Fig. 1b). Healing was uneventful and healthy contour of gingiva was regained after four weeks (Fig. 1c)

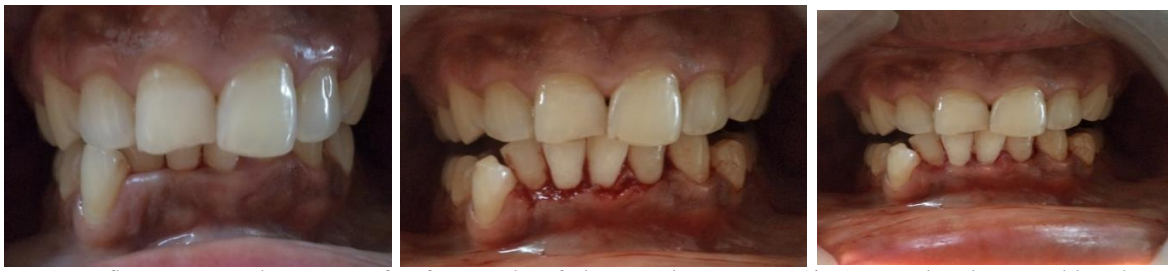

Fig.1a: Inflammatory enlargement after four weeks of phase 1 Therapy. **Fig.1b**: Conventional external bevel gingivectomy, **Fig. 1c:** Healing after 4 weeks

CASE 2

A 26 year old female patient reported to the Department of Periodontology, I.T.S-CDSR, Muradnagar, with chief complaint of swelling in the upper and lower gums since 1 year. Patient gave a history of epilepsy from past 5 years and was under medication ever since. Currently, the patient was on Phenytoin (100mg) twice a day. On examination, generalized diffuse enlargement was seen in both the arches, covering more than two-third of the clinical crown both buccally and palatally/lingually. The gingival surface appeared to be granular/pebbly and fibrotic with loss of stippling (Fig. 2a). On palpation, tenderness was present over the maxillary and mandibular labial gingiva. On probing, there were pseudo pockets involving all the teeth. A provisional diagnosis of drug induced (phenytoin) gingival enlargement was given. Phase 1 therapy was advocated. Patient was referred to the Physician for possible substitution of Phenytoin. Its dosage was reduced from 200mg per day to 100mg with addition of 50mg Lamotrigine. Patient was put on thorough maintenance phase and curettage for next 6 months during which there was a significant reduction in the gingival enlargement (Fig. 2a). Minimal gingivoplasty was done using electrocautery in papillary region after six months (Fig. 2c)

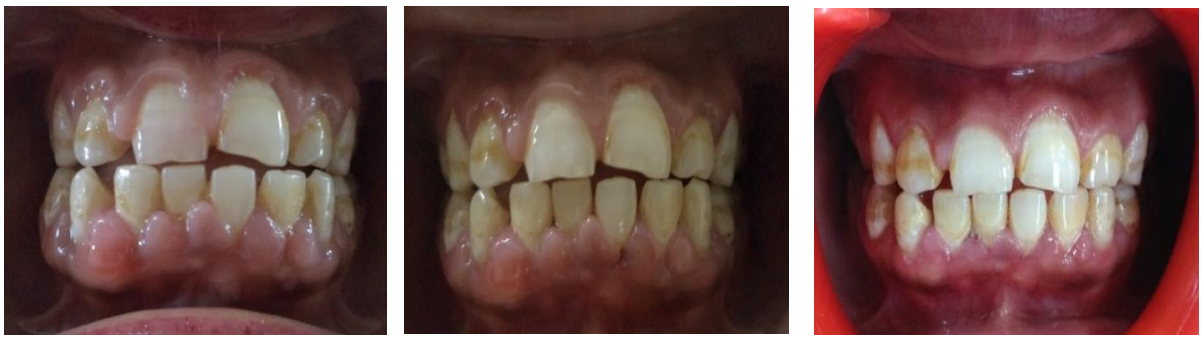

Fig. 2 (a) Phenytoin induced gingival enlargement (PIGO), **(b)** After 4 weeks of dose alteration, **(c)** Remission of enlargement after 6 months.

CASE 3

A 38 year old female patient reported to the Department of Periodontolgy, I.T.S-CDSR, Muradnagar, with generalised swelling of upper and lower gums on since 2-3 months with tendency to spontaneous bleeding. History revealed that patient was a known hypertensive from past 3 years and was under medication for the same (amlodipine 5 mg tablet once daily). On examination, generalized enlargement of the interdental and the marginal gingiva was present, more pronounced in the lower arch having a pebbled appearance. The normal gingival architecture was lost although stippling was present in the lower anterior region (Fig. 3a). On palpation, the gingiva was tender, firm and fibrotic in consistency. A provisional diagnosis of drug induced (amlodipine) gingival enlargement was given. Phase 1 therapy was advocated. After four weeks quadrant wise gingivectomy was done with Diode LASER at 2.0 W to minimize bleeding due to hypertension.

Oral hygiene instructions were re-inforced. The normal gingival contour was achieved (Fig. 3b) and the results were maintained after 6 months follow up.

