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Editorial

The Editor of the " UPDATES IN DENTISTRY" had the audacity to publish my views from dentistry. As I write this column, we are living under the shadow of the corona-virus pandemic. The morbidity and mortality statistics are truly frightening at this point and are supposed to get much worse. Amidst this pandemic, this journal continues its normal publication schedule, thanks to the production team they are doing right now in the face of this global crisis.

With the concern of infection control in health care settings, personal protective equipments (PPE) have been given to many individuals. American Dental Association advised all the dental practices to cease non-emergent in-person care to reduce the infection rate and started to rebuild stockpiles of PPE for health care providers.

Many people today enjoy excellent oral health and are keeping their natural teeth throughout their lives. But for some, caries are still the most prevalent chronic disease of childhood. Too many people mistakenly believe that they need to see a dentist only if they are in pain or something is wrong.

Dentistry promotes continuity of care that is comprehensive, convenient, cost effective and efficient. Their responsibilities include diagnosing of oral diseases and promoting oral health and its prevention. Even the routine procedures such as tooth extractions, preparing and placing fillings, carry potential risks of complications such as infection, temporary or even permanent nerve damage, prolonged bleeding, pain etc. Dentists can spot early warning signs in t he mouth that may indicate disease elsewhere in the body. Regular dental visits and care will help maintain and improve optimal health throughout their lifetimes.

With people around the world wondering what the future will hold after this pandemic, I remain confident that our profession will not only survive but thrive. My confidence is even deeper, with a passion for symmetry, perfection and beauty to unlock each patient's epitome of a perfect smile.

Going forward with the most rewarding thing, the patient's happiness and satisfaction and the stability of the results.

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Contents

Orignal Artical

IMPACT OF DENTAL NEGLECT SCALE ON ORAL HEALTH STATUS AMONG DIFFERENT PROFESSIONALS IN SRI GANGANAGAR -A CROSS SECTIONAL STUDY

Dr. Parul Mangal, Dr. Simarpreet Singh , Dr. Manu Batra, Dr. Deeksha Gijwani, Dr. Sakshi Shukla, Dr. Thounaojam Leimaton Chanu

ABSTRACT:

Aim: To evaluate the impact of dental neglect scale on oral health status among different professionals in Sri Ganganagar. Dental neglect (DN) has been defined as behavior and attitudes which are likely to have detrimental consequences for the individual's oral health, or more specifically as failure to take precautions to maintain oral health, failure to obtain needed dental care, and physical neglect of the oral cavity.Material and Methods: The present cross sectional study consisted of a convenient sample of 238 students aged 18-25 years of Surendera Group of Institutions Sri Ganganagar. Dental Neglect Scale score by using a pretested as well as validated Dental Neglect Scale questionnaire and examination of oral hygiene status, dental caries and periodontal health by using OHIS13, DMFT and CPITN. Results: It was found thatdental health care among students of different professional courses where lowest OHIS (1.34±.48), CPITN (1.10±.72) and DMFT (3.66±4.61) score was observed in dental students whereas it was worst in engineering students. DNS score was found highest (16.50±2.52) in engineering students and it was least (12.44±2.33) in dental students. Conclusion: The Dental Neglect Scale appears to be a sound method for objectifying dental neglect. It has many of the features of a satisfactory health index; it is easily measured, apparently unaffected by the observation process, and able to be manipulated statistically.

Keywords: Dental care, DMFT index, oral hygiene index, Dental neglect

INTRODUCTION: Dental neglect (DN) has been defined as behavior and attitudes which are likely to have detrimental consequences for the individual's oral health, or more specifically as failure to take precautions to maintain oral health, failure to obtain needed dental care, and physical neglect of the oral cavity.1 The notion that DN may explain differences in caries experience among various groups in society has a rich anecdotal tradition among dental practitioners, and with more rigorous scrutiny, the concept of DN may offer a viable linkage between dental health and cultural, social and attitudinal factors which have hitherto received attention.2

In other words Dental Neglect is the failure to fulfill the known knowledge of oral health care for proper maintenance of oral cavity.3 Dental neglect, manifested in behaviors and/or attitudes related to the undervaluing of oral health, has been found to be a predictor of poor oral health in children and adults, measured by indices of caries, toothache, and number of teeth lost, among others.4Young educated Indian generation are very much health conscious. They take adequate nutritious balanced diet and practice physical exercise regularly to keep themselves active and healthy. Oral health is a part of general health care system. If oral health is neglected it may affect our general health and as a result it affects our quality of life too.5

Prevention is the better option than cure. People need to be very much attentive and meticulous to maintain oral health for the prevention of oral disease. Dental professionals and audio visual media provide the necessary dental care measure.6 But, the truth is that a very few people take adequate regular home dental care and do not take periodic/yearly dental check up by dental professionals to keep their oral cavity healthy.5The dental treatment is still a night mare for most of the people. Dental neglect have tight bond with dental caries. Dental caries has been called as scourge of modern civilization and is without doubt, one of the mankind’s most prevalent chronic diseases. The concept of dental neglect may offer a viable linkage between dental health and the cultural, social and attitudinal factors.7

Dental neglect is willful failure of parent or guardian to seek and follow through with treatment necessary to ensure a level of oral health essential for adequate function and freedom from pain and infection.8 The Dental Neglect Scale (DNS) assesses the extent to which an individual cares for his/her teeth, receives professional dental care, and believes oral health to be important. Dental neglect has been found to be related to poor oral health, a tendency not to have had routine

check-ups, and a longer period of time since the last dental appointment in samples of children and adults. The Dental neglect scale (DNS) has been found to be a valid measure of dental neglect in samples of children and adults, and may be valid for adolescents as well.

It has been observed that dental neglect is associated with illiteracy amongst low socio economic class and the prevalence of oral diseases are highest amongst them.9 But on the contrary the professionals who will hold a respectable position in our country in distant future, whether they are practising healthy oral health care practices or not has to be assessed.5

Oral health is now recognized as equally important in relation to general health. Various factors like nutritional status, tobacco smoking, alcohol, hygiene, stress, etc. are linked to a wide range of oral diseases forming the fundamental basis of the common risk factor approach (WHO, 2000) to prevent the oral diseases.10 Among these, oral hygiene is the most significant factor in terms of prevention of oral diseases.11

The aim of the study was to assess dental negligence and oral health status by using Dental neglect Scale, oral hygiene questionnaire and OHI-S, DMFT, CPITN among different professionals of Sri Ganganagar city.In the present study, DNS was administered to a sample of adolescents and the relationships between the DNS and oral health status, whether or not the adolescent has been to the dentist recently for routine check-ups, and whether or not the adolescent currently goes to a dentist was studied. The internal and test-retest reliabilities of the DNS in the sample was also reported along with the results of an exploratory factor analysis.

MATERIALS AND METHODS: The present cross sectional study consisted of a convenient sample of 238 students aged 18-25 years of Surendera Group of Institutions Sri Ganganagar. The participants were taken into consideration were Dental (106), Engineering (62), Nursing (70). These participants were selected as they all were in same college campus and were residing in the adjacent hostels and sharing the food from common canteen and mess.

The study was conducted in two parts: First part consisted of collection of Dental Neglect Scale score by using a pretested as well as validated Dental Neglect Scale questionnaire,12 Proforma contain a comprehensive questionnaire in which dental neglect was investigated by capturing parental responses to six statements, using a 5 point Likert scale ranged from one (“definitely no”) to five (“definitely yes”). The total scores for the DNS ranged from 6 to 30, with higher scores signifying greater dental neglect. The statements were: ‘‘I, keep up my home dental care’’, ‘‘I receive the dental care I should’’, ‘‘I need dental care, but I put it off’’, ‘‘I brush as well as I should’’, ‘‘I control snacking between meals as well as I should’’, and ‘‘I consider my dental health to be important’’.

Second part consisted of self administrated oral hygiene questionnaire and examination of oral hygiene status, dental caries and periodontal health by using OHIS13, DMFT and CPITN14 Index respectively. Purpose of study was clearly explained to student of different profession of institute. Students who were willing for participation were included and undergoing treatment of ortho treatment were excluded. The obtained data were statistically analyzed using SPSS (V20.0) and level of significance was set at <0.05.

RESULTS:- A total of 238 students from different professions were recruited for the study. Table 1 showed the spectrum of students recruited for the study in which maximum were dental students (44.5%) followed by nursing (29.4%) and engineering students (26.1%).

Table 2 showed the item responses of Dental neglect scale by participants where maximum mean±SD responses were among “I keep up my home dental care” (3.53±1.00), “I consider my dental health to be important” (3.46±1.12) and “I brush as well as I should” (3.42±1.00).

Table 3 showed the item responses of dental neglect scale according to different professional students where maximum mean±SD response from dental students i.e “I consider my dental health to be important”(4.51±.56) to compare with engineering

students(2.42±.50).

Table 4 showeddental health care among students of different professional courses where lowest OHIS (1.34±.48), CPITN (1.10±.72) and DMFT (3.66±4.61) score was observed in dental students whereas it was worst in engineering students. DNS score was found highest (16.50±2.52) in engineering students and it was least (12.44±2.33) in dental students.

Table 5 showed response of the participants on oral hygiene questionnaire. Majority (65.1%) of the participants brushed once a day whereas only 31.5% of the students brushed twice daily . Around 20.2% use floss and 30.7% use mouthwash. 46.2% of the participants brushed about 2 min and 18.5% brushed more than 2 min. The habit of brushing after meals at a frequency of never, sometimes and always was 41.2% , 51.3% and 7.6% respectively. Nearly 52.5% of the students changed their toothbrushes once in 3 months. Almost 50.0% of the students had never visited a dentist in their lifetime, whereas 38.7% and 11.3% had visited a dentist one a year and more than once a year respectively. 54.2% of participants used regular rinse with plain water for controlling mouth odour.

DISCUSSION :-

The DNS can be considered to be a "behavioral audit" which encompass both attitudinal and behavioral aspects. Therefore, the inclusion of both aspects in the same scale is both purposeful and indicated, given the nature of the construct.15 The first four items seek information on respondent's self-care & professional dental care behaviour, while the fifth item seeks a global rating of the importance placed upon dentition.5 The present study tested a modification of previously reported six items dental neglect scale given by Thomson et al.3 and examined and impact of dental deglect scale on oral health status of different professional in Sriganganagar.DNS score was significantly related to the engineering students who had greater levels of mean dental neglect scores of 16.59±2.52 followed by nursing students (15.69±2.38). This finding was in agreement with the finding as reported by Prasad KVV et al (2005)16. Dental student had lower mean DNS score of 12.44±2.33. According to Silver DH et al. lack of awareness towards dental treatment is a major contributor in developing countries then that of people from developed countries.17 In the present study, the mean number of CPITN of engineering students was found to be higher(2.60±.66) than study done by Shardaet al(1.48±.61) in 2009.11

Dental caries experience was significantly higher in engineering students(10.90±6.45) than nursing students(8.31±5.34)followed by dental students(3.66±4.61). this finding was not in agreement with Sarkar P et al (2015)5. Nursing students which are professionally very close to both medical and dental professionals and expected to acquire the skills of preventive aspect of the disease. In this study, their oral hygiene score was high compared to the engineering students which are similar to the results of Singh et al.18 However, there was no significant DNS score differences related to gender in the present study which was in agreement with the study done in United States and Hong Kong populations respectively.19 whereas this finding was in contrast to the study done in Dunedin population.15

Student community all together play a vital role in bringing about a behavioral change in the society.20 With this in view, the present study was also concluded oralhygiene-related practices and knowledge. Among these students, 65.1% brushed once a day which was in consonance with the study by Kumar MP20 (66%) in 2016 and Bandyopadhyay A et al21 (63.5%) in 2017. A higher percentage (67%) of students brushed twice daily in studies done by Kakkad et al22 and Peltzer and Pengpid23 in comparison to our study (31.5%) and this is similar to Bandyopadhyay A et al (25.4%).21 This may be attributed to the lack of oral health knowledge or negligence due to busy study schedule.The majority of the participants are residing in the campus hostel so it might have to some extent provide a sense of freedom and autonomy and thus change their attitudes towards negative aspect of dental health and oral hygiene habits. The findings of Lissau et al. were in accordance to our study.24

CONCLUSION:

The Dental Neglect Scale appears to be a sound method for objectifying dental neglect. It has many of the features of a

satisfactory health index; it is easily measured, apparently unaffected by the observation process, and able to be manipulated statistically. The Dental Neglect Scale appears to be a sound method for objectifying dental neglect.It has already been proved that education level and socioeconomic status is a major contributor towards oral health of an individual, but person with lower dental neglect score in spite of being well educated or affluent are not demonstrating a regular dental visiting pattern. Oral health education programs for various professionals are required to increase knowledge, understanding and practices that foster improved oral health. It has many of the features of a satisfactory health index; it is easily measured, apparently unaffected by the observation process, and able to be manipulated statistically.

