### ORIGINAL ARTICLE

**SEXUAL DIMORPHISM IN PERMANENT 1ST MOLAR: A FORENSIC TOOL**

*Dr. Ramandeep S Narang **Dr. Adesh S Manchanda ***Dr. Preeti Chawla Arora ****Dr. Gurpreet Kaur

**CORRELATION OF CHRONOLOGICAL, DENTAL AND SKELETAL AGE: A RADIOGRAPHIC STUDY**

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DR. C.S. BAL
Patron(IJCDC) & Principal,
Sri Guru Ram Das Institute of Dental Sciences & Research,
Amritsar.
Editorial

It gives me immense pleasure to present the third issue of Indian Journal of Comprehensive Dental Care. It has been a commendable effort on the part of the authors, editorial board and the publishers that we could derive, what we strived for and bring to you informative, interesting and innovative literature regarding recent research, treatment protocol and options available for various dental ailments.

Recently on the specifications laid down and on suggestion of Punjab Pollution Control Board (PPCB), the use of mercury and mercury based dental and medical products has been restricted in the state. Though the vision behind the action seems justified but does stopping the use of dental amalgam going to help?

Some people might argue that dental amalgam is 50% mercury. The implication of the statement “dental amalgam is 50% mercury” is that all this mercury is readily available to the patient. Frankly, this is a misrepresentation and an exaggeration, either intentionally or naively.

When chewing, pressures of 30,000 psi or higher are commonly obtained in the oral cavity and the high friction can generate heat in small areas. It is theorized (Mitchell, 2004) that high forces and/or subsequent heat could be the reasons that amalgams release small amounts of mercury during their lifetime. The amount of mercury released is in the range of 1.7 millions of a gram (µg) per day of 12 amalgams (Berglund, 1990).

This fraction of mercury release in numerous studies has been documented to be clinically non-detrimental. No material has stood up to the test of time as amalgam. I hope in coming times sensibility prevails and the 'silver maiden' gets her way back.

Yours sincerely

Dr Shantun Malhotra
Editor-in-chief IJCDC
ABSTRACT

Introduction: Sexual dimorphism refers to those differences in size, stature and appearance between male and female that can be applied to dental identification because no two mouths are alike.

Aims & Objective: To determine sexual dimorphism based on bucco-lingual (B-L) dimensions of permanent 1st molars on study casts and to analyze if any sexual variation exists in the B-L dimensions of these teeth.

Materials and Method: The study sample comprised 150 individuals (75 males and 75 females) of an age group ranging from 20-40 years, in a Punjabi population. Impressions were made with alginate and study models prepared with dental stone. The Bucco-Lingual diameters of the first molars were measured using digital vernier calipers on study casts. Percentage of sexual dimorphism was calculated.

Results: The mean values of parameters showed statistically significant differences between males and females with p < 0.05, in the maxillary casts, and insignificant differences in the mandibular casts. Sexual dimorphism amounted to 7.4% and 6.3% for right and left buccolingual dimensions of maxillary first molars respectively.

Conclusion: The study concludes that the sexual dimorphism of teeth is population specific and among Punjabis, B-L dimensions in maxillary 1st molar can aid sex determination.

Key words: forensic, molar, sexual dimorphism.

INTRODUCTION

Sex determination is one of the prime factors employed to assist with the identification of an individual. Correct sex identification limits the pool of missing persons to just one half of the population. In forensic contexts, however, it is not uncommon to recover partial remains, with fragmentary skull and pelvic bones. The teeth are one of the strongest human tissues and are known to resist a variety of ante-mortem and post-mortem insults. Teeth being the central component of the masticatory apparatus of the skull, are good sources of material for civil and medico-legal identification. In addition, the degree to which they provide resistance to damage in terms of bacterial decomposition, fire and fracture, makes them valuable for forensic investigation and research. Various studies have been reported on sex determination and age estimation using dental traits and cheiloscopy.

Information concerning tooth size aids in age and sex determination of human remains. With such tooth size standards, whenever it is possible to predict the sex, identification is simplified because then only missing persons of one sex need to be considered. In this sense identification of sex takes precedence over age. Sex determination using dental features is primarily based upon the comparison of tooth dimensions in males and females or upon the comparison of frequencies of non-metric dental traits like Carabelli’s trait of upper molars, deflecting wrinkle of the lower first molars, distal accessory ridge of the upper and lower canines or shovelling of the upper central incisors. This is based on the fact that although the morphology of the tooth structure is similar in males and females, the size of the tooth does not necessarily remain...
the same, as the tooth size is determined by cultural, environmental, racial and genetic factors.‘Sexual dimorphism’ refers to those differences in size, stature and appearance between male and female that can be applied to dental identification because no two mouths are alike. The present study aims to determine sexual dimorphism based on bucco-lingual (B-L) dimensions of permanent 1st molars on study casts and to analyze if any sexual variation exists in the B-L dimensions of these teeth.

MATERIALS AND METHOD

The study sample comprised 150 individuals (75 males and 75 females) of an age group ranging from 20-40 years, in a Punjabi population. This particular age group was studied as ante-mortem insults such as regressive alterations (attrition and abrasion) affecting occlusal and approximal tooth surfaces are minimal. The inclusion criteria taken into consideration were as follows:

- Healthy state of periodontium
- Caries free teeth
- Presence of bilateral maxillary and mandibular first molars

Following informed consent, impressions of the maxillary arch were made with irreversible hydrocolloid (alginate) material and casts poured immediately in type II dental stone to minimize dimensional change. The B-L diameters of the first molars were measured using digital vernier calipers (resolution 0.01mm) on study casts [Figure 1 & 2].

B-L diameter of the crown: This measurement is the greatest distance between buccal and lingual surfaces of the crown parallel to long axis of tooth.

The measurements were performed by one person and all values were rounded to two decimal places. In order to assess the reliability of the measurements, intra-observer error was tested. The same measurements were obtained from 50 randomly selected teeth from the original sample at a different time by the same author to assess intra-observer error. Another observer measured the same randomly selected teeth in order to test the inter-observer error. Their measurements were analyzed using Student’s t-test. There was no statistically significant difference between the findings of the two observers. Statistically significant sexual dimorphisms in male and female odontometric features were tested by the unpaired t-test.

The level of statistical significance was set at \( p < 0.05 \). The mean values of BL dimensions of males and females were subjected to the formula to calculate sexual dimorphism

\[
\text{Percentage of sexual dimorphism} = \left( \frac{X_m}{X_f} \right) - 1 \times 100
\]

Where \( X_m = \) mean male tooth dimension; \( X_f = \) mean female tooth dimension.

RESULT

B-L diameter of right and left maxillary and mandibular 1st molars were observed on the study casts. It was seen that the mean values of parameters showed statistically significant differences between males and females with \( p \geq 0.05 \), in the maxillary casts, and insignificant differences in the mandibular casts (Table 1). Sexual dimorphism amounted to 7.4% and 6.3% for right and left buccolingual dimensions of maxillary first molars respectively (Table 2). In terms of B-L dimension the maxillary right first molar showed greater sexual dimorphism as compared to the left side.

DISCUSSION

The fact that most teeth complete development before skeletal maturation makes the dentition a valuable sex indicator, particularly in young individuals. The present
In the present study the B-L width of 1st maxillary and mandibular molars was observed and significant sexual dimorphism was only observed in the maxillary molar. Sexual dimorphism on the right side was observed to be 7.4%, while on the left side was 6.3%. No sexual dimorphism was observed in the mandibular 1st molar.

This variation in the magnitude of dimorphism can be a result of various factors. Some authors have explained that such variation could be due to environmental influences on tooth size. Variation in food resources exploited by different populations has been explained as one such environmental cause. Others have suggested the interference of cultural factors with biological forces. According to Garn et al., teeth have behaved in many ways through the course of evolution, ranging from reduction of the entire dentition to reduction of one group of teeth in relation to another. According to Garn et al., teeth have behaved in many ways through the course of evolution, ranging from reduction of the entire dentition to reduction of one group of teeth in relation to another.2,14 There can be a complex interaction between a variety of genetic and environmental factors that is responsible for the variation in the magnitude of dimorphism.

It was further postulated by Garn et al. that tooth size dimorphism in various populations can also be due to various factors, the first being identity in patterning but differences in level or variability and the second being variability in patterning as well as variability in magnitude or level.

There is a greater B-L tooth size noted among the male population as compared to females and this could be attributed to the differences in enamel thickness due to the long period of amelogenesis in males. However, in females the completion of calcification of the crown occurs earlier in both deciduous and permanent dentition as quoted by de Vito.16

Sex chromosomes are also known to cause different effects on tooth size. The 'Y' chromosome influences the timing and rate of body development, thus producing slower male maturation, and acts additively and to a greater extent than the 'X' chromosome.1

Kalai S quotes that according to Townscend the difference in size has been attributed to differently balanced hormonal production between the sexes consequent to the differentiation of either male or female gonads during the sixth or seventh week of embryogenesis rather than any direct effect of sex chromosome themselves.17

It has been shown that 'Y' chromosome has a direct effect on tooth size, which may be related to a more non-specific effect of heterochromatism or cellular activity.

On the whole, the study concludes that the sexual dimorphism of teeth is population specific and among Punjabis, B-L dimensions in maxillary 1st molar can aid sex

---

**Table 1: Comparison of mean values of different parameters in males and females measured on study casts using unpaired t-test (right and left maxillary and mandibular molars).**

<table>
<thead>
<tr>
<th>Study cast</th>
<th>Parameters</th>
<th>Sex</th>
<th>Mean (mm) ± S.D</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maxillary</td>
<td>BL-R</td>
<td>M</td>
<td>11.04 ±0.56</td>
<td>≥ 0.05*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>10.28 ±0.51</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BL-L</td>
<td>M</td>
<td>10.96 ±0.48</td>
<td>≥ 0.05*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>10.31 ±0.48</td>
<td></td>
</tr>
<tr>
<td>Mandibular</td>
<td>BL-R</td>
<td>M</td>
<td>10.09 ±0.35</td>
<td>≥ 0.05**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>10.07 ±0.55</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BL-L</td>
<td>M</td>
<td>10.05 ±0.34</td>
<td>≥ 0.05**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>10.04 ±0.61</td>
<td></td>
</tr>
</tbody>
</table>

*p ≥0.05: significant; **p ≥0.05 not significant

---

**Table 2: Percentage Sexual Dimorphism in Maxillary first molars.**

<table>
<thead>
<tr>
<th>Study cast</th>
<th>B-L Right</th>
<th>B-L Left</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maxillary</td>
<td>7.4%</td>
<td>6.3%</td>
</tr>
</tbody>
</table>

---

study established the impact of sex factor on the morphometry of permanent first molars. The comparison of mean values of parameters measured between males and females showed statistically significant differences with p<0.05 in the maxillary 1st permanent molar and these results were in agreement with the studies done by various researchers in which they have observed that the males had larger teeth than females in all the dimensions.

The present study showed no statistically significant difference between the mean values of parameters on the left side as compared to the right side. The results were in disagreement to the study done by Rai B et al., who found the left buccolingual dimensions of maxillary first molars to be greater than its counterparts.

Studies conducted by different researchers on various populations shows a varied percentage of dimorphism in maxillary teeth. Native South American population has shown the least dimorphism of 1.90 %. A relatively larger percentage of dimorphism was seen in American Caucasoid (6.11), South African Caucasoid (4.83) and Australian aborigine (4.02) populations. Similarly, a moderate level of dimorphism has been demonstrated in the mandibular teeth in Nepalese (2.69), Swedish (2.80), Australian aborigines 3.88, and American Caucasoids (5.20).
determination. It is recommended to conduct similar studies on various populations taking greater sample size for further confirmation. It is also recommended to consider the entity for sex determination along with other odontometric and skeletal traits as it has shown moderate magnitude of dimorphism.

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CORRELATION OF CHRONOLOGICAL, DENTAL AND SKELETAL AGE: A RADIOGRAPHIC STUDY

ABSTRACT
Assessment of age is an indispensable part of forensic sciences. Skeletal and dental development can be used proficiently in the estimation of chronological age.

Aim: The aim of this study was to investigate the relationship between chronological, dental and skeletal ages among 8 to 17 year old children.

Materials and Method: The sample consisted of panoramic and hand-wrist radiographs of 82 children between 8 and 17 years of age. Nolla’s method was used to estimate the dental age through the assessment of different calcification stages of the right maxillary and mandibular dentition. Skeletal age was determined using Greulich and Pyle atlas and skeletal maturity stage was established utilizing Björk’s skeletal maturity indicators. The results were analyzed using Pearson coefficient correlation.

Results: Pearson's correlation test demonstrated high correlation between chronological, skeletal and dental age (p<0.001). The correlation constant between chronological age and skeletal age was found to be slightly better (r=0.867) than the correlation between chronological age and dental age (r=0.851).

Conclusion: It is suggested that tooth calcification stages in panoramic radiographs might be a valuable indicator to assign timing of growth spurt. Chronological age is a reasonable indicator of the dental and skeletal maturation in our study sample.

Key words: skeletal age measurement, chronological age, dental age, age estimation.

INTRODUCTION
Age estimation forms one of the most important subdisciplines of forensic sciences and is of paramount importance in medico-legal issues, pediatric dentistry and orthodontic treatment planning. The estimation of the age of a person has been an archaic exercise and since decades even dentists have contributed to this science with several methods. The tooth with its developmental stages provides us with a non-invasive modality to determine the age of the person. It also allows the assessment of the period when no clinical tooth emergence takes place.²

In the current scenario, most of the age estimation modalities are invasive, requiring lengthy processing times and use of expensive instruments to deduce the age of the person. But the biggest pitfall had been the lack of the usability of these methods in-vivo.³ It is at this juncture, that the branch of radiology comes handy as it offers an insight into the developmental stages of the teeth, which provides a baseline data for age estimation in children and adolescents. Among the other diagnostic tools available, hand-wrist radiographs have been used extensively and reliably to assess the skeletal maturity and predict the pubertal growth spurt.

The aims of the present study were: 1) to test the applicability of the Nolla’s method of age estimation and to assess the skeletal age of the individual by interpretation of the hand wrist radiograph by Bjork’s method, 2) to establish the relationship between dental, skeletal, and chronological ages in the study sample.
The assessment of dental maturation from the panoramic radiographs was based on the method described by Nolla et al, in which ten stages of calcification from 0-10 are described for each tooth.

1. Stage 0 : Absence of crypt.
2. Stage 1 : Crypt present.
3. Stage 2: Initial cusp calcification
4. Stage 3 : One-third of the crown complete
5. Stage 4 : Two-thirds of the crown complete
6. Stage 5 : Crown almost complete
7. Stage 6: Crown complete
8. Stage 7 : One-third of the root complete
9. Stage 8 : Two-thirds of the root complete
10. Stage 9: Root formation complete but apex not closed

**MATERIALS AND METHODS**

The study subjects were randomly selected from patients visiting the Department of Oral Medicine, Diagnosis and Radiology during the study period. The study population consisted of 82 subjects (43 males and 39 females) in the age group of 8-17 years.

The inclusion in the study was set to include only those children who presented with the following criteria:

1. Chronological age ranging from 8 to 17 years.
2. Free of any skeletal, musculoskeletal and endocrinal diseases.
3. No previous history of trauma or disease to the face and the hand-wrist region.

The selected patients were examined and their age, sex and date of birth were noted. The chronological ages of the children were obtained by subtracting their birthdates from the date of taking the radiograph. Informed consent was obtained from each participant for the radiographic examination.

Each patient underwent a panoramic radiograph (73 kvp,12 mA and 13.9 seconds ) and hand wrist radiograph of the left hand with fingers slightly apart on Kodak 8000 C digital panoramic machine with 60 kvp,10 mA and 0.5 seconds. Only those radiographs that were without any distortions were selected for the study.

![Fig 1: Correlation between chronologic age and dental age.](image1)

![Fig 2: Correlation between chronologic age and skeletal age.](image2)

<table>
<thead>
<tr>
<th>Pearson coefficient of correlation</th>
<th>r value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>0.876</td>
<td>0.000</td>
</tr>
<tr>
<td>Female</td>
<td>0.815</td>
<td>0.000</td>
</tr>
<tr>
<td>Total</td>
<td>0.851</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Table 1: Correlation constants for males and females for chronologic age and dental age.

<table>
<thead>
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<th>Pearson coefficient of correlation</th>
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</tr>
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<tbody>
<tr>
<td>Male</td>
<td>0.827</td>
<td>0.000</td>
</tr>
<tr>
<td>Female</td>
<td>0.897</td>
<td>0.000</td>
</tr>
<tr>
<td>Total</td>
<td>0.867</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Table 2: Correlation constants for males and females for chronologic age and skeletal age.
Stage 10: Apex closed.

After assignment of a dental maturation stage for each tooth in the right maxillary and mandibular quadrant, a total score was calculated for each subject. Dental age was determined by comparing the total score of each subject with established norm tables, as described by Nolla. The following ossification events were described:

**PP2 Stage**: Epiphysis of the proximal phalanx of the second finger equals its diaphysis.

**MP3 Stage**: Epiphysis of the middle phalanx of the third finger equals its diaphysis.

**S stage**: First mineralization of the ulnar sesamoid bone.

**MP3 Stage**: Epiphysis of the middle phalanx of the third finger caps its diaphysis.

**DP3 Stage**: Visible union between epiphysis and diaphysis of the distal phalanx of the third finger.

**MP3 Stage**: Visible union between epiphysis and diaphysis of the middle phalanx of the third finger.

Radiographic assessments for dental and skeletal maturity were performed simultaneously using an illuminated viewing box by two authors, with a single examiner performing all the dental maturation assessment while the other was assessing the skeletal maturity stage of all hand-wrist radiograph.

Data were analyzed statistically and the relationship between the recorded characteristics was evaluated by Pearson's Correlation (Karl-Pearson Correlation Constant).

### RESULTS

**Interrelationship among dental, skeletal and chronological age.**

The mean chronological age for males was 13.6 years and 12.53 years for females. Pearson's correlation test demonstrated high correlation between chronological, skeletal and dental ages. (r<0.001) This indicates that chronological age is a reasonable indicator of the dental and skeletal maturation in the study sample.

**Relationship between chronological age and dental age.**

Pearson's coefficient of correlation, showed high correlation between chronological and dental age (r=0.851). Pearson's correlation constant (r) value for males was found to be 0.876 and 0.815 for females. (Fig 1 and Table 1).

**Relationship between chronological age and skeletal maturity markers.**

The correlation constant between chronological age and skeletal age was found to be slightly better (r=0.867) than the correlation between chronological age and dental age (r=0.851). The correlation constant for males was 0.827 and 0.897 for females. (Fig 2 and Table 2)

The correlation constant for males was slightly higher between chronologic age and dental age (r=0.876) as compared to the correlation between chronologic age and skeletal age (r= 0.827). This indicates that dental age was found to be more strongly correlated to chronologic age in males.

For females the skeletal age (r= 0.897) was found to be strongly correlated with the chronological age, as compared to (r=0.815) for dental age.

Test for inter-observer difference and intra-observer bias did not yield any significant statistical variation.

### DISCUSSION

Age estimation is of wider importance in forensic medicine, not only for the purpose of identifying deceased victims but also in connection with crimes and accidents, school attendance, employment and marriage. Age estimation is also proving valuable when birth data is lacking or doubted in the management of immigration to help determine physiological age. According to the suggestions produced by the Study Group on Forensic Age Diagnostics, a forensic age estimate of a living person for the purpose of criminal prosecution should consist of: a physical examination that also records anthropometric data, any age-relevant developmental disorders and signs of sexual maturation; an X-ray examination of the left hand; and a dental examination that records dentition status and evaluates an orthopantomograph.

Generally, it has been the consensus that chronological age is regarded as a poor indicator of the skeletal development due to significant individual's variability. The hand wrist has been widely studied and used as an area that helps to determine bone maturation with scientifically proven efficacy. Dental development has been widely investigated as a potential predictor of the skeletal maturity level. Various methods were recorded for the assessment of the dental maturation depending on tooth calcification. Nolla's technique, 1960 is considered one of these methods and it was reported to be more precise for assessing dental calcification at a wide range of age. The advantages of this method are that it can be applied to an individual with or without the third molar and that girls and boys are dealt with...
separately. It also includes maxillary as well as mandibular teeth, as compared to the Demirjian method which only includes mandibular teeth. This study has adopted Nolla’s technique due to its applicability and accuracy. The results of the right and left teeth showed no significant difference that is why only the right side was used.

Several investigations have evaluated the association between dental maturity and chronological age in different populations. Many authors agreed that dental growth and development should be adapted as a more reliable criterion of biological age and teeth maturation has been found to have intimate relationship to the chronological age.

Adel Al-Hadla et al in their study of male children have found that skeletal age is found to be less than the chronological age. This finding is in harmony with our study in which the males showed a slightly more closer association in dental and chronological age as compared to the skeletal age. In contrast, the chronological age of females showed a closer association of chronological age with their skeletal age. In agreement with the present study, high correlation between skeletal maturity stages and dental calcification stages of individual teeth has been reported.

The ability to assess skeletal maturity by the developmental stage of the dentition through the examination of a panoramic radiograph offers several advantages over the conventional hand-wrist radiographic method. Compared to bone mineralization, tooth mineralization stages are much less affected by variation in endocrine and nutritional status and developing teeth therefore provide a more certain indication of chronological age. The complete hand wrist radiograph involves thirty bones and assessment of these stages is one elaborate task which needs time and experience and also involves increased radiation exposure, therefore putting a question mark on ALARA (as low as reasonably achievable) principle. Generally, dental professionals are more familiar with the stages of dental development than with the skeletal maturity indicators present in the hand-wrist radiograph. Also, no additional exposure to radiation would be necessary if skeletal maturity can be assessed through routinely taken panoramic radiographs. The age assessment methods are relatively simple and involve the identification of the stage of mineralization on radiographic images followed by their comparison with the standard stage to estimate the approximate age range.

CONCLUSION

In conclusion, no significant differences were found between dental age, skeletal age and chronological age in the study sample. Therefore, chronological age can be regarded as an acceptable indicator of the skeletal maturity and dental development in study sample. Significant association between the dental calcification stage and the individual’s skeletal maturity stage was demonstrated. Thus the dental age estimation itself can be a useful clinical tool to estimate the skeletal maturity stage of the individual by examination of his/her routine dental panoramic radiograph.

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ABSTRACT

BACKGROUND AND OBJECTIVE

Hospital helping staff who come in contact with HIV patient’s blood and other body fluids run very high risk of being infected. Occupational exposures have been reported by health care workers worldwide, thus to minimize risk of exposure, awareness about HIV is very essential.

This study was conducted to analyse the level of awareness and knowledge about AIDS in the hospital helping staff. Since these people are susceptible to infection in hospital setup and lack basic knowledge about the disease.

METHODOLOGY

A self-designed questionnaire was randomly distributed in 4 eminent hospitals of city, subjects were hospital assisting staff which included dental and medical assistants, laboratory workers, technicians, ambulance drivers, embalmers, laundry workers and cleaners. 203 Subjects were requested to respond about basic characteristics of AIDS, out of which 66% were females.

RESULTS

Survey conducted was subjected to analysis. The percentage of correct answers ranged from 6% to 62%. From the responses it was inferred that many of the subjects (51%) were unaware of various modes of transmission of AIDS. Amongst numerous other prevailing myths about AIDS, misconception of AIDS being a hereditary disease was most prevalent (44%) in the questioned subjects.

CONCLUSION

Awareness about AIDS was highly neglected, thus an urgent need to spread awareness in this vast and high-risk group is required. Participation and success of AIDS awareness workshops should be regularly evaluated.