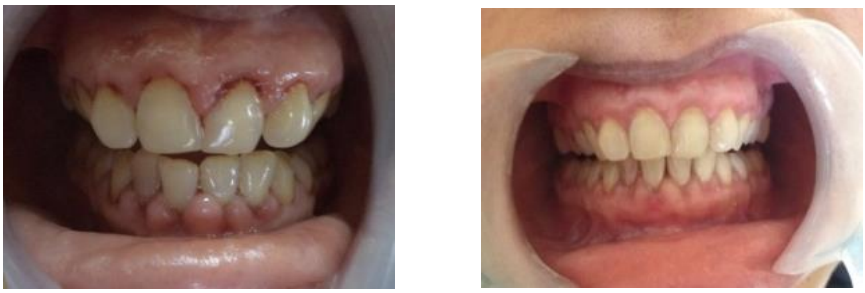

Fig. 3: (a) Amlodipine induced gingival enlargement in a hypertensive female patient. (b) Healing after gingivectomy

CASE 4

A 17 year old female was referred from Department of orthodontics to department of periodontology I.T.S-CDSR, Muradnagar, during her active treatment phase for assessment of gingival condition. Clinical examination revealed generalized enlargement of marginal and papillary gingiva. A provisional diagnosis of iatrogenic (bracket induced) gingival overgrowth was made. Patient was enrolled for Phase I periodontal therapy. Evaluation of phase I therapy was done after four weeks (Fig. 4a). The decision was made to correct residual gingival overgrowths by Electrocautery (Fig. 4b). Orthodontic therapy was resumed after 2 weeks of adequate healing. Patient was given proper home care instructions and is under follow up till completion of the orthodontic treatment.

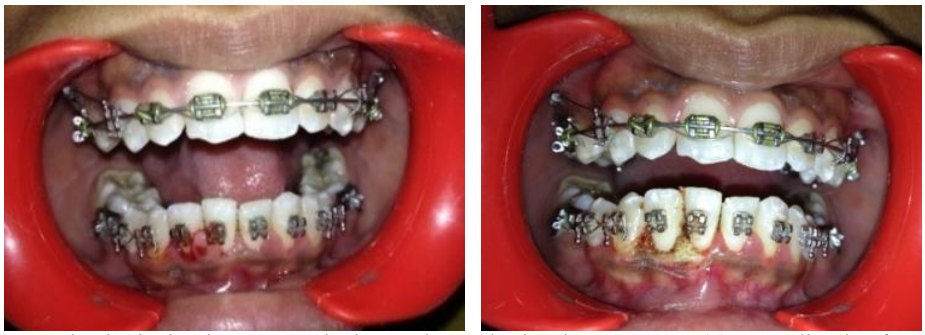

Fig. 4: (a) Iatrogenic gingival enlargement during active orthodontic treatment. (c) Immediately after gingivoplasty with electrocautry

CASE 5

A 13-year-old female patient reported to the Department of Periodontolgy, I.T.S-CDSR, Muradnagar, with a chief complaint of swollen gums involving all her teeth since last 2-3 years with difficulty in speech, articulation, mastication and poor esthetics. She did not give any significant medical history or history of drugs intake. On examination the gingiva was firm, fibrotic, pink in color and rubbery in consistency completely covering the crown and the occlusal surfaces of posterior teeth (Fig. 5a). A provisional diagnosis of idiopathic enlargement was made based on history. Informed consent was obtained from the parent. After Phase 1 therapy, full mouth gingivectomy and gingivoplasty procedures were conducted using combination of scalpel, Diode LASER and Electrocautery. Surgery was conducted in four appointments one week apart, one quadrant each week. Healing was uneventful and patient could resume normal functions of speech and mastication (Fig. 5b).

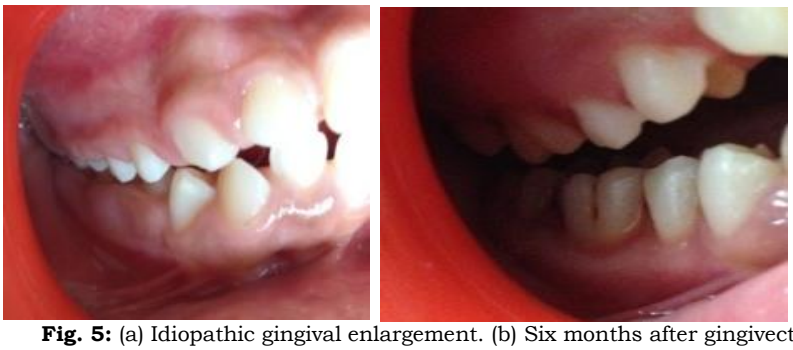

Fig. 5: (a) Idiopathic gingival enlargement. (b) Six months after gingivectomy

CASE 6

A 39 year old male patient reported to the Department of Periodontology, I.T.S-CDSR, Muradnagar, with chief complaint of short teeth since eruption. On examination, the gingiva was firm and resilient with normal surface texture, however it covered the cervical third of crown beyond the normal level of marginal contour giving the appearance of altered passive eruption (Fig. 6a). Therefore, an esthetic crown lengthening procedure using the golden ratio and other principles of esthetic surgery was planned with Diode LASER after Phase 1 therapy. Healing was uneventful and an increase in crown length of 2-3 mm was achieved with better esthetic outcome (Fig. 6b).