Table1:- Distribution of students enrolled in the study

STREAM	GENDER N(%)		TOTAL N(%)
	MALE	FEMALE	
DENTISTRY	31(13.0%)	75(31.5%)	106(44.5%)
NURSING	24(10.1%)	46(19.3%)	70(29.4%)
ENGINEERING	46(19.3%)	16(6.7%)	62(26.1%)
TOTAL	101(42.4%)	137(57.6%)	238(100.0%)

Table 2: Frequency distributions of dental neglect scale item responses

DNS scale	1 **definitely No** N(%)	2 **No** N(%)	3 **Neither No Nor Yes** N(%)	4 **Yes** N(%)	5 **definitely yes** N(%)	mean±SD
1 : I keep up my home dental care	6 (2.5)	28 (11.8)	78 (32.8)	83 (34.9)	43 (18.1)	3.54±1.00
2: I receive the dental care I should	12(5)	30(12.6)	99(41.6)	64(26.9)	33(13.9)	3.32±1.03
3: I need dental care, but I put it off	23(9.7)	143(60.1)	45(18.9)	23(9.7)	4(1.7)	2.34±.84
4: I brush as well as I should	0	52(21.8)	72(30.3)	76(31.9)	38(16.0)	3.42±1.00
5:I control snacking between meals as well as I should	44(18.5)	64(26.9)	62(26.1)	47(19.7)	21(8.8)	2.74±1.22
6: I consider my dental health to be important	0	59(24.8)	72(30.3)	46(19.3)	61(25.6)	3.46±1.12

Table 3:- Item responses of dental neglect scale according to different professional students

STREAM	I keep up my home dental care (mean±SD)	I receive the dental care I should (Mean±SD)	I need dental care, but I put it off (Mean±SD)	I brush as well as I should (Mean±SD)	I control snacking between meals as well as I should (mean±SD)	I consider my dental health to be important (Mean±SD)
DENTISTRY	4.05±.82	4.10±.79	2.03±.77	4.21±.73	3.55±.96	4.51±.56
NURSING	3.66±.79	2.94±.34	2.37±.64	2.79±.68	2.14±1.1	2.79±.72
ENGINEERING	2.55±.76	2.40±.93	2.82±.93	2.79±.72	2.02±.88	2.42±.50

Table 4: dental health care among students of different professional courses

STREAM	OHI-S (Mean±SD)	CPITN (Mean±SD)	DMFT (Mean±SD)	DNS (Mean±SD)
DENTISTRY	1.34±.48	1.10±.72	3.66±4.61	12.44±2.33
NURSING	2.29±.62	2.53±.65	8.31±5.34	15.69±2.38
ENGINEERING	2.61±.49	2.60±.66	10.90±6.45	16.50±2.52
p-value	<0.0001	<0.0001	<0.0001	<0.0001

Table 5:- Response of the participants on oral hygiene questionnaire

Questions	RESPONSES	Responses of participants N(%)
1. **How many times do you brush your teeth?**	Never	8 (3.4)
	once a day	155 (65.1)
	Twice/ More than twice a day	75 (31.5)
2. **What do you use to clean your teeth?**	Toothbrush and toothpaste	159 (66.8)
	Toothbrush, toothpaste and floss	48 (20.2)
	Other	31 (13.0)
3. **How often do you change your toothbrush?**	Once in a month	17 (7.1)
	Once in a three months	125 (52.5)
	more than 3 months	96 (40.3)
4. **How often do you go to dental clinic for checking your teeth?**	Never	119 (50.0)
	once a year	92 (38.7)
	More than once a year	27 (11.3)
5. **What is your consideration when choosing toothbrush?**	Brand	86 (36.1)
	Design	94 (39.5)
	Price	58 (24.4)
6. **How often do you get your teeth clean by dentist?**	Never	114 (47.9)
	Once a year	96 (40.3)
	more than once a year	28 (11.8)
7. **What is the technique you used while brushing your teeth?**	Vertical motion	79(33.2)
	Vertical and horizontal motion	79(33.2)
	Vertical, horizontal, round	80(33.6)
8. **How long do you take**	About one minute	84 (35.3)

to brush your teeth?	About two minute	110 (46.2)
	more than two minute	44 (18.5)
9. Do you normally brush your teeth after your meal?	Never	98 (41.2)
	Sometimes	112 (51.3)
	Always	18 (7.6)
10. How do you control your mouth odour?	Regular rinse with plain water	129 (54.2)
	Rinsing with salty water	36 (15.1)
	Using mouthwashes	73 (30.7)

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Review Article

FRENECTOMY – A RECAP.

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ABSTRACT

'Smile', a person's ability to express a range of emotions with the structure and movement of the teeth and lips, can often determine how well a person can function in society. Frequent complaint of patients seeking periodontal aesthetic consultation relates to midline diastema, frenal pull causing gingival recession and unaesthetic smile. Aberrant frenal attachment is one of the major etiologies for midline diastema. Thus, this comprehensive review focuses on anatomy, development, diagnosis, classification of frenum and various techniques of frenectomy.

INTRODUCTION

A frenum is a fold of mucous membrane enclosed with muscle fibers, which attaches the lips and cheeks to the alveolar mucosa or gingiva and underlying periosteum1. In an oral cavity several frena are present, but most notable are maxillary labial frenum, mandibular labial frenum and lingual frenum. The major function of frenum is to provide stability of the upper and lower lip and the tongue 2.

This frenum may jeopardize the gingival health in abnormal frenal attachment i.e. when they are attached too closely to the gingival margin, which can lead to frenal pull that may result in distension of gingival sulcus which in turn encourages plaque accumulation and increases the severity of periodontal pockets, it may bias the denture fit or retention, can cause recession, and also present aesthetic problems or negotiation of orthodontic results in the midline diastema cases, therefore causing a recurrence after the treatment3,4,5. The mandibular diastema is not a common growth characteristic as seen less frequently than maxillary diastema. The primary etiologic factor in mandibular diastema is tongue thrust in a low rest position6.

The frenum may be abnormal because it may be enlarged or hypertrophied or may be incidental presence of midline diastema of the teeth. It consists of mainly connective tissue and epithelium, with some nerve fibers like elastic and collagen fibers are found to be traversing the entire length of the frenum, originating in the periosteum, which covers the anterior maxillary alveolus. 7.

The maxillary labial frenum usually triangular in shape extends from maxillary midline area of gingiva into the vestibule and mid portion of upper lip. From the frontonasal process, superior labial frenum appears to be developed. It emerges as a part of the oral cavity, within first few months of fetal life, along with the lips and cheeks. A prominence begins to appear in the middle part of the inner zone of the upper lip, and this becomes the tuberculum, as growth and development progresses. Another prominence forms on anterior part of palate about this time and develops into palatine papilla. A continuous fold of tissue, the tectolabial frenum, connects tuberculum with the palatine papilla. Normally, the growing alveolar process causes a severance of the continuous fold of tissue, dividing it into a palatal and labial portion. The palatal part relates to the palatine papilla, and labial tissue becomes the superior labial frenum, extending from the lip to the crest of alveolar ridge 8.

Placek et al in 1974 has given epidemiology of the labial frenum. In a study by Nagaveni NB, Umashankara KV on 3000 Indian children found simple frenum as most prevalent type in all kind of dentition increased from 60% in the primary dentition to 78% in the permanent dentition. 9.

DIAGNOSIS

The abnormal frena are usually detected by applying tension over it to see the movement of papillary tip or blanch produced by ischemia in that region. 10

Midline diastema is diagnosed clinically by blanching test which could be due to high frenal attachment, pathological migration caused by periodontitis and tooth size discrepancy. Radiographically, IOPAR's and occlusal radiographs should be done to rule out mesiodens or other pathologies causing midline diastema. 11

CLASSIFICATION: By Placek et al in 197412.

1. Mucosal – when the frenal fibers are attached up to mucogingival junction.
2. Gingival – when fibers are inserted within the attached gingiva.

3. Papillary – when the fibers are extending into the interdental papilla.

4. Papilla penetrating – when the fibers cross the alveolar process and extend up to the palatine papilla.

By Sewerin in 197113.

1. Simple frenum
2. Persistent tectolabial frenum
3. Simple frenum with appendix
4. Simple with nodule
5. Double frenum
6. Frenum with nichum
7. Bifid frenum
8. Frenum with two or more variations at the same time.

Syndromes associated with Frenal attachment includes Ehlers-Danlos syndrome, Infantile hypertrophic pyloric stenosis, Holoprosencephaly, Ellis-van Creveld syndrome, Oro-facial digital syndrome, Pallister-hall syndrome, Opitz C syndrome, Turners syndrome 11.

MANAGEMENT

The aberrant frena can be treated by frenectomy or by frenotomy procedures. Frenectomy is the complete removal of the frenum, including its attachment to the underlying bone, and may be required for correction of an abnormal diastema between maxillary central incisors. Frenotomy is the relocation of the frenal attachment.

The various techniques used for frenectomy are:

1. CONVENTION/ CLASSICAL TECHNIQUE11: It was introduced by Archer (1961) and Kruger (1964). This approach is indicated in midline diastema cases with an aberrant frenum to ensure the removal of muscle fibers. Frenum is engaged with a haemostat to the depth of vestibule and incisions are placed on upper and lower surface of haemostat, and triangular frenum is removed followed by suture placement. It is simple, easy to perform and economical. But labial tissue scarring, post-operative pain, restricted lip movement and compromised esthetics are few disadvantages associated with this technique.

2. MILLERS TECHNIQUE11: Advocated by Miller PD in 1985. Under Local anaesthesia, a sharp dissection in an apical direction along maxillary alveolar process is given. A triangular shaped free gingival graft of an adjacent papilla approximately 1.25mm is taken and sutured in place to prepared bed using 5-0 sutures with the apex of the graft positioned coronally. Requires minimum of surgical intervention and it is esthetic, as transeptal fibres are not disrupted surgically, there is no loss of interdental papilla, healing takes place by primary intention so, postoperatively there is a continuous collagenous band of gingiva across the midline, which gives a bracing effect than the scar tissue, thus preventing an orthodontic relapse.

3. V – Y PLASTY11:The frenum is engaged with a haemostat and an incision is made in the form of V on the under-surface of the frenal attachment. The frenum is relocated at an apical position and the V shaped incision is converted into a Y, while it is sutured with 4-0 silk sutures. This helps in relocation of frenum to an apical position.

4. MODIFIED FRENECTOMY TECHNIQUE/ BILATERAL DISPLACED PEDICLE FLAP11: Given by Bagga et al in 2006. AV-shaped full thickness incision is placed at the gingival base of the frenal attachment with an external bevel and undermining of the labial mucosa is done. An oblique partial thickness incision is placed on the adjacent attached gingiva beginning 1 mm apical to the free gingival groove and extending beyond the mucogingival junction. Partial- thickness dissection from the medial margin is carried out in an apico-coronal direction to create a triangular pedicle of attached gingiva with its free end as the apex and its base continuous with the alveolar mucosa. A similar procedure is repeated on the contralateral side of the V-shaped defect, resulting in 2 triangular pedicles of attached gingiva. These two pedicles were sutured with each other at the medial side and laterally with the adjacent intact periosteum of the donor site by 4-0 silk sutures. It helps to gain in attached gingiva in the region previously covered by the frenum and excellent colour match, healing by primary intention; minimal scar formation and prevention of coronal reformation are achieved.

5. Z PLASTY11:Double rotation flaps which are at least 1 cm long are obtained. The resultant flaps which are created are mobilized and transposed through 90º to close the vertical incisions horizontally and sutures given. It requires technical skill.