Keywords: NSI (Needle stick injuries), AIDS, SGPC

INTRODUCTION

Human Immunodeficiency Virus (HIV) is a pandemic affecting millions of people worldwide, it was estimated about 2.39 million people are living with HIV in India. The first case of HIV was reported in India in late 1986 in Chennai. Originally associated with only sex workers HIV now has engrossed its roots in all sections of society. All health care workers run the risk of being infected and because of their unique employment environment they should even be more careful and should demand that correct protocol be followed and maintained at all times. Hospital is very vulnerable environment for HIV and other blood borne infections. The healthcare workforce, is about 35 million people worldwide, represents 12% of the working population. The occupational health of this significant group has been long neglected. Misunderstanding exists that the health care industry is “clean” and without hazard, when actually the chemical and blood-borne exposures encountered outnumber any other profession. There are various means how hospital workers can inoculate the virus. Sharp instruments, needles and blood spill being some of the major routes. Needle stick injuries are silent epidemic. Globally, Needle Stick Injuries (NSI) are the most common source of occupational exposures to blood and the primary cause of blood-borne infections of Health Care Workers. The two most common causes of NSIs are two handed...
recapping and the unsafe collection and disposal of sharp waste. Apart from NSI, mishandling of body, body fluids and waste disposal are some of the other exposure hazards. The Centers of Disease Control (C.D.C) stresses on practice of universal precautions for every patient\(^5\). Even after all the scrupulous guidelines\(^6\) there are still fairly good chances of exposure. There is negligible amount of knowledge about the management of these unfortunate episodes. This study was conducted to analyze the risk of HIV in hospital helping staff, which is directly dependent upon their knowledge about the disease.

**METHODOLOGY**

Study was carried out in Amritsar city of Punjab. On a random basis in 4 hospitals of city (under Shiromani Gurdwara Parbandhak committee) namely: -

1) Shri Guru Ram Das Institute of Dental Sciences and Research Amritsar,
2) Shri Guru Ram Das Charitable Hospital Amritsar,
3) Mata Kaulan Bandi Chodd Hospital Amritsar,
4) Shri Guru Ram Das Medical College Amritsar.

**SUBJECTS**

All the health care workers which included dental and medical assistants, nurses, embalmers, laboratory workers and technicians who handle sharp instruments and are exposed to blood and other infectious material. Ambulance drivers who come in contact with blood when they move patients from site of emergency to the hospital. Laundry workers who are exposed to the infected linen and patient drapes and cleaners who manage the waste disposal, blood spillage in hospitals. This vast group runs a high risk of HIV exposure but have very limited knowledge about disease.

**DATA COLLECTION**

A self designed questionnaire form (written in Punjabi vernacular, which was easily understood by all the participating subjects, figure 1) requesting information about Acquired Immunodeficiency Syndrome (AIDS) was randomly distributed amongst hospital workers of selected hospitals in urban and suburban areas of Amritsar. Distribution and collection of questionnaire was done by hand under author’s responsibility. Information was requested on age, gender, professional title of respondent and name of institute. 22 simple questions based on fundamentals of AIDS like its causative agent, transmission routes, universal precautions, some misconceptions about AIDS, etc were taken in a standard questionnaire. Respondents were not allowed to discuss the questions amongst themselves.

**RESULTS**

Out of the 213 questionnaire forms distributed. Total of 203 (95%) were accepted. 10 of them had to be discarded, since they were returned incomplete. Out of 203 subjects, 134 (66%) were females and 69 (33%) were males. Age of participating subjects ranged between 18 years to 63 years. Mean age range being 30-40 years. 14% of respondents (29/203) were from nursing department, 25% (51/203) were laboratory technicians, 42% (87/203) were cleaners, 14% (29/203) were medical and dental assistants and 7% (7/203) others (ambulance drivers, laundry workers, embalmers).

(Table 1) shows percentage of correct answers to different categories of questions. Only 49% of subjects had heard about HIV and AIDS. Just 48% of them were aware of major routes of transmission of AIDS. Universal precautions were known to and followed by only 40% of the subjects. 62% answered AIDS is more prevalent in females (Table 2). 58% of respondents replied correctly to other precautions against HIV transmission (example - needle stick injury hazards, sexual transmission, vertical transmission). Only 46% of the subjects realized that hospital staff has higher risk of HIV exposure. Precautionary blood screening was taken by only 41% of subjects in past one year. Only 60% of subjects were familiar with correct sterilization and wastage disposal.
Indian Journal of Comprehensive Dental Care

Survey on Awareness of AIDS in Shiromani Gurdwara Parbandhak Committee hospitals helping staff.

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Occupation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Religion</td>
<td>Hospital</td>
</tr>
</tbody>
</table>

1* Do you know full form of AIDS?  yes___ no___
2* Do you know any one of the means of AIDS transmission? yes___ no___
3* Can AIDS spread via a mosquito bite? yes___ no___
4* Can AIDS spread by consuming contaminated food/water? yes___ no___
5* Is AIDS a sexual transmission disease? yes___ no___
6* If you get pricked by an AIDS patient’s infected needle, is there a possibility that you may acquire AIDS? yes___ no___
7* Can AIDS spread through vertical transmission (through mother to her child immediately before or after birth)? yes___ no___
8* Is AIDS hereditary disorder? yes___ no___
9* Do you know what H.I.V means? yes___ no___
10* Are hospital workers more susceptible of acquiring AIDS? yes___ no___
11* Have you ever been pricked by a needle or any other sharp instrument? yes___ no___
12* In past one year, have you ever got your blood screening done? yes___ no___
13* Do you usually wear gloves, while working in hospital? yes___ no___
14* Is there any cure for full blown AIDS? yes___ no___
15* Can AIDS patient survive as long as 10 years after being infected? yes___ no___
16* Do you know any precaution against AIDS? yes___ no___
17* Do you think an AIDS patient deserves equal rights and privileges as a common man in the society? yes___ no___
18* Do you think AIDS patients should be treated in the same hospital with other patients? yes___ no___
19* Have you ever participated in any “AIDS AWARENESS PROGRAMME”? yes___ no___
20* Out of following, mark the correct--:
- what precautions which should be taken while treating an AIDS patient?
  - Destroy the needle and gloves used during treatment
  - Sterilize instruments used during treatment
  - Contact with patient’s infectious blood should be avoided
  - Which kind of sterilization method is the best:
    - Autoclave
    - boiling
    - chemical
21* AIDS can spread by coming in contact with which of these fluids of AIDS patient: His saliva____ tears____ blood______ Urine____
22* Which sex is most likely to be infected by AIDS? Males_____ females_____ both_____

DISCUSSION
In the list “Ranking OF Indian States by awareness of AIDS” Punjab ranks 6th and 12th in males and females respectively depicting that 90-92% of men are aware of HIV while only 65-70% of women acknowledge the disease characteristics. Discrimination and social stigma associated with AIDS patients was high, 73% of subjects believed that AIDS patients should not be treated with other patients in the same hospital.
Punjab total of 30,001 HIV positive cases from Integrated Counseling and Testing Centers (ICTC) have been reported since 1993 to February 2012. Amritsar definitely is a very high risk city of Punjab, it has the highest number of HIV positive cases in state. Total of 9154 HIV positive cases were recorded in Amritsar irrespective of the causes of transmission. It was also observed that injecting drug users (I.D.U) were main source of HIV infection. HIV prevalence among I.D.Us has reached to 30% in Amritsar. World wide total of 23,212 health care workers reported to have AIDS by occupational exposure, out of which 57 cases were documented where actual seroconversion after an occupational exposure was seen.

Thus awareness in hospital staff is an alarming concern and should be carefully evaluated. Results of this survey state that most of the questioned subjects (48 %) were unaware of the means of spread of HIV and many of them (36%) believed that HIV could transmit via mosquito bite and intake of infected food and water (18%). Other misconceptions like HIV being hereditary disease were also very prominent (44%). Level of social stigma and repulsion towards an AIDS patient was noted to be very high as majority of subjects (73%) claimed that AIDS patients should be separately treated in another ward or hospital. Most of the subjects affirmed that HIV transmits only through female sex workers, hence it is more prevalent in females than males (62%) which further increased the social stigma and discrimination towards the affected gender. About 40 % of helping technician staff did not know the correct sterilization protocol and waste disposal methods, which are life lines against HIV transmission. Almost 70% of subjects said they have been pricked by infected sharp instruments like needle sticks and other objects , occurrence of these episodes was highest among nursing staff (90%). Participation in AIDS awareness workshops was negligible, 82% of subjects had never attended any of the awareness program. Although Punjab State AIDS Control Society (SACS) has taken strong steps in spreading awareness about AIDS by starting 44020 free ICTC in the state, promoting training for nursing and counseling staff . Due to hindering factors like low literacy rate of 69.7% in Punjab and growing negative social responses towards HIV elevate sense of disgrace associated with the disease. This prevents people living with HIV from revealing their status to others and serve as a barrier to HIV treatment and awareness programme participation. Evaluation of participation in AIDS Awareness programs is highly required, especially to alleviate the mental status and fear of masses. Surveys should be taken on a larger and more regular basis to test knowledge about HIV. Information regarding management of occupational exposures and Post Exposure Prophylaxis (P.E.P) should be given to hospital workers to minimize risk of occupational exposures amongst hospital staff.

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EVALUATION OF EFFECT OF A SEALER ADDED WITH ANTIBIOTICS AGAINST MICROORGANISMS IN AN INFECTED ROOT CANAL

ABSTRACT
The in- vitro study was conducted to determine the antimicrobial effects of three antibiotics added to AH 26 Sealer against Enterococcus faecalis (EF). Three antibiotics: Linezolid, Augmentin and Ofloxacin, were added in AH 26 Sealer and were used in two hundred extracted human teeth, which were tested using root inoculation method. The freshly mixed sealer was placed in prepared roots inoculated with EF. The findings of resistance/ non resistance of Enterococcus faecalis after culturing were subjected to statistical analysis. The findings of this study revealed that sealer-antibiotic combination containing antibiotics had a significant inhibition when compared to AH26 sealer alone. It was concluded that AH26-antibiotic combination were effective in killing EF in dentinal tubules.

Keywords: Enterococcus fecalis (EF), AH 26 sealer, antibiotic

INTRODUCTION
Successful endodontic treatment relies on the triad of proper diagnosis, thorough biomechanical preparation and three dimensional obturation of root canal spaces. Disinfection of the root canal system is accomplished mainly with intracanal medicaments and irrigants. Despite these treatment procedures, bacteria can persist in the complex anatomy of the root canal space, thus the ability of root fillings to curtail residual bacteria and to prevent reinfection may play an increasingly important role in achieving and maintaining a higher success rate of root canal treatment.¹

Systemically administered antibiotics have complications such as toxicity, allergic reaction and development of resistant strains of microorganisms. It has been reported that the main advantage of local antibiotics compared to systemic use is that systemic complications are prevented and that substantially higher concentrations can be used thus making local application of antibiotics as an attractive alternative to systemically administered antibiotics.²

To date, limited studies have been performed to assess the incorporation of antibiotics to endodontic sealers, ³ the purpose of this in vitro study was to evaluate the antimicrobial effects of Ofloxacin, Augmentin and Linezolid when added individually to AH26 sealer against Enterococcus faecalis.

MATERIALS AND METHOD
Two hundred human permanent maxillary and mandibular single rooted teeth were selected for the study. The selected teeth were scaled to remove calculus, tissue tags and debris and stored in formalin. The coronal half of teeth were cut at the level of cemento-enamel junction with the help of a diamond disc, mounted on a straight handpiece. Root canal were instrumented upto the root apex using K file (Dentsply, Maillefer,Tulsa, UK, USA) and enlarged three times larger than the first snugly fitting file at the root apex. Teeth were autoclaved for complete asepsis.

A pure culture of Enterococcus faecalis was isolated in department of microbiology. A bacterial suspension of E.faecalis was prepared in brain heart infusion (B.H.I) broth by incubation for 24 hours at room temperature. A tuberculin syringe was used to inoculate a suspension of E.faecalis into the autoclaved sample. The teeth were randomly divided into 5 groups:

GROUP 1: Control.
GROUP 2: Sealer (AH 26).

1. Dr. Kanishk Mohanty
2. Dr. C.S.Bal
3. Dr. Aruna Aggarwal
4. Dr. Ripu Daman Singh

Corresponding author: Name : Dr. Kaniskh Mohanty
Sri Guru Ram Das Institute of Dental Sciences and Research, Amritsar.
(M) 9463543188

1. PG student, Deptt. of Conservative Dentistry and Endodontics; Sri Guru Ram Das Institute of Dental Sciences and Research, Sri Amritsar.
2. Professor and Head and Principal, Deptt. of Conservative Dentistry and Endodontics; Sri Guru Ram Das Institute of Dental Sciences and Research, Sri Amritsar.
3. Professor and Head, Deptt. of Microbiology; Sri Guru Ram Das Institute of Medical Sciences and Research, Sri Amritsar.
4. Reader, Deptt. of Conservative Dentistry and Endodontics; Sri Guru Ram Das Institute of Dental Sciences and Research, Sri Amritsar.
GROUP 3: Sealer plus linezolid.

GROUP 4: Sealer plus augmentin.

GROUP 5: Sealer plus ofloxacin.

AH 26 sealer (Dentsply, DeTrey, and Konstanz, Germany) was placed inside the tooth using a sterile K-file and kept at room temperature for 15 hours. The groups in which drugs were incorporated, amount corresponding with minimum inhibitory concentration (MIC) of the drug was mixed to the sealer before placement of the mixture in the root canals.

The treated samples were cut with the help of diamond disc mounted on a straight handpiece, to yield three sections coronal, middle and apical third. Holes were drilled in each section at outer, middle and inner portion with the help of a round bur. The dentinal shavings from the drilling process were suspended in brain heart infusion broth. After overnight incubation of the samples they were inoculated onto Mc Conkey agar plate and Blood agar plates, these plates were incubated at 37°C for 24 hrs and results were noted as positive, negative or contaminated cultures depending on the presence, absence or contamination of growth of E. faecalis on Mc Conkey and data obtained was put to statistical analysis.

RESULTS

The results of study showed that with AH 26 sealer when placed in root canal, the percentage of negative cultures obtained were 30%, 31.6% and 32.5% in coronal, middle and apical sections respectively. The inhibition percentage of 92.5%, 89.1% and 85.8% respectively obtained by Linezolid added to AH 26 sealer at coronal, middle and apical levels. The percentage of negative cultures obtained with Augmentin added to AH 26 sealer were 95.8%, 84.16% and 83.3% at coronal, middle and apical level. The susceptibility of E. faecalis to ofloxacin added to AH 26 sealer were 23.3%, 17.5% and 19.1% negative cultures at coronal, middle and apical levels. The results obtained in the in-vitro study showed that antibiotics, when added to AH 26 sealer, have a synergistic effect causing greater degree of inhibition of E. faecalis. Linezolid and Augmentin had a significantly greater antibacterial effect compared to ofloxacin added to AH-26 sealer and AH-26 sealer alone.

DISCUSSION

The role of microorganisms in the development and perpetuation of pulp and periapical diseases has been demonstrated in animal models and human studies (Kakehashi S et al) 4. In this study, E. faecalis was chosen as the test organism because it is known to invade dentinal tubules in vitro (Love RM) 5 and is associated with persistent periapical pathosis (Molander et al) 6. Enterococcus faecalis possess certain factors facilitating its presence in filled root canals with persistent lesions including the ability to invade dentinal tubules upto depth of at least 150 micrometer (Weiger R et al 7), ability to tolerate the high pH (11.1) produced by calcium hydroxide and ability to withstand long periods of starvation with subsequent recovery in the presence of serum (Figdor D et al 8). Due to above stated reasons and unique properties of E. faecalis, it was chosen as the test strain in the study.

AH26 was chosen as the test sealer because of it’s easy handling characteristics, good flow, good sealing to dentin, sufficient working time, prominent antimicrobial activity (Heling I and Chandler NP) 9 and good depth of penetration into dentinal tubules in clinical situations.

Linezolid was chosen as an agent because the oxazolidinones have shown to have excellent in vitro activity against all of the major gram-positive bacteria that are pathogenic in humans. These agents also have a unique mechanism of action that precludes cross-resistance with currently available agent. Al-Tatari H et al 10 described the use of linezolid in vancomycin resistant Enterococcus.

Augmentin is a formulation of amoxicillin and clavulanic acid. In a study undertaken by Salinas MB et al 11 for finding antibiotic susceptibility of the bacteria causing odontogenic infections, 94.3% of E. faecalis were susceptible to Augmentin.

Ofloxacin is a synthetic broad-spectrum antimicrobial agent which is a fluorinated carboxy quinolone. Levofloxacin is the S(-) form of ofloxacin and it is an active antimicrobial agent. It is substantially more active than ofloxacin.

The more accurate method of evaluating the efficacy of antibiotic incorporated in sealer would be placing the combination in root canal and assessing the disinfection of dentinal tubules thereafter. Haapasalo M and Orstavik D 12 suggested an in vitro method of evaluating root canal disinfection. Root dentin blocks of specific dimensions were cut and infected with bacterial suspension. The disinfection achieved was assessed by culturing dentin samples collected from dentin blocks, with the help of burs. Razmi H et al 13 in a study evaluating the antimicrobial effects of antibiotics added to AH 26 sealer used dentin powder of inner surface of the root canal for evaluating the efficacy against Enterococcus faecalis and found that the antibiotic sealer combination was able to kill Enterococcus faecalis in dentinal tubules.

In group 2 in which AH 26 sealer was placed in root canal, the percentage of negative cultures obtained were 30%, 31.6% and 32.5% in coronal, middle and apical sections respectively, this can be attributed to the formaldehyde release by AH-26 sealer which may not be able to totally eliminate Enterococcus faecalis as stated by Mickel AK et al. 14

According to the present study the inhibition percentage of
92.5%, 89.1% and 85.8% respectively obtained by Linezolid added to AH 26 sealer in group 3, at coronal, middle and apical levels point towards the excellent activity of linezolid against Enterococcus faecalis which is further corroborated by study of Al - Tatari H et al. 15 Lentino JR et al 16 in which they described the excellent activity of linezolid against Enterococcus.

In group 4, the percentage of negative cultures obtained with Augmentin added to AH 26 sealer were 95.8%, 84.16% and 83.3% at coronal, middle and apical level. The findings of the study concurred with results obtained by Salinas MB et al 17 which pointed towards the higher susceptibility of E. faecalis to amoxicillin /clavulanate, and this is further supported by study of Kresken M et al. 18

In group 5, the susceptibility of E. faecalis to ofloxacin added to AH 26 sealer were 23.3%, 17.5% and 19.1% negative cultures at coronal, middle and apical level. The present study results point towards the high percentage of inhibition being obtained with the addition of antibiotic in the root canal sealer which is in concurrence with the results of studies of Hoelscher AA et al 9 and Razmi H et al 10. Although promising and showing potential, further clinical trials and evidence based studies of various antibiotic sealer combinations are still required for the option to be considered as a viable and successful technique for eradication of microorganisms within the dentinal tubules.

**CONCLUSION**

The systemic and topical use of antibiotics has been utilized in both medicine and dentistry. The main advantage of local antibiotics compared to systemic use is that systemic consequences and complications are prevented and that substantially higher concentrations can be utilized. The results obtained in the in vitro study showed that antibiotics, when added to AH 26 sealer, have a synergistic effect causing greater degree of inhibition of E. faecalis. Linezolid and Augmentin had a significantly greater antibacterial effect compared to ofloxacin added to AH- 26 sealer and AH -26 sealer alone.

**REFERENCES**


COMPARISON OF EFFICACY OF PERiapICAL SURGERY WITHOUT REMOVING ROOT APEX AND APICOECTOMY PROCEDURE WITH MTA AS ROOT END FILLING MATERIAL IN-VIVO STUDY

ABSTRACT

Integrity of the natural dentition is an essential prerequisite for a fully functional and esthetic masticatory apparatus. Although overall success rate of initial endodontic treatment is high, but there are failed cases also. Endodontic surgery enhances the retention of many teeth which might otherwise require extraction. The present study aims at comparison of efficacy of periapical curettage procedure without removing root apex of teeth to apicoectomy procedure with MTA as root end filling material. Total 45 teeth were treated in this study. In group A, 30 teeth were treated by periapical curettage In group B, 15 teeth were treated by apicoectomy procedure with MTA as root end filling material. Patient’s follow-up was done at 6 weeks, 12 weeks, 24 weeks, and 48 weeks for clinical and radiological examination. The findings revealed that percentage reduction in radiolucency in Group A after 48 week was 69.00% and 86.73% in group B. Thus result of study showed that healing is better in patient treated in Group B (apicoectomy) compared to Group A (periapical curettage) and statistically significant at different time interval.

Keywords: Periradicular, Surgery, curettage, MTA apicoectomy

INTRODUCTION

Maintaining the integrity of the natural dentition is an essential prerequisite for a fully functional and esthetic masticatory apparatus. Endodontic therapy has played an important part in achieving this objective. Many a times, the large periapical radiolucency warrants the dental surgeon to opt for surgical intervention as the conventional therapy may not be effective in such case. Periradicular curettage is a surgical procedure to remove diseased or reactive tissue from the alveolar bone in periradicular or lateral region surrounding pulpless tooth. In a study by radiographic evaluation after 3 years, it was found that 50% of curedtted roots showed complete healing, 33% were uncertain and 17% were unsatisfactory.

Whenever root resection is done it is advised to give a root end filling material because ineffective retrograde sealing of root canal following apicoectomy is a major factor in surgical endodontics failure. Several different materials have been proposed to seal root end preparation including cavit, gutta-Percha, composite resin, zinc oxide-eugenol cement, glass ionomer, gold foil, etc but none of them meet all the important standards for ideal root end filling material. Mineral trioxide aggregate shows significantly less microleakage, better marginal adaption and better biocompatibility than other materials, newly formed cementum over MTA root-end filling at resected root end makes MTA preferable to all the other materials. Randomized clinical trials reported success rates of 8492% for MTA after 1 year, and 92% for MTA after 2 years. Therefore, this study aimed to evaluate the success rate of periapical surgery without root end resection versus apicoectomy procedure with MTA as root-end filling material.
MATERIAL AND METHOD

In the present study, forty five teeth having definite periapical radiolucent areas at the periapex were selected and randomly divided into two groups. Group A Thirty teeth were treated with conventional root canal therapy followed by periapical surgery without root end resection, but it was ensured that root canal was properly sealed with gutta percha and zinc oxide eugenol as sealer. Group B Fifteen teeth were treated with conventional root canal therapy followed by periapical surgery with root resection and mineral trioxide aggregate (MTA) was given as retrofilling material for sealing the apical end of root canal. Preoperative radiograph of the selected tooth was taken by using standardized bisecting angle technique to evaluate the status of root canal and periapical area. Access cavity was prepared following Grossman’s principles using sterilized carbide bur no 2. Working length of canal was measured following Ingle’s method. Root canal was prepared using step back technique. The patient was recalled after 48 hours. After 48 hours, the patient was clinically examined, if the patient was comfortable and canal was free from any discharge, it was dried with paper points and obturated with gutta percha and zinc oxide eugenol as sealer using lateral condensation method. Periapical surgery procedure was performed under strict aseptic conditions. After adequate anaesthesia was achieved, a full thickness mucoperiostel flap was reflected using periosteal elevator exposing the cortical bone. The exposed cortical bone over the periapical surgical site was removed with the help of no. 6 round carbide bur revolving at slow speed. Curettage of granulomatous tissue was done. The flap was re-approximated and sutured using braided silk no. 3-0 suture. Immediate post operative radiograph was taken following bisecting angle technique. Patient was asked to report after 1 week for the removal of sutures, in case of swelling or pain patient was instructed to report immediately. In this group fifteen teeth was treated as given in group A, but addition to periapical curettage, root end resection was done and MTA was given as retrofill material. In both groups, the patient was asked to report for recall check up after 6 weeks, 12 weeks, 24 weeks and 48 weeks for clinical and radiological examination. An intraoral periapical radiograph was taken at each follow up visit. The size of periapical radiolucency was measured with the help of a digital vernier caliper. On each follow up, the measurements were made by calculating the mean of maximum vertical and horizontal dimensions of that area and compared with pre-operative radiograph. The observations of study were tabulated and put to statistical analysis.