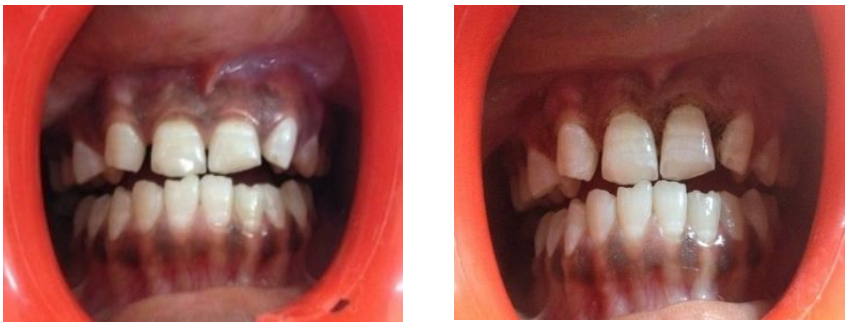

Fig. 6. (a) Altered passive eruption in maxillary anteriors. **(b)** Four weeks after esthetic crown lengthing surgery with Diode LASER.

DISCUSSION

Gingival enlargement can be hereditary or acquired. Improper oral hygiene leads to plaque accumulation and subsequent periodontal problems or caries.[5] Plaque and calculus can lead to chronic inflammatory enlargement originating as a slight ballooning of the interdental papilla and/or the marginal gingiva.

Gingival hyperplasia can occur after therapy with drugs like phenytoin,[6] cyclosporine and nifedipine. The mechanism behind drug-induced gingival hyperplasia involves inflammatory and non-inflammatory pathways.[7] Kimball in 1939 reported the first case of phenytoin induced gingival enlargement.[8] Phenytoin induced gingival hyperplasia has a higher prevalence rate of 50% when compared to cyclosporine and calcium channel blockers.[2] Amlodipine is a third generation dihydropyridine calcium channel blocker used for the management of hypertension and angina.[9] Phenytoin and amlodipine inhibit the intracellular calcium ion uptake which stimulates the gingival fibroblasts, those which have an abnormal susceptibility to the drug.[10] Patients having high plaque score and gingival inflammation have a higher risk of developing drug-induced gingival enlargement than in patients having a good oral hygiene.[11] Inflammatory changes that occur within the gingival tissues appear to orchestrate the interaction between the "modified fibroblast" and the drug. These drugs may also influence the inflammatory response resulting in enlargement. This information can be valuable for the clinician as it will have implication to treat the patient effectively. The most effective treatment for drug-related gingival enlargement is withdrawal or substitution of the medication. This possibility should be examined with the patient's physician. Orthodontists are frequently challenged by soft tissue problems associated with treatment. Most frequent challenges include gingival overgrowths and gingival asymmetry that can turn even good treated case into one that falls short aesthetically. Conventional surgical recontouring of the gingival may have patient related problems like bleeding, post operatve pain and swelling and poor patient acceptance. Soft tissue lasers and electrocautery provide a painless and bloodless surgical option which are more readily accepted by the patients.[11]

Idiopathic gingival fibromatosis may be congenital or genetically acquired. However, many cases may be sporadic with no familial

background. The most common mode of transmission is mainly autosomal dominant. The polymorphic marker for HGF phenotype has been identified on chromosome 2p21.[12,13] Recurrence usually occurs within a few months after surgery and patient may need to undergo repeated gingivectomy procedures. Recurrence rate with LASERS have shown to be minimal as compared to conventional procedures.

Apart from esthetic and functional interference gingival overgrowth can also result in delayed eruption and displacement of teeth and arch deformities. Therefore a thorough understanding of the various etiological factors is essential for the proper diagnosis and treatment planning of such patients.

CONCLUSION

Gingival overgrowth is relatively common disfiguring problem of the gingiva encountered by the Periodontists, inflammatory enlargement being the most common reason followed by intake of various drugs. Thus, thorough scaling and root planning and plaque control form the mainstay of the treatment. This has to be followed by surgical interventions to correct the gingival contour and improve the esthetics. Newer techniques like LASER and electrocautery offer greater advantage over conventional procedures by reducing bleeding and minimal post-operative discomfort.

Dentists and physicians should first consider the non-surgical approach, including the removal of local factors and discontinuation of the offending drug. Then periodontal surgery in the form of gingivectomy or periodontal flap procedures can effectively reduce the enlarged gingival tissues. Oral hygiene and the superimposition of plaque accumulation have a crucial effect on the prognosis of gingival enlargement. The maintenance of treated cases should include meticulous home care and professional recalls. Surgical re-treatment of areas showing recurrence may need to be reconsidered periodically. This case series emphasizes on the different types of gingival enlargement based on the etiology and highlights different treatment modalities advocated in the management of such cases.

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How to cite this Article: Rathi P, Sood R, Dodwad V, Vaish S. Fighting five categories of enlargement…from big gums to big smile - a case series. J Dent Specialities, 2015;3(1):112-116

Source of Support: NIL
Conflict of Interest: None Declared

Guided flange prosthesis; A non-surgical aid for hemi mandibulectomy patient: A case report.