6. FRENECTOMY USING ELECTROCAUTERY11:Done using loop electrode tip. It takes minimal time consumption, minimal procedural bleeding, but have burning Flesh odour, post-operative discomfort, and uncontrolled depth of penetration and also contraindicated in patients with pacemakers.

7. FRENECTOMY USING LASER11:The frenum is held with the hemostat and by using LASER tip; frenum is excised until the wound took a rhomboidal shape. The ablated tissue is continuously mopped using wet gauze piece. The attachment of frenum to the alveolar ridge is excised to prevent tension on gingiva. This has minimal bleeding, minimal pain, does not require sutures, minimal damage to deep tissue, good wound healing. But requires more precision & control, if beam touches the bone surface can cause necrosis and also costly.

8. PARALLEL TECHNIQUE14:Two paralleling incisions are placed on side of the ridge of the frenum. Incised frenum was removed by giving releasing incision on the top and bottom of the frenum. It helps to reduce the removal of excess mucosal tissue, decrease the chances of recurrence, primary closure is possible in this case throughout the length of frenum because of close approximation of margin produced by thin paralleling incision, there is less postoperative pain and speech discomfort, more conservative and precise – so create more functional and aesthetic results.

9. INCISION BELOW THE CLAMP TECHNIQUE15:Incision is performed beneath the haemostat, by placing haemostat on the innermost region of vestibule and positioned near and parallel to lips mucosal area and immediate suturing was performed. This technique aims to decrease bleeding from the open wound that commonly occurs in conventional technique. This method is simple and provides comfort to both the patient and operator.

10. FRENECTOMY WITH A FREE GINGIVAL AUTOGRAFT12:Frenum is excised and recipient bed has been prepared to accommodate the gingival auto graft. With the connective tissue side against the recipient bed, the free gingival graft is placed.

CONCLUSION

Frenum is one of the most interesting yet often misunderstood anatomic structures in the oral cavity and may not regularly draw close scrutiny on routine dental examination. However, the presence of any abnormal frenal attachments can be corrected with a wide variety of surgical techniques thereby creating a balanced esthetic and functional outcome.

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Review Article

RECENT TRENDS IN ORTHODONTICS

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ABSTRACT

Dental caries, periodontal disease, malocclusion and dentofacial anomalies are the major global oral health problems. Twenty first century has brought revolutionary changes in quality of human life in many ways, including oral health care. The changing life style, food habits and increasing number of elderly patients have become more challenging for oral health care providers. The future of dentistry depends on its ability to incorporate new, better diagnostic and treatment modalities into clinical practice, to ensure a sufficient supply of well-trained manpower, to fulfill the consumer demands, to maintain a strong research focus and to provide quality health care to those who do not have easy access to dental care. The developments in the field of dentistry occurred in unison with other fields like material sciences, Bio-technology, Imaging technology and stem cell biology etc. Newer technologies and materials are coming up every day which has helped in newer strategies for diagnosis, prevention and quality treatment outcome.

Key words: 3D imaging, Dental implantology Stem cell biology, tissue regeneration, tissue bioengineering.

INTRODUCTION:

Dental caries and periodontal disease have historically been considered the most important global oral health problems. Malocclusion and dentofacial anomalies form the 2nd largest burden of oral health related needs after dental caries among children. The treatment of these oral diseases requires restoration and rehabilitation of mutilated dentition.

Origin of dentistry dates as back far as about 7000 B.C1. Since those ancient times the quest for ideal dental material and treatment procedure have began. Queen Elizabeth I (1533-1603) used cloth fragments to fill the cavities in her teeth. The necessity for new dental material has been increased, since evolution of the different specialties within dentistry, in the early 20th century.

Branemark introduced Titanium implants in 1965 and paved way for implant dentistry. It is one of the significant scientific breakthroughs in dentistry. Implant dentistry plays important role in modern dentistry especially in Orthodontics and Prosthodontics specialties. Bone regenerative materials like acidic extract of enamel matrix proteins (EMPs), Emdogain and Recombinant amelogenin are playing major role in regeneration of tooth-supporting tissues, alveolar bone and periodontal-ligament3. Stem cell biology, an emerging field of research, has shown promising future application in medicine and dentistry. Stem cells are a promising tool for regeneration of tissues such as bone, dentin, periodontal ligament, cementum and dental pulp tissue 4,5.

3D intraoral scanner, 3D printing and CAD-CAM technology are proven to be better alternative for conventional impression and model methods and will replace them in near future. The use of three dimensional imaging utilizing cone beam computed tomography (CBCT) is the newest innovation and it has multiple application in dentistry, from analysis of root canal anatomy to orthognathic surgical planning and evaluation of treatment outcome. The major advantage of CBCT over conventional CT is lesser radiation exposure. The field of view for the CBCT imaging can be as small as 4x4 cm, directly related to radiation exposure, thereby better definition and more radiation safety to the patient.

Nano-dentistry is a science & technology of diagnosing, treating & preventing diseases, using nano scale structured materials. With developments in materials science and biotechnology, nanotechnology is especially anticipated to provide advances in dentistry and innovations in oral health-related diagnostic and therapeutic methods. Various potential nanotechnology applications in dentistry include Nanocream- Nano Aluminium Oxide Fibres, Nano Filtration, Oral Anesthesia Induction, Nanorobotics, Dental Hypersensitivity, Tooth Repositioning, Digital dental imaging 6. More and more applications and possibilities are continually evolving. These technologies promise to enhance dentistry for the clinician and patient alike.

Periodontal disease

Periodontal disease affects both the young and the adults with

variable frequency, which is closely related to level of oral hygiene. The main concern of periodontal treatment is prevention of periodontal diseases, resolution and regeneration of lost periodontal support. Recent advances in material science and stem cell biology have opened new and exciting scenarios for nonsurgical and surgical therapy of periodontal diseases.

Periodontal ligament and alveolar bone regeneration: One of the most interesting and intriguing aspects of dental research is periodontal ligament and alveolar bone regeneration. Current research is yet to find a foolproof way for regeneration of periodontal ligament, alveolar bone and tooth attachment apparatus. Although experimental regeneration of alveolar bone has been shown to be possible in animal models using stem cells,its expansion to humans is yet to be accomplished with concreteness. Studies have shown that induced mesenchymal cells when implanted into periodontal defects may significantly increase the amount of regeneration and newly formed mineralized tissue present. These stem cells may be sourced from various body tissues like dental pulp and the umbilical cord. Current research is focusing in harvesting stem cells from adipose tissue. Efforts are needed to further explore the role of stem cells in periodontal regeneration.

Orthodontics (Malocclusion and deformities)

The rapid advances in other fields have larger impact in all branches of dentistry; orthodontics is not an exception to this. Skeletal anchorage systems, 3D imaging and virtual treatment planning, 3D surface scanning, CAD-CAM bracket customization and robotic wire bending are the few recent advances in field of orthodontics. These are likely to revolutionize the current orthodontic clinical practice in next decade.

Temporary anchorage devices and skeletal anchorage system

Temporary anchorage devices (TAD) have been used increasingly in the orthodontic field. Because of their small size, they can be used in many places in the maxilla and mandible. Accurate mini-implant positioning reduces problems such as loosening of the implant or root surface. Surgical guides have been used to place implant accurately in desired site and in proper angulations. Recently new surgical guide system that uses CBCT images, an implant-positioning program (Sim Plant), and stereo lithography to make a surgical guide for accurate placement of orthodontic mini-implants were used by Kim et al 13. The skeletal anchorage system (SAS) which uses titanium miniplates and screws 14,15 has brought new dimension in orthodontic treatment . SAS can be placed in piriform rim, zygomatic buttresses, and any regions of the mandibular cortical bone and it has been used successfully for skeletal class III malocclusion16, correction of severe open bite and distalization of mandibular molars.

Digital models, 3D skeletal imaging, and Virtual Treatment planning

In near future digital models will entirely replace the conventional plaster models. Virtual study models introduced to orthodontic market in 1999 17 and proven to be used success-fully for orthodontic diagnosis and treatment planning18. These digital models are obtained from 3D scanning of impressions/plaster models or direct Intra-oral digital scanning. These technologies are one of the most exciting new areas in dentistry. There are almost ten intraoral scanning devices have been developed for various specialties in dentistry 19. Recently Kau CH et al 20 showed that digital models obtained from CBCT are as accurate as conventional digital models in making linear measurements. Craniofacial imaging is a crucial component of an orthodontic patient's record. Computerized cephalometrics utilizes computers to perform cephalometric analyses, where the orthodontists mark landmarks manually and computers do perform the measurements. Fully automated computerized 2D cephalometric analyses have been introduced recently, since its full potential in clinical practice yet to be tested.

3D imaging techniques like computed tomography (CT), magnetic resonance imaging (MRI) and cone beam computed tomography (CBCT) are recent advances in craniofacial imaging. Although CBCT was introduced two decades after CT imaging, it has undergone very rapid development and it is used extensively

in orthodontics. These are going to be valuable aid in diagnosis, treatment planning and assessment of treatment outcomes in patients with impacted teeth, facial deformities, craniofacial anomalies, obstructive sleep apnea (OSA).

The importance of soft tissue in orthodontic diagnosis and treatment has been emphasized since Angles' era. The 2D photographs provide less information of 3D face regarding facial depth, symmetryand shape21. Various technologies such as laser scanning, stereo photogrammetry, an optoelectronic device are available to create 3D images 22. As a complementary technology to 3D skeletal imaging, 3D facial surface scans and digital models are being constantly improvised for virtual treatment planning. Virtual treatment planning has wide range of application, from simple orthodontic tooth movement 23 and implant placement 24 to planning for functional jaw orthopedics and orthognathic surgery 25. It can be carried out in an orthodontic clinic or from a remote station and sent to remote area as a digital data. Virtual treatment planning and digital records reduce the need for extensive storage space required to store files and plaster models. Thus more data can be stored, effectively managed, communicated and transported when required. Apart from being used as an orthodontic/surgical treatment planning tool it can be used to educate and motivate the patient and parents.

Orthodontic treatment without orthodontic brackets

Traditional fixed appliances with wires, bands, and brackets are efficient and versatile treatment method. The idea of invisible appliance was first introduced by Kesling in 1945 26. As an alternative to the bracket system the invisible method of orthodontic tooth movement was introduced in 1999 by Align Technology Inc with the trade name of Invisalign 27. This is a major area with tremendous possibilities. These are sequential clear, removable plastic aligners. This invisible appliance uses the principles of Kesling set-up through virtual digital models and computer aided design and manufacturing process (CAD-CAM). Series of clear aligners are capable of incremental tooth movement of 0.25-3mm, over a period of 2 weeks. The Clear Aligner is especially indicated for treatment requiring minor tooth movement and in cases of relapse. The main indications are minor crowding, rotation control, expansion (non-skeletal), intrusion, space closure, less than 4 mm; passive/active retainer.

Customized Brackets and robotic wire bending

In 1928 Edward angle introduced edgewise system which has three dimensional controls on the teeth. Andrews28 modified Angles' edgewise appliance by incorporating predetermined first, second and third order compensation in brackets (straight wire appliance (SWA). The SWA rarely accomplish the treatment goals only with straight arch wires, as its name implies, and it requires bends incorporated in arch wire at certain treatment period to accomplish desired treatment goals. It is because of the inter-individual variation of the teeth is not taken into consideration in the process of standardization of brackets. If the straight wire approach should be followed, the bracket would have to be custom made 29. With the recent advances in computer and imaging technology, this problem may be solved by combination of computer assisted virtual treatment planning and bracket placement, customized brackets individualized to each tooth, robotic wire bending and indirect bonding procedures to create the ultimate orthodontic appliance.