RESULTS

Table I shows the mean size of radiolucency in group A and group B pre-operative, after 6 weeks, 12 weeks, 24 weeks and 48 weeks. The student-t-test was used for comparing the size of radiolucency of both the groups at different time intervals. The results showed that the difference between mean sizes of radiolucency between the two groups was not significant at different time interval. Table II shows mean percentage decrease in size of radiolucency at different time interval. The percentage reduction in mean radiolucency for group A and B after 6 weeks was 7.150% and 14.131%; after 12 weeks 19.246% and 31.794%; after 24 weeks 40.75 and 60.52%; and after 48 weeks 69.002% and 86.532% respectively. The mean decrease in radiolucency after 48 weeks in group B was higher than group A, and the difference was statistically significant (p>0.05)

DISCUSSION

The present study was conducted as an randomized clinical trial (RCT) The major advantages of a RCT compared with a non-RCT are: the comparative study design is essential in the search for the best treatment method; during a randomization procedure patients are allocated randomly across the treatment groups. The randomization procedure seemed to be adequate since the clinical variables, which could have an impact on healing, were equally distributed in the two groups. Only a few studies in the field of periapical surgery have been conducted as RCTs (Niederman R and Theodosopoulou JN.)

In this study, the surgical outcome was evaluated 1 year postoperatively; follow-up studies by Rud J et al 8 and Molven O et al 9 of periradicular surgery have confirmed the long-term predictability of the 1-year outcome. Further, analyzing of homogeneous group of single-rooted teeth was tried and roots of molar teeth were not included in this study especially as it is unclear if the outcome of surgical endodontics of molars is comparable to that of single-rooted teeth.10 In this study clinical symptoms were rare during the follow-up period and occurred in combination with radiographic findings indicating failure. Because the patient is often clinically symptom free, the final case disposition is mainly determined by the radiographic findings. As stated by Grung B et al 11 assessments by radiography has a high degree of validity.

In the present study in group A (Periapical curettage) show about 69% reduction of radiolucent area after 12 month. Finding of the present study concur with study by Altonen M and Hakala P 7 who evaluated the apical curettage as a treatment of acute periapical inflammation . In the radiographic examinations, it was found that after 1 year healing had occurred in 2/3 (about 66%) of initial lesion. Similarly, Rud J et al 8 in their follow-up study evaluated complete healing in 69% patients after 1 year of follow up.

In the present study, in group B, in which apicoectomy with
The findings of the present study concur with the findings of Xu Q et al, who evaluated the clinical outcome of periapical endodontic surgery. They analyzed that the success rate for retrograde filling was higher (85% after 12 months, 88% after 24 months) compared with that of periapical curettage (52% after 12 months, 45% after 24 months). The difference in success rate between the two groups was statistically significant.

But the finding of present study do not concur with Grung B et al and Molven O et al, who concluded that there is no significant difference in success rate of periapical surgery with or without removing root apex.

In the present study better success rate was reported in apicoectomy group as compared to periapical curettage group. According to Kim S et al major cause of periapical lesions is a leaky apical seal with attendant regrowth of microorganisms and their toxins. The removal of the diseased periapical tissues by periradicular curettage eliminates only the effect of the leakage, not the cause. Thus, elimination of the periradicular lesion alone will likely result in the recurrence of the lesion as leaky root filling or an untreated accessory canal or isthmus causes problems.

CONCLUSION

The findings revealed that percentage reduction in radiolucrency in Group A after 6 weeks was 7.15%; after 12 weeks 19.24%; after 24 weeks 40.75% and after 48 week 69.00%. The findings revealed that percentage reduction in radiolucrency in Group B after 6 weeks was 14.13%; after 12 weeks 31.79%; after 24 weeks 60.52% and 86.73% after 48 week. Thus results of this study show that healing is better in patient treated in Group B (apicoectomy) compared to Group A (periapical curettage without removing root apex) and statistically insignificant but mean decrease in radiolucent area and percentage reduction in radiolucent area was statistically significant. Thus finding of the study show that healing is better in patient treated in group B (apicoectomy with MTA as root end filling material) compared to Group A (periapical curettage without removing root apex).

MTA was given as root end filling material showed about 86% reduction of radiolucent area after 12 month. Findings of the present study concur with the findings of a study by Chong BS et al in which apicoectomy followed by MTA as root end filling material was given. Success rate of 84% after 12 months, 92% after 24 months was observed. Similarly, Saunders WP conducted periradicular surgery using microsurgical techniques and root-end filling with MTA. The overall success rate was 88.8%, including all teeth with no clinical symptoms. Findings of the present study also concur with findings of Christiansen R et al who evaluated that overall teeth treated with MTA had 96% success rate after 12 months.

High success rate shown by MTA as retrofilling material during periapical surgery was due to its superior sealing ability, biocompatibility and cementum regeneration capacity. Following in-vitro studies by Torabinejad M et al and Seung-Ho B et al confirm the advantage of MTA over other root end filling materials.

The findings of present study showed that at different time interval initial size of radioluency in both groups are statistically insignificant but mean decrease in radiolucent area and percentage reduction in radiolucent area was statistically significant. Thus finding of the study show that healing is better in patient treated in group B (apicoectomy with MTA as root end filling material) compared to Group A (periapical curettage without removing root apex).

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REFERENCES

USE OF TEMPORALIS MYOFASCIAL FLAP INTERPOSITION ARTHROPLASTY FOR THE TREATMENT OF TEMPOROMANDIBULAR JOINT ANKYLOSIS

ABSTRACT

AIM: The aim of this study was to determine the effectiveness of using temporalis myofascial flap for interposition arthroplasty in temporomandibular joint ankylosis (TMJ) in children and adults.

MATERIAL AND METHODS: Five patients (8 joints) of TMJ ankylosis aged 14-18 years underwent temporalis myofascial flap interposition arthroplasty. Patients were assessed both clinically and radiographically, up to a maximum follow up period of 6-19 months.

RESULTS: The preoperative maximum interincisor distance was 0-28 mm (average 14 mm) which was increased to 10-40 mm (average 39 mm) postoperatively. One patient developed reankylosis and anterior open bite at thirteenth month of follow up. Excursive condylar movements, deviation of mandibular midline in centric occlusion and chin point deviation in relation to facial midline showed a correction of the respective deformity postoperatively. Class I molar relation was maintained postoperatively in all the patients. Both mandibular body length and ramus height of the affected side were seen to increase postoperatively in three of the five patients.

CONCLUSIONS: The findings of this study shows that temporalis myofascia is a versatile flap for interposition arthroplasty in temporomandibular joint ankylosis.

Keywords: Temporomandibular joint ankylosis; Interposition arthroplasty; Temporalis myofacial flap

INTRODUCTION

TMJ ankylosis involves fusion of the mandibular condyle to the base of the skull. When it occurs in a child, it can have devastating effects on the future facial growth, cause facial deformity, difficulty in mastication and breathing during sleep. Furthermore it can have profoundly negative influence on the psychosocial development of the patient, because of obvious facial deformity which worsens with growth. In addition to obvious facial deformity TMJ ankylosis is also associated with malocclusion. TMJ ankylosis is classified according to the site, type of tissue and the degree of fusion. Trauma, local or systemic infections and systemic diseases, such as ankylosing spondylitis, rheumatoid arthritis and psoriasis are the main causes of ankylosis. Definitive diagnosis of the type and extent of ankylosis is made after a complete history, thorough clinical examination along with an extensive radiographic survey. There are various treatment options for surgical correction of temporomandibular joint ankylosis. Reankylosis and limited mouth opening are the most frequently reported complications after treatment of ankylosis, which can be prevented by aggressive sectioning of the bony or fibrous segment and reconstruction with an appropriate interpositional material. Autogenous materials used for interpositional arthroplasty are temporalis muscle and fascia, homologous human costal cartilage, ear cartilage, skin, dermis, fat, autogeneous bone, fascia lata, chondro-osseous iliac bone, costochondral graft, metatarsal, metatarsophalangeal graft, clavicle, sternoclavicular joint and retroauricular skin graft. Alloplastic materials for...
interpositional arthroplasty include acrylic, silastic, silicone, tantalum foil and plate, vitallium plate, gold plate, oxycel, gutta-percha and Teflon sheets. The earliest description of the role of temporalis myofascial flap in TMJ surgery was in the management of the ankylosis. The first available report is from Verneuil (1872) who used temporalis myofascial flap as an interpositional material after ankylosis release. The use of temporalis myofascial flap as an interpositional material in the treatment of TMJ ankylosis is well recognized, as it can be harvested through the same incision used for surgical procedure, is well vascularised and remains biologically viable. This article describes the outcome of treatment of TMJ ankylosis using temporalis myofascial flap as an interpositional material in children and adults.

MATERIAL AND METHODS

The present study was undertaken in five patients with TMJ ankylosis reporting to the Department of Oral and Maxillofacial surgery, Sri Guru Ram Das Institute of Dental Sciences and Research, Sri Amritsar. Informed consent from the patient and approval from the local ethical committee was obtained. Alkayat Bramely incision was used to expose the ankylosed TMJ. Once the ankylosis was released interpositional arthroplasty was performed using a Temporalis Myfacial flap. Patients were evaluated preoperatively and postoperatively both clinically and radiographically. Following parameters were recorded in all the patients:

CLINICAL EVALUATION:

- Maximum inter-incisal opening was measured from the incisal edge of mandibular central incisor to the incisal edge of maxillary central incisor using a vernier calliper.
- Condylar movements- Protrusive and lateral excursive movements were evaluated.
- Occlusal relationship
- Deviation of mandibular midline in centric occlusion- The mandibular midline was assessed in relation to the maxillary midline by drawing an imaginary line extending from between the upper central incisors and passing down between the lower central incisors. This should be in a straight line and coincide with the center of the philtrum.
- Chin point deviation in relation to facial midline- The chin point deviation was assessed in relation to a line joining glabella, nasal bridge, nasal tip and midpoint of philtrum of upper lip.

RADIOLOGIC EVALUATION:

Panoramic radiograph (OPG)- OPG was used for evaluation of any evidence of reankylosis. Lateral cephalogram:- was done to evaluate 2 parameters:-

1. Ramus height- measured as distance between sella(S) and gonion(Go)
2. Mandibular body length- measured as distance between pogonion (Pg) and gonion(Go)

Location of articulare point (Ar) is subject to identification errors in patients of TMJ ankylosis. To overcome this, the distance between sella (a more easily identifiable and stable point) and gonion was taken as index of posterior ramus height.

RESULTS

In the present study, patient’s age ranged from 14-18 years, with male: female ratio being 1:1.5. Three patients had bilateral TMJ ankylosis while two patients had unilateral TMJ ankylosis of right side (Table I).

Lateral excursive condylar movements were present only on the unaffected side in both the patients with unilateral TMJ ankylosis and only in one patient of bilateral TMJ ankylosis. The protrusive condylar movements were present in one out of five patients (2/8 joints) postoperatively, the ratio being 0.2:1. Class I molar relationship was maintained postoperatively in all the patients.

In the present study, three out of five patients (60%), having deviation of mandibular midline in centric occlusion and two out of three patients (66%) having chin point deviation in relation to facial midline showed a correction of the respective deformity by 1 mm, postoperatively (Table II).

Average maximum mouth opening was 14 mm preoperatively and 36.5 mm intraoperatively. Average mouth opening was maintained at 39 mm till the last followup period, except one patient who developed reankylosis at thirteenth month postoperatively with a mouth opening of 10 mm (Table III).

Both mandibular body length and ramal height of affected side were seen to increase postoperatively in three of the five patients (Table IV)

DISCUSSION

The aim of treatment in TMJ ankylosis is not only to re-establish the movement at the joint, but also to prevent it from relapsing again. Equally important is the restoration of occlusion and minimizing the secondary facial and occlusal abnormalities.

The definitive treatment of ankylosis is primarily surgery. Although, gap arthroplasty is still preferred by some, interpositional arthroplasty is considered to be the standard procedure for TMJ ankylosis.
The use of temporalis myofascial flap is recommended on the fundamental concept of providing a soft tissue interpositional lining within the TMJ to prevent fibrosis or bony union as well as supplying an easily displaceable material that aids in joint unloading. Satisfactory results have been reported on the use of temporalis myofascial flap as an interpositional material. It has been demonstrated to maintain its vitality over time under function.\(^{15}\)

In the present study, patient age at the time of reporting for treatment ranged from 14-18 years. Abbas I et al (2005)\(^{16}\) reported the age of patient for treatment to be ranging from 11 to 20 years and Ahmad QG et al (2004)\(^{15}\) reported it to 15-20 years.

Out of five patients included in the study, two patients were males and three patients were females, the ratio being 1:1.5. This is in concurrence with the findings of El Sheikh MM (1999)\(^{17}\) and Erol B (2006)\(^{9}\), who reported the prevalence ratio of gender to be 1:1.5 and 1:1.56 respectively. Contrary to our findings, a higher prevalence of males as compared to females was found in the studies conducted by Chidzonga MM (1999)\(^{18}\), Qudah MA et al (2005)\(^{15}\) and Maki MH (2008)\(^{19}\). Out of the five patients included in our study, unilateral ankylosis was present in two patients (40%) whereas three patients (60%) had bilateral ankylosis (ratio 1:1.5). He D et al (2008)\(^{12}\) have reported the ratio of unilateral and bilateral cases to be 1:1.5. Supporting results were also found by Moorthy AP and Finch LD (1983)\(^{20}\) and Abbas I et al (2005)\(^{14}\).

However, a higher incidence of unilateral as compared to bilateral TMJ ankylosis has been published in certain studies.\(^{4,10,23}\) The present study included three cases of primary (60%) and two cases of recurrent ankylosis (40%). Abbas I et al (2005)\(^{16}\) and Medra AMM (2005)\(^{21}\), in their studies on TMJ ankylosis, also reported higher percentage of primary cases than recurrent cases of ankylosis. On the other hand, Salins PC (2000)\(^{22}\), included two cases of primary ankylosis and twelve cases of recurrent ankylosis. Certain studies have reported absence of lateral movements postoperatively.\(^{20,27}\) These findings support our study, in which we found that preoperative and postoperative lateral excursive condylar movements were present only on the unaffected side in both the patients with unilateral TMJ ankylosis, whereas they were absent in all the patients of bilateral ankylosis, except one case (1/8 joints) in which postoperative lateral excursive condylar movements were present on the right side of the joint. Contrary to this, Kaban et al (1990)\(^{7}\) in their landmark study of TMJ ankylosis management protocol used temporalis fascia or cartilage for lining of the temporomandibular joint followed by reconstruction of the ramus with a costochondral graft in eighteen joints. They reported presence of lateral excursive movements in sixteen out of eighteen joints postoperatively.

### TABLE I

**SHOWING DISTRIBUTION OF AGE, GENDER AND TYPE OF ANKYLOSIS**

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Age (Years)</th>
<th>Gender</th>
<th>Side involved</th>
<th>Primary or recurrent</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>17</td>
<td>Male</td>
<td>Right side</td>
<td>-</td>
</tr>
<tr>
<td>II</td>
<td>14</td>
<td>Female</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>III</td>
<td>16</td>
<td>Male</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>IV</td>
<td>18</td>
<td>Female</td>
<td>-</td>
<td>+ recurrent</td>
</tr>
<tr>
<td>V</td>
<td>18</td>
<td>Female</td>
<td>Right side</td>
<td>- recurrent</td>
</tr>
</tbody>
</table>

+ Indicates present
- Indicates absent

### TABLE II

**PREOPERATIVE EVALUATION OF CLINICAL PARAMETERS**

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Condylar movements</th>
<th>Occlusal relationship (Molar relation)</th>
<th>Deviation of mandibular midline towards (mm)</th>
<th>Deviation of chin point in relation to facial midline (mm)</th>
<th>Maximum follow up period (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lateral excursive</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>movements</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Protrusive movements</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>+ -</td>
<td>Class I</td>
<td>6 mm</td>
<td>- 5 mm</td>
<td>19</td>
</tr>
<tr>
<td>II</td>
<td>- -</td>
<td>Class I</td>
<td>1 mm</td>
<td>- 1 mm</td>
<td>13</td>
</tr>
<tr>
<td>III</td>
<td>- +</td>
<td>Class I</td>
<td>- 4 mm</td>
<td>- 1 mm</td>
<td>12</td>
</tr>
<tr>
<td>IV</td>
<td>- -</td>
<td>Class I</td>
<td>- 3 mm</td>
<td>- 1 mm</td>
<td>6</td>
</tr>
<tr>
<td>V</td>
<td>+ -</td>
<td>Class I</td>
<td>1 mm</td>
<td>- -</td>
<td>6</td>
</tr>
</tbody>
</table>

### TABLE III

**POSTOPERATIVE EVALUATION OF CLINICAL PARAMETERS AT MAXIMUM FOLLOW UP PERIOD**

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Condylar movements</th>
<th>Occlusal relationship (Molar relation)</th>
<th>Deviation of mandibular midline towards (mm)</th>
<th>Deviation of chin point in relation to facial midline (mm)</th>
<th>Maximum follow up period (months)</th>
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<tbody>
<tr>
<td>I</td>
<td>Lateral excursive</td>
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<td></td>
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<td></td>
<td>movements</td>
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<td>Protrusive movements</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>+ -</td>
<td>Class I</td>
<td>5 mm</td>
<td>- 4 mm</td>
<td>19</td>
</tr>
</tbody>
</table>

### TABLE IV

**PREOPERATIVE AND POSTOPERATIVE MAXIMUM INTERINCISAL OPENING**

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Preoperative mouth opening (mm)</th>
<th>Postoperative mouth opening</th>
<th>At maximum follow up (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mouth opening achieved on table (mm)</td>
<td>One month (mm)</td>
<td>Six months (mm)</td>
</tr>
<tr>
<td>I</td>
<td>28</td>
<td>38</td>
<td>40</td>
</tr>
<tr>
<td>II</td>
<td>0</td>
<td>35</td>
<td>38</td>
</tr>
<tr>
<td>III</td>
<td>8</td>
<td>36</td>
<td>38</td>
</tr>
<tr>
<td>IV</td>
<td>0</td>
<td>38</td>
<td>38</td>
</tr>
<tr>
<td>V</td>
<td>1</td>
<td>38</td>
<td>39</td>
</tr>
</tbody>
</table>
In this study preoperative and postoperative protrusive condylar movements were absent in all the patients with TMJ ankylosis, except one patient (2/8 joints) of bilateral ankylosis in whom postoperative protrusive condylar movements were present, the ratio being 0.2:1. Mehrotra D et al (2008) reported presence of protrusive movements in three out of total nine patients who were treated using interpositional temporalis myofascial flap. Salins PC (2000) also reported presence of protrusive movement in 100% patients with craniomandibular ankylosis, whereas Brusati R et al (1990) reported protrusive movement ranging from 0-3 mm in six patients who were operated upon for TMJ ankylosis using temporalis muscle flap. In our study, class I molar relationship was maintained postoperatively in all the patients. This is in concurrence with Sembronio S (2007) who endoscopically osteotomised the ankylotic mass followed by interpositional temporalis myofascial flap. However, Motta A et al (2007) stated that unilateral ankylosis during active growth period develops into a class II asymmetric malocclusion with chin deviation to the affected side because the unaffected side grows normally. In the present study, it was observed that postoperative deviation of mandibular midline in centric occlusion decreased by 1 mm as compared to preoperative findings (range; 1 to 6 mm) in three out of five patients. Mehrotra D et al (2008) reported presence of midline shift in eight out of nine TMJ ankylosis patients treated by using temporalis myofascial flap. In the present study, chin point deviation in relation to facial midline decreased postoperatively by 1 mm in two patients out of three patients. The presence of preoperative chin point deviation from facial midline was also reported by Chidzonga MM (1999) in 100% patients, whereas contrarily, Mehrotra D et al (2008) reported this finding in only one out of total nine cases of unilateral TMJ ankylosis. In the present study, preoperative mouth opening ranged from 0-28 mm (average 14 mm), in five patients. Peroperative mouth opening ranged from 35-38 mm (average 36.5 mm) and at 1 month and 6 months, the mouth opening ranged from 38-40 mm. Further, at maximum followup (6-19 months) satisfactory mouth opening of 38-40 mm was maintained in four patients (80%) whereas one patient who developed reankylosis, had mouth opening of 10 mm at 13 months. Similar results have been reported by Karasu et al (2005), who in their study used temporalis myofascial flap on three TMJ ankylosis patients and found that mouth opening ranged from 38-42 mm at 6 months postoperatively. Mehrotra D et al (2008) found mean mouth opening value (33.3± 4.4 mm) higher in dermis fat group as compared to temporalis myofascial flap group (25.9 ± 5.4mm). The authors explained this difference to the inherent virtue of scarring of muscle. Contrary to our findings, certain studies have reported postoperative mouth opening ranging from 25-33 mm after use of temporalis myofascial flap. In the present study, an average postoperative increase of 0.5 mm (range 1-3 mm) in mandibular body length was observed in three patients, whereas it remained constant in two patients. Farmanand M et al (1989) also noted growth on the ankylosed side after treatment. However, it was not numerically comparable because of the projection geometry and the midline shift. However, Ko EW et al (1999), in their study on temporomandibular joint reconstruction using costochondral graft in children have reported the average growth of mandible (condyion-gnathion) to be 14.7 mm on the affected side and 15.1 mm on the non affected side. In our study, ramal height was found to increase (range 1 to 8 mm) postoperatively in three patients, whereas in two patients, it decreased by 2 to 5 mm. Contrary to our findings, Ko Ew et al (1999) found an average increase of 7.1 mm on the affected side and 7.3 mm on the unaffected side in children who underwent temporomandibular joint reconstruction using costochondral graft.

We encountered temporary paresis of frontal branch of facial nerve in the immediate postoperative period in one patient (20%) which recovered spontaneously in 3 weeks. Temporary paresis of facial nerve has also been reported in literature as a complication by various authors, which was found to recover spontaneously within a time period of 2 weeks to five months. Failure to fulfill the protocol of TMJ ankylosis surgery and the difficulty level of the surgical procedure in relation to the type of ankylosis have been documented to increase the risk of damage to facial nerve, especially because the longer the duration of surgery, more the retraction of tissues, thereby increasing the risk of such damage. We observed reankylosis in one of the total five patients (20%) at the thirteenth postoperative month. Chidzonga MM (1999) and Maki MH (2008), have also reported a relapse rate of 19 % and 20 % respectively. Contrary to our findings, Balaji et al (2003), Brusati R et al (1990), and Mangenello LC and Mariani PB (2003) have reported no recurrence of TMJ ankylosis when temporalis myofascial flap was used as an interpositional material. The reasons cited in literature for reankylosis are - deficient resection of the anterior and medial extension of the ankylotic mass, the inherent thin nature of temporalis fascia and muscle along with poor compliance and inadequate postoperative physiotherapy.