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Received: 24-10-2014
Accepted: 26-03-2015

ABSTRACT

Loss of the continuity of the mandible destroys the balance and the symmetry of mandibular function, leading to altered mandibular movements. Due to undergoing surgery or trauma results in mandibular deviation towards the defect side resulting in loss of occlusion on the unresected side. This imparts greater effect on patients over all functioning, nutrition, mastication and speech. This case report describes prosthodontic management of a patient who has undergone hemi-mandibulectomy; provided mandibular guide flange prosthesis. The prosthesis helps patient moving the mandible normally, without deviation during functions like speech and mastication.

Keywords: Hemimandibulectomy, Resection, Ameloblastoma.

INTRODUCTION

Mandible is the most common site for intraoral tumors as compared to maxilla, which often requires the resection of large portions of the mandible. Disabilities resulting from such resections include impaired speech, difficulty in swallowing and deviation of mandible during functional movements and severe cosmetic disfigurement. Surgical reconstruction of mandibular discontinuity defects involves placing autogenous graft, allogeneic graft, xenograft, or alloplastic implants such as titanium, vitallium, stainless steel, silicone, and plastics.[1] Discontinuity of the mandible after surgical resection or trauma destroys the balance and symmetry of mandibular function, which leads to altered mandibular movements and deviation of the residual segment towards the defect side ,resulting in loss of occlusion on the unresected side.[2] This mandibular deviation is mainly due to uncompensated influence of contralateral musculature particularly the internal pterygoid muscle and pull from the contraction of cicatricial tissue on the resected side.[3,4] Prosthetic rehabilitation of mandibular discontinuity defects aims in restoration of mastication within the unique movement capabilities of the residual function in the mandible . However for some patients who do not desire reconstruction, or who are medically compromised, mandibular guidance therapy can be instituted to retrain the patient's neuromuscular system to achieve an acceptable occlusion of the remaining natural teeth.[2]

Guide flange prosthesis (GFP) is a mandibular conventional prosthesis designed for the patient who is able to achieve an appropriate mediolateral position of the mandible but is unable to repeat this position consistently for adequate mastication. The following case report presents one such case of hemimandibulectomy which has been rehabilitated using a mandibular Guiding Flange Prosthesis.

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CASE REPORT

A 45 year old male patient was referred to the department of prosthodontics with the chief complaint of difficulty in mastication due to deviation of the mandible towards the defective side**,** thus causing disocclusion of the teeth on the normal side. Patient also complained of difficulty in speech. A detailed case history revealed that the patient was operated due to squamous cell carcinoma of the right side of mandible 2 months back and had undergone radiation therapy postoperatively for a period of time after the hemimandilulectomy procedure. Extraoral examination shows facial asymmetry due to depression on righ side and deviation of the mandible towards the right**.** (Fig. 1).

FIG 1:PRE OPERATIVE

Intraoral examination showed thick, freely movable soft tissues with scar formation, loss of alveolar ridge and obliteration of buccal and

lingual sulci in the left half of mandibular region. The right maxillary anterior teeth and maxillary posterior teeth were attrited. Patient was unable to guide the residual mandible to occlude with the remaining maxillary dentition even on application of external force. On the basis of clinical and radiographic examination the patient was classified as Class III Mandibular defect according to Cantor and Curtis classification of mandibular defects. Based on the clinical situation, a transitional guiding prosthesis was planned along with maxillary removable prosthesis, followed by cast metal prosthesis.

Two sets of the maxillary and mandibular preliminary impressions were recorded using stainless steel stock trays with irreversible hydrocolloid impression material. The impressions were poured with Type III gypsum material and casts were retrieved. A 21 guage orthodontic wire was adapted on to the lower cast with u shaped loop extending to maxillary arch, (Fig. 2). The maxillomandibular relations were recorded using wax bite to measure the deviation of the mandible accurately.

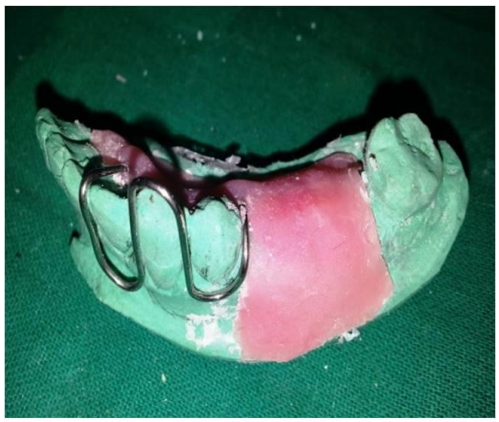

FIG 2: WIRE FRAMEWORK

The maxillomandibular relations were transferred on to the articulator. Another set of casts were mounted on articulator with maximum intercuspation between the Maxillary and Mandibular teeth. The labial flange was waxed-up with modeling wax around the wire substructure and subsequently, with teeth setting and try in followed by acrylization with clear heat-polymerized acrylic resin to make the Guiding Flange Prosthesis. (Fig. 3). The prosthesis was adjusted in patient mouth and finished and polished (Fig. 4). Post-insertion instructions were given. The patient was followed up at the regular interval, for next one year and the prognosis were good. (Fig. 5)