Biological Mediators to facilitate orthodontic treatment

The synthesis and release of various inflammatory mediators, neurotransmitters, growth factors and other cytokines in response to applied mechanical forces was identified to be the cause of cellular differentiation during tooth movement 30. Extensive research still continues to identify the mediators and signaling molecules responsible for tooth movement. These chemical molecules are believed to initiate, maintain and cessation of the orthodontic tooth movement. The use of inflammatory and other mediators may also accelerate the tooth movement as these mediators strongly influence the bone remodeling. Gurton AU et al 31 showed that prostacyclin (PGI2) and thromboxane A2 (TxA2) analogs increased the number of multinuclear osteoclasts, osteoclastic bone resorption, and rate of orthodontic tooth movement in rats. Local ad-ministrations of prostaglandins E1 or

E2 combined with orthodontic tooth movement can approximately double the rate of tooth movement 32 and the main side effect of PG is hyperalgia. Also the local injection of echistatin and arginine-glycine-aspartic acid (RGD) peptides prevent tooth movement, thereby enhancing anchorage and also echistatin showed inhibitory effect on root resorption 33,34. Alteration of speed of tooth movement in orthodontics through gene modulation but has great potential in future.

Tissue Engineering

The fields of tissue engineering andorthodontics share a common general objective of applying scientific principle sincon junction with advanced technologiest oachieve orrestore tissue functionan desthetics. The field of tissue engineering specifically involves "the application of principles and methods of engineering and life sciencestoward the fundamental understanding of structure-function relationships in normal and pathological mammalian tissues and the development of biological substitutes to restore, maintain, or improve tissue functions.

In order to overcome limitations, investigators have explored a variety of tissue engineering strategies to generate whole teeth or tooth roots as an alternative to traditional dental implants. As teeth naturally develop through reciprocal interactions between epithelial and mesenchymal cells, some strategies seek to leverage cells isolated from epithelium and mesenchyme to produce a bio-engineeredgerm from which a tooth could be generated by replicating the reciprocal epithelial-mesenchymal interactions of normal tooth development upon implantation a defect site. While tissue engineering strategies have demonstrated great potential toward regenerating teeth, numerous challenges remain, including control of the size, color, and anatomy of the engineered tooth and integration of the engineered tooth with vasculature and a functional periodontium. Nevertheless, as tissue engineering technologies for generation of viable teeth continue to advance, they present increasing potential to not only provide an alternative to traditional dental implants, but viable teeth that might be moved into proper position through orthodontic treatment. Craniofacial bony defects present a tremendous clinical burden and can arise from a number of causes, ranging from trauma and pathology to congenital disorders.

Clinical applications of tissue engineering approaches for bone regeneration to repair or augment alveolar bone can facilitate placement of dental implants and orthodontic movement of teeth into spaces that otherwise might not support dentition. Indeed, some studies demonstrate that teeth can be moved orthodontically through tissue engineered bone, although the properties of the scaffold material applied to support bone formation should be carefully considered. Tissue engineering approaches for bone regeneration could also find application in facilitating bone healing after orthognathic surgery. While numerous clinical successes have been realized in tissue engineering approaches to address small bone defects, the repair of larger bony defects remains a significant challenge. However, as the clinical presence of bone tissue engineering expands, orthodontists should remain aware of the technologies and the character of the generated bone to ensure successful execution of treatment plans.

Nasoalveolar Moulding (NAM)

Cleft lip and palate management require a multidisciplinary approach involving the orthodontist, oral surgeon, prosthodontist, speech therapist etc. Timely intervention and scheduled treatment approach is an integral part of cleft treatment. Orthodontist intervention is needed at the initial stages of treatment mainly to approximate the cleft part of the deformity and simultaneous moulding of the nose (NAM). The timing of such a treatment is of great importance, the early the better, probably days after birth. The concept behind NAM is to approximate the widely apart cleft segment so as to facilitate a better surgical results. Although there are conflicting reports on the advantages of NAM, our studies have shown beneficial effects with timely intervention.

SUMMARY

Technological innovations are crucial for the advancement of the art and science of clinical dentistry. The challenge to our profession today is to improve the quality of oral health while satisfying the developing needs. The combined efforts of dental

education, dental researchand dental practice will be needed to maintain the quality of our present system and to meet new challenges. The time is not far when there will be no impressions, no plaster models, no tracing papers, and no pliers in the orthodontic office. However it is important that these tools should be cost effective, so that benefits of these technologies can be extended to all sections of society including economically disadvantageous population and those living in remote locations.

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LASERS IN ORTHODONTICS

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ABSTRACT

Laser was invented and has been used inoral maxillofacial surgery for more than three decades. It is a relatively new technique that has been introduced into orthodontics within the last twenty years. It soon gained its place in solving a variety of problems relating to orthodontic treatment ranging from ceramic bracket debonding and enamel surface etching to mucogingival surgery. Lasers with different wavelengths can manage both hard and soft tissue problems. Moreover, low level lasers were reported to be beneficial in pain control induced by orthodontic arch wire placement. As an adjunctive procedure, laser therapy has helped many orthodontists to elevate the level of patient care. This paper will provide an overview of laser physics, alongwith its effect on biological structures, application in orthodontics and dental laser safety.

Keywords- Orthodontics, Laser, patient care, laser therapy, pain, low level laser therapy

INTRODUCTION

The word LASER is an acronym for Light Amplification by Stimulated Emission of Radiation. Light is a form of electromagnetic energy that behaves as a particle and a wave. The basic unit of this energy is called a photon. Unlike other forms of light, laser light has special properties. It is usually monochromatic (consisting of just one specific wavelength or colour of light), coherent (all photons are in phase), collimated (the photons are almost parallel, and the light diverges very little compared with a point source), and uniformly polarized (all photons share the same polarization).1

A laser consists of three components:

1. A source of energy (or 'pump'), which may be an electric current or discharge, flash lamp, light from another laser, or a chemical reaction.

2. A lasing (or gain) medium, which may be solid (crystals, glasses and semiconductors); liquid (organic solvents and dyes; 'dye lasers'); or gas. The type of laser is usually named after the lasing medium, and this is also the main factor determining the type of pump required and the wavelength of the resulting laser light.

3. An optical resonator, which in its simplest form consists of two parallel mirrors: a highly reflective mirror and a partially reflective mirror ('output coupler').2

BIOLOGICAL EFFECTS OF LASER

The Cellular Mechanism Of Laser:

The main cellular effects of laser are dependent upon the absorption of wavelengths of red and infrared light that activates the electron respiratory chain in mitochondrial membranes. The photon of the laser is absorbed in cytochrome, generating single oxygen free radicals which increase its cellular energy by elevating ATP synthesis. These responses from nitric oxide (NO) leads to the alteration of cell activity by increasing cell membrane permeability to calcium and other ions.Furthermore, this laser may also affect RNA and DNA synthesis and therefore have an effect on cell proliferation, release of the growth factors, an increase in collagen synthesis by fibroblast, change in nerve conduction, and release of the neurotransmitter.3The effects of the laser particularly on osteoblasts, osteoclasts, and fibroblasts are more of interest in regards to orthodontic tooth movement.

OSTEOBLAST

Dörtbudak et al.4 described the biostimulatory effect of laser on osteoblasts in vitro while reporting an increased bone matrix production by irradiation of a pulsed diode soft laser. While some studies demonstrated an increase in DNA replication and proliferation of the osteoblasts in vitro in response to laser stimulation,5,6 others demonstrated temporarily triggered G2/M arrest on the cell cycle of the osteoblast and promoted osteoblast differentiation and osteogenesis.7 Furthermore, Grassi et al.8 reported that laser augmented the osteogenic potential of growth-induced cells and further stimulated the rate of growth and differentiation of the human osteoblast-like cells.

OSTEOCLAST

Unlike the effects of laser on osteoblasts, its effects on osteoclasts are not clear. Aihara et al.9 demonstrated that laser facilitated differentiation and activation of osteoclasts via RANK

expression. Macrophage colony-stimulating factor(M-CSF) is essential for osteoclastogenesis to stimulate not only osteoclast precursor cells but also mature osteoclasts. Yamaguchi et al.10 presented that laser increased the velocity of tooth movement via stimulating the expression of M-CSF and its receptor system (colony stimulating factor-1 receptor; c-fms). The follow up study11 asserted that the expression of MMP-9, cathepsin K, and integrin α (v) β3 increased with application of laser which may help to increase the rate of tooth movement.

EFFECTS OF LASER ON FIBROBLASTS

The stimulatory effects of laser on fibroblast proliferation in vitro are well established. At low doses (e.g., 2 J/cm2), laser stimulates proliferation, while at high doses (e.g., 16 J/cm2) the effcets are suppressive. Fibroblast maturation and locomotion through the matrix is also influenced by laser, and this in turn may contribute to the higher tensile strengths reported for healed wounds. There are several mechanisms by which laser may stimulate the proliferation of fibroblasts. laser has been shown to stimulate the production of basic fibroblast growth factor (bFGF), a multifunctional polypeptide which supports fibroblast proliferation and differentiation. Fibroblasts irradiated with low dose laser show both increased cell proliferation and enhanced production of bFGF, while high dose laser suppresses both parameters,12 indicating a causal relationship between autocrine production of bFGF from fibroblasts and proliferation.

LASER APPLICATION IN ORTHODONTICS

Soft Tissue Management

Soft tissue abnormalities often occur before, during and after orthodontic treatment. The three main clinical situations associated with orthodontic therapy include gingival overgrowth, abnormal frenum and impacted teeth. Therefore surgical procedures such as gingivectomy, gingivoplasty, frenectomy and surgical exposure of impacted teeth are most commonly required to solve the above problems.

Gingival enlargement can affect orthodontic therapy from the beginning of bonding brackets to the final finishing stage. During orthodontic treatment, teeth disproportionality caused by gingival overgrowth makes it hard for clinicians to correctly evaluate and judge the axial inclination of the teeth, leading to an unsatisfactory finishing and compromised esthetic result. Gingivectomy and gingivoplasty are required for the correction of problems brought by gingival enlargement13.

Hypertrophic labial frenum which remains inserted in the free gingival margin or on the palatine papillae causes a midline diastema. This type of low frenum can impede the insertion of temporary anchorage devices which are used for the intrusion of upper incisors in the case of gummy smile. A short lingual frenum may cause ankyloglossia, and lead to problems such as atypical swallow, disproportional lower jaw growth and a lower midline diastema. Frenectomy with lasers of different wavelengths has been reported by previous authors.14

Impacted teeth can be aligned into position by orthodontic force following surgical exposure. Surgical exposure of impacted teeth is not uncommon in everyday orthodontic treatment.15 Laser techniques are especially beneficial when applied to perform surgical exposure of teeth which are either impacted at a mucogingival or bone level. Surgical exposure performed by laser is quick, clean and painless. A dry field without contamination of blood results after laser surgery, making it easier to directly bond a bracket on the exposed tooth. Various laser wavelengths including erbium, diode, Nd:YAG and CO2 lasers were used to perform this procedure. Erbium gained more interest from clinicians because it is able to cut both soft and hard tissues, thereby being able to expose teeth at bone level.

Bracket Debonding

A major concern of brackets debonding in orthodontics is the risk of enamel damage. The occurrence of enamel fracture is relatively higher with ceramic brackets because of the high bond strength. In order to reduce the risk of enamel fracture, a debonding technique that requires less force is needed. Laser irradiation can soften the composite resin by heating the brackets, help reducing the force required for debonding. The mechanism of laser debonding

includes: thermal softening, thermal ablation or photoablation. Thermal softening occurs when laser with low power density irradiates the brackets until the resin softens. The brackets will slide off the tooth surface with gravity. Thermal ablation and photoablation vaporize the resin when its temperature is raised quickly by high power density lasers. The resulting bracket can be blown off the tooth surface. The increase of pulp temperature and potential hazard to tooth vitality resulting from laser heating is the main concern of clinicians.

According to Zach and Cohen16, the pulp can only tolerate an increase of 5.5˚C in intrapulpal temperature. Overheating will harm the pulpal tissue. Most of the previous studies had been carried out to evaluate the thermal effect of laser on pulp temperature and determine factors that cause temperature rise. Key factors include types of lasers and brackets, duration of heating, energy level and methods. It was also reported that different resins have varied reactions against certain types of lasers. The conclusions of these studies indicate that the temperature change will remain within the safety threshold if the appropriate laser can be chosen and the application duration and method can be precisely controlled.

PAIN CONTROL

Tooth movement is often associated with pain, especially within the first 7 days after force applied.17 Low-level laser therapy (LLLT) has been shown to have analgesic effect in a variety of therapeutic procedures. LLLT is a new technique and is defined as the laser treatment in which the energy output is low enough that the temperature of the applied area will not rise above body temperature. The mechanism of pain relief by LLLT is not yet well established. The analgesic effect is believed to be attributed to its anti-inflammatory and neuronal effect.Most of the studies showed positive results and concluded that LLLT helped reduce pain in orthodontic treatment within the first 5 or 7 days, especially within the first 2 to 3 days.