In our study, one patient of bilateral TMJ ankylosis developed anterior open bite along with reankylosis at thirteenth month follow up period. Erol B (2006) also reported mild degree of anterior open bite in five out of fifty nine patients, who had been operated for temporomandibular joint ankylosis. The clockwise rotation
that usually ensues immediately postoperatively has been cited as the cause of anterior open bite which is easily treated by elastic traction followed by rigid maxillomandibular fixation."

In conclusion, the temporalis myofascial flap is a versatile interpositional material for interpositional arthroplasty in the management of TMJ ankylosis. It helps to restore movement at the ankylosed temporomandibular joint, does not require a second surgical site for harvesting and is not associated with any major complications. Short sample size is one of the limitations of the present study. Other limitation of the study included lack of comparative study on cephalometric analysis of growth changes of mandible after temporals myofascial flap interposition arthroplasty of ankylosed temporomandibular joint.

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ACCESS BARRIERS IN DENTAL CARE

ABSTRACT
The problem of inadequate access to dental care for some segments of the population is complex and cannot be solved simply. A complete knowledge of various access barriers to dental care by people should be achieved and an improvement plan must be designed to address those specific barriers.

Key words: access barriers, dental care.

Introduction:
The interrelationship between oral health and general health is particularly pronounced. Poor oral health can increase the risk to general health. Poor dental health is a serious health issue in rural communities. People living in rural areas face a multitude of structural barriers when seeking dental care. These barriers, which include dentist availability, ability to pay, and transportation issues, contribute to minimal expectations for receiving dental care and cause people to undervalue dental care. An individual may have dental treatment needs as determined by health care professional but fail to seek services because he or she either does not perceive reason for seeking services (demand services) or lacks sufficient resources as time, money and or transportation to initiate treatment.

What do you mean by Access?
The current concept of ‘access to dental care’ reaches far beyond its traditional meaning. In the past, when one considered the concept of access to dental care, the frame of reference was almost exclusively related to a patient’s ability to obtain or make use of dental care. Factors external to the patient - for e.g., adequacy of the dental workforce and ability to pay for care - were the primary determinants of access. Factors internal to the patient - perceived need for care, cultural preferences, language and so forth, relate directly to the demand for dental care and may operate independent of the availability of that care, and are patient based. When speaking of access to dental care today, we must consider both the availability of dental care and the willingness of the patient to seek that care. It is a supply demand consideration.

Components of health care access:
Access to health care means having “the timely use of personal health services to achieve the best health outcomes.” Attaining good access to care requires three discrete steps:

• Gaining entry into the health care system.
• Getting access to sites of care where patients can receive needed services.
• Finding providers who meet the needs of individual patients and with whom patients can develop a relationship based on mutual communication and trust.
Health care access is measured in several ways, including:
- Structural measures of the presence or absence of specific resources that facilitate health care, such as having health insurance or a usual source of care.
- Assessments by patients of how easily they are able to gain access to health care.
- Utilization measures of the ultimate outcome of good access to care (i.e., the successful receipt of needed services).

The dental care access triangle

These factors act interdependently, and none can be ignored. Deficiency of anyone of these factors is the sole cause of failure to an access.

1. Demand for dental care: There is an important difference between the need for dental care and the demand for dental care exhibited by any group. There is not a one to one relationship between dental needs and dental demand. The gap between the need for dental care and demand for dental care should be narrowed.

Although there are some external economic factors involved in the demand for dental care, major factors generally are internal to the person or to the group and often are ignored. Culturally sensitive educational activities can be an effective tool, in increasing the demand for dental care where dental needs exist.

2) The dental workforce: There are two basic workforce considerations: the effective number of dentists (taking into consideration demographic accommodations) in the system relative to the demand for dental care, and the distribution of the available dentists relative to where the patients who are seeking care are located. The other aspect of workforce adequacy that must be considered is real productivity. Obviously, the absolute number of dentists in an area is an important factor to consider, but the actual output produced by the dentist is the end result that, if enhanced, will improve the access to care. Since output is the product of the number of dentists and their productivity (workforce x productivity = output), increase in either factor can enhance output and help improve access to dental care. We know that dentists will establish private practices in areas where there is an adequate concentration of people in the practice catchment area who will seek dental care and have the resources to pay for that care. Elsewhere especially in some poor urban areas - there may be inadequate financial resources and insufficient demand, so dentist do not establish private practices in those areas, which hinder access to care. In addition, the population in some rural areas may be so sparse that maintaining a dental practice is difficult. The most difficult access challenges may be in poor rural areas, where none of the essential criteria, for establishing a private practice is satisfied.

3) The economic environment: Low reimbursement to dentist for treatment provided and high cost (other than professional fees) associated with obtaining dental care for patients create circumstances that discourage access to care. An economic environment must be created that provide the poor incentives or economic support for both patients and dentists to participate in the system. Payments that dentists receive for providing services must be appropriate in relation to their costs for providing those services. Also, the acquisition costs (such as lost wages and transportation costs) for patients receiving care should be reasonable and not be perceived as outweighing the benefits to be received from that care.

Groups with access challenges:

1. The poor and the working poor: These individuals or families do not have adequate financial resources to avail themselves of appropriate dental care. Financial costs of dental treatment remain a significant barrier to accessing dental care. Statistics throughout the world show that people's ability to access regular dental care is directly related to their annual income. Interestingly the effect of annual income influences the entire family's dental attendance patterns. Children living in areas of social deprivation are, for instance, less likely to attend for restorative care; their irregular pattern of dental attendance mirroring that of their parents. When affordability of dental care is combined with socio-economic status (SES), it appears that those from lower SES access care less often and admit to being less satisfied with treatment they received compared with others. In one study by Brown T et al. the authors found that the demand for dental care is strongly related to the financial factors of family income and dental insurance as well as several nonfinancial factors. Specifically, the demand for dental care is positively related to having dental insurance, being female, increasing age, being white, Hispanic or Asian, having higher levels of education, higher
levels of family income, better health status, and being unmarried. In contrast, not being able to afford needed dental care is positively related to lacking dental insurance, being female, younger in age, being black or other race, less educated, lower family income, and having worse health status.

2. **Rural area residents**: People living in rural areas face a multitude of structural barriers when seeking dental care. These barriers, which include dentist availability, ability to pay, and transportation issues, contribute to minimal expectations for receiving dental care and cause people to undervalue dental care. It is important to recognize that there is a complex interrelationship of both the supply of dentists and the population's demand for services. Not only do we need to increase the supply of dentists in rural areas, but we must work to eliminate the barriers that discourage care-seeking behaviour and change people's expectations and attitudes about dental care.

3. **Mobility restricted people**: People who cannot travel to dental care treatment facility because they are homebound or are residents of nursing homes or other assisted living settings must have dental personnel provide dental care to them where they reside. There are a variety of barriers to access for this group, including lack of facilities, insufficient reimbursement, complicated administration, poor daily support from caregivers and lack of experience among dental personnel.

4. **Culturally isolated group**: Various ethnic groups, particularly newcomers to the states, often find that their language, political status and/or all cultural values may be barriers to receiving dental care.

5. **Unemployed**: Families that have limited income and have lost dental benefits because of unemployment may find that their access to dental care is interrupted. Similar effects may be experienced during periods of underemployment, while families await the return to full employment at accustomed wages.

6. **Uninsured**: Persons without health insurance are not only less likely to receive the health coverage afforded by typical health insurance plans; they are also less likely to get needed dental care. Children with no health insurance are three times as likely as privately insured children to be unable to get dental care when they need it. Working-age adults are four times as likely as their privately insured counterparts to be unable to get dental care when they need it. And older adults with no health insurance are twice as likely as privately insured older adults to be unable to get dental care when they need it. Lack of dental insurance can be a barrier for seeking dental care for some; particularly those in the lower socioeconomic classes, People with limited financial resources may give dental care a lower priority than other expenses that they perceive to be more pressing.

7. **People with special needs**: "Special needs refers to people, with intellectual or physical disability or medical or psychiatric conditions, that increase their risk of oral health.

<table>
<thead>
<tr>
<th>Potential Barriers to Oral Health and Dental Care Potential Barrier</th>
<th>Example</th>
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</thead>
<tbody>
<tr>
<td>Consumer Issues</td>
<td></td>
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<tr>
<td>Knowledge of oral health</td>
<td>Don’t recognize importance of baby teeth</td>
</tr>
<tr>
<td>Daily priorities</td>
<td>Too overwhelmed to seek dental care</td>
</tr>
<tr>
<td>Cultural discordance with dental providers</td>
<td>Feel uncomfortable and can’t communicate well</td>
</tr>
<tr>
<td>Dental office environment</td>
<td>Not “child friendly” or staff appear insensitive</td>
</tr>
<tr>
<td>Don’t know eligibility for services or benefits</td>
<td>Can’t find information or it is confusing</td>
</tr>
<tr>
<td>Services difficult to access</td>
<td>No transportation, too far away, 8-5 schedule</td>
</tr>
<tr>
<td>Other costs associated with appointments</td>
<td>Time off work, child care and transportation costs</td>
</tr>
<tr>
<td>Geography and weather</td>
<td>Mountain passes, poor roads, snow and fog</td>
</tr>
<tr>
<td>Non-English language or low literacy levels</td>
<td>Problems finding and understanding information</td>
</tr>
<tr>
<td>Number of appointments needed</td>
<td>If can’t do multiple appts, care is not completed</td>
</tr>
<tr>
<td>Inadequate financial coverage or high costs</td>
<td>Don’t seek care or only seek emergency care</td>
</tr>
<tr>
<td>Anxiety or stress</td>
<td>Avoid care or present behavioral problems</td>
</tr>
<tr>
<td>Advanced disease or complex care needed</td>
<td>Specialists not available or too expensive</td>
</tr>
<tr>
<td>Seasonal laborers or temporary jobs</td>
<td>Can’t predict schedule or location to make appt</td>
</tr>
<tr>
<td>Economic problems or fluctuations</td>
<td>Difficult to budget, pay for care or qualify for help</td>
</tr>
<tr>
<td>Dentists don’t accept Medi-Cal or new patients</td>
<td>Can’t find a dentist to provide care</td>
</tr>
<tr>
<td>Provider Issues</td>
<td></td>
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<tr>
<td>Doesn’t live in community</td>
<td>Doesn’t know local resources or feel “connected”</td>
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<tr>
<td>Inexperienced with multi-cultural groups</td>
<td>Lack of credibility, recommendations not followed</td>
</tr>
<tr>
<td>New graduate or clinically inexperienced</td>
<td>Overwhelmed/frustrated by complex dental needs</td>
</tr>
<tr>
<td>Need adequate mix of income sources</td>
<td>Need adequate cash flow to pay expenses/overhead</td>
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<tr>
<td>Staff hiring and turnover</td>
<td>Difficulty finding qualified or long-term staff</td>
</tr>
<tr>
<td>Scheduling prevention vs treatment services</td>
<td>Treatment appts may overwhelm recall appt slots</td>
</tr>
<tr>
<td>Complex consumer needs and issues</td>
<td>More urgent care than comprehensive care</td>
</tr>
<tr>
<td>Lack of specialists in area</td>
<td>More complex care, inability to refer families</td>
</tr>
<tr>
<td>Equipment repair or replacement</td>
<td>“Down time” and expensive repairs</td>
</tr>
<tr>
<td>Paperwork and regulations for reimbursement</td>
<td>Confusing and time consuming</td>
</tr>
<tr>
<td>Licensure/insurance/economic issues</td>
<td>Inhibits providers moving from other states</td>
</tr>
<tr>
<td>Uncompensated or donated care</td>
<td>May be overwhelmed with requests</td>
</tr>
<tr>
<td>Consumer knowledge of oral health</td>
<td>Frustrated with apparent inattention to prevention</td>
</tr>
</tbody>
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Example: compensated or donated care may be overwhelmed with requests.
problems or increase the complexity of oral health care” .Such people experience much higher levels of oral disease with considerably less access to treatment, yet it seems little is being done by governments to redress this. As special needs patients often lack the resources to obtain appropriate dental treatment.  

Strategies to solve utilization issues:

1. Strengthening of safety network; e.g. health care system, private practice etc.
2. Assessing the oral health care needs and demands of population.
3. Proper planning and setting realistic oral health goals, e.g. working hours of clinic should be modified as per the convenience of the community.
4. Provision of adequate payment for health professionals.
5. Optimal use of auxiliary staff and health education.
6. Special arrangements of special populations’ e.g. mobile dental vans and dental camps.
7. Change in mind set of dentistry, e.g. to increase social responsibility.
8. Proper development and utilization of resources.

References:

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ABSTRACT

Periodontal diseases are caused by microorganisms that proliferate in dental plaque and gingival sulcus. Scaling and root planing is basic treatment modality for periodontal diseases. But, mechanical treatment is limited by physical impediments and biochemical considerations. Antimicrobial agents may be used as an adjunct to overcome limitations of mechanical therapy. The rationale for use of antibiotics in periodontal therapy is based on concept that bacteria are primary cause of periodontal disease and thus treatment should be directed towards controlling bacterial flora. Antimicrobial treatments in periodontics range from mechanical debridement of tooth surfaces to local and systemic delivery of chemical antimicrobial agents. Systemic administration of drugs leads to therapeutic concentrations at the site of infection, but for short periods of time, forcing repeated dosing for longer periods. Local delivery of antimicrobials has been investigated for the possibility of overcoming the limitations of conventional therapy. This article reviews various types of local drug delivery systems in periodontal therapy.

KEY WORDS: local drug delivery, periodontitis, tetracycline, chlorhexidine, minocycline

INTRODUCTION:

Periodontitis is an inflammatory disease of the supporting tissues of teeth caused by specific microorganisms that colonize the tooth surface at or below the gingival margin. Bacteria begin reattaching to the tooth surfaces soon after the teeth have been cleaned i.e. within nanoseconds of thorough tooth brushing. These microbes form an organized matrix called as plaque; a biofilm. If not removed, overtime this supragingival plaque becomes more complex and will lead to growth and deposition of bacteria into more apical areas; resulting in subgingival plaque deposition. Eventually, the inflammatory process ensues and leads to bone loss thus, resulting in periodontal pocket formation.

An essential component of periodontal therapy is the elimination or regulation of the bacterial aetiology. This is accomplished largely by mechanical means including patient performed oral hygiene techniques and therapist performed scaling and root planing. However, despite diligent mechanical therapy, some individuals continue to experience periodontal breakdown as these mechanical means of controlling etiological factors are difficult, time-consuming, and occasionally ineffective, in terms of reducing or eliminating bacterial etiologic agents because of unfavorable anatomy, intra oral microbial translocation, tissue invasion by microorganisms and bacterial invasion into dentinal tubules (Quirynen et al 2001). Also subgingival recolonisation by microorganisms occurs within few days to months of mechanical debridement in case of poor oral hygiene (Sbordone et al 1990).

Periodontal pocket provides an ideal environment for the growth of anaerobic pathogenic bacteria. These pathogens are susceptible to a variety of antiseptics and antibiotics.
cases of conventional treatment failure and more aggressive diseases antimicrobial agents have been used as adjuncts to mechanical therapy (Van Winkelhoff et al 1996, Walter and Karpinia 2002). Various modalities used to convey antimicrobial agents into periodontal pocket are - rinsing, irrigation, systemic administration and local application of the drug at the site of infection. But antiseptics in mouthrinses exert no direct effects on the subgingival microbiota due to total lack of penetration of oral rinses below the gingival margin (mean 0.2 mm). Similarly, toothbrushes fail to gain substantial access into subgingival areas (mean 0.9 mm penetration) and systemic route poses risk of adverse reactions to non-oral body sites viz. 

1. Gastrointestinal intolerance by majority of antibiotics e.g. Tetracyclines, Metronidazole, Clindamycin, Ciprofloxacin
2. Hypersensitivity reactions e.g. Penicillin
3. Dental staining and hypoplasia in childhood by Tetracyclines
4. Unpleasant metallic taste by Metronidazole and Ciprofloxacin
5. Some serious but infrequent side effects of antibiotics such as haematological toxicity, pseudo-membrane colitis, nephrotoxicity, hepatitis, photosensitivity etc.

Local antimicrobial therapy in periodontitis involves direct placement of an antimicrobial agent into subgingival sites thus, minimizing the potential side effects associated with systemic therapy. 

Success of any drug delivery system depends on
1. Its ability to deliver the antimicrobial agent to the base of the pocket at a bacteriostatic or bactericidal concentration.
2. Retention of the antimicrobial agent at the site of infection for sufficient period of time to eliminate periodontal pathogens (Van Winkelhoff et al 1996).

Since local drug delivery meets these requirements so it may help to further suppress periodontal pathogens and thereby augment conventional treatment.

HISTORY:

Local antimicrobial therapy is the result of more than 20 years of work by Dr. Max Goodson et al (1979) of Forsyth's Dental Research Center. First sustained release dosage form of Chlorhexidine diacetate for topical use was developed by Friedman and Golomb in 1982.

CLASSIFICATION:

I. Based on application (Rams and slots):
   i. Personally applied at home by the patient:
      a. Nonsustained subgingival delivery provides high pocket concentrations of the antimicrobial agent for only short time periods due to lack of substantivity, e.g. Subgingival irrigation with antiseptic agent like povidone-iodine.
      b. Sustained subgingival drug delivery provides retention of the antimicrobial agent over an extended time period within periodontal pockets. None has been developed till date.

   ii. Professionally applied in dental office:
      a. Nonsustained subgingival delivery pocket irrigation
      b. Sustained subgingival drug delivery - controlled release device

II. Based on the duration of medicament release (Greenstein 2000):

   a. Sustained release devices designed to provide drug delivery for less than 24 hours.
   b. Controlled release devices designed to provide drug release that at least exceeds 1 day, or for at least 3 days following application (Kornman 1993).

III. Based on degradation:

   a. Biodegradable
   b. Non-biodegradable

IV. Based on physical form (Soskolne 1997):

   a. Fibers e.g. Tetracycline
   b. Films/slabs e.g. Chlorhexidine chip
   c. Injectable form e.g. Minocycline

Ideal requisites of locally administered antimicrobial agents:

1. Must deliver the drug to the base of pocket.
2. Must have microbiologically effective concentrations in the pocket.
3. Be there for sufficient period of time
4. Little or no effect on host tissues
5. Retentive after placement.
6. Ease of placement and cost effective.
7. Biodegradable

Advantages of local drug delivery:

1. A local route of drug delivery can attain 100-fold higher concentrations of an antimicrobial agent in subgingival sites compared with a systemic drug regimen. For example, local placement of a tetracycline-releasing ethylene vinyl acetate monolithic fiber can yield tetracycline concentrations in excess of 1300μg/ml in gingival crevicular fluid over 10
days. In comparison, repeated systemic doses of tetracycline-HCl can only provide tetracycline levels of 4-8 μgm/ml in gingival crevicular fluid.  

2. Local drug delivery may employ antimicrobial agents not suitable for systemic administration, such as various broad-spectrum antibiotic agents e.g. tetracyclines.

3. Personally applied antimicrobial regimens offer, for compliant patients, the potential of daily drug placement into periodontal pockets as a part of home self-care procedures.

4. Professional pocket application of local antimicrobial agents reduces potential problems with patient compliance that plague the use of systemic antibiotic drug regimens.

5. Local antibiotic delivery provides an alternative for treatment of women with a propensity for vaginal superinfections and for individuals predisposed to gastrointestinal complications (ulcerative colitis) or other adverse reactions, from systemic antibiotic administration.

6. Local antibiotic placement also reduces the risk of developing drug-resistant microbial populations at non-oral body sites.

7. It leads to sustained delivery of drug at the site of application.

8. Lower total drug dosage.

Disadvantages of local drug delivery:\n
1. Difficulty in placing therapeutic concentrations of the antimicrobial agent into deeper parts of periodontal pockets and furcation lesions.

2. Personal application of antimicrobial agents by patients as a part of their home self-care procedures is frequently compromised by the patient's lack of adequate manual dexterity, limited understanding of periodontal anatomy, and poor compliance and performance with recommended procedures.

3. The task of professionally applying local antimicrobial agents in periodontitis patients with numerous advanced lesions distributed throughout their oral cavity is time-consuming and labor-intensive.

4. Nonsustained subgingival drug delivery is limited by only brief exposure of the target microorganisms to the applied antimicrobial agent.

5. Antimicrobial agents locally applied into periodontal pockets do not markedly affect periodontal pathogens residing within adjacent gingival connective tissues and on extra-pocket oral surfaces (tongue, tonsils and buccal mucosa)

6. It is more expensive.

7. If used as a monotherapy, problems associated with local delivery include allergic reactions, possible inability to disrupt biofilms, and failure to remove calculus.

Indications:

1. Pockets ≥ 5mm

2. Bleeding on probing

3. Sites non-responding to Scaling and root planing

4. Where aesthetics is a concern and surgery is contraindicated

5. Refractory Periodontitis

6. Medically compromised patients

7. In cases where periodontal surgery is contraindicated:
   a) Recent oral cancer
   b) AGE > 80 years
   c) Uncontrolled Diabetes
   d) Smokers
   e) Dental phobic patients

Contraindications:

1. Allergy to a particular drug used.

2. As a monotherapy i.e. without scaling and root planing.

3. To pregnant and lactating mothers e.g. Tetracycline group of drugs.

4. To be used with caution in patients with history of immune deficiency (to prevent the overgrowth of candida or other resistant organisms).

Adverse drug reactions:

1. Allergic reactions.

2. Might produce resistant strains.

3. Occurrence of candidiasis.

4. Pain and burning sensation on insertion (with Chlorhexidine).

5. Development of abscesses.

6. Interference with taste

7. Staining of teeth with their adsorption to teeth

8. Carcinogenicity

AGENTS USED FOR LOCAL DRUG DELIVERY:

1. Tetracycline Fibers: It was the first local drug delivery product available in United States. They are non-resorbable cylindrical drug delivery devices made of a biologically inert, plastic co-polymer ethylene/vinyl acetate fiber containing 25% tetracycline hydrochloride, 12.7 mg per 9 inches (Goodson et al 1983).
The fiber is 23 cm in length and 0.5 mm in diameter.

It is able to produce and maintain a concentration of 1300µg/ml for a period of 7 days (Tonetti et al 1990) with mean concentrations of 43µg/ml in the superficial portions of the pocket wall.

Drug is also deposited on root surface and penetrates in soft periodontal tissues.

They are bacteriostatic for many pathogens at concentrations found in the gingival crevicular fluid after systemic administration (3-6 microgram/ml). However, at a concentration more than 150 times achieved by systemic tetracycline, these fibers provide bactericidal concentration in the periodontal pocket.

When tetracycline fibers were compared with scaling and root planing, a vehicle control, and an untreated control, the tetracycline fibers resulted in a significant improvement in all the tested outcome measures similar in magnitude to the improvement from scaling and root planning.

They can be classified as:

- Hollow fibers: Cellulose acetate fibers are filled with tetracycline and they provide only sustained release system.

- Monolithic fibers: Prepared by melt extrusion technique, wherein, a mixture of 25% tetracycline HCl and 75% ethylene vinyl acetate was heated to 214°C and extruded as 0.5 mm fiber and they provide a controlled release system (Goodson et al 1985).

- Resorbable fibers: Minabe(1989) described a device in which tetracycline is incorporated into cross-linked collagen matrix, atelocollagen, capable of delivering tetracycline in the crevicular fluid at therapeutic levels for up to 10 days after insertion and drug levels ranging from 17 to 180µg/ml.

**Technique of insertion**:

Fibers or thread-like devices are reservoir-type systems, placed circumferentially into the pockets with an applicator and secured with cyanoacrylate adhesive for the sustained release of the trapped drug into the periodontal pocket.