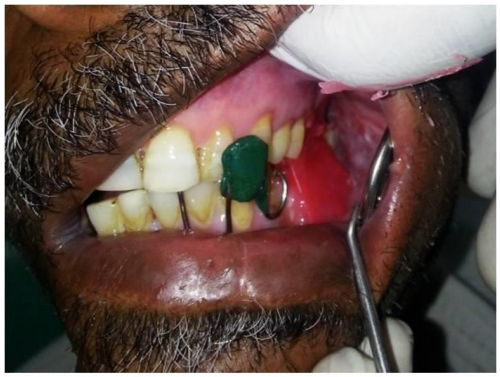

FIG 3: WAX TRY IN

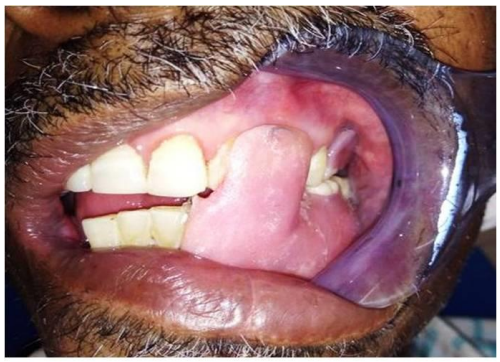

FIG 4: FINAL PROSTHESIS

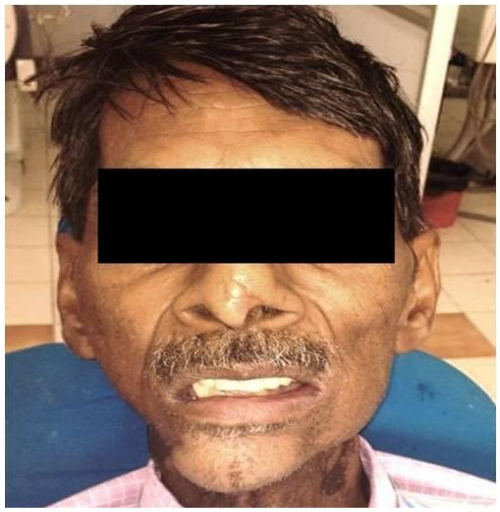

FIG 5: FOLLOW -UP

DISCUSSION

This clinical report illustrates the prosthetic management of a patient who underwent mandibular resection due to squamous cell carcinoma. Loss of mandibular continuity causes deviation of remaining mandibular segment(s) towards the defect and rotation of the mandibular occlusal plane inferiorly. Mandibular deviation toward the defect side occurs primarily because

of the loss of tissue involved in the surgical resection.[5] Successful rehabilitation of edentulous mandibulectomy patients is more difficult than that of a dentulous patient. Sharry [6] described the difficulties encountered as:

i. Limited coverage and retention
ii. Grossly impaired relation of the mandible to the maxilla
iii. Limited movement of the mandible
iv. Loss of facial structures, sensory and motor.

This prosthesis helpful in reducing the unavoidable sequelae resulting from extensive mandibular resection like muscular con-traction, mutilation of occlusal plane etc.

With most mandibulectomy patients the primary determinant usually is related to occlusion. In these patients definitive partial denture restoration are deferred until acceptable maxillomandibular relationship are obtained or an end point in mandibular guidance therapy has reached. Guidance prosthesis serves as a training appliance till a cast partial denture can be fabricated for the patient.

Within 3 weeks, the mandible is guided to the correct occlusal position. [7] This prosthesis helped the patient to get accustomed to close the mandible into the correct intercuspal position without the use of any external aid. The literature shows various types of cast metal guidance prostheses which are effective in managing the mandibular deviation. The guiding flange prosthesis can be regarded as a training prosthesis. If the patient can successfully repeat the mediolateral position, the use of the prosthesis can often be discontinued.[8]

The main purpose is to re-educate the mandibular muscles to re-establish an acceptable occlusal relationship for the residual hemimandible, so that the patient can control the opening and closing of the mandibular movements adequately and repeatedly.[9] However, a removable prosthesis is an equally effective alter-native for most patients with mandibular defects, considering the poor prognosis, difficulty in decision making for use of implant and economic feasibility and The presence of teeth in both the arches is important for effective guidance and reprogramming of mandibular movements.[10]

CONCLUSION

Mandibular guidance therapy, can be a useful adjunct to preserve the mandibular function after partial mandibulectomy procedures and to minimize complications associated like mastication, speech and swallowing. Application of conventional prosthodontic principles, along with patient cooperation, can achieve long term success of the prostheses and predictable patient satisfaction in such cases.

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How to cite this Article: Gupta S, Mishra P, Shivakumar GC. Guided Flange prosthesis; A non-surgical aid for hemi mandibulectomy patient: A case report. J Dent Specialities,2015;3(1):117-119

Source of Support: NIL
Conflict of Interest: None Declared

Crossbite correction made easier – A case report

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Received: 05-02-2015
Accepted: 26-03-2015

ABSTRACT

Anterior crossbite is an abnormal labiolingual relation in which maxillary anterior teeth are locked behind the mandibular anterior teeth. Many methods are used to raise the bite to correct anterior crossbite. Here, a new method is described which will retain the bite blocks in place for easier correction of anterior crossbite.