TOOTH MOVEMENT

The “biostimulating effect” of LLLT has been studied since 1971. LLLT was reported to be able to stimulate fibroblast and chondrocyte proliferation, collagen synthesis, nerve regeneration, wound healing, and bone regeneration.18 It was suggested LLLT can accelerate bone remodeling and cause changes in alveolar bone during induced tooth movement. Changes were found in the number and proliferation of osteoblasts and osteoclasts and collagen deposition in both pressure and tension sites. Based on the previous basic science studies, LLLT has been demonstrated to increase the rate of tooth movement during orthodontic therapy. Tooth movement with LLLT was found to be faster in some studies. Cruz et al showed an increase of 34% of canine retraction within 60 days with fixed appliance. The group irradiated by laser moved 4.39mm comparing to the control group which moved 3.30mm. Kawasaki showed a 1.3 fold more movement of rat teeth irradiated by laser after 12 days. However some studies found insignificant differences19 or even diminished tooth movement.20 According to some authors, if a laser dose is too low it will not cause a biostimulating effect, whilst a higher dose can inhibit tooth movement.

BONE REGENERATION AFTER EXPANSION

Rapid maxillary expansion is commonly used in orthodontic therapy. The separation of mid-palatal suture with an increased bone mass in the center can change the maxillary arch shape dramatically. Usually following expansion a retention period of 3 to 4 months is needed for bone regeneration and remodeling. Low-level lasers can accelerate the opening of the mid-palatal suture and improve bone regeneration during and after rapid maxillary expansion according to several studies.21 It can be helpful in reducing the retention time and preventing relapse. However, further studies are required to closely investigate this effect.

DENTAL LASER SAFETY

Safety issues are a major concerns of laser applications in dentistry. Laser injuries are reported every year around the world.

Laser hazards vary, depending on the type and use of laser. According to guidelines provided by American National Standards Institute Z136.1-2007, there are four classifications(ranging from 1 to 4) of lasers based on the potential of causing biological damage to the eyes or skin by the primary or reflected beam. Lasers used in dentistry mainly fall into classes 3B and 4. Class 3B represents a maximum output of 0.5W which can cause eye damage. Class 4 includes all high-powered lasers that are used in dentistry and oral maxillofacial surgery. There is no upper output limit, so lasers in this class will cause different injuries.22 All staff in clinics where lasers are used must receive appropriate safety training.

Eye Damage

The cornea mainly consists of water, and absorbs the wavelength of CO2, erbium and holmium lasers. Thus these lasers can burn the cornea. They can also affect aqueous, vitreous humor and lens of the eye, resulting in aqueous flare and cataract formation. Lasers such as Nd:YAG, diode and argon are highly absorbed by pigment, and have greater penetration into tissue. Retinal damage caused by these lasers can lead to blindness. Eye protection is crucial for both the clinical staff and the patient. There is specific eye wear for different wavelengths available in the market. No goggle can provide protection against all wavelengths ranging from 400nm to 10600nm. When choosing eye goggles, be aware of the optical density and wavelengths printed on the goggles. It is important that eye wear is chosen for the correct wavelength of laser.

Skin Hazard

Skin can be penetrated at wavelengths from 300nm to 3000nm. Laser-induced skin damage includes excessively dry skin, blistering and burning. Clinical staff and patient should be fully covered during the laser therapy.

Laser Plume

The emission of noxious plume by the laser vaporization of tissue can obscure the surgical field and contains toxic chemicals and debris including bacterial spores, cancer cells and viruses (Human Papillomavirus HPV, Human Immunodeficiency Virus HIV and herpes). Inhalation of the plume can cause symptoms such as coughing, nasal congestion, nausea and vomiting. Apart from the regular dental protective equipment, high volume evacuation and masks that can filter up to 0.1μ should be added as extra protection during laser therapy.

Fire Hazard

Heat generated by the laser beam may cause a fire if in contact with combustible materials or gas. Some precautions must be taken during laser therapy. Any combustible or explosive materials should not be placed in the nominal hazardous zone. Avoiding using any alcohol-based anesthetics and gauze. Use wet or fire retardant material only. Gas such as nitrogen dioxide and oxygen can only be used by dentist in a close circuit delivery system with high-speed evacuation system (ANSI Z136.3, 2005). Perform the operation near a water source.

Laser Safety Officer

A laser safety officer, LSO, is needed by every dental practice with laser. According to the ANSI Z136.1 standard, 1993, “a LSO is defined as a person who is trained and certified to take responsibility and have authority to monitor and enforce the control of laser hazards and to effect the knowledgeable evaluation and control of laser hazards.” A LSO must be present when using class 3B and class 4 lasers.

CONCLUSION

The use of lasers offers many advantages such as improved oral hygiene, practice efficiencies, and esthetic finishing. Clinicians interested in incorporating lasers into their practice should obtain proficiency certification, attend continuing education courses, and recognize the inherent risks associated with laser therapy. As an orthodontist committed to provide the best possible service, adjunctive procedures such as laser therapy can dramatically enhance the overall treatment experience of the patient.

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TOBACCO AND DENTAL PROBLEMS

Dr A.P Dadhich

INTRODUCTION

Use of tobacco in society is very prevalent and the causative factor of various dental illnesses. Many people have belief that tobacco has antiseptic property1 and it will be able to control various oral infections . People are taking tobacco in different forms . Tobacco chewing with lime is the common intake and tobacco with fettle is also very common way of taking tobacco. Tobacco contains nicotine as an active principle which is more rapidly absorbed in oral cavity at alkaline PH. Other ways of taking tobacco in fine powder by nasal snuffing .Chronic use may cause perforation of nasal septum2 and some times chances of epistaxis can be there.Tobacco use is related with many dental problems varying from gingivitis, hypertrophic gingivitis to oral cancer.

Most dangerous aspect of tobacco is in the form of bidi , cigarette , hukka and cigar. Smoking is very common habit in the society . Smoking not only affects the user but other family members who are not smokers, may also get affected. They are known as non volunteer smokers. It is said that when a non smoker sits with a smoker 1/10 part of the smoke may be inhaled by him. A smoker in the house creates smoking environment in the house which reduces the immune response of the non smoker family member too.

Tobacco chewing may lead to brownish discolouration of teeth, xerostomia responsible for dental caries,gum infection leading to pyorrhoea which is the most causative factor for early shedding of teeth3. Hypertrophic gingivitis leads to bleeding from gums and abscess formation on the gums. These chronic ulcers may get converted into malignancies affecting not only gums but whole oral cavity. There can be stomatitis,pharyngitis, tonsillitis, bronchitis,laryngitisandcancer of oral cavity .4

Oral Submucousfibrosis(OSF) is also a potential hazard of tobacco chewing and smoking.5It is a precancerous condition where the patient feels difficulty in opening the mouth and eating. Studies have shown that chewing betel nut is one of the most significant risk factors for OSF. Arica nut is an important ingredient of beetle chewed with tobacco. Many times big Arica nut swallowed goes into trachea or larynx and may cause death due to asphyxia. Unfortunately,there are no effective treatments available for OSF.

Tobacco is also considered as teratogenic6.It can cause cleft lip and cleft palate in the developing foetus. It is a habit forming drug that creates psychological dependence followed by physical dependence .7 It is CNS stimulant followed by depressant and comes as a soft drug of abuse.Besides cancer,other social hazard which is related to tobacco use is forest destruction and environmental pollution as it has been seen that tobacco cultivation causes deforestation and over utilizes harmful chemicals.8

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Case Report

A DEFINITIVE HOLLOW OBTURATOR TECHNIQUE FOR MANAGEMENT OF HEMI- MAXILLECTOMY

Dr. Akhilesh Malethia, Dr. Sandeep Kumar, Dr. Rajnish Aggarwal, Dr. Sunita Choudhary, Dr Sukhdeep Kaur

Abstract

Maxillary obturator prosthesis is the most frequent treatment option for management of partial or total maxillectomy. Heavy weight of the obturators is often a dislocating factor. Hollowing the prosthesis to reduce its weight is the well established fact. In this article, a simple technique has been described for the fabrication of hollow definitive obturator in a hemi maxillectomy patient.

Keywords

Hollow obturator, definitive obturator, Hemi-Maxillectomy.

Introduction

The term maxillectomy refers to partial or total removal of maxilla in a patient suffering from benign or malignant neoplasm.1 The resultant surgical defect often includes part of hard and soft palate, which results in an oro-antral and/or oro-nasal communication.2 Maxillary obturator prosthesis is more frequent treatment modality than surgical reconstruction due to ease of fabrication and maintenance.3-6 The prosthesis recreates a partition between oro and naso-pharynx and facilitates improvement in mastication, deglutition and speech intelligibility.7 Increased weight of the obturator prosthesis is usually a major concern to the Prosthodontist. The obturator should be light in weight to provide favorable retention, stability, support, patient comfort and cleanliness.

The open-hollow obturators often collect moisture and require frequent cleaning or exit holes to prevent the fluid accumulation. On the contrary, the closed obturators do not get moisture collection while extending it superiorly into the defect and reducing the air space. Different materials like Silicone rubber and visible-light-cured resin have been used to fabricate the obturators; however, the long-term strength and durability of these prostheses have not been studied. Need for a water-tight closed hollow obturator fabricated from a durable material is the prime objective in such situations. Heat-polymerizing acrylic resin is one of the most strong, tissue compatible and durable materials for the fabrication of such prostheses. Various methods have been described in the literature to fabricate the closed-hollow obturators in heat-polymerizing acrylic resin.8-15

Uniform wall thickness of a hollow prosthesis ensures the least possible weight without hampering the durability of the material. But most of the processing techniques, with which uniform wall thickness can be achieved, are complex and time-consuming. The processing technique described in this article is a single step procedure resulting into the closed-hollow obturator prosthesis as single unit with uniform wall thickness. This article describes a case report of a patient who had undergone partial maxillectomy secondary to low grade salivary gland malignancy of maxilla rehabilitated with a hollow obturator prosthesis.

Case Report

A 40 years old women patient was wearing an interim prosthesis from last 6 months. An intraoral examination showed presence of healthy surgical site with caries-free remaining maxillary as well as mandibular dentition. There were no gingival or periodontal problems found in the remaining dentition. The patient complained of difficulty in chewing and speech and also nasal regurgitation of fluids. There was facial asymmetry due to depression in left malar prominence.The surgical defect was classified as class I defect according to Aramany's classification (Fig 1).

Fig1: Hemi-maxillectomy on right side

A hollow definitive obturator was planned for this case.

Technique

1. The primary impression was made using irreversible hydrocolloid impression material by packing the defect area with gauze, poured and cast was obtained.
2. After obtaining the cast, it was surveyed for designing of the cast partial denture framework. The framework was designed such that maximum retention, stability, and support could be achieved using the dentition on the contralateral side.
3. Custom tray was fabricated on the cast and mouth preparation was completed in subsequent appointment. The border molding was carried out and impression of the defect area was registered using greenstick compound. Wash impression of the defect area was made using light body impression material.

4. A pick up impression was made in stock tray using irreversible hydrocolloid impression material (Fig 2).

Fig2: Definitive impression

Wax pattern fabrication done on refractory cast (Fig 3) and framework trial done in the next appointment (Fig 4).

Fig3: Wax Pattern Fabrication

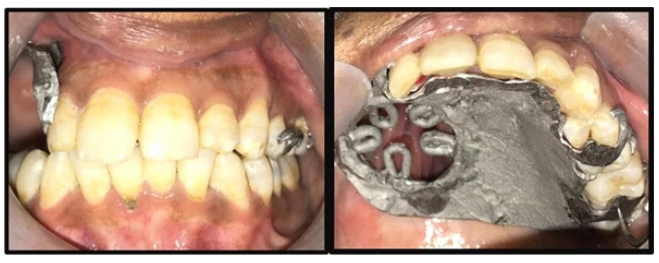

Fig4: Metal framework try in

5. Jaw relation and try-in was done taking into the esthetic and phonetic requirements consideration (Fig 5).

Fig5: Teeth arrangement try in

6. An auto-polymerising shim was adapted on the floor of the defect in the cast (Fig 6) and flasking was done covering the teeth area and the framework space at the defect region.