**Disadvantages**:

- Length of the time required for placement of the fiber in the pockets (≥10 minutes per tooth).

- The considerable learning curve required to gain proficiency at placement.

- Need for a second appointment 10 days after placement for fiber removal.

- Placement of fibers around 12 or more teeth resulted in oral candidiasis in a few patients.

- Super infection by tetracycline-resistant periodontal pathogens may also limit the efficacy of tetracycline fibers in periodontal disease management in the presence of Actinobacillus actinomycetamcomitans.

- Some patients experience discomfort during fibre placement and at fibre removal various degrees of gingival redness were observed. The intricacies of winding a fibre into place, the need to retain the device within the pocket and then the removal of it after seven to ten days may limit its wide acceptance by patients and periodontists.

2. Chlorhexidine chip (Periochip): It is the controlled subgingival delivery of Chlorhexidine, was developed by Perio Products Ltd, Jerusalem, Israel. It is a small chip (4.0×5.0×0.35mm) composed of a biodegradable hydrolyzed gelatin matrix, cross linked with glutaraldehyde containing glycerine and water, into which 2.5 mg of 34% chlorhexidine gluconate has been incorporated per chip.

It weighs about 7.4mg and should be stored under refrigeration at 20- 80°C. It was first introduced into U.S. dental market in 1998. Room temperature periochip, which provides the added benefit of being easy to store, and simple to use was introduced in 2002.

It maintains drug concentrations in the GCF greater than 125µg/ml for at least one week after a single application, concentrations well above the tolerance of most oral bacteria. Chlorhexidine has been shown to reduce the number of bacteria in saliva by 85% after 24 hrs. 40% of Chlorhexidine is released within 24 hours and the remainder in 7-10 days. The mean concentration of chlorhexidine in gingival crevicular fluid was ±1000 mg/ml at 4 hours and ± 480 mg/ml within 24 hours and the remainder in 7-10 days.

**Technique of insertion**:

Tooth with probing pocket depth of >5 mm are selected for the placement of chip. After thorough scaling and root planing, area is dried and chip is inserted into periodontal pocket with tweezers. After placement of the chip the area can be protected with periodontal pack.

**Advantages**:

- It has very low systemic toxicity and teratogenicity in humans.

- It has not produced any appreciable resistance to oral microorganisms.

- It is clinically safe and effective in reducing plaque and gingivitis.

- Substantivity.

- Affects the pathogenic flora.

- Acceptable in terms of taste, cost and ease of use.

- As the chip biodegrades in 7 to 10 days, no second appointment is required.
Disadvantages:
- Few patients’ complaint of slight pain and swelling in the first 24 hours after chip placement.
- Environmental conditions in periodontal pockets may alter effective in vivo concentrations of chlorhexidine. It may be inactivated in periodontal pockets via binding to serum proteins35, which are markedly elevated in gingival crevicular fluid.

Pooled data from controlled clinical trials from 10 centers have shown that the adjunctive use of chlorhexidine chip results in significant reduction of probing depth, significant improvement in attachment level, compared with scaling and root planing alone and Jeffcoat et al in 199834 suggests that the chlorhexidine chip is a safe and effective adjunctive chemotherapeutic agent for the treatment of periodontitis. A degradable controlled release device based on formaldehyde cross-linked Bycoprotein matrix containing chlorhexidine has been described by Steinberg et al 1990. Bycoprotein is a hydrolyzed gelatin of bovine origin.14

3. Doxycycline: The FDA has approved 10% doxycycline in a gel system using a syringe (Atridox). It is the only local delivery system accepted by the American Dental Association. It is available as a two syringe mixing system for the controlled release of doxycycline. One syringe contains the delivery vehicle, flowable, bioabsorbable poly (DL-lactide) dissolved in N-methyl 2-pyrrolidone, and the other syringe contains doxycycline hyclate powder.37 It is a liquid biodegradable system that hardens when placed in periodontal pocket.

It is active against putative periodontal pathogens and is effective in management of human periodontal diseases (Golub et al 1985, McCulloch et al 1990).31 Studies have shown that with the use of 10% doxycycline gel group, there was statistically significant reduction in probing depth, bleeding on probing and gain in clinical attachment level.36

4. Minocycline: The FDA recently approved a new, locally delivered, and sustained release form of minocycline microspheres for subgingival placement as an adjunct to scaling and root planing2. It is a product with the physical properties of a powder, consisting of resorbable polymer microspheres in a gel carrier containing 2% minocycline (Arestin) It is a bacteriostatic antibiotic.

The subgingival delivery of minocycline has been investigated in different forms. 3 modes of local application are available: film, microspheres and ointment.

Film: Ethylcelullose containing 30% of minocycline cast from ethanol, chloroform or chloroform with polyethylene glycol were tested as sustained release devices (Elkayam et al)35. The results of this study indicated that the use of this device may cause complete eradication of pathogenic flora from the pocket for 14 days.

Microspheres: Minocycline micro-encapsulated in a resorbable poly (glycolide-lactide) slow release polymer (Van Dyke et al).36 This can be administered by means of disposable plastic syringe. The volume of microspheres in each syringe is 4 mg which is equivalent to 1 mg of minocycline base.

Ointment: It is a light yellow colored ointment base of 20 mg hydroxethyl cellulose, 10 mg eudragit RS, 60 mg triacetine and glycerine 0.5 g, supplied in a disposable polypropylene applicator and each applicator contains the equivalent of 10 mg minocycline in 0.5 g ointment. The concentration of minocycline in the pocket was 1300 µg/ml, 1 hour after single topical administration of 0.05 ml ointment and decreased to 90µg/ml after 7 hours (Satomi et al).37

Repeated applications of 2% minocycline, 1 application per week for 4 weeks, 2 applications at intervals of 1 or 2 weeks, and 3 applications at 2 weekly intervals were effective. Minocycline can be used as an adjunct to mechanical debridement with improved effectiveness for treatment of chronic periodontitis

5. Metronidazole: A 5-nitroimidazole compound specifically targets anaerobic microbes but has essentially no activity against aerobic or microaerophilic bacteria but its hydroxyl metabolite enhances its effect even against other group of bacteria (Pavicic et al).38 Upon entry into an organism, metronidazole is reduced at 5-nitro position by electron transport proteins. The reduction of parent molecule produces free radicals which react with bacterial DNA causing cell death. Hence it is primarily a bactericidal agent Metronidazole Gel is a bioabsorbable delivery device containing 25% Metronidazole benzoate in a matrix consisting of mixture of glyceryl mono-oleate and sesame oil. The gel is subgingivally placed with a syringe and a blunt cannula. Decay of the drug concentration in crevicular fluid follows an exponential pattern which is compatible with sustained drug delivery. A substantial amount of this drug can be swallowed, or absorbed through the mucosa, as indicated by peak plasma concentration observed 2-8 hours following administration (Stolze et al 1992)39. The effectiveness of metronidazole as an adjunct to SRP in the treatment of chronic adult periodontitis, but clinical significance and dissemination of antibiotics should be taken into account in the evaluation of metronidazole as an alternative to SRP (Pavia et al 2004)40.

CONCLUSION:
It can be concluded that local delivery systems are logical adjuncts to conventional surgical or non-surgical treatments,
for the treatment of a few, localized non-responding sites, in particular, recurrent and refractory periodontitis. But, is no substitute for these measures. Despite the large number of studies, there are insufficient comparative data to support any one of the local delivery systems as superior to another and several questions related to the optimal use of such new therapies remain unanswered. There is only limited data to indicate that local drug delivery induces bacterial resistance to antimicrobial agents. Long term studies are needed to address this important issue. In conclusion, in conjunction with scaling and root planing, the adjunctive use of local drug delivery devices may enhance the results in sites which do not respond to conventional therapy.

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AVULSION OF TEETH AND VARIOUS STORAGE MEDIA

ABSTRACT

Avulsion of a tooth caused by trauma, and its successful treatment is a challenging situation that a dentist encounters in clinical practice. There is a definitive treatment for the avulsed tooth, which depends on many factors. The immediate replacement and replantation of the avulsed tooth is necessary, but it cannot always be accomplished for a number of reasons. Thus, the tooth should be transported in a suitable medium to maintain the cell viability. The storage medium is one of the important factors that will help the dentist in rendering successful treatment for the avulsed tooth. There is a continuing search for an ideal storage medium. This review paper focuses on the various storage media, with special reference to coconut water.

Keywords: avulsion, replantation, storage medium, coconut water

Introduction

The incidence of complete avulsion ranges from 1% to 16% of all traumatic injuries in permanent dentition.1 Avulsion injury one of the most severe form of dental trauma, is characterised by complete displacement of the tooth from its alveolar socket. This damage includes disruption of the gingival epithelium, severance of the periodontal ligament (PDL), injury to the cementum and alveolar bone, and severance to the dental pulp neurovasculature.

When injuries occur, the avulsed tooth should immediately be replaced into the socket at the accident site to prevent further damage to the PDL cell from desiccation, but it is not always accomplished, as a lay individual might be afraid to replant a tooth or might fear contracting an infection. It is common practice to carry an avulsed tooth wrapped in tissue paper. This led to the tooth drying out, resulting in the remaining PDL dramatically decreasing the chance for success and leading to external root resorption.2,3

Sequelae of avulsion

Trauma leading to avulsion of the tooth leads to localized inflammation in the PDL. The PDL is stretched and split into two halves. One half is attached to the socket, which receives nourishment from the blood vessels present in the bone. The other half is attached to the root surfaces, which is devoid of nourishment.4 When the blood supply is interrupted for these cells, the stored metabolites become depleted and cells begin to die.

If the inflammatory response is not excessive, then healing occurs with the formation of new PDL. If trauma is extensive, then abnormal attachment can occur after healing, which might be in the form of ankylosis (replacement resorption).5
Critical factors to be considered

The factors if not implemented, result in the failure of replanted avulsed teeth, are:

(a) storage of the tooth in a physiological medium until replantation;
(b) replenishment of the depleted cellular nutrients of the PDL cells;
(c) protection of the root PDL cell from trauma, in particular, crushing.

Authors reported that immediate replantation within 5 min was one of the most critical factor related to PDL healing. Delay in replantation, even as little as 8 min, decreases the probability of periodontal healing to less than 50%.

According to Andreasen and Andreasen, the success of the replanted tooth placed in an unsuitable storage medium for 45 min or more is less than 20%.

View on various storage media

Tap water

Tap water is not effective in maintaining PDL cell viability and is as good as air-drying. Due to its hypotonicity, it causes rapid cell lysis.

Saliva

Saliva might be slightly more effective than tap water, but is a potential source of bacterial contamination for PDL cells. The cells which are kept in saliva shows swelling and damage cellular membrane. This is due to its low osmolality (110-120 mosmo/kg) as compared to the physiological osmolality. The only advantage of saliva is that it is easily availability, but it is always beneficial to transport the tooth in saliva (by buccal vestibule) rather than transporting it under dry conditions.

Saline

Saline has been suggested as a short-term storage medium due to its physiological osmolality (295 mosmo/kg). It does not have essential nutrients that are important for the normal function of PDL cells. If the avulsed tooth is stored for longer than 2 hours, the periodontal cells gets destroyed.

Milk

It has been found that teeth show less inflammation and inflammatory response after replantation when stored in milk than in saliva. According to the authors, in cool conditions, cells have a higher percentage of viability than at room temperature, as cooler temperatures reduce cell swelling, increase cell viability, and improve recovery, all of which promote wound healing. Studies have shown that the lower the fat content of the milk, the higher the tendency to maintain cell viability.

Milk is considered to be a good storage medium for the avulsed tooth because

(a) 275 mosmo/kg osmolality
(b) pH is 6.5-6.8, which supports cell viability
(c) pasteurized milk has markedly few bacteria
(d) essential nutrients present in the milk.

An in vitro study was conducted by Hiremath G using coconut water, propolis, and milk as a storage medium and the results showed that the group that had simulated immediate replantation showed 85% cell viability, followed by coconut water (81%), milk (68%), and propolis (64%).

Viaspan

Viaspan is an extremely effective cold storage medium for organs before transplantation. It has been shown to decrease the incidence of root resorption after replantation, and is considered a better medium than milk and HBSS. In contrast to this study, Viaspan demonstrated lower viability and mitogenicity when compared to HBSS or milk in another study. Viaspan has an osmolality of 320 mosmo/kg and pH of 7.4, ideal for cell growth. The only disadvantage is that it is not widely available.

HBSS (Save-A-Tooth)

Hanks’ balanced salt solution (Save-A-Tooth; Save-A-Tooth, Pottstown, PA, USA) is a standard saline that is widely used to support the growth of many cell types. It is non-toxic and biocompatible. It contains sodium chloride, glucose, potassium chloride, sodium bicarbonate, sodium phosphate, calcium chloride, magnesium chloride, and magnesium sulfate. The presence of glucose, calcium, and magnesium sustains and reconstitutes the depleted cellular components of PDL cells. It has a long shelf life of 2 years. Krasner has reported that HBSS is the best solution for storing avulsed teeth. It has an inner net to receive the avulsed tooth, and thus minimizes the trauma to cells during transportation. Its osmolality (270-290 mosmo/kg) and pH (7.2) are ideal, but the medium is not easily available.

Gatorade

Gatorade is an oral rehydration fluid which contains 20 mEq/L sodium, 3 mEq/L potassium, 11.5 mEq/L chlorine, 22 mEq/L phosphorous, and 333 mmol/L carbohydrate sucrose/glucose.

Because of the favorable osmolality (280-360 mosmo/kg) and carbohydrate content, which provides an energy source for the PDL, it appears to be a suitable medium for the avulsed tooth. Studies have shown Gatorade to be a potential storage medium, although it was inferior to tap water in maintaining cell viability. The pH of Gatorade is 3 and this low pH was thought to be the principal cause for maintaining decreased cell viability.
It has a specific gravity of approximately 1.020, comparable with blood plasma. Following avulsion, the tooth has to be carried in the shell of the coconut, because once it is exposed to air or is removed from the shell, the liquid rapidly loses most of its organoleptic and nutritional characteristics and begins to ferment. Coconut water serves as a good storage medium for the avulsed tooth, which might be attributed to nutrients present in it, such as proteins, amino acids (lysine, cystine, phenylalanine, histidine, and tryptophan). This helps in nourishing the cells and maintains their viability.

The composition of coconut water resembles that of intracellular fluid, but it has to resemble the extracellular fluid to be more effective. Coconut water has an ionic concentration of potassium (51.4 mEq/L) and sodium (32.5 mEq/L), which is very different from that of plasma (potassium 3.5-5 mEq/L and sodium 135-145 mEq/L), but this sodium and potassium might affect excitable cells, such as neurons and muscle cells, whose resting membrane potential will be disturbed. PDL cells, which do not have any role in impulse transmission, and moreover, are not excitable cells electrically, have no effect from the varied concentration of potassium and sodium ions. Therefore, the osmolality of coconut water, which is close to that of plasma, and the presence of glucose and amino acids, which will nourish the PDL cells, enables it to maintain their viability.

Studies have shown that coconut water is superior to HBSS, milk, and propolis in maintaining PDL cell viability after avulsion and storage. Few of the storage media, which can be used for avulsed teeth, are discussed later. The only reason they have not been recommended to the public is because of their unavailability near the site of an accident. Therefore, the concept has been thought to be of academic interest only.

Eagle's medium
Studies have demonstrated that the cell culture medium (at 37°C) can preserve PDL viability for longer periods of time. The medium contains 4 mL l-glutamine, 10⁵ IU/L penicillin, 100 μg/mL streptomycin, 10 μg/mL nystatin, and calf serum (10% v/v) (Biological Industries Beit Haemek, Israel).

However, Ashkenazi conducted a study in which Eagle's medium decreased the functional capacities of PDL cells, which are attributed to cell aggregation due to low temperature. When growth factors were supplemented with Eagle's medium, the viability, mitogenicity, and clonogenic capacity of PDL cells was better.

Emdogain
A study was conducted by Ashkenazi and Shaked to evaluate the clonogenic capacity of Emdogain on PDL fibroblasts.

### Table 2: pH and osmolality of various media

<table>
<thead>
<tr>
<th>Media</th>
<th>pH</th>
<th>Osmolality (mosmo/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saline</td>
<td>7.0</td>
<td>295</td>
</tr>
<tr>
<td>Tap water</td>
<td>7.5</td>
<td>12</td>
</tr>
<tr>
<td>Saliva</td>
<td>6.3</td>
<td>110–120</td>
</tr>
<tr>
<td>Viaspian</td>
<td>7.4</td>
<td>320</td>
</tr>
<tr>
<td>Gatorade</td>
<td>3.0</td>
<td>280–360</td>
</tr>
<tr>
<td>Milk</td>
<td>6.75</td>
<td>275</td>
</tr>
<tr>
<td>Coconut water</td>
<td>6.2</td>
<td>288</td>
</tr>
<tr>
<td>Blood plasma</td>
<td>7.2–7.4290</td>
<td>270–290</td>
</tr>
</tbody>
</table>

### Propolis
Propolis, a substance made by honeybee, is a potent antimicrobial, antioxidant and anti-inflammatory agent. The main chemical classes present in propolis are flavanoids, phenolics, and aromatic compounds. It is relatively non-toxic, with a no-effect level of 1440 mg/kg/day in mice. It is an aqueous extract, as well as an ethanol extract, with the latter being the more common formulation. Flavanoids have antioxidant, antibacterial, antifungal, antiviral, and anti-inflammatory properties. Iron and zinc are also present, which are important for collagen synthesis. Therefore, it was tried as a medium for avulsed teeth.

### Coconut water
The biologically pure, tender coconut water is readily accepted by the body because it is sterile and thus used as a blood plasma substitute. It helps to replace fluids, electrolytes and sugars lost from the body during heavy physical exercise.

The composition of coconut water resembles intracellular fluid more closely than extracellular plasma. The predominant cations are potassium, calcium and magnesium. Sodium, chloride and phosphate are found in much lower concentrations. The primary sugars present in coconut water are glucose and fructose, which are responsible for the high osmolarity of coconut water.

The idea that coconut water can be used as a storage medium arose from its past use as an intravenous resuscitation fluid for dehydrated patients, and also as an intravenous fluid for war patients.
According to the study, the percentage of fibroblasts was diminished, along with the capacity to form colonies. Emdogain might delay, but not stop, the development of replacement resorption. It is not efficient in the regeneration of injured PDL tissues.  

**Eggwhite**

Eggwhite has a better incidence of repair when compared to milk, according to Khadmi et al. After analysing the periodontal ligament microscopically for attachment, Sousa et al. observed that the organization of collagen fibers and the number of cells were similar for both milk and eggwhite. Thus, eggwhite can serve as a better medium for the avulsed tooth.

**Conclusion**

The pH and osmolality of HBSS resembles that of blood plasma. Thus, HBSS is considered the best storage medium for avulsed teeth, but HBSS is not available easily at the site of accident. Coconut water is easily available in most tropical countries. It also maintains the cells viable for longer periods of time, as shown in various studies. Thus, taking into consideration all of these factors, coconut water appears to be a good storage medium in tropical countries. In the case of unavailability of any media, saliva can be used, as it is better than carrying the avulsed tooth under dry conditions.

The replantation of teeth has been considered a temporary measure, as many teeth succumb to root resorption. However, an increasing number of cases have been reported where teeth have been in service for 20-40 years with normal periodontia. Thus, replanted teeth, under certain conditions, do not necessarily undergo resorption, but can maintain their integrity and function. In vitro studies conducted so far have shown that coconut water maintains cell viability for a longer period of time. However, long-term in vivo studies need to be conducted to evaluate the efficacy of coconut water in maintaining the healthy periodontium.

**References**


MANAGEMENT OF HORIZONTAL ROOT FRACTURE
- A CASE REPORT

ABSTRACT
Tooth trauma and its management loom as a major challenge to the dental practitioner. Radicular fractures in permanent teeth are uncommon injuries with incidence ranging from 0.5% to 7%. Maxillary anteriors are most commonly affected teeth. The present case report discusses the management of horizontal root fracture in the middle 3rd of permanent left maxillary central incisor using dowel inlay and mineral trioxide aggregate. Clinical and radiographic follow up showed a stable condition without any pocket formation, root resorption or periapical pathology.

Keywords: horizontal root fracture, dowel-inlay.

INTRODUCTION
Radicular fractures in permanent teeth are uncommon injuries with incidence ranging from 0.57%. Maxillary anteriors are most commonly affected teeth. In cases of horizontal root fracture, the diagnosis is essentially radiographic, as clinical features similar to luxation and alveolar ridge fracture can be there. Various treatment modalities for the management of horizontal root fractures include:

1. Root canal treatment of the coronal segment only
2. Surgical removal of the apical segment
3. Removal of the coronal segment and orthodontic or surgical extrusion of the apical segment
4. Removal of the apical segment and stabilization of the coronal segment with endodontic implants and intraradicular splinting to unite the fracture.

A Dowel inlay is a combination of dowel and an inlay where in the inlay is locked to the dowel, post which helps in improving the retention of the restoration as well as resistance to laterally directed forces. Dowel-inlay technique was first introduced by Shillingburg in 1982. If the tooth is endodontically involved, a cast dowel core that passes through the crown and into the root can solve the retention problem and obviate prefabrication of the crown. This technique is used in a case without crown loss to restore the endodontic access opening and at the same time the tooth is stabilized.

Mineral trioxide aggregate offers certain favourable features like good sealing properties, biocompatibility, bactericidal effects, radiopacity and ability to set in the presence of blood. MTA was used with the goal of inducing...
osteogenesis and cementogenesis. Aim of the present case was to manage a case of horizontal root fracture in the middle third in left maxillary central incisor using dowel inlay and MTA.

**Case report**

A 22 years old male patient reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of pain and mobility of tooth in left upper front tooth region. History revealed that 1 month ago the patient had fractured his left upper front tooth while playing. The tooth was mobile and painful. Medical history was not contributory. Clinical examination revealed tooth 21 had intact clinical crown and it remained in its anatomical position with regard to aesthetics and occlusion (Fig. 1). Tooth exhibited Grade II mobility. The fracture was not evident labially and the crown remained in its anatomical position with regard to aesthetics and the occlusion. The radiographic examination revealed clear radiolucent line in the midroot region and no periapical changes were noted in relation to tooth no. 21 (Fig. 2). Diagnosis made was Ellis Class VI fracture (Horizontal root fracture).

The tooth was stabilized with a composite splint. Root canal treatment was performed and sectional obturation was done (Fig. 3). Post space was prepared with peeso reamer in relation to tooth no. 21. Care was taken to ensure that both the fractured segments were included in the post space. A direct wax pattern was made for the indirect fabrication of a Dowel-Inlay. The wax pattern had dowel attached with lingual surface of the inlay component.

The casting procedure was done and the final casting comprising of dowel inlay was finished, polished and checked for fit in the prepared root canal space. Mineral Trioxide Aggregate was pushed into the fracture line with the help of the prepared dowel inlay (Fig. 4).

The type I Glass Ionomer Luting cement (Fuji I) used for the final cementation of the Dowel-Inlay. Cement was applied to the post space with a Lentulo spiral cement filler. Care was taken to coat the walls of the canal all the way to the apical end of the dowel preparation. The dowel inlay was cemented in the canal, providing a closure of the endodontic access and reinforcement of the root and coronal tooth structure under the crown. A large, coarse, red rubber point was used to...
smooth the surface of the inlay to eliminate scratches produced by the abrasive stones used to finish the casting. A final polish was added by using a large, fine, green rubber point (Fig. 5,6).