Keywords: Anterior crossbite, acrylic bite blocks.

INTRODUCTION

Anterior crossbite is an abnormal labiolingual relationship between one or more maxillary and mandibular incisor teeth.[1] Cross bite correction is highly recommended as this kind of malocclusion does not diminish with age. Cross bites that are not corrected may lead to abnormal wear of lower anteriors and cuspal interference, mandibular shift resulting in mandibular asymmetry and temporomandibular joint dysfunction syndrome.[2] There are several methods for treating this type of malocclusion. Traditionally acrylic bite blocks are fabricated which are cemented to the posterior occlusal plane with glass ionomer cement (GIC) but it is not stable as it becomes loose or breaks for which the treatment time is delayed.[3,4] GIC bite blocks are also preferred by some clinicians but it wears off easily and also it causes supra eruption and intrusion of the molars. A clinical innovation was published by Ahmad N et al in JIOS (2015) regarding the use of posterior bite blocks with steel tubes underneath for retention to the teeth with the help of steel ligatures.[5] This innovation was used for the fabrication of bite blocks in a patient with cross bite and was found to be quite effective and comfortable for the patient.

CASE REPORT

This is a case report of a 15 year old female patient who reported to the department of orthodontics with the chief complaint of irregularly placed upper front teeth. Patient had a skeletal class I relationship with average mandibular growth pattern. Intraorally, crossbite was present with respect to upper left lateral incisor. Molars and canines were present in class I relationship bilaterally.(Fig. 1-4)

Treatment progress

Fixed orthodontic treatment was started by placement of pre-adjusted edgewise appliance (MBT 0.022 inch slot). Arch alignment with 0.014 inch NiTi wires was carried out and the space for upper left lateral incisor was maintained with passive open coil spring in 0.018 inch AJ wilcock orthodontic australian wire. After, the arches were aligned to 0.019 x 0.025 inch SS wire, GIC bite blocks were placed on the lower posterior teeth to open the bite. However, there was repeated wearing of GIC bite blocks. So, they were replaced with acrylic bite blocks cemented with glass ionomer cement (GIC) on the posterior teeth. However, repeated decementation and loosening of the bite blocks made treatment progression difficult. Patient was reluctant to wear removable posterior bite plane as she found it uncomfortable. Thus, a different technique was used to retain the bite blocks on the posterior teeth. Acrylic bite blocks were fabricated by incorporating steel tubes (14-gauge needle) beneath the acrylic bite blocks (Fig 2,3). Braided steel ligatures were inserted through the tubes and secured to the interdental contact area between the second premolar and first molar and one between the both the first and second molars. Thus, mechanical retention is obtained by tying the bite blocks to the teeth without the use of GIC (Fig 5). After, 1 month the anterior cross bite was corrected by piggy backed 0.014 inch NiTi that was engaged to the upper left lateral incisor over a AJ wilcock orthodontic australian wire 0.018 inch wire (Fig 6) and after the crossbite was corrected, the lower arch was bonded (Fig 7). This new method of retention of the acrylic bite blocks to the occlusal surface is quite simple to fabricate and comfortable for the patient as compared to traditional bite blocks.

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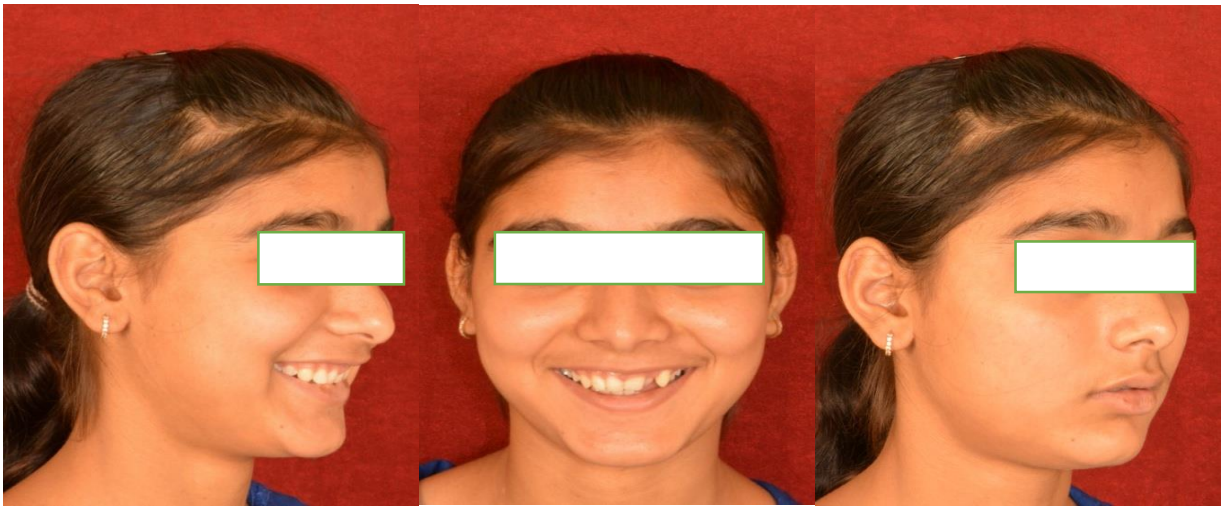