Fig 6: Base formation for hollow bulb by auto-polymerising resin

7. Dewaxing was done (Fig7) followed by packing using the heat cure acrylic resin.

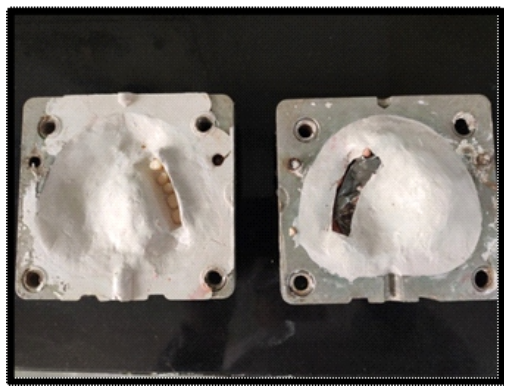

Fig7: Dewaxing

8. After the acrylization process, the prosthesis was removed form the flask carefully.

9. There was union of the shim and heat cure acrylic resin on the lateral border of the prosthesis. The rest of the plaster was removed carefully and after cleaning all the area, a lid of auto-polymerising resin was fabricated to make the prosthesis hollow.

10. The obturator was finished, polished and delivered to the patient (Fig 8-10).

Fig8: Definitive prosthesis after finishing and polishing

Fig9: Definitive hollow obturator insertion

Fig10: Definitive prosthesis in situ

Discussion

Patients who have undergone maxillectomy as a result of carcinoma or facial trauma have facial disfigurement, i.e., associated with long-term psychosocial effects. Prosthetic rehabilitation of such patient becomes difficult due to numerous clinical and technical problems. Obturator prosthesis remains the treatment of choice over surgical reconstruction due to ease of fabrication and maintainance. The glossary of prosthodontic terms defines an obturator as "a maxillofacial prosthesis used to close a congenital or acquired tissue opening, primarily of the hard palate and/or contiguous alveolar/soft tissue structures."

The open hollow obturators are easy to fabricate but are difficult to maintain due to collection of moisture and debris, which leads to oral malodor and requires frequent cleaning. Hence, closed hollow obturators are preferred. However, the processing techniques are tedious and time consuming.Grinding out the unwanted part directly after processing described by Habib and Driscoll was once a classic technique. However, this technique is time consuming and it is difficult to maintain the adequate and uniform thickness of the prosthesis wall. Also, techniques involving processing the obturator in two halves separately and later joining them together are described. These techniques are tedious, time consuming, require attachments, and are also difficult to repair.

This article described a relatively inexpensive technique for fabrication of definitive closed hollow obturator for a patient using a new, simple, two-stage method to create hollow space.

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Case Report

MANAGEMENT OF TEETH WITH BILATERAL RADIX ENTOMOLARIS: A CASE REPORT

Amulya Vanti, Madhu Pujar, Sheetal Ghivari

ABSTRACT

Understanding the presence of an additional root and its root canal anatomy is essential for successful treatment outcome.Usually mandibular molars have two roots with three canals (mesiobucccal , mesiolingual & distal) but in few teeth, the number of roots and canals vary. The mandibular molars which ares associated with an extra root on the lingual side are known as Radix Entomolaris. This case report discuss the prevalence, morphology,clinical diagnosis, problems encountered during treatment and prognosis of tooth in bilateral radix Entomolaris case.

Key words: Bilateral Radix Entomolaris, Anatomic root variation

Introduction

According to Weine, the maincauseof endodontic failureare improper identification of canals, untreated major canals, incorrect canal instrumentation, incomplete obturation and. Magnification, radiographs, operating microscope, loupes and illumination are aids that must be utilized to achieve this goal1. Failure to recognise the presence of an additional canal may result in unsuccessful treatment and may be the origin of acute flare ups during and after treatment2.

Radix Entomolaris is a developmental variation commonly found in mandibular molars which is associated with an extra root on the lingual side known as Radix Entomolaris3. Incidence of Bilateral Radix Entomolaris is reported to vary from 37.14 to 67 %. Here in this case report,the bilateral management of radix entomolaris of mandibular first molar teeth4was discussed.

Case Report 1

A 35 year old female patient reported to Department of Conservative Dentistry andEndodontics with a chief complaint of severe pain in the lower left and right back tooth region since one week. Pain was of sharp , throbbing, continuous in nature, aggravated on mastication with 36 and 46.

A diagnostic radiograph was taken which showed radiolucency involving pulp and periodontal ligament widening. On observation of radiograph, an additional root bilaterally was noticed. Another radiographs was taken with mesial and distal angulations for confirmation. Local anesthesia was administered and the tooth was isolated under rubber dam . Access cavity preparation was modified from a triangular to a trapezoidal form for proper accessibility of all the canals.The working length was determined radigraphically.Cleaning and shaping of canals was performed with protaper rotary instruments in a stepdown manner and obturation was done with cold lateral condensation. Glyde lubricant was used and the canals were irrigated using sodium hypochlorite and normalsaline and final irrigation was done with chlorhexidine . Post obturation restoration was restored with composite. Follow-up was done for three months and no signs and symptoms were noticed.

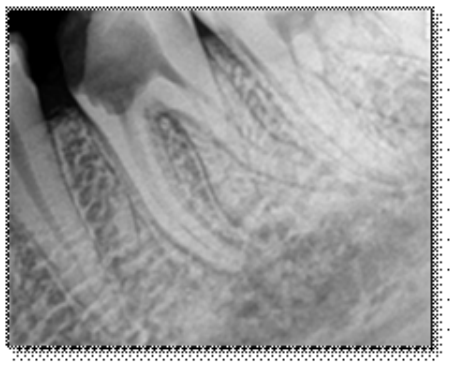

Fig 1a

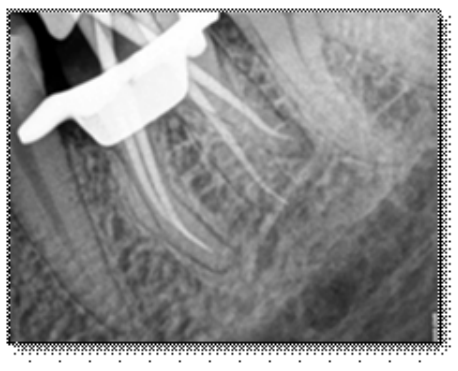

Fig 1b

Fig 1A& 1B: Pre–operative and Post-obturation radiographs showing all the four canals in 36

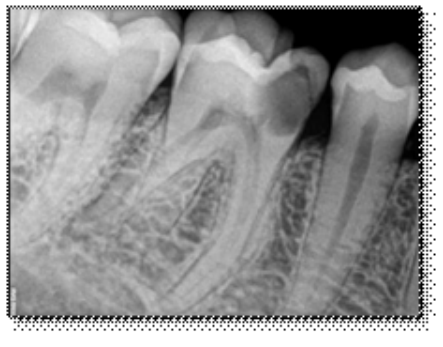

Fig 2 A

Fig. 2A, 2 B

Pre operative working length and post obbervation Radiographs showing all the four canals in 46.

Fig 3 : Preoperative OPG Showing Bilateral Radix Entomolaris

Fig 4: Post Obturation OPG Showing Bilateral Radix Entomolaris

Discussion

Radix Entomolaris (RE) was first described by Carabelli. It is characterized by the presence of an additional or extra third root, which is typically found disto-lingually5.Radix entomolaris can be found in the first, second, and third mandibular molars, highest among the population of Mongolian origin.Radix Entomolaris is not very common in African, Eurasian, Caucasian. prevalence of RE, with a range from 2.19-13.3%, among the Indian population. There is no significant difference was found in the prevalence of RE according to gender6. Similarly no difference was found in the side of occurrence. The bilateral occurrence of RE is reported to vary from 37.14 to 67%. frequently fora correct diagnosis minimum of two diagnostic radiographs are necessary using buccal object rule. Even the presence of an extra cusp may sometimes indicate the presence of radix entomolaris7,8.Access cavity preparation should be modified usually from a triangular to a trapezoidal shape. The modification should be done following the dentinal map9. Advanced diagnostic aids help in the better identification and visualization of all the canals.the diagnosis and management of RE are of paramount importance from the point of endodontic success10,11.

Conclusion

The knowledge of variation in anatomy of mandibular permanent first molars, proper interpretation of radiographs, identification of number of roots and morphology, proper cleaning and shaping of the canals and three dimensional obturation is very important in success of endodontic treatment..

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Case Report

FUNCTIONAL AND ESTHETIC REHABILITATION OF SEVERELY MUTILATED PRIMARY ANTERIOR TEETH: A CASE REPORT

Mahima Saini, Lalita Singla, Shubhada Kasat, Heema Sambyal

ABSTRACT

Early childhood caries is most common childhood disease which affects children in early stages of development. This severe form of caries is also associated with the deleterious effects like difficulties in phonation, mastication and alters esthetics. It is necessary to restore severely decayed teeth to maintain form and function of dentition. The restoration of these severely mutilated primary anterior teeth is often well thought-out as a special challenge by pediatric dentists. This case report presents a simple and effective method for restoring severely mutilated primary anterior tooth in a 5-year old girl with composite post and core build-up followed by strip crowns that reestablishes function, shape, and esthetics.

Key words: Phonation, Mastication, Esthetics, Mutilated teeth.

INTRODUCTION

Early childhood caries (ECC) is a destructive condition for both the child undergoing dental treatment and the concerned parents. It is also a challenge for pedodontist to restore these mutilated teeth.1 ECC and trauma are the main reasons for the restoration of anterior teeth in young children. The early loss of primary anterior teeth may result in neuromuscular imbalance with reduced masticatory efficiency, speech disturbances, such as interfering with the pronunciation of tongue-tip consonants (e.g, “t,” “d,” “s,” “sh,” and “ch”) and labial sounds (e.g, “f ” and “v”); loss of vertical dimension, development of parafunctional habits, esthetic-functional problems such as malocclusion and space loss, and psychological problems that can interfere in the personality and behavioral development of the child.2 Inspite of the increasing awareness among parents about dental caries and its ill effects, we frequently faced the situations where we need to extract the teeth with its imminent consequences. There has been a paradigm shift in the attitude of parents wherein a good portion of the society is more determined to maintain the primary teeth in the oral cavity of their children for as long as they should naturally last. Not surprisingly, there are diverse techniques and materials that are being used to maintain the primary teeth in the oral cavity of children in a healthy condition. It is the responsibility of the pediatric dentist to choose the technique and the material that best suit the patient’s condition.3 The purpose of this report was to demonstrate the rehabilitation of primary anterior teeth in a 5-year-old girl with early childhood caries. The endodontically treated teeth were reinforced using composite post and core technique and restored with celluloid strip crowns.

CASE REPORT

A 5 year old, female patient reported to the Department of Pediatric and Preventive Dentistry, Surendera Dental College and Research Institute, Sriganganagar with a chief complaint of decayed upper anterior teeth. Patient’s medical and dental history was non-contributory. Patient’s mother gave a history of breast feeding for 1 year after which the child was bottle fed for 2 years. The milk contained sugar and the child went to sleep with the bottle in his mouth. On soft tissue examination, intra oral swelling was found w.r.t. tooth number (#) 84. On hard tissue examination, type of dentition seen was mixed dentition, with dental caries w.r.t. #54, 64, 65, 75, 74, 84, 85 and grossly decayed teeth were #51 52 61 62. Intraoral periapical radiograph showed the involvement of pulp in relation to #61 and 84 (Figure 1).