The occlusion was then checked. A follow up examination after 15 days, one month, two months, six months. Satisfactory healing was evident both clinically and radiographically (Fig. 7,8).

Discussion

Root fracture is one of the consequences of dental trauma. The possibility of saving the fractured tooth depends on the level of the fracture and also on pulp vitality. After horizontal root fracture, the apical fragment remains vital in approximately 99% of cases while the pulp tissue on the cervical fragment can develop necrosis with consequent formation of granulation tissue between the fragments. The coronal segment may or may not be vital and may or may not be mobile depending on the state of the tooth at the time of fracture and on the extent of the fracture and the location of the fracture line.

Transverse root fracture healing can involve union of segments with hard tissue, interposition of connective tissue (periodontal ligament), or nonunion with associated interposition of granulation tissue. The ideal repair process should be the formation of hard tissue between the two fragments, creating a functional unit with normal dental mobility and pulp vitality. If the fracture is below the alveolar crest and no oral contamination occurs, the pulp tissue may survive and repair the fracture with calcified tissue. True union across the fracture line is a relatively uncommon occurrence; the healing that apparently occurs is the result of consolidation of the surrounding and supporting tissues.

Traumatic injuries involving tooth root fracture can now be treated by dowel-inlay to provide what is considered to be most conservative of restorations. Factors influencing the extent and feasibility of such repairs include:

- The position of the tooth after it has been fractured
- The mobility of the coronal segment
- The status of the pulp
- The position of the fracture line
- The status of the periodontium
- The occlusion
- The time and resources of patient

If the tooth is endodontically involved, a cast dowel core that passes through the crown and into the root can solve the retention problem and obviate prefabrication of the crown. This is the same technique that Shillingburg described as the dowel inlay crown repair. Shillingburg used this technique in a case with a lost crown to restore the endodontic access opening and at the same time to strengthen the tooth. This technique for stabilizing a loss crown with a post & core that passes through the crown is quite simple and can save considerable time and expenses over remaking the crown. Also this technique utilizes the standard materials and method used to produce dowel inlay castings.

If endodontic therapy must be done on a tooth after it has received a crown, the access opening diminishes the crown retention by 61%. Therefore the placement of dowel inlay for stabilizing of crown has been described. Dowel-Inlay can be used in repair of loose crown of an endodontically involved tooth and for stabilizing crowns that are over tapered or in short crown preparations.

Other treatment options available in the treatment of horizontal root fractures in the middle third include:

- Orthodontic extrusion
- Intra alveolar transplantation of the fractured tooth
- Root extraction and prosthetic replacement
- Root burial and prosthetic replacement

Mineral trioxide aggregate (MTA) is a biomaterial that has been investigated for endodontic applications since the early 1990s. MTA was first described in the dental scientific literature in 1993 and was given approval for endodontic use by the U.S. Food and Drug Administration in 1998.

In numerous in vitro studies, MTA was proven to create a biocompatible environment and stimulate mineralization of cementoblasts. MTA, however, like calcium hydroxide causes inflammatory and necrotic changes in adjacent tissues, although to a lesser degree.

Pathological complications associated with the outcome of the treatment include:

- Pulp necrosis
- Root canal obliteration
- External and internal surface resorption
- Inflammation around the fracture
- Periapical inflammation

In the presented case as there was absence of any of the mentioned complications, so a successful outcome could be expected.

Conclusion

An attempt should be made to conservatively treat horizontal root fractures. When crown portion of tooth is intact and tooth is asymptomatic, it may heal spontaneously. But, when necrotic coronal pulp is there, by maintaining the vitality of apical portion of the root, hard tissue repair can be promoted between the fracture fragments. Management of
horizontal root fracture with dowel inlay is quite simple, economical, and minimal invasive technique. It can save considerable time over other alternative treatment options available but only few studies are available and long term follow up is required to prove its success.

References
AESTHETIC CROWN LENGTHENING- A PERIO-ORTHO INTERRELATIONSHIP

ABSTRACT
In the 21st century, the dental practitioner must be prepared to meet the challenges necessary to provide care that will result in a true condition of oral health. Current standards dictate the importance of avoiding procedures that will result in aesthetic compromise as well as the concept of providing patients with improved aesthetics whenever possible. With the increased emphasis on interdisciplinary treatment planning, there is a concomitant need for greater cooperation between the restorative dentist and the supporting specialists. This is especially true for the interdisciplinary relationship between the restorative dentist, the periodontist, and the orthodontist. Contemporary dental treatment must result in true oral health, incorporating comfort, function and aesthetics. The key to successful treatment is establishing accurate diagnosis and comprehensive treatment plan. The patient presented with a need for orthodontic alignment of her teeth and had excessive gingival coverage of her clinical crowns. It is the purpose of this article to discuss the diagnosis and sequencing of aesthetic crown lengthening treatment for an orthodontic patient.

Key Words: aesthetic crown lengthening, orthodontic teeth alignment, excessive gingival display, gummy smile

INTRODUCTION:
Aesthetic considerations have influenced the management of dental maladies in varying degrees for many years. Patient awareness and expectation have increased recently to the point that less than optimal aesthetics are no longer acceptable outcome. With increased awareness and expectations, there is a concomitant need for greater emphasis on interdisciplinary relationship between the restorative dentist, the periodontist and orthodontist.

The timing of esthetic crown lengthening surgery is variable. When the crown lengthening surgery is done prior to placement of orthodontic appliances, a second-stage touch-up surgery is commonly required after de-banding. In addition, it is very difficult and commonly impossible to do the crown lengthening surgery when the teeth are crowded and/or rotated. The teeth must first be aligned orthodontically prior to the surgery. For these reasons, the surgery is usually accomplished approximately 6 months prior to de-banding. This gives the orthodontist time, after the surgical procedure, to move the teeth into their correct positions.

The key to good results and successful treatment depends upon accurate diagnosis and comprehensive treatment plan. The purpose of this article is to discuss the role of anterior aesthetic surgery after orthodontic treatment.

CASE REPORT:
A 22 years old female reported to the department of Periodontology and Oral Implantology, Sri Guru Ram Das Institute of Dental Sciences and Research, Amritsar, with chief complaint of unaesthetic and short appearance of upper front teeth.
Patient was already getting her treatment from the Department of Orthodontics, Sri Guru Ram Das Institute of Dental Sciences and Research for alignment of her teeth. Traditional nonsurgical orthodontic treatment was performed, over a period of 2 years, resulting in favourable tooth alignment, but excessive gingival display in the maxillary arch significantly compromised the aesthetic outcome (Fig. 1, 2).

A thorough examination revealed face height and lip height to be within the normal range. The patient was physically healthy, adequately nourished and mentally sound. There was no history of drug intake, smoking or tobacco chewing. No extra-oral abnormalities were found.

Intraoral examination revealed generalized mild plaque and calculus with no history of spontaneous gingival bleeding and halitosis. (Examination also revealed the excessive gingival coverage of anatomic crown and shorter clinical crowns.)

Intraoral periapical radiographs of the all teeth were taken and no bone loss was found. The routine haematological investigations were carried out and were found to be within the normal range.

TREATMENT: Considering the patient’s chief complaint, a comprehensive treatment was planned, which included

a) Phase 1 therapy

b) Surgical therapy (aesthetic crown lengthening)

PHASE 1 THERAPY INCLUDED:

- Oral hygiene instruction
- Oral prophylaxis
- Chemical antimicrobial therapy (0.12% CHX)

Patient was re-evaluated after 4 weeks to check patient’s response to phase 1 therapy. Re-evaluation revealed healthy gingival tissue and good oral hygiene maintenance. Circumferential probing revealed false pocket of 3-4mm in relation of upper anterior teeth (Fig 3, 4).

SURGICAL THERAPY

Aesthetic crown lengthening as planned to correct the excessive gingival display in relation to upper anterior teeth.

TECHNIQUE:

After the proper anaesthesia was achieved, the pockets were marked and the bleeding points were induced with the help of a pocket marker. Continuous external bevel incision was given with the Kirkland knife (Fig 5).

Tissue tags were removed with the help of curettes to achieve thin marginal gingiva, thick tissue was de-epithelized with Kirkland knife. Hemostasis was achieved by giving the pressure pack and later on periodontal dressing was applied on the wound.

Patient was recalled after an interval of 1 week, periodontal dressing was removed which showed excellent wound healing without any complication (Fig 6). Post operative follow up visits were arranged weekly for 1 month and then bi-weekly for 3 months. Patient maintained the oral hygiene and was very pleased with aesthetic results. The results remained unchanged during follow up of 6 months. (Fig 7)

DISCUSSION:

Kornikoff et al reported on the prevalence of short clinical crowns due to excess gingival coverage of crowns, based on the width to height ratio, in post-orthodontic patients. They
found that 66% of patients studied, had a width to height ratio in maxillary central incisors greater than 80%. The normal width to height ratio is 75-80%.

McGurie provided a protocol for diagnosing possible esthetic problems. He reported that the average tooth lengths for the maxillary anterior were 11 to 13 mm, 10 mm, and 11 to 13 mm for the centrals, laterals, and canines respectively.

Townsend reviewed many gingival aspects of the ideal smile. Canines and central incisors should be the same length and lateral incisors 1 to 2 mm shorter. The most apical part of the gingival scallop should reflect the angle of the long axis of the tooth. The gummy smile is generally defined as more than 2 mm of gingival display in full smile.

Tjan reported on the smile dynamic of a population in the second decade of life. He reported 2mm or more of gingival display in 13.8% of females and 6.8% of males.

Four possible etiologies of gummy smile may include:
1) Short or hyperactive upper lip
2) Dentoalvelar extrusion
3) Vertical maxillary excess
4) Altered passive eruption

To diagnose a patient with altered passive eruption, 2 criteria must be met. First, the tooth is short by measurement with average length of central incisor with 10 to 11 mm. Second, the cementoenamel junction cannot be detected in the sulcus with tip of explorer because it is covered with attachment apparatus.

When the cause of the condition is identified and an accurate diagnosis is obtained, a treatment plan can be formulated that will predictably produce optimum long term result.

CONCLUSION:

Contemporary dental treatment must result in true oral health, incorporating comfort, function and aesthetics. The key to successful treatment is establishing accurate diagnosis and comprehensive treatment plan. Attention should be given to facial symmetry, face height, lip anatomy, profile and smile line when performing extraoral examination. Dimensions of teeth, height of anatomic crowns versus height of clinical crown, thickness, width, position and contour of gingival tissue should be checked intraorally.

Accurate diagnosis and proper treatment plan is mandatory to achieve good results and harmony between the hard and soft tissue.

Effective daily plaque control and periodic recall are essential to maintain long term stability.

References

CASE REPORT OF HORIZONTAL ROOT FRACTURE TREATED WITH MTA: A THREE YEAR FOLLOW UP

ABSTRACT

Incisors are the most frequently involved teeth to suffer dental trauma, with root fractures occurring in 0.5% to 7% of injuries. Horizontal root fractures mostly affect upper central incisors, mainly in the middle third of the root. This case report presents the three year follow up of 12 year old child who had sustained complicated crown fracture in relation to right maxillary central incisor with a horizontal root fracture in the middle third of root, and to the lateral incisor with complicated crown fracture only. After splinting, only the coronal fragment of central incisor to the apical mid-fractured site was treated with MTA. Both radiographic and clinical follow-up after three years revealed no periapical pathology, and no internal or external resorption with adequate clinical function and no tenderness of percussion, pain or discomfort. Hence, a MTA seems to be a successful alternative approach for treating horizontal mid root fracture.

Key Word: dental trauma, horizontal root fracture, mineral trioxide aggregate (MTA)

INTRODUCTION

Traumatic injuries of teeth are the main cause of emergency treatment in dental practice. It occurs most commonly in young patients, and varies in severity from enamel fracture to avulsion. Compared to other dental traumas, root fractures are relatively uncommon. The frequency of root fractures in permanent teeth is only 0.5% to 7%, and in deciduous teeth, just 2% to 4%. Root fractures occur mainly in the central (68%) and lateral (27%) maxillary incisors; in contrast, only 5% of root fractures are found in mandibular incisors. The classification of horizontal root fractures is based on the location of the fracture line (apical third, middle third, cervical third of the root) and on the degree of dislocation of the coronal fragment. The prognosis of the tooth concerned is also influenced by other factors, such as the patient's age, stage of root growth, mobility of the coronal fragment, and diastasis of the fragments. Communication between the palatal sulcus and the fracture line can additionally negatively influence the prognosis. Fractures in the middle third of the root are the most common.

The majority of root fracture space has been shown to undergo some form of healing. It has been reported that 77% of root-fractured teeth healed, with pulp necrosis occurring in 20%. The histological reactions at the fracture line are categorized into four types: (I) interposition of calcified tissue (callus formation); (II) interposition of connective tissue, which is characterized by peripheral rounding of the fracture's ends; (III) interposition of bone and connective tissue, radiologically characterized by the clear separation of the two fragments; and (IV) interposition of granulation tissue, caused by an infected or necrotic
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Type I is found most commonly in those root-fractured teeth in which the coronal fragment is not or only slightly dislocated. Type II often results after lateral dislocation or extrusion of the coronal fragment. If the trauma occurs before growth of the alveolar process is complete, the coronal fragment continues to erupt, but the apical fragment remains in its pre-trauma position. As a result, bone and connective tissue grow between the two fragments (type III). In type IV, infected or necrotic pulpal tissue causes an inflammatory reaction in the fracture line. The last mode of healing, with granulation tissue, is a sign of pulp necrosis and an indication that endodontic treatment of the coronal portion of the tooth is required. According to Andreasen and Hjörting-Hansen, necrosis of the pulp usually occurs only in the coronal fragment, while the pulp of the apical fragment remains vital. This finding provided a basis for testing various medicaments in the treatment of non-vital coronal root canal fragments. Such treatment was intended to achieve peri-radicular healing and the formation of hard tissue that closed the fracture line apically and acted as a barrier.

One of these alternatives, mineral trioxide aggregate (MTA), which was first introduced in 1993, has been advocated for creation of an apical barrier. Grey MTA (Proroot MTA, Dentsply) has been reported to have superior biocompatibility, sealing ability and is less cytotoxic than other materials currently used in pulpal therapy. Current literature supports its efficacy in promoting the overgrowth of cementum and it may facilitate the regeneration of the periodontal ligament because of its alkaline pH of 12.5 and the presence of several mineral oxides in its composition. It sets to a hard consistency about four hours after mixing and insertion, thus allowing early completion of final obturation of the root canal when acting as artificial barrier.

There are few case reports suggesting the use of MTA material in the treatment of teeth with horizontal root fracture. This case report describes the treatment and 3 year follow up of two incisors, one with complicated crown fracture along with horizontal mid root fracture using MTA, and the other with only complicated crown fracture.

**CASE REPORT**

A 12-year-old male came to the Department of Pedodontics Sri Guru Ram Das Institute Of Dental Sciences and Research, Amritsar with the complaint of crown fracture and pain since 1 week in maxillary anterior teeth. He reported an incident at his school place, 20 days back wherein a foreign object had injured his front tooth. The patient explained that he had been attended by a physician who prescribed NSAIDs and advised him to have a dental checkup. Clinical examination revealed complicated crown fracture in relation to right maxillary central incisor and lateral incisor with no signs of alveolar bone fracture. On percussion both the teeth were slight tender. An initial pulp vitality test was performed (heat and electric), and patient gave varied response. Intraoral periapical radiograph (IOPA) of 11, 12, 13 region, revealed single horizontal fracture at the mid root level of 11, with slightly displaced coronal fragment (Fig. 1).

The initial treatment involved repositioning using firm finger pressure to the coronal segment, fixation of teeth with an 0.7mm orthodontic wire bonded to the labial surfaces of the maxillary teeth with composite resin (canine to canine), which intended to maintain for 3 months period.

After local anaesthesia, only the coronal fragment of central incisor to the apical mid-fractured site and whole root canal of lateral incisor were cleaned biomechanically and irrigated with a sodium hypochlorite 2.5% solution. The canals were then dried with paper points. The MTA material (Proroot MTA, Dentsply) was mixed in a 3:1 proportion and was carried with a small amalgam carrier to whole coronal fragment of the central incisor to the apical fracture site and put in place with fine condensers and adapted gently. To
check the correct positioning of the MTA mixture, an intra-
oral periapical radiograph was taken. A wet cotton pellet with
sterile water was then placed in the pulp chamber and the
access cavity was closed with temporary filling material IRM.
After 24 hours, the IRM and the cotton pellet were removed
and the set of the MTA was gently tested with gutta-percha
and the rest of the lateral incisor root canal was obturated
with gutta-percha and sealed with temporary filling material.
After 3 weeks of healing the splinting was removed. In
subsequent visit, glass post was placed in lateral incisor and
final restorations in both the teeth were done with composite resin coronally. The patient attended the all
routine follow-up appointments, which were at six-monthly
intervals. The symptoms ceased and the results were
satisfactory after three years of follow-up. A radiographic
follow-up after three years revealed no periapical pathology,
and no internal or external resorption (Fig. 4). The clinical
follow-up after three years revealed adequate clinical
function and no tenderness of percussion, pain or and no
abscess formations. This case illustrates the potential for
repair of horizontal root fracture sealing with MTA.

DISCUSSION

Trauma to anterior teeth is commonly found among young
children resulting in luxation to avulsion injuries. The
magnitude of prevalence is confirmed by the statistical
analysis of trauma during childhood and adolescence stage.
Radicular fractures compromise 0.5 to 7% of all the dental
injuries.  Most common type of such fractures are in the
middle being 57% followed by 34% in the apical part and
9% in the coronal part of the root. The International
association of Dental Traumatology has developed a
consensus statement on diagnosis and treatment of dental
traumas. According to these guidelines, proper clinical and
radiographic examinations should be performed, followed by
vitality tests and patient care instructions.

The radiological evaluation of root fractures is normally
based on single-tooth radiographs and occlusal images.
However it must be carried out with care when a root
fracture is in an oblique direction facio-palatally, since the x
ray beam when directed to the tooth may not pass directly
through the fracture line, hence x-ray must be done at three
vertical angulation of 5°, 0° and 110°. The fracture root is
identified by a radiolucent line running mesiodistally through
the root, passing from the periodontal ligament space on one
side to the opposing side.

If the root fracture is in the apical third of the root and the
tooth is not mobile, no treatment is necessary. A long term
follow is adequate. However, in case of root fracture
accompanied by mobility, the immediate treatment should
be the repositioning of the fragments. This can be done by
simply using finger pressure to reduce the fracture and use of
orthodontic wire and acid etched composite resin splint
using adjacent firm teeth to stabilize the traumatized tooth.
Splinting is usually recommended for a period of at least 2 to
4 months. In this case, maxillary right central incisor has mild
mobility and dislocation of coronal segment, we
repositioned the coronal segment and the splint was
maintained for a period of 3 months.

According to the International Association of Dental
Traumatology guidelines, root canal therapy is not instituted
until conclusive evidence of pulpal necrosis exists. The
frequency of pulp necrosis following root fractures is higher
in mature teeth than in teeth with open apices. Time
between the accident and treatment of complicated crown
fracture has been shown to be an essential requirement for
successful therapy. For 24 hours after a traumatic injury, the
initial reaction of the pulp is proliferative, with no more than
2 mm depth of pulpal inflammation. After 24 hours, chances
direct bacterial contamination from the pulp increases
with resultant progression of the zone of inflammation in an
apical direction. Thus as time progresses the chance of
successfully maintaining a healthy pulp decreases. in the
present case, slight dislocation of coronal fragment was seen
with complicated crown fracture and patient reported after
20 days post trauma. Varied pulpal response to electric pulp
testing was also noticed at that time. Decision was taken to
perform root canal therapy, so that the healing process which
occurred is not affected by the bacterial by products. When
pulpal necrosis develops, the apical part of the fractured
tooth remains vital. Hence root canal treatment is performed
only in the coronal fragment. However, it is difficult to seal
this fragment because an apical stop is often impossible to
achieve. Calcium hydroxide has been used to achieve an
apical stop. The main drawback of this procedure include a
need for multiple scheduled visits, susceptibility of treated
canals to reinfection, as they are restored with temporary
filling, and susceptibility of treated roots to fracture in
immature teeth, because root resistance reduces after a long
term contact between calcium hydroxide and root dentin.

For this reason MTA in teeth with necrotic pulps and open
apices has been recommended. Studies have observed
higher fracture resistance, higher clinical and radiographic
success at inducing apical closure and absence of signs of
clinical and radiographic failure, greater amount of hard
tissue formation and a lower level of inflammation when
MTA filled root canals are compared with root canals filled
with calcium hydroxide. Hence MTA was selected in the
root canal treatment of the present horizontal root fracture,
because its use might improve the outcome of the treatment.
In the presented clinical case after 3 years, the patient
reported absence of any painful symptoms and the tooth had
normal mobility. Radiographic exploration revealed an altered status of the tissue around the teeth, with a repair by interposition of connective tissue. There was no evidence of periodontal ligament breakdown either at the fracture level or periapically. Similar result were shown by Roig et al and Altinok et al in a case report of horizontal root fracture treated with MTA.

Removal of the apical segment is indicated when the two segments are considerably separated and there is evidence of apical pulpal necrosis. In the presented case no such finding was observed after 3 years.

**CONCLUSION**

Mid-root fractures have long been considered to have hopeless prognosis because of poor understanding of the biologic concept of such fracture and lack of availability of biocompatible materials. Availability of materials, like MTA have put forth varied treatment options for clinicians in the management of mid root fractures. However long term follow-up of patients with injuries is important because pathological changes can occur several years following injury. So far, for the patient described in this case report, MTA appears to have been a valid option for horizontal root fractures, with the added advantage of speed of completion of therapy.

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RARE CASE OF BILATERALLY IMPACTED SECOND AND THIRD PERMANENT MANDIBULAR MOLARS

ABSTRACT
Removal of an impacted tooth is the most common minor oral surgical procedure performed in oral surgery. However, bilaterally impacted permanent second and third mandibular molars is a rare presentation. The clinical case report presents a rare clinical situation and discuss its etiology, various treatment modalities with their implications and complications related to impacted teeth.