Fig 1: Pre-treatment photographs (Extra oral)

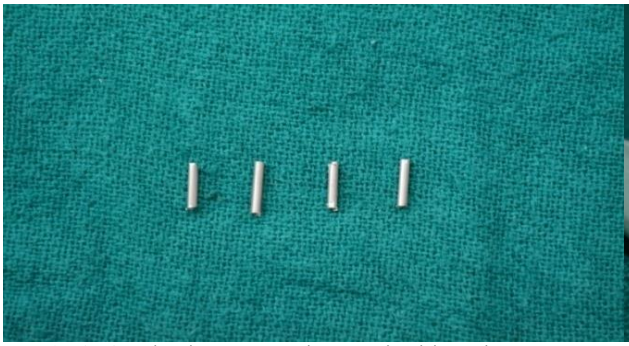

Fig 2: Steel tubes cut to the required length

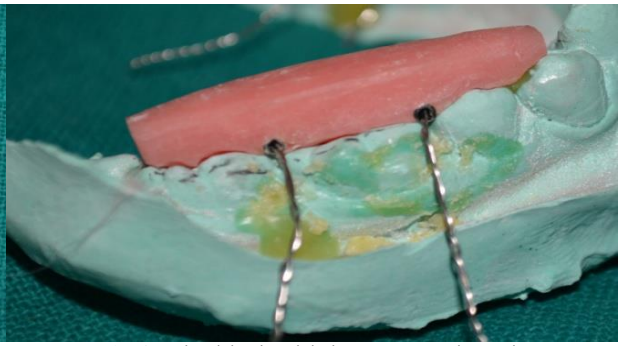

Fig 3: Bite block with incorporated steel tubes for braided steel ligature wires

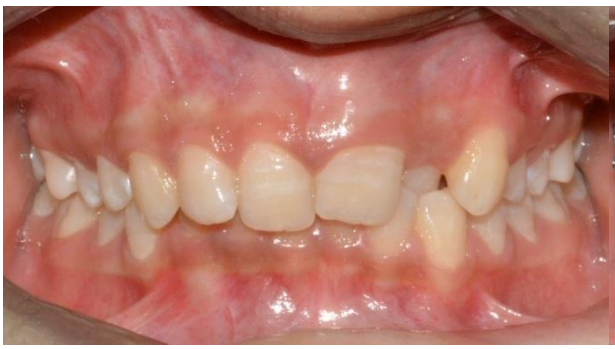

Fig 4: Pre-treatment photograph (Intra oral)

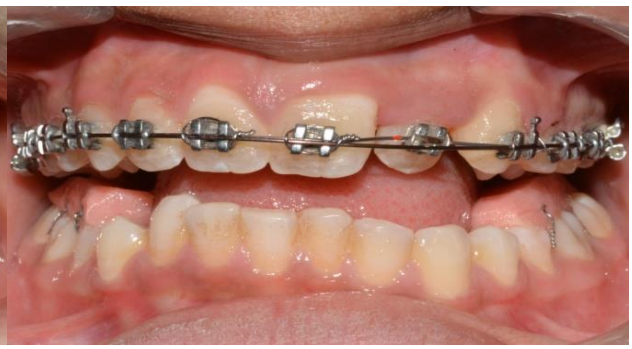

Fig 5: Bite blocks attached to the posterior teeth.

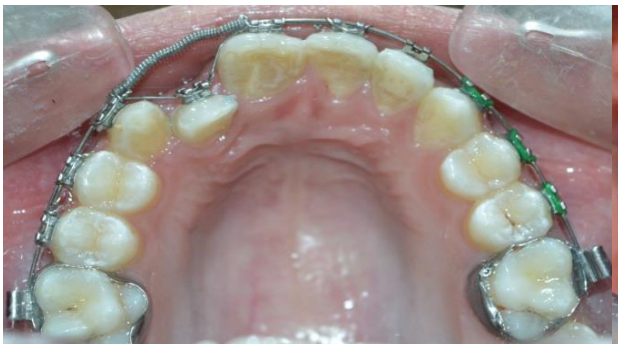

Fig 6: Space maintained with open coil spring and piggy back wire

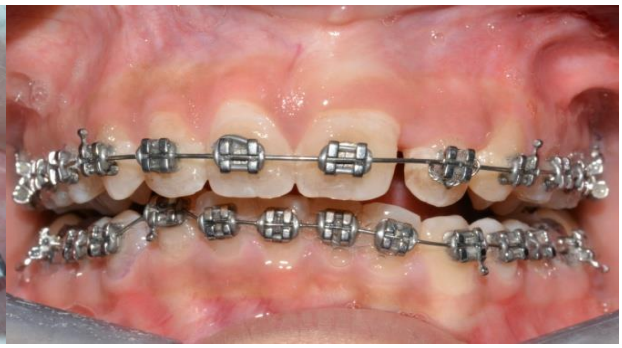

Fig 7: Bonding of lower arch after cross bite correction and removal of bite blocks