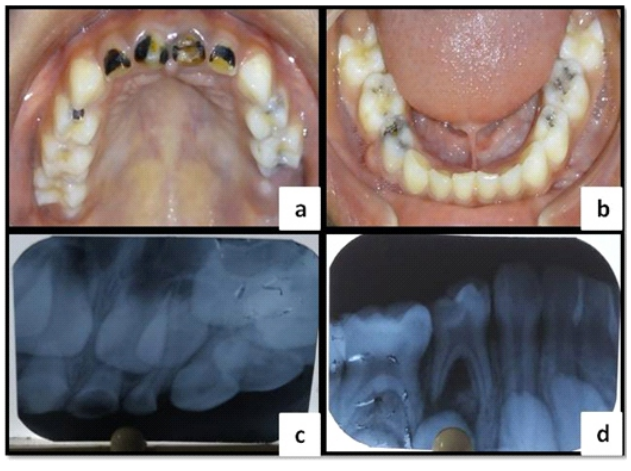

Figure 1 a) Maxillary arch view showing dental caries wrt. 54, 64, 65 and grossly decayed teeth wrt. 51 52 61 62; b) Mandibular arch view showing dental caries wrt. 75, 74, 85 and deep dental caries & intraoral swelling wrt. 84; c) Preoperative radiograph showing radiolucency involving pulp wrt.61; d) Preoperative radiograph showing radiolucency involving pulp wrt 84

TREATMENT PLAN

It was decided to pulpectomize 61 and 84. GIC restoration wrt 54 52 51 62 64 65 74 75 85, post and core followed by strip crown wrt. 61, strip crowns wrt. 51 52, ribbond fiber reinforced

Composite build up w.r.t. #62, stainless steel crown w.r.t. #84 were planned. Treatment was carried out in multiple sittings as per the standard norms. For post space preparation, about 4 mm of obturation was removed from the coronal third of the root canal of 61and 1 mm of glass ionomer restorative cement plug was placed. A composite post was fabricated and cemented with dual cure composite in 61 (Figure 2). The incisal end of the post was projected 2-3 mm above the remaining tooth structure. The composite was light cured for 40 seconds. A strip crown was used to reconstruct the crown form. For ribbond fiber reinforced composite build up w.r.t. #62, desired length of ribbond fiber was taken. After try in, etching and bonding of the tooth surface was done. Then fiber was dipped in bonding agent and after adaptation on labial surface of 62, it was reinforced by flowable composite. Then composite build up followed by finishing and polishing was done(Figure 3).This provided additional mechanical retention and support for the restorative material. Stainless steel crown was adapted and cemented on # 84 after pulpectomy (Figure 4). After completion of the procedure, post-operative photographs and radiographs were taken (Figure 5). Post operative instructions, including oral hygiene measures and diet counseling, were given to the parents. Recall checkup was scheduled after every 6 months to assess the maintenance.

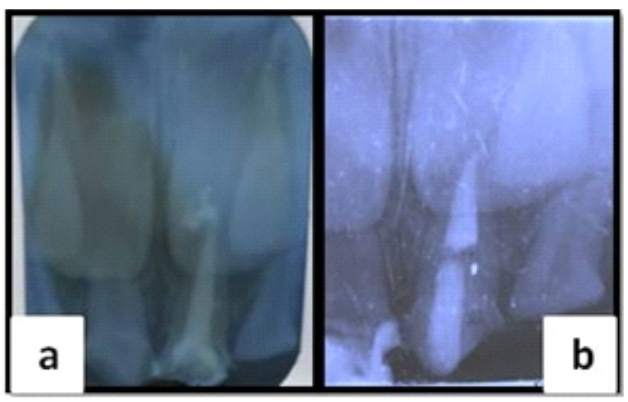

Figure 2 a) IOPA showing obturation w.r.t. # 61; b) IOPA showing post placement w.r.t. #61

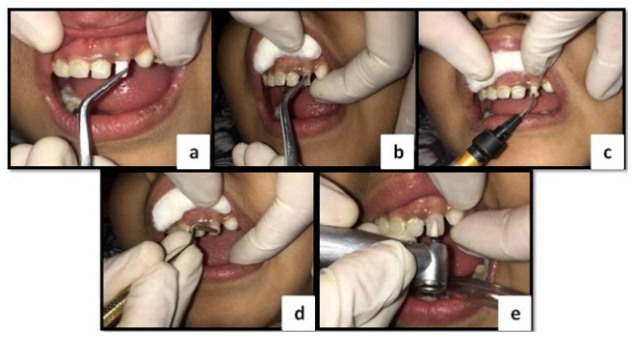

Figure 3 a) Ribbond fiber try in; b) Placement of the fiber onto the tooth surface after dipping in bonding agent; c) Fiber is being reinforced by flowable composite; d) Composite build up; e) Composite build up

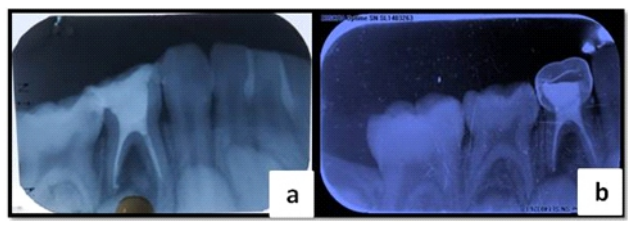

Figure 4 a) IOPA showing obturation w.r.t. # 84; b) IOPA showing stainless steel crown w.r.t. #84

Figure 5 a) Post- operative maxillary arch showing strip crown w.r.t. #51 52 61 62 and GIC restoration in #54 64 and 65; b) Post - operative mandibular arch showing stainless steel crown w.r.t. # 84 and GIC restoration w.r.t. #74 74 and 85.

DISCUSSION

The main aim of rehabilitation of ECC is to avoid unwanted early extraction of primary teeth and restore them so that child is able to perform normal speech, mastication and also good aesthetics.4 Direct and indirect composite, strip crowns, polycarbonate crowns, zirconia crowns, open faced strip crowns, and acrylic crowns are the various treatment options available for restoring primary anterior teeth. Although multiple treatment options are available in children for esthetic rehabilitation, most of these options are technique sensitive. Composite resin materials have

shown the best strength, wear resistance, esthetics, and color matching abilities of all the materials and are often the first choice of many clinicians for restoring anterior teeth, so here in this case report we have used resin composite post. Although a lot of treatment options are available, the beauty of the esthetic crown will depend on the clinician's knowledge, child's behavior, and retention of the crown and proper maintenance of the oral hygiene.5 The technique involved use one cohesive material in the canal and crown (resin composite). Also, resin short posts offered better esthetic results since they do not require a layer of opaque material as used in metal posts. The use of celluloid strip crowns with resin composite short posts reduces operatory chair time. The technique does require selection and adaptation of strip crowns on the cervical margins of the teeth and the reduction of excess resin composite around the gingival margin. The celluloid crown is filled with a resin composite, which is the same material used in fabricating the post. In addition, the celluloid crown produces a glossy finish, thereby minimizing polishing.6,7

Fiber reinforced composite showed higher strength, retention and marginal adaptation; this led the authors to use the said material in composite build up. However the high cost of glass fiber reinforced composite resin limits its use.8-10 Hence composite posts and fiber reinforced composite build up can be an easier, simpler and inexpensive treatment of choice for severely damaged primary anterior teeth.

CONCLUSION

The importance of retaining the primary anterior teeth till their natural exfoliation time cannot be overemphasized. It plays a pivotal role in maintaining esthetics, development of speech, and building up of a confident individual. The post core design presented in this case report is an easy-to-fabricate and inexpensive alternative and can be used as prosthodontics restoration to restore severely mutilated or fractured primary anteriors, restoring function, shape, and esthetics in young children.

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Case Report

MANAGEMENT OF GROSSLY DECAYED MANDIBULAR MOLAR WITH SPLIT CAST POST AND CORE

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ABSTRACT

In a multirooted tooth with extensive loss of tooth structure especially where no cavity wall is remaining, the post core is often required to gain support from the remaining tooth structure.Endodontic treatment of a mutilated tooth may prove unfruitful if it is not well restored to bear the forces of occlusion. So the options of prosthetic reconstruction should be well consideredbeforeattemptingendodontictreatmentonbadlybrokenteeth.Insuchcases,postisthechoiceofrestorationasitservestoretaincore.Badlybrokenmolarwaspreservedbyusingmultiplepostsinthedivergentcanals.Nonparallelaccessorypostswasusedasitincreasedtheretentivesurfaceareaofthecastpostand core,minimizedthechanceofrootperforationduringtoothpreparationandalsoredistributetheforcesofocclusion.Anidealpostsystemshouldhavetheabilitytodistributethefunctionalstressesevenlyalongtherootsurfaceandproducemini malstressduringplacementandcementation.Theclinician shouldselecttherighttypeofpostandcoresystemconsideringthebiological,mechanicalandestheticneedsforeachindividual.

KEY WORDS: Divergent root canal, Multirooted teeth, Custom made split post and core, Direct technique.

INTRODUCTION

Endodontically treated posterior teeth are often mutilated due to caries and access requirement, sometimes to the extent that all the walls of coronal structure are missing and only the radicular portion is present1. In such cases, if ferrule is available and coronal retention core buildup is not sufficient, then intraradicular retention may be used by custom made post and core which replaces any lost coronal tooth structure2.For these teeth, retention is better provided by two or more relatively short posts in divergent canals. This can be achieved by multisection post and core with each section having its own path of withdrawal or single piece post and core with a separate auxiliary post3.

This case report presents restoration of an endodontically treated carious broken left mandibular molor with divergent roots, restored with split- cast post and core fabricated by direct technique.

CASE REPORT

A19 years old female patient with a root canal treated left mandibular first molar (36) reported to the Department of Prosthodontics with grossly decayed coronal structure. Treatment options figured out were:

• Restoration of the fracture tooth using post and core with fabrication of cast crown.

• Core build up by using amalgam restoration, Miracle mix/ Admix or Composite restoration

It was planned to rehabilitate the tooth with custom-made split cast metal post and core and further with PFM crown. Other treatment options were omitted due to their unreliability. As the coronal structure of the tooth was grossly decayed, composite and amalgam restorations were ruled out due to their reduce tolerance to functional stresses and diminished strength to retain a core for subsequent cast metal crown.

In the following case report, direct technique for fabricating the pattern of post and core has been discussed using split post core technique. The material used for fabrication the post and core pattern wasautopolymerizing acrylic resin and the patterns were fabricated with the help of bead-brush technique. Further the patterns are casted using the conventional lost wax technique in base metal alloy and then adjusted in the canals one by one. After the adjustment, the cementation of the post has been done with resincement4.

PROCEDURE

Since the mesial and distal root were divergent, split post core was planned.

1. Using peeso reamer numbers 1–3 (1.1mm diameter) post space of length 4mm (leaving 7mm of gutta percha apically) was prepared in the mesiolingual canal, taking care that at least minimum of 1mm of dentin remains around the canal (Fig 1).

2. Similarly post space was prepared in the distal canal using peeso reamer numbers 1–4 (1.3 diameter) of length 6mm (leaving 7mm of gutta percha apically)3(Fig 1).

Fig 1:Post space preparation of the mesiolingual and distal canals

3. Lightly lubricate the distal canal (primary canal) and notch the loose fitting wooden stick. It should extend to the full depth of the preparedcanal.(Fig 2)

Fig 2: Resin pattern fabrication of distal canal

4. Usethebead–brushtechniquetoaddresintothewooden stick and seat it in the preparedcanal.

5. Do not allow the resin to harden fully within the canal. Loosenandreseatitseveraltimeswhileitisstillrubbery.

6. Once the resin pattern had been polymerized, it was removed from the distal canal. (Fig 3)

Fig 3: Distal section of split post and core

7. It was then invested and casted.

8. During the final finishing, a key way was made in distal canal custom post.

9. Seating was checked in patient's mouth. While the distal canal post was seated in the canal, mesiolingual canal pattern including a key was fabricated. (Fig 4)

Fig 4:Intraoral photograph showing resin pattern fabrication of mesiolingual canal

10. As the key was seated in the keyway of distal canal post, the whole assembly was removed as a unit from the mouth to prevent the distortion of the pattern.

11. Now the mesiolingual canal pattern was separated from the distal canal post and carefully invested and casted. (Fig 5)

Fig 5: Distal post core assemble with mesiolingual post core pattern.

12. Both the posts were adjusted inside the primary (distal) and secondary (mesiolingual) canals one by one. After the adjustments both the posts were cemented with resin cement. Final restoration was done with full veneer cast metal crown4. (Fig 6 -12)

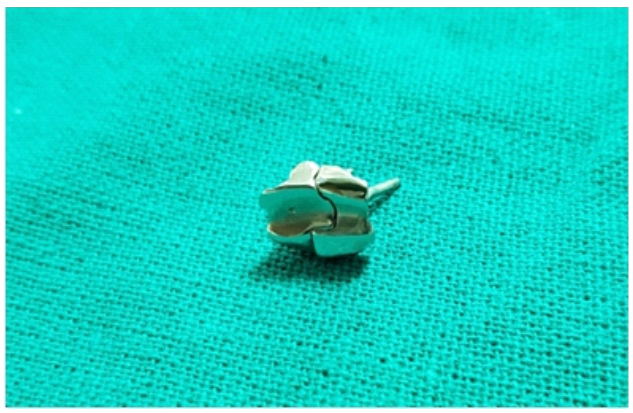

Fig 6: Assembly of mesial and distal sections of split cast post and core.

Fig 7: Split cast post and core

Fig 8: Luted and finished split cast post and core

Fig 9: Metal trial of the PFM crown

Fig 10:FinalrestorationwasdonewithPFMcrown

Fig 11:Intraocclusal view of final restoration

Fig 12: IOPA of luted and finished split cast post and core and PFM crown

DISCUSSION

An endodontically treated and restored tooth looses much of its natural tooth structure due to caries decalcification, access cavity preparation and crown preparation. It is this loss of structural integrity rather than the changes in dentin that lead to a higher occurrence of fractures in endodontically treatedteeth compared

with “vital”teeth. Accesspreparations result in increased cuspaldeflection during functionand increase the possibility of cusp fracture and micro leakage at the margins of restorations. Randow and Glantz reported that teeth have a protective feedback mechanism that Is lost when the pulpisre moved which mayalsocon tribute to tooth fracture.

Consequently, a pulpless tooth requires a restoration that conserves and protects the remaining tooth structure. Ithas been reported that a large number of endodontically treated teeth are restored to their original function with the use of in traradicular devices.These devicesvary from a conventional custom cast post and core to one-visit techniques, using commercially available prefabricated post systems.

Custom cast posts and cores are generally recommended for posterior as well as anterior teeth with grossly decayed crown structure. The cast post and core is custom fitted to the prepared root canal space and designed to resist torsional forces. According to Morgano5 and Heydeche5, custom fabricated castpost and cores are still the established technique or gold standard forre storing extensively damaged teeth.

Smith6 and Ash7stated that canal configuration aids in making a choice between a custom designed postanda prefabricated post. The selected post should closely conform to the canal shape and sizetomakerestoration more conservative as thisre quiresless dentin removal, enhances fracture resistance of the tooth and also enhances retention of the post and core system. The primary reason for using a postistoretain the core that substitutes the missing coronal tooth structure. Therefore, the post head design is an important factor. The post head should provide adequate retention and resistance to displace ment of the corematerial. Studies have reported thatprefabric atedmetal posts with direct coremade of glassionomer, compositeoramalgamare lessre liable thana one piece castpost and core because of the interface between the post and the core2.

CONCLUSION

The clinic I an should be knowledge able inselecting the right type of post and core systems to meet the biological, mechanical, and esthetic needs for each individual tooth. An ideal post system should have the ability to distribute the functional stress esevenlya long the root surface, should beesthetically compatible with the definitiverestoration and surrounding tissue and produce minimal stress during placementandcementation.Custom-cast post and cores are recommended for noncircular root canals and when coronal tooth structure loss is moderate-to-severe. The recommendations for the split cast metal post and core designdiscussedin the present case are forteeth having divergent roots,with canals not allowing the same path of insertion forthe posts. Simplified design and ease offabricationare the major advantages of this technique. The technique can be accomplished in any dental clinic without using any complicatedequipment.

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Case Report

MANAGEMENT OF SKELETAL CLASS II DIV 1 MALOCCLUSION USING TWIN BLOCK WITH HEAD GEAR: A CASE REPORT

Renu, Gupta Seema, Bhambri Eenal, Bharadwaj Ankit

Abstract

Class II malocclusion is one of the most common orthodontic problems and it occurs in about one third of the population. A variety of functional appliances are available to correct Class II malocclusions. Twin block is the most common functional appliance used successfully in correction of a skeletal class II relationship. Sometimes, extra oral traction is also used along with twin block to reinforce the functional component for correction of skeletal Class II relationship. A 12 year old female patient reported to the Department of Orthodontics with chief complaint of forwardly upper front teeth. The case was diagnosed as skeletal Class II due to retrognathic mandible and prognathic maxilla with normo towards hypodivergent growth pattern and it was treated with twin block along with high pull head gear. Combination of these two appliances gave desired results.

Keywords: High pull head gear, Twin block, skeletal class II, functional appliance, extra oral traction

Introduction

Class II malocclusion is one of the most common orthodontic problems and it occurs in about one third of the population.1 Skeletal class II is caused due to: (1) maxillary jaw protrusion.(2) Mandibular jaw retrusion. (3) Combination of both.The treatment modalities are: (1) Growth modification with functional/orthopedic appliances. (2) Dental camouflage, (3) Fixed Appliance(extraction non extraction)2.

A variety of functional appliances are available to correct class II malocclusions like activator, functional regulator, twin block etc. The twin block, given by Clark3, is a very commonly used appliance for many reasons; it has reduced bulk unlike other appliances, patient adjusts to speech and other functions very quickly, it can be fixed to the teeth in non-compliant cases, patient immediately sees the changes upon wearing the appliance which acts as a positive reinforcement. Compared to other appliances, twin block seems to be more useful in causing sagittal and vertical changes.4 The indication for functional therapy with orthopedic traction is confined to cases requiring mandibular advancement along with intrusion and/or distalization of maxilla.3

Case report

A 12 year old prepubertal female patient reported to the Department of Orthodontics and Dentofacial Orthopedics with the chief complaint of forwardly placed upper front teeth. On clinical examination, patient had convex profile with acute nasolabial angle, incompetent lips with 3mm of interlabial gap, deep mentolabial sulcus and retrognathic mandible. The patient had Class II skeletal pattern with low Frankfort-mandibular plane angle and reduced lower anterior face height. There was no facial asymmetry. Intraoral examination revealed end on molar relationship on right side & class II molar on left side. The incisor relationship was class IIwithexcess overjet of 14mm & 100% deep bite (10mm overbite). There was crowding in lower anteriorswith scissor bite in left first premolar region. The pretreatment intra-oral and extra-oral photographs are shown in (Fig 1).

Fig 1: Pretreatment intraoral and extraoral photographs

The case was diagnosed as skeletal class II malocclusion with a combination of slight maxillary excess and mandibular deficiency with deep bite. The cephalometric analysis confirmed a skeletal Class II jaw relationship with a retrognathic mandible and prognathic maxilla. Additionally, the maxillary incisors were labially inclined and mandibular incisors were slightly retroclined on the mandibular base. The lateral radiographs of the patient are shown in (Fig 2). Evaluation of patient's cervical and handwrist radiographs indicated considerable amount of growth remaining

(CVMI 2 & SMI 4). Pretreatment OPG indicated unfavourably impacted 13 along with a presence of supernumerary tooth (Fig 3).

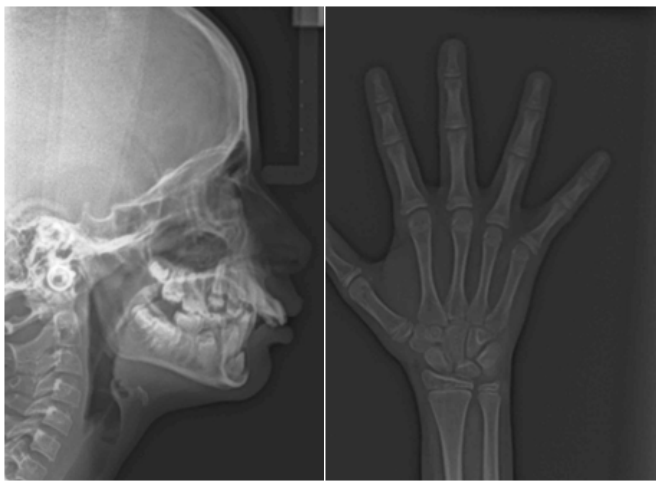

Fig 2: Pretreatment lateral cephalogram and handwrist radiogaph

Fig 3: Pretreatment OPG

Treatment objectives

• Correction of skeletal class II jaw relationship

• Reduction of convexity of profile

• Achievement of class I molar and canine relationship

• Achievement of normal overjet and overbite

• Achieve optimal facial balance and esthetics.

Treatment plan

Since patient was skeletal class II and she was in her growing stage and prepubertal, therefore to correct skeletal dysplasia, restrict the maxillary growth and to redirect the mandibular growth, growth modification was planned with functional appliance. Twin block with high pull head gear for advancement of mandible and for restriction of maxillary growth, in first stage followed by fixed orthodontic appliance was planned. Twin block appliancewith high pull head gear was worn for a period of 15 months (Fig 4 & Fig 5). Twin block was scheduled for full time wear, while head gear was given for 16 hours per day. To decrease the maxillary incisor show, high pull head gear was given. Mandibular advancement was done in two stages. Bite registeration was done with 4mm vertical and 6 mm horizontal advancement in both stages. Unfavouably impacted 13 along with supernumerary crown were planned for extraction before delivering functional appliance.

Fig 4: Mid treatment extra oral photographs

Fig 5: Mid treatment intraoral photographs

Treatment progress

There was remarkable correction in sagittal skeletal dysplasia along with achievement of class I molar relationship bilaterally with significant reduction in overjet and overbite. Post functional extraoral and intraoral photographs are shown in Fig 6 & 7. Pre & Post functional cephalometric analysis are shown in Table 1. Post functional lateral cephalogram and handwrist radiograph are shown in Fig 8.

Fig 6: Post functional intaoral photographs

Fig 7: Postfunctional extraoral photographs

Fig 8: Postfunctional Lateral cephalogram and handwrist radiograph

Parameters	Pretreatment	Postfunctional
SNA	80.5°	80°
SNB	73.5°	77°
ANB	7°	3°
Angle of convexity	16°	8°
Upper incisor- NA (degree)	35°	21°
Upper incisor- NA (mm)	8.5mm	4mm
Lower incisor- NB (degree)	18°	26°
Lower incisor- NB (mm)	4mm	6mm
AO-BO (Wits appraisal)	4mm	2mm
Go-Gn to SN	30°	31°
FMA	26°	28°
Nasolabial angle	85°	100°
S- Line – Upper lip	4mm	2.5mm
S- line – Lower lip	4mm	3mm
Upper Pharyngeal airway	13mm	15mm
Lower pharyngeal airway	11mm	13mm
Extent of anterior cranial base	59mm	59mm
Extent of ascending ramus	46mm	48mm
Extent of maxillary base	43mm	43mm
Extent of mandibular base	57mm	59mm
Angle of inclination	77°	75°
Basal plane angle	19°	21°
Palatal plane to occlusal plane angle	14°	9°
Occlusal plane to mandibular plane angle	5°	12°

Table 1: Cephalometric analysis

Discussion

Various factors play an important role in the development of sagittal discrepancies. Identifying and understanding the involvement of specific causative factors is essential in developing an effective treatment plan.5 Twin Block developed by Clark (1982), has proved a popular and clinically successful appliance. With improved patient co-operation and increased daily wear correction of a sagittal discrepancy is possible.6 It enables the patient to perform masticatory function, speech, lateral excursion and other jaw functions very comfortably.7 Several studies have been performed and have documented the skeletal and dentoalveolar effects of twin block with extraoral traction for correction of skeletal class II malocclusion.8

In this case, when pretreatment and postfunctional cephalometric parameters are compared, skeletal and dentolalveolar changes can be appreciated well with decrease in ANB, decrease in convexity, opening of mandibular plane angle, reduction in proclination of upper anteriors. The twin block traction technique resulted in functional correction with restriction of maxillary growth and sagittal correction of mandibular base.

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Case Report

FULL MOUTH REHABILITATION WITH FIXED IMPLANT SUPPORTED PROSTHESIS: A CASE REPORT

Dr. Ritwik Tyagi, Dr. Sandeep Kumar, Dr. Rajnish Aggarwal, Dr. Sunita Choudhary, Dr Sukhdeep Kaur

ABSTRACT

The objective of a dental prosthesis is to replace the teeth and