Key Words - bilaterally impacted mandibular molars

INTRODUCTION
Removal of impacted teeth is the most common minor oral surgical procedure performed in the dental practice. Impaction is defined as “the cessation of the eruption of the tooth caused by clinically or radiographically detectable physical barrier in the eruption path or by the ectopic position of the tooth”. Mandibular third molars are the most commonly affected and comprises over 80% of all impacted teeth. These are followed by maxillary canines (0.8 to 2.9%), mandibular premolars (0.2 to 0.3%) and central incisors. Eruption disturbances and impaction of second permanent molars is relatively rare with mandibular second molars more commonly affected than the maxillary molars. The incidence of second permanent molar impaction by radiographic studies has been reported to be as low as 0.03%-0.06% of all the impacted teeth. However, unilateral impaction of mandibular permanent second molar is more common than the bilateral presentation and most of the impacted molars are mesially angulated. Crowding and any disturbance in the physiologic growth of mandible and tooth development have been quoted as the most common causes of second mandibular molar impaction. Excessive space between the developing second molar and first molar may also result in second molar impaction by radiographic studies has been reported to be as low as 0.03%-0.06% of all the impacted teeth. However, unilateral impaction of mandibular permanent second molar is more common than the bilateral presentation and most of the impacted molars are mesially angulated. Crowding and any disturbance in the physiologic growth of

CASE REPORT
A 19 year old female was referred to department of oral and
maxillofacial surgery from a local dentist for the removal of her bilaterally impacted second and third mandibular permanent molars. The chief complaint of the patient was crowding in her teeth and missing posterior teeth bilaterally for the past three years. Intraoral examination revealed dental crowding in the lower anterior and premolar region. Clinically the distal cusp of the lower right mandibular molar was seen but the left mandibular second molar and both the third molars were not clinically visible. There was crowding seen in the right maxillary premolar region. Orthopantomograph revealed the presence of all permanent teeth except maxillary third molars (fig 1). The second and third mandibular molars were impacted bilaterally. The root formation of second molars was complete but the roots of third molars were partially formed. Both the second molars were mesially impacted under the distal bulge of crown of first molar. Both the third molars were lying in the ramus above the second molars with mesial inclination. After considering the chief complaint, age of the patient, dental crowding and in consultation with the orthodontist it was decided to extract her bilaterally impacted third molars and then to refer the patient to the orthodontist for uprighting of her bilaterally impacted second mandibular molars. The plan was explained to the patient and her impacted third molars were extracted under local anesthesia. The patient reported back after a week for suture removal with uneventful healing the last follow up being at 6 months post operatively (fig 2)

**DISCUSSION**

Third mandibular molars are the most commonly teeth impacted followed by maxillary canines, premolars, central incisors. Studies have reported very low radiographic incidence (0.03 to 0.06%) of impacted mandibular second molars. Simultaneously impacted mandibular second and third molars in adolescent population with arch space deficiency, although uncommon but may be encountered in the clinical practice and requires an interdisciplinary approach. The chronological age for eruption of mandibular second molar is 11 to 13 years with complete root formation by 14 to 15 years. The tooth bud of second mandibular molar develops with some mesial inclination. The space for the eruption of second molar is obtained by the resorption of bone at the anterior border of mandibular ramus and mesial migration of first molar into the Leeway space. As the bone at the anterior border of ramus continues to remodel the mesial angulation of the second molar attains an upright position due to a spontaneous self correction mechanism. Any disturbance in this physiologic developmental process can result in an environment favouring impaction. Shiu Yin Chu et al in 2008 observed three patients with impacted mandibular second molar in the age group of 11 to 13 years for spontaneous self correction by a biannual follow up and suggested that monitoring the eruption pattern is important in this particular age group and timely referral to a specialist becomes mandatory. Orthodontic uprighting of the impacted second molar with distal movement of third molar followed by their removal or performing germectomy of third molar also gives good results involving long treatment period but may be contraindicated in molars with gross displacement or widely diverging roots. Motamedi et al (2007) used a technique of apically repositioning buccal mucosal flap sutured to the buccal cortex of the extracted third molar distal to the impacted second molar with simultaneous orthodontic movement applied to impacted second molar. Orthodontic uprighting and extrusion have functional, periodontal and restorative advantages. It allows avoidance of a shortening of occlusal plane that may result from impacted tooth loss especially in unpredictable third
molar positions, while the periodontal benefit of uprighting is the elimination of pseudo pocket formation for better plaque control. Although, the position of a slightly tipped molar can be corrected by placing a brass wire separator between the teeth. Extraction of impacted second molar and transplantation of third molar into the extraction site is technically difficult with an added risk of pulp necrosis and root resorption and should be only advocated when orthodontic treatment is contraindicated. It also involves a longer waiting period after extraction of second molar and problem of waiting for the third molar for eruption before it can be drifted into second molar site. While surgical repositioning gives better long term prognosis than transplantation as the tooth is not removed from its socket with intact apical vessels and with no contamination of roots with saliva. Removal of the bone around the second molar for its removal can also result in mandibular fracture and injury to the inferior alveolar canal. Extraction of the second molar and to allow the third molar drift mesially depends on eruption path of third molar which is unpredictable. Undiagnosed second molar impaction can result in dental caries, periodontal diseases, resorption of adjacent teeth and malocclusion. Moreover, unopposed teeth have a tendency to erupt excessively. The oral hygiene becomes difficult to maintain around partially impacted tooth resulting in plaque accumulation.

Hence, treatment of second and third mandibular molar impactions is very challenging requiring proper clinical, radiological and biomechanical evaluation. It is our aim to diagnose and discuss all the treatment possibilities and their prognosis with the patients and their parents. However, timely referral to specialist care is mandatory.

**BIBLIOGRAPHY.**


PALATAL FLANGE AS A MANDIBULAR GUIDE APPLIANCE FOR A PATIENT TREATED FOR AMELOBLASTOMA - A CASE REPORT

ABSTRACT
Mandibular resection usually produces problems in surgical and prosthetic reconstruction. The challenge of this condition requires maximum cooperation between the surgeon and the prosthodontist. The prosthodontist can play a vital role in reestablishing normal or near normal function in patients who have undergone mandibular resections in the course of removal of a neoplasm. Loss of the continuity of the mandible destroys the balance and the symmetry of mandibular function, leading to altered mandibular movements and deviation of the residual fragment towards the surgical side. This clinical report gives a brief review of resection guidance prosthesis and describes the fabrication of an acrylic guidance flange prosthesis. Successful intercuspal position was accomplished with the use of the guidance appliance, combined with physiotherapy in a patient who underwent a hemisection of the mandible, subsequent to treatment for an ameloblastoma.

Keywords: mandibular guidance therapy, mandibular resection, hemimandibulectomy, guide flange.

Introduction
The increasing incidence of cancer of the oral cavity places great responsibility on the dental profession.1 Surgical treatment for cancer of the oral cavity frequently requires resection involving the mandible, floor of the mouth, tongue, and soft palate. This extensive loss of tissues often results in impaired function in mastication, deglutition, and speech, compounded in some instances with drooling.2,4 Segmental resection of the mandible commonly results in deviation of the mandible to the defective side, resulting in facial asymmetry and malocclusion, preventing the patient from chewing normally or having a normal appearance.5,6 The amount of deviation depends on the amount of hard and soft tissue involvement, the method of surgical site closure, the degree of impaired tongue function, the presence and condition of teeth, the loss of proprioceptive sense of occlusion.7,8 Prosthetic methods, including intermaxillary fixation, mandibular-based guidance restorations, and palatal-based guidance restorations along with physiotherapy may be useful in reducing mandibular deviation and improving masticatory efficiency.9 Success of mandibular guidance therapy varies and depends upon the nature of the surgical defect, early initiation of guidance therapy, patient cooperation, and other factors.7 Delay in the initiation of mandibular guidance therapy, due to problems such as extensive tissue loss, tight wound closure, radiation therapy, radical neck dissection, flap necrosis, and other postsurgical morbidities, may result in an inability to achieve normal maxillomandibular relationships.9

Case Report
A 46-year-old male patient came to the Department of Prosthodontics and Crown & Bridge, Sri Guru Ram Das Institute of Dental Sciences & Research, Amritsar.
Institute of Dental Science & Research, Sri Amritsar, for prosthetic rehabilitation following resection of the left mandible. History dates back to one and half years when patient had pain in the left side of the mandible due to carious teeth. Patient got medicine but did not get relief. The lesion eventually degraded and was later diagnosed as ameloblastoma. Mandibular resection surgery was carried out then, and the left side of mandible beyond left lateral incisor region was resected.

Clinical examination and treatment plan

The mandibular defect reported in this clinical report is Cantor and Curtis Class IV defect, wherein resection of left lateral portion of mandible was carried out. TMJ examination revealed severe deviation of the mandible towards the resected site (fig.1). Intraoral examination revealed multiple
missing teeth. After resection, teeth present were 11, 12, 13, 14, 15, 21, 22, 23, 24, 25, 46 and 47. Panoramic radiograph revealed mandibular continuity defect on the left side beyond left lateral incisor region.

Based on the clinical situation, a removable partial denture with a palatal guiding flange was planned. It was noted that the patient’s mandible could be manually guided to the right side. Primary impressions were made with irreversible hydrocolloid. Impressions were poured with type III dental stone. Special trays were constructed on the primary casts. Border moulding was done in maxilla and the mandible using low fusing compound. Dual impressions were made for both maxilla and mandible (fig.2). Impressions were poured with type III dental stone. Acrylic base plates were made on the master casts and occlusion rims were constructed. Both occlusal rims were inserted in patient’s mouth and jaw relations were recorded.

The mandible was manually guided towards the right side and patient was asked to close the mouth. Indentations of maxillary teeth were recorded on the mandibular occlusal rim and vice versa. Then mounting was done on the articulator. Teeth arrangement was done into centric occlusion. Final trial was done by guiding the mandible into centric occlusion (fig.3). After trial, the guiding flange was established using modeling wax palatal to the maxillary right teeth on the acrylic base plate (fig.4). This guiding flange should be of sufficient length and height so that on closure of articulator, its buccal surface touches the lingual surfaces of mandibular natural and acrylic teeth. Clasps were adapted on the maxillary and mandibular casts and wax-up was completed. The wax up was replaced with heat-polymerized acrylic resin following conventional laboratory procedures, finished and polished (fig.5). The removable partial dentures were evaluated intraorally and adjusted (fig.6). It was noted that the patient was able to achieve a functional intercuspal position immediately after insertion of the prosthesis (fig.7).

Discussion

Mandibular guidance prosthesis can be helpful in minimizing the unavoidable sequelae resulting from extensive mandibular resection, some of which are muscular contraction, mutilation of occlusal plane, scar contracture, etc. The success of mandibular guidance therapy depends on early intervention, nature of the surgical defect and patient’s cooperation. Mandibular guidance therapy begins when the immediate postsurgical sequelae have subsided, usually within 2 to 3 weeks after surgery. This sort of therapy is most successful in patients whose resection involves only bone structures and minimally the tongue, the floor of the mouth and contiguous soft tissues. The mandibular guidance prosthesis consists of a removable partial denture framework, with a flange extending medially and inferiorly on the palatal aspect of the bicuspid and molars on the nondefect side. The flange provided on the maxillary denture serves as a training device for returning the mandible to a functional position. Patients adjust well to these appliances. Through determination and practice, they learn adequate control of mandibular movements. Mastication generally is possible after a short period of accommodation. The presence of the teeth in both the arches is important for the effective guidance and the reprogramming of the mandibular movements. If guidance therapy is successful and the patient is able to achieve the intercuspal position, efficient mastication may still not be possible for patients with compromised tongue mobility and control. In most patients, reestablishment of reasonable masticatory efficiency is dependent upon good tongue mobility.

Various methods advocated to reduce or eliminate mandibular deviation include mandibular guidance therapy, intermaxillary fixation, resection guidance restorations, splinting, and fabrication of prosthesis similar to ‘swing lock’ removable partial dentures. For best results, these methods and restorations should be combined with a well-organized mandibular exercise regimen.

Conclusion

Mandibular guidance therapy is most successful in patients whose resection involve only bony structures with minimal loss of soft tissue and no radical neck dissection or radiation therapy. The patients who are treated for ameloblastoma are ideal candidates for the use of a mandibular guidance therapy. For better results, the prosthetic management should be combined with an exercise program.

References


MANAGEMENT OF FLABBY RIDGES A CASE REPORT

ABSTRACT-
The presence of fibrous or flabby alveolar ridges often present a difficulty when making complete denture. Unless managed appropriately such ‘flabby ridges’ adversely affect the support, retention and stability of complete denture. From a clinical perspective, construction of a retentive maxillary denture for patient with flabby maxillary ridge can be extremely challenging. Flabby tissues are easily distorted by routine impression procedure resulting in unstable base. Surgical reduction of fibrous tissue, bone grafting or placement of dental implants are the main treatment options available but they too are not without risk. This case report describes one such clinical scenario and describes an impression technique for flabby ridges with addition silicone impression material routinely available in dental practice.

Key words: Flabby ridges, Fibrous tissue.

INTRODUCTION
Good impressions are basic requirements for construction of a good denture. No matter how good the prosthesis is constructed it will not function as intended if it was not made on an accurate impression. So master impression for a complete denture should record the entire functional denture bearing area to ensure maximum support, retention and stability for denture during use. However, presence of displacable denture bearing tissues or flabby tissue presents a particular difficulty and may give rise to complaints of pain or looseness relating to complete denture that rests on them.\(^1\)

Flibrous or flabby ridge is a superficial area of mobile soft tissue affecting the maxillary or mandibular alveolar ridges.\(^1\) It develops as a result of replacement of alveolar bone by hyperplastic soft tissue and is a common finding, particularly in upper anterior region or overlying an atrophic knife edge mandibular ridges. Studies indicate an overall 24% prevalence of flabby ridges in edentulous maxilla and 5% in edentulous mandible.\(^3\)

A particular problem is encountered if a flabby ridge is present with an otherwise normal denture bearing area. If the flabby tissue is compressed during impression making it will later tend to recoil and dislodge the resulting overlying denture. So clearly an impression technique is required which will compress the non flabby tissue to obtain optimum support and at same time, will not displace the flabby tissue.

A multitude of impression techniques have been described (Liddelow\(^4\), Osborne\(^5\), Watson\(^6\), Khan\(^7\), Lynch and Allen\(^8\)) in the past for overcoming the problem of flabby ridges. But they are not user friendly, difficult and often time consuming. Therefore it is important to have a simple and user friendly impression technique for flabby ridges.
Two uniform thickness of dental wax were placed as a spacer over the displaceable area and one thickness wax over the remaining non-displaceable area. The custom tray was fabricated using autopolymerising resin (fig.4). Tray was checked into the oral cavity and reduced 2-3mm from the periphery. After application of uniform adhesive, heavy bodied addition silicone (Zhermack) was applied to the border area and border moulding performed (fig.5).

Now spacer was removed and relief holes are made in the area of custom tray associated with flabby tissue. Heavy body impression material was placed to the area of custom tray associated with normal tissue to record this area. Once set the impression was removed (fig.6).

The area of custom tray associated with flabby tissue was then filled with light body silicone; wash of light body also applied on heavy bodied material that had compressed the normal tissues. Tray was placed into mouth and material allowed to set (fig.7).

Once set, impression was removed and inspected. Impression was then poured in dental stone and denture fabrication completed in usual manner.

DISCUSSION

Prevalence of edentulousness has decreased as a result of advances in dental technique and dental treatment options. A variety of treatment options such as surgical removal of fibrous tissue or implant was discussed with patient. It was clear that she was anxious to avoid surgical procedures. It was decided to provide her with a new denture, paying special attention to the impression technique. Primary impression of maxillary denture bearing area was made with irreversible hydrocolloid material (alginate; Dentsply, Ltd) to ensure minimal distortion (fig.2).

Impression was poured in dental stone. The displaceable area was identified on primary cast (fig.3).
philosophies. More patients retain some or all of their natural teeth. Sometimes, unusual arrangements of remaining natural teeth can lead to unfavourable distribution of occlusal forces on residual alveolar ridges, resulting in bone resorption and development of flabby tissues. Flabby tissues are a common finding, particularly in the upper anterior region or overlying an atrophic knife edge mandibular ridge.

When found in anterior portion of maxilla it is usually the result of anterior hyperocclusion, excessive forces in the anterior region result when a complete maxillary denture occludes against mandibular natural teeth. This combination causes trauma to the anterior maxillary ridges as all occlusal forces are directed on to this area and fibrous replacement of bony ridges occur.

Watson discussed this phenomenon in 1970 and described an impression technique for maxillary fibrous ridges; further discussion was reported by Kelly in 1972. He described changes caused by a mandibular removable partial denture opposing a maxillary complete denture. He suggested the term Combination Syndrome to describe the clinical situation.

Such flabby tissue could also arise as a result of unplanned or uncontrolled dental extraction. Excessive anterior forces can also result when porcelain anterior teeth are used in the same denture with acrylic resin posterior teeth. The lower wear resistance of acrylic resin teeth result in hyperocclusion of anterior porcelain teeth.

A particular problem is encountered if a flabby ridge is present with in an otherwise normal denture bearing area. Standard mucocompressive techniques are likely to result in an unretentive and unstable denture as the denture is constructed on a model of the flabby tissue in a distorted state. The treatment option available in such cases is surgical removal of flabby ridges, bone grafting or placement of dental implants but they too are not without risk.

Surgical debulking of flabby tissue is mainly a historical concept now a days. The rationale behind its use was that removal of flabby tissue would result in a normal compressible denture bearing area on which a mucocompressive impression technique could be used. Difficulties caused by this approach are as with any surgical treatment option, the health of the patient must be taken into consideration, removal is contraindicated in cases where little or no alveolar bone remains. Moreover retention is also affected by significant loss of sulcus depth which is important in border seal area and there is increase in weight and bulk of the prosthesis. It has been stated that while the flabby ridge may provide poor retention for a denture, it is better than no ridge as could occur following surgical excision of the flabby tissue.

Other surgical treatments such as bone grafting and dental implants again are not without risk. If there has been excessive bone resorption and replacement of flabby ridges then there will be little bone remaining into which implant can be placed. While it would be technically possible to augment the remaining ridge with bone graft, the prognosis of such treatment would be questionable. Moreover, it is a costly procedure. Furthermore, there are a group of patients who for a variety of clinical or medical reasons are unsuited for surgical procedures. Emphasis has moved towards conservative procedures which are based on sound prosthodontic principles. The commonly cited long term goal in prosthetics is conservation of what remains rather than meticulous replacement of what has been lost. Various impression techniques have been described for overcoming the problem of the flabby ridges. Liddelow in 1964 described a technique whereby two separate impression materials, plaster of paris over flabby tissues and zinc oxide eugenol over normal tissue are used in a custom tray. Osborne in 1964 suggest use of two separate impression trays. Watson in 1970 described window impression technique where a custom tray is made with window over the flabby tissue. Lynch and Allen in 2004 described a technique using impression compound and zinc oxide eugenol.

All these techniques are time consuming, complex and uses materials not commonly used in general dental practice. Present technique in this case report is

- simple
- easy to master
- consumes less chair side time and
- Uses additional silicone impression material routinely available in dental practice.

This technique is designed to capture the form of mobile fibrous tissue without distortion under light physiological load. Denture support is improved and the displacement that might result from the rebond of distorted tissue is reduced. Present technique is a ray of hope in patient with fibrous flabby tissue where surgical procedures such as bone grafting, dental implant and surgical debulking is contraindicated because of clinical and medical reasons. This technique can be readily completed by general dental practitioner, allowing flabby ridge complete denture cases to be managed in a primary dental care setting.

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HISTOLOGIC DIVERSITIES IN PLEOMORPHIC ADENOMA- AN AID OR A DIAGNOSTIC CHALLENGE: A CASE REPORT

ABSTRACT
Salivary gland tumours are a morphologically and clinically diverse group of neoplasm, which may present considerable diagnostic and management challenges to the pathologist or surgeon. Pleomorphic adenoma, or mixed tumour of the salivary glands, is a benign salivary gland tumour. The characteristic heterogeneity of the morphological patterns causes confusion and difficulty in its diagnosis microscopically particularly in small incisional biopsies as areas of pleomorphic adenoma may resemble or be identical to a range of other tumour types including polymorphous low grade adenocarcinoma, adenoid cystic carcinoma, basal cell adenoma and epithelial-myoepithelial carcinoma. In addition pleomorphic adenomas may contain areas, or show metaplastic changes which resemble other tumour types. Pattern matching using an atlas or even past experience can seem to be a worthwhile and rewarding exercise as many tumours have aesthetically pleasing patterns which, to the unwary, may appear to be characteristic or even diagnostic. The present case highlights the perplexity in diagnosing pleomorphic adenoma due to its varied morphological diversity in histopathological architecture.

Key Words: histological diversity, pleomorphic adenoma, salivary gland

INTRODUCTION
Salivary gland tumours are a morphologically and clinically diverse group of neoplasm, which may present considerable diagnostic and management challenges to the pathologist or surgeon. Tumours of minor salivary gland origin are uncommon, accounting for 23% of all malignant neoplasm of the upper aero digestive tract and less than 20% of all salivary gland tumours. Pleomorphic adenoma, or mixed tumour of the salivary glands, is a benign salivary gland tumour. Eighty-five percent of these tumours are found in the parotid gland and it is the most common intraoral minor salivary gland tumour. The palate is the most commonly affected site; other intraoral sites include the upper and lower lips, buccal mucosa, gingiva, and tongue.

The term Pleomorphic adenoma was first suggested by Willis and is an equally appropriate designation that avoids confusion with other tumors composed of more than one type of tissue (Mixed tumors). It is a mixed salivary gland tumor originating from ductal epithelium and myoepithelial cells. The fact that these tumours arise in organs located in an ontogenetic transitional zone, a region where endoderm and ectoderm meet, might be one of the reasons for the often-problematic histopathological classification.

The characteristic heterogeneity of the morphological patterns may also cause confusion and difficulty particularly in small incisional biopsies. Areas of pleomorphic adenoma may resemble or be identical to a range of other tumour types including polymorphous low grade adenocarcinoma, adenoid cystic carcinoma, basal cell adenoma and epithelial-myoepithelial carcinoma. In addition pleomorphic adenomas may contain areas, or show metaplastic changes which resemble other tumour types.

For the unwary pathologist these may lead to a misdiagnosis. Particular care is needed when examining incisional biopsies from the palate, which is a site at which any of these tumours could arise. The pathologist must...
consider the site and the clinical history, but in some cases the characteristic morphological diversity of the lesion may only become apparent when the lesion has been excised and examined in its entirety.¹

The present case highlights the perplexity in diagnosing pleomorphic adenoma due to its varied morphological diversity in histopathological architecture.

**CASE REPORT**

A 24 year old male patient presented with a painless swelling in the upper left palatal region of mouth. The swelling had persisted since 3 months and was gradual in onset. Intra oral examination revealed soft tissue swelling in the left posterior palatal region (Fig. 1). The overlying mucosa was pink in color and appeared stretched. The swelling was firm in consistency, slightly compressible and non tender with well defined regular margin.

Orthopantomograph (OPG) & occlusal radiograph revealed no bone involvement. A provisional diagnosis after clinical analysis was given as a minor salivary gland tumor. An excisional biopsy was performed and the lesion along with surrounding minor salivary gland was removed.

The histological section showed a partially encapsulated tumor mass with normal salivary gland outside the capsule. Lesional tissue showed glandular epithelial cells arranged in sheets, islands, strands (Fig 2) and duct pattern along with hyaline material (Fig 2 & 3). Eosinophilic mass was seen in the lumen of ductal arrangement which was more prominent on PAS stain (Fig 3). Few keratin pearls were also evident (Fig 4). Mesenchymal component showed an eosinophilic hyalinized stroma along with areas of myxoid components (Fig 5). Features were mimicking the histopathology of a number of salivary gland tumors but the varying morphological patterns in the biopsy specimen were inclined towards pleomorphic adenoma. Correlating with the clinical and radiographic findings a final diagnosis of pleomorphic adenoma was given. Follow up of the patient was uneventful.

**DISCUSSION**

Salivary tumours are a particular challenge to the diagnostic pathologist. A diagnosis based on haematoxylin and eosin stained sections remains the gold standard in salivary gland pathology, but some recent developments in immunocytochemistry have been helpful and have a number of specific applications.

Clinical findings in this case correlates with literature which dictates pleomorphic adenoma to be the most common minor salivary gland lesion representing 40% of intraoral tumors and about 50% of those on the palate.¹² Pleomorphic adenoma clinically exhibits slow growth of an irregular or a well circumscribed, sessile-based, firm mass that
The myoepithelial cells are arranged in thick collars and responsible for production of basophilic mucoid material which might accumulate to give a cartilaginous appearance along with vacuolar degeneration of the surrounding cells. Myoepithelial cells are evident in variable morphologies like polyhedral, stellate, plasmacytoid cells & spindle shaped cells. In the present case the polyhedral and spindle shaped modified myoepithelial cells were evident. Eosinophilic hyaline material can also be located between epithelial cells in form of foci or bands, which is believed to be basal lamina like produced by myoepithelial cells. The present case demonstrated abundance of eosinophilic coagulum.