DISCUSSION

Different techniques have been used to correct anterior dental crossbite. The use of removable acrylic appliances with posterior bite opening platforms and anterior finger springs for labial tipping of maxillary teeth also requires patient cooperation.[5] The use of GIC bite blocks is also advocated in some case but it wears off easily and also causes supraeruption. Coloured composite blocks are also preferred by some clinicians but at the end of treatment it becomes difficult to remove the blocks. Guray bite raiser [6], a fixed auxillary that is used in opening bites, can also be used however it has a drawback that it can cause supraeruption of molars. Because of the disadvantages of the methods mentioned above, the case reported here was treated using a new method to retain the bite blocks. This method represents a quick, easy and esthetically acceptable alternative for the correction of anterior dental crossbite. The procedure is low-cost, involves no discomfort, and it can be completed in one single visit to the clinic. Treatment time is shortened, since retention of the bite blocks is achieved and the anterior crossbite can be corrected easily.

CONCLUSION

This new technique is found to be very reliable and effective. Loosening and breakage of bite block is infrequent, so, treatment duration is altered minimally. As it covers the occlusal surfaces of all the posterior teeth it avoids the supra eruption.

GIC is not used for its retention, so, it can be easily be removed. Moreover, the patient compliance with the bite block is excellent.

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How to cite this Article: Konwar SK, Saxena A, Singla A, Chandna AK. Crossbite correction made easier – A case report. J Dent Specialities, 2015;3(1):120-122

Source of Support: NIL
Conflict of Interest: None Declared

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Abstract and Keywords: The second page should carry the full title of the manuscript and an abstract (of no more than 150 words for case reports, brief reports and 250 words for original articles). The abstract should be structured with subsections, Statement of problem, Purpose, Materials and Method, Results and Conclusions. Avoid abbreviations and manufacturing information. Below the abstract provide 5-6 Keywords.

Introduction: It should briefly review the current state of knowledge strictly concerning topic of paper. It should also make statement on the reason for undertaking the study and what's the aim to achieve.

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Results: Present the results in logical sequence in the text, tables, and illustrations. Do not repeat in the text all the data in the tables or illustrations; emphasize or summarize only important observations.

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Short Communication/ Clinical Tip: Up to 1000 words excluding references & abstract with up to 5 references.

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AACD 2015
31st Annual Scientific Session of the American Academy of Cosmetic Dentistry
06 May 2015 - 09 May 2015
San Francisco, United States
http://www.aacdconference.com

10th CAD/CAM
10th CAD/CAM & Digital Dentistry International Conference
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http://cappmea.com/cadcam10/
Phone: +971 4 3616174

Malaysia International Dental Exhibition and Convention:
June 12th to 14th 2015
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Visit: www.mda.org.my

The 25th Congress of International Association of Paediatric Dentistry:
July 1st to 4th 2015
IAPD 2015 Congress Secretariat
Glasgow -G20 0SP-UK
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Fax: + 44 (0) 141 945 6899
Email: iapd2015@meetingmakers.co.uk

Southwest Dental Conference:
August 6th to 8th 2015
Southwest Dental Conference
Dallas, TX 75244
Fax: +1 972 233 8636
Email: bonnie@dcds.org
Website: www.swdentalconf.org

FDI Annual World Dental Congress
Bangkok 2015:September 22nd to 25th 2015
71 Ladplaw 95 Wangthonglang,
Bangkok 10310,Thailand.
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Fax: +662 514 1100
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Email: contact@fdi2015bangkok.org

World Dental Show:
16-17-18 Oct 2015
Indian Dental Association (Head Office).
Sane Guruji Premises, Block No. 6, 1st Floor,
386 Veer Sawarkar Marg,
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Prabhadevi, Dadar(W),Mumbai - 25,
Maharashtra, India.
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2015 ADA - American Dental Association
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American Dental Association
211 East Chicago Ave.
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Visit: www.ada.org

World Implant Orthodontic Conference
10 Nov 2015 → 13 Nov 2015
Dubai, United Arab Emirates
http://www.wioc2015.com/
Neha Choudhary; Phone: [+971 (4) 311 6300]

Greater New York Dental Meeting 2015
- 91st Annual Session
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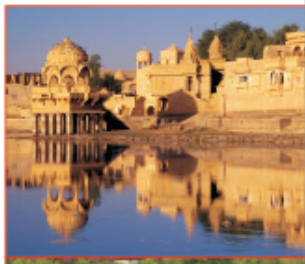

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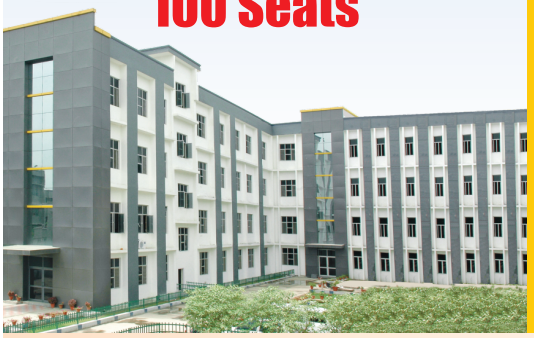

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