The varying morphological patterns of pleomorphic adenoma masquerades its resemblance to other tumor types and this has been enumerated in Table 2. An accurate diagnosis is necessary as any diagnostic pitfall may result in an under or an over treatment protocol.

Salivary gland tumors are a relatively rare and morphologically diverse group of lesions. For many salivary tumors diagnosis is straightforward but the wide range of morphological diversity between and within tumor types poses a diagnostic challenge. The present article gives an insight into the varying patterns encountered in a pleomorphic adenoma of the palate.

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Pleomorphic adenoma shows a number of characteristic features (Table 1) that in most cases enable a diagnosis to be made. The epithelial component may assume ductal architecture; cell nests & solid sheets, along with squamous metaplasia and keratin pearl formation (20% cases). The ductal lumen frequently contained eosinophilic material which is PAS positive. These findings were consistent in the present case also. The other growth patterns as reported by Yih et al could be solid, papillary, cribriform or fascicular type.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Morphological diversity</td>
<td>Variable appearance of the epithelium with ductal structures, sheets and islands of cells</td>
</tr>
<tr>
<td>Stromal changes</td>
<td>The stroma is typically eosinophilic and hyalinized but also shows myxoid, mucoid or chondroid change</td>
</tr>
<tr>
<td>Bilayered ducts with clear outer cells</td>
<td>The outer cells are myoepithelial cells</td>
</tr>
<tr>
<td>Melting of myoepithelial cells from the ducts into the stroma</td>
<td>Single myoepithelial cells become engulfed in the stroma</td>
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<tr>
<td>Lobular pattern</td>
<td>The tumour has an irregular lobular margin resulting often in the appearance of pseudoinvasion of the capsule.</td>
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<tr>
<td>Plasmacytoid or hyalinized cells</td>
<td>Altered myoepithelial cells, reported to be characteristic of more solid palatal lesions</td>
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<th>Feature</th>
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<tr>
<td>Morphological diversity</td>
<td>Polymorphous adenocarcinoma</td>
</tr>
<tr>
<td>Bilayered ducts and cribriform pattern</td>
<td>Adenoid cystic carcinoma</td>
</tr>
<tr>
<td>Bilayered ducts with clear outer cells</td>
<td>Epithelial-myoepithelial carcinoma</td>
</tr>
<tr>
<td>Sheets of epithelioid or basaloid cells</td>
<td>Basal cell adenoma or adenocarcinoma</td>
</tr>
<tr>
<td>Myxoid stroma</td>
<td>Myxoma, neural tumours</td>
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<tr>
<td>Chondroid stroma</td>
<td>Chondrosarcoma</td>
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<td>Plasmacytoid cells</td>
<td>Plasmacytoma</td>
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<tr>
<td>Spindled myoepithelial cells</td>
<td>Sarcoma or soft tissue tumour</td>
</tr>
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<td>Squamous metaplasia</td>
<td>Squamous carcinoma</td>
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<td>Oncocytic metaplasia</td>
<td>Oncocytoma</td>
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Table 1: Characteristic features of pleomorphic adenoma

Table 2: Cellular features and metaplastic changes in pleomorphic adenoma

The varying morphological patterns of pleomorphic adenoma masquerades its resemblance to other tumor types and this has been enumerated in Table 2. An accurate diagnosis is necessary as any diagnostic pitfall may result in an under or an over treatment protocol.

Salivary gland tumors are a relatively rare and morphologically diverse group of lesions. For many salivary tumors diagnosis is straightforward but the wide range of morphological diversity between and within tumor types poses a diagnostic challenge. The present article gives an insight into the varying patterns encountered in a pleomorphic adenoma of the palate.
TREATMENT OF PYOGENIC GRANULOMA OF PREGNANCY- A CASE REPORT

Abstract

The clinical manifestation of plaque-induced gingival inflammation is modulated by the hormonal imbalances during pregnancy. The persistent influence of the plaque induces catarrhal inflammation of the gingiva that serves as a base for the development of gingival overgrowth, modulated by the cumulating hormonal stimuli. In non-controlled cases a development of pyogenic granuloma can be observed. During pregnancy the pyogenic granuloma when treated surgically by excision may reappear due to incomplete excision or non-adequate oral hygiene. This case report describes the successful treatment of a 25 year old female patient in fifth month of pregnancy with localized gingival enlargement in relation to mandibular anterior teeth. The treatment involved oral prophylaxis, gingivectomy and undisplaced flap.

Key words: pregnancy, gingivitis, gingival enlargement, pyogenic granuloma (pg), gingivectomy, undisplaced flap

Introduction:

Gingival enlargement may cause discomfort, interfere with speech or chewing, result in halitosis and it may look unsightly. Gingival enlargement, the currently accepted terminology for an increase in the size of the gingiva, is a common feature of gingival disease. Gingival enlargements can be caused by a wide variety of etiologies. They can be classified as:

I) Inflammatory enlargement:
   A. Acute
   B. Chronic

II) Drug-induced enlargement

III) Enlargements associated with systemic diseases or conditions:

A. Conditioned enlargement:
   1. Pregnancy
   2. Puberty
   3. Vitamin C deficiency
   4. Plasma cell gingivitis
   5. Nonspecific conditioned enlargement (pyogenic granuloma)

B. Systemic diseases causing gingival enlargement:
   1. Leukemia
   2. Granulomatous diseases

IV) Neoplastic enlargement (gingival tumors)

A. Benign tumors
B. Malignant tumors
V) False enlargement
Hormonal changes occurring during pregnancy have long been known to be associated with generalized gingival hyperplasia. Pregnancy does not cause the condition, but altered tissue metabolism in pregnancy accentuates the response to local irritants. During pregnancy, there is an increase in levels of both progesterone and estrogen, which, by the end of third trimester, reach levels 10 and 30 times the levels during menstrual cycle, respectively. These hormonal changes induce changes in vascular permeability, leading to gingival edema and an increased inflammatory response to dental plaque. The subgingival microbiota may also undergo changes, including an increase in Prevotella intermedia.

Case report:
A 25 year old female patient reported to the Department of Periodontology and Oral Implantology, National Dental College & Hospital, Dera Bassi, with marked enlargement of gums in relation to lower anterior teeth (Fig.1) which was associated with severe pain. Patient was having problem while having food as the enlarged gingiva interfered during chewing. There was history of spontaneous bleeding from gums for more than one month.

Patient was five months pregnant and revealed that her gums used to bleed on brushing since three months of pregnancy, but the gingival enlargement has appeared in last one month.

On examination the patient was physically healthy, adequately nourished and mentally sound adult. No relevant medical history of intake of drugs, nutritional deficiency or any underlying genetic disorder was recorded. There was no history of smoking or tobacco chewing. No extra-oral abnormalities were found. Pregnancy does not cause the condition, but chewing. There was history of spontaneous bleeding from gums for more than one month.

On examination the patient was physically healthy, adequately nourished and mentally sound adult. No relevant medical history of intake of drugs, nutritional deficiency or a family history indicating any underlying genetic disorder was recorded. There was no history of smoking or tobacco chewing. No extra-oral abnormalities were found.

Intra-oral examination revealed diffuse enlargement of gingiva encroaching between mandibular left central and lateral incisor; extending from facial to lingual side (Fig.2). Mild gingival enlargement was also seen in relation to other lower anterior teeth. The lower anterior teeth were almost completely covered with gingiva. The color of gingiva was normal. It was tender on palpation. Bleeding on even slight provocation was noticed. Oral hygiene was poor and associated with halitosis.

The routine hematological investigations which included Hb, TLC, DLC, platelet count, bleeding time, clotting time and fasting blood sugar were carried out and were found within normal limits. Patient was also tested for Hepatitis B and HIV at a certified laboratory and was found to be free from any disease.

Treatment: After assessing the complete medical and oral status of the patient, the following treatment plan was outlined:
Phase I Therapy which included:
• Oral hygiene instructions
• Thorough oral prophylaxis including scaling, root planing
and curettage (Fig.3)

Surgical therapy which included:

- Gingivectomy
- Undisplaced flap

Technique: Pockets were measured with a calibrated periodontal probe and bleeding points were produced on the outer surface of the gingiva for marking the bottom of the pocket. First of all, internal bevel incision was given at the level of the bleeding points. The incision was carried to a point little apical to the alveolar crest. The crevicular incision was made from the bottom of the pocket to the bone to detach the connective tissue from the bone. Then with the help of interdental knife, interdental incision was made and the triangular wedge of the tissue created by these incisions was removed. The area was thoroughly debrided, removed of all tissue tags and granulation tissue (Fig.4). After the necessary scaling and root planing, the flap was sutured at root-bone junction. With the help of interrupted figure of eight sutures, the flap was stabilized at its position. The area was covered with periodontal dressing for seven days. After 7 days pack was removed. The area healed quite well and without any complication (Fig.5).

The gingival tissue which was excised was sent for histopathological examination.

Histopathology: Microscopic examination (Fig.6) showed a highly vascular proliferation resembling granulation tissue. Numerous small and large blood vessels were seen which were engorged with red blood cells.

Discussion:

Pyogenic granuloma (PG) is a kind of inflammatory hyperplasia. The term “inflammatory hyperplasia” is used to describe a large range of nodular growths of the oral mucosa that histologically represent inflamed fibrous and granulation tissues. It includes fibrous inflammatory hyperplasia (clinical fibroma, epulis fissuratum and pulp polyp), palatal papillary hyperplasia, giant cell granuloma, pregnancy epulis and pyogenic granuloma. Pyogenic granuloma is a common tumor like growth of the oral cavity or skin that is considered to be non-neoplastic in nature. It is considered to be a reactive tumor like lesion which arises in response to various stimuli such as chronic low grade irritation, traumatic injury, hormonal factors or certain kinds of drugs. Although it was originally thought to be caused by pyogenic organisms, it is now believed to be unrelated to infection. So the term “pyogenic granuloma” is a misnomer because the lesion does not contain pus and is not strictly speaking a granuloma.

Pyogenic granuloma of the pregnancy develops in 5% of the pregnancies, hence the terms “pregnancy tumor” and “granuloma gravidarum” is often used. The hormonal imbalance incident with pregnancy heightens the organism’s response to irritation; however bacterial plaque and gingival inflammation are necessary for sub-clinical hormone alterations leading to gingivitis. The development of this particular type of gingivitis, typical in pregnancy, not different from that appearing in non-pregnant women suggests the existence of a relationship between the gingival lesion and hormonal condition observed in pregnancy. Sometimes pregnancy gingivitis can show tendency towards localized hyperplasia, which is called pregnancy granuloma. Generally, it appears between 2nd & 3rd month of pregnancy, with a tendency to bleed and interference with mastication.

Clinically, pyogenic granuloma is a smooth or lobulated exophytic lesion manifesting as small, red erythematous papules on a pedunculated or sometimes sessile base, which is usually hemorrhagic and compressible and may develop as dumb bell shaped masses. The size varies in diameter from a few millimeters to several centimeters. Young pyogenic granulomas are highly vascular in appearance because they are composed predominantly of hyperplastic granulation tissue in which capillaries are prominent. Minor trauma to the lesion may cause considerable bleeding due to its pronounced vascularity.

Differential diagnosis of pyogenic granuloma includes peripheral giant cell granuloma, peripheral ossifying fibroma, metastatic cancer, hemangioma, conventional granulation tissue, hyperplastic gingival inflammation, Kaposi’s sarcoma, bacillary angiomatosis, angiosarcoma and non Hodgkin’s lymphoma. Peripheral giant cell granuloma (PGCG) is an exophytic lesion that is seen exclusively in the gingiva and is clinically similar to PG but is often more bluish red compared to the bright red of a typical PG. Hemangioma is a development disorder but small lesions may be clinically indistinguishable from PG. Most oral hemangiomas are located on the tongue where they are multi-nodular and bluish red. Conventional granulation tissue resembles PG but it has different clinical behavior: PG shows rapid growth, multiple occurrences and frequent recurrence. Hyperplastic gingival inflammation should also be considered. The histopathologic differentiation of PG from hyperplastic gingival inflammation is sometimes impossible, and the pathologist must depend on the surgeon’s description of a distinct clinical mass to diagnose the granuloma. PG can be distinguishable from angiosarcoma by its lobular growth pattern well formed vessels and cytologically bland endothelial cells. Bacillary angiomatosis shows dense extracellular deposits of pale haematoxyphilic granular material representing masses of bacilli that stain positive with Warthin-Ostarry stain.
Conclusion:
The treatment of gingival enlargement depends on the clinical, radiographic and histopathologic assessment supported by hematologic and hormonal investigations. Surgical excision with maintenance of proper oral hygiene rarely leads to the recurrence of the condition. In the present case, the inflammatory enlargement of the gingiva w.r.t. lower anterior region was completely resolved with scaling, root planing, gingivectomy, undisplaced flap and proper oral hygiene measures. The 6 month follow up visit of the patient revealed clinically healthy gingiva along with adequate maintenance.

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SINGLE TOOTH IMPLANTS AS A TREATMENT OPTION FOR MISSING MAXILLARY ANTERIOR TEETH: A CASE REPORT

ABSTRACT

Before the invention of dental implants, fixed partial denture was considered as the best treatment, among the various replacement options available for missing teeth. Nevertheless, it involves sacrificing the adjacent healthy teeth. In the recent years, dental implants are fast replacing this conventional treatment modality. Successful esthetic results of dental implant placement in the esthetic zone require knowledge of various concepts and techniques. This article presents two case reports involving the replacement of missing maxillary anterior teeth.

Keywords: single tooth implants, missing maxillary anterior, division A bone, osteoplasty.

Introduction

The introduction of osseointegration and replacement of lost teeth by implants have revolutionized oral rehabilitation while significantly advancing restorative dentistry. Implant supported restorations in edentulous or partially edentulous patients have been shown to be highly predictable in numerous studies.1 Nearly all patients have an emotional response regarding maxillary anterior missing tooth. Various treatment options are available for the replacement of missing maxillary anterior single tooth, which includes traditional fixed partial denture (i.e. FPD), cantilever fixed partial denture, removable partial denture (RPD), acid-etched resin bonded FPD and implant-supported crown. However, when anterior, normal looking teeth must be prepared to serve as FPD abutments, the patient is more anxious and often looks for an alternative.2

When possible, the independent implant and crown is the treatment of choice. This paper describes the use of single-tooth implant as a replacement for missing teeth in anterior maxilla in two different cases.

Case Report

Case 1: A 21 year old male patient presented with a chief complaint of a missing tooth in the upper left anterior region (21) (fig 1 A). Past history revealed that the tooth got fractured due to accident 1 year back and subsequently the root portion of the tooth was extracted. There was no history of any systemic illness which could compromise the treatment plan. On extra oral examination, no abnormalities were observed. Intra oral examination showed that the oral cavity was in good condition. Soft tissues were normal and other hard tissues were sound. Patient was wearing an interim prosthesis (RPD). The neighboring teeth were caries-
free without any signs of periodontal problems. Treatment alternatives were discussed with the patient and implant-supported restoration was selected by patient. The pre-implant diagnosis and bone mapping indicated the possibility for an implant with a diameter of 3.75 mm and length of 13 mm. A tapered self threaded (EZ-internal hex) implant was chosen. But during the first stage of surgery, the bone was found to be slightly thin at the crest (division B). Osteoplasty was performed to increase the width of ridge at the crest, thereby modifying it to division A ridge. The selected implant was placed and the next day the patient was reviewed for any post surgical complications and instructed to maintain oral hygiene.

Since the crestal cortical bone was removed during implant placement, Phase II surgery was performed after 6 months considering the D3 bone density of the site. The implant was uncovered and healing abutment was placed. Healing was found to be satisfactory with normal soft tissue contour. After two weeks of the stage II surgery, patient was recalled for the prosthetic procedure. On removal of the healing abutment, gingival thickness was found to be of 3 mm (fig 1 B). With a special tray, implant level impression was made using additional silicone (polyvinyl siloxane) impression material. For this procedure, a transfer coping was inserted into the implant body and closed tray impression technique was followed. After making the impression, the permucosal healing abutment was reinserted into the implant body until the next restorative appointment. Later, the transfer coping was removed, connected to implant body analog, and reinserted into the impression. A master cast was poured. The master cast was mounted in centric occlusion. The implant abutment was modified for height and secured in mouth (fig 1 C). A full-contour wax-up and cut-down of 2 mm in the regions of porcelain was made on implant abutment. After satisfactory metal try-in, prosthesis was completed. The prosthesis looked more like FP-2 prosthesis because bone was removed at the crest at the time of surgery (fig 1 D). In the following appointment, the soft tissues were healthy, the patient’s home care was found satisfactory, and thus the restoration was cemented. The patient was recalled after a month for maintenance appointment. The soft tissue and hard tissue surrounding the implant revealed stable peri-implant condition. Further he was recalled every 3 to 4 months for oral hygiene examination.

**Case 2:** A 46 year old male patient presented with the chief complaint of missing teeth in the upper right anterior region. Past history revealed that the patient got his teeth removed 2 years back due to trauma and was wearing a removable prosthesis, but was not satisfied with it. His medical history did not reveal any previous illness. On extra oral examination, no abnormalities were observed. Intra oral examination showed that his oral cavity was in good condition. Soft tissues were normal and other hard tissues were sound. As per his chief complaint, 11 and 12 were missing [fig 2 A]. The
neighboring teeth were caries-free without any signs of periodontal problems. The bone in the edentulous region was found to be of division A type. Tapered self threaded (EZ-internal hex) implant of 4.20 mm diameter and 13 mm height was selected and placed. The rest of the procedure was performed as in case 1 except that there was no need of osteoplasty as there was abundant bone in the edentulous site for placement of division A type implants and stage II surgery was performed after four and a half months (Fig 2 B-D).

Discussion

Implant dentistry has become successful because of the biological properties of titanium. Studies have advocated a 2-stage surgical protocol for load-free and submerged healing to ensure predictable osseointegration. It has been advocated that after implant placement, surgical site should be undisturbed for a period of 3-6 months, depending on the bone quality, to allow uneventful wound healing, thereby enhancing osseointegration between the implant and bone. The rationale behind this approach is that implant micromovement caused by functional force around the bone-implant interface during wound healing may induce fibrous tissue formation rather than bone contact, leading to clinical failure. In addition, primary closure of the implant after stage I surgery has also been thought to prevent infection and epithelial downgrowth. Branemark theorizes that the implant must be protected and completely out of function, as he envisions a healing phase up to 12 months in which new bone is formed close to the immobile, resting implant; remodeling phase of 3 to 18 months when the implant is exposed to masticatory forces; and a steady state after 18 months, in which there is a balance between the forces acting on the implant and remodeling capacities of the anchoring bone.

Management of an anterior missing tooth can pose a challenge to practitioners. The alternative treatment options for the restoration of a single, maxillary anterior missing tooth include a fixed partial denture, a removable partial prosthesis, and acid-etched resin-retained prosthesis or an implant supported prosthesis. For many years, conventional fixed bridgework was considered the best treatment option for the replacement of a missing single tooth. The survival of this type of restorations was estimated to be about 75% after 15 years. Although this estimate is considered to be a fair result, the high investment in terms of both biological and economical costs requires less demanding alternative treatment. The most commonly observed contraindication for traditional fixed prosthesis is the patient's desire. Patients are more concerned regarding the appearance of anterior teeth and wish to keep adjacent teeth intact. A second option is to restore the anterior edentulous site with a removable partial prosthesis. A common axiom in restorative dentistry is to use a fixed prosthesis whenever possible. The usual indication for removable option is the low cost. A third option to replace the single maxillary anterior tooth is resin-bonded prosthesis. Research groups in several centres have demonstrated that the resin-bonded bridge may function for years. Nevertheless, adequate case selection is difficult and failures in performance have diminished credibility amongst dentists, despite the conservative nature of the technique.

In clinical situations where adjacent teeth are healthy, with acceptable esthetics and contour or in the presence of diastema that the patient wishes to maintain, or when the patient refuses the preparation of adjacent teeth for the fabrication of three unit fixed partial restoration, a single tooth implant is the best solution. Studies have shown that single-tooth implant restorations are a valid and lasting treatment alternative to conventional prosthetic treatment. Jemt et al reported one failure out of 70 single-tooth implants inserted with 98.5% survival rate at 3 year. Schimitt and Zarb reported no failures for 40 implants placed in 32 patients. Implant retained single-tooth replacements do save adjacent teeth from treatment, but the operative procedure is extensive. Predictable results have been reported when clinicians adhere to the recommended protocol for placement and reconstruction.

Conclusion

The primary reason to suggest or perform a treatment is often not related to the cost, time, or difficulty to perform the procedure, but lays in the best possible long-term solution for each individual patient. The single tooth implant is indicated to improve the daily hygiene and decrease caries and endodontic risks to adjacent teeth.

References


"ESSENTIALS OF ENDODONTICS"
by Dr. Vimal K Sikri published by quintessence publishers (India).

Endodontics is fundamental to the modern clinical practice of dentistry. As evidenced by this timely, authoritative book titled 'Essentials of Endodontics', by Quintessence Publishers (India), the subject of endodontics has, over the years, grown and expanded to become a multifaceted branch of the art and science of dentistry.

As in all branches of dentistry, successful clinical outcomes are highly dependent on the knowledge, understanding, skill and meticulous attention to detail by the clinician. This book, through the careful structuring and presentation by Dr. Vimal K Sikri, an eminent endodontist, Principal, Professor and Head, Department of Conservative Dentistry & Endodontics, Punjab Government Dental College & Hospital, Amritsar and many eminent contributors, provides an opportunity to develop a sound understanding and knowledge of contemporary endodontics. This is the sixth text book by the author.

Given the appropriate application of this knowledge and understanding, those who read and otherwise consult this "treasurehouse" of information should be able to look forward to practicing highly effective and professionally rewarding endodontics.

Dr. Sikri along with contributors and the publishers are to be congratulated on the way in which they have lucidly presented a considerable mass of important information in respect of modern endodontics in an easy to read, user friendly and extensively illustrated text. The book incorporates all the recent advancements in the subject of Endodontics. The chapter on 'Resinifying Therapy' is first time added in any Endodontic book. The book covers the syllabi as prescribed by Dental Council of India.

Dr. Sikri fulfills his mission in sharing his expert knowledge and understanding, enthusiasm and quest for excellence in "principle-based" endodontics.

This book is highly recommended to both students and practitioners wishing to provide their patients with high quality, state of the art endodontics. Endodontics as presented in this book will enhance clinical success in the management of diseased and damaged teeth with a compromised, let alone non-vital pulpo-dentinal complex.
DENTAL DILEMMA-3

Dr. Ramandeep S Narang *
Dr. Adesh S Manchanda **

* Associate Professor, Department. of Oral Pathology & Microbiology, SGRD Institute of Dental Sciences and Research, Sri Amritsar.

** Senior Lecturer, Department. of Oral Pathology & Microbiology, SGRD Institute of Dental Sciences and Research, Sri Amritsar.

QUESTION:
A 45 year old female had a complaint of reduced mouth opening, dry mouth and hoarseness of voice. Physical examination revealed shortened Claw like fingers, mask like face with skin having a diffuse hard texture (Figure 1). Intraoral examination revealed microstomia, xerostomia, board like tongue and loss of attached gingival. IOPA X ray showed diffuse widening of periodontal ligament space. (Figure 2). Identify the condition?

Answer to DENTAL DILEMMA-2: Apert Syndrome
Dr. Sardarjit Singh Dr. Bhatia 

Email: jpsbhatia@hotmail.com
visit us at: www.addictionandyou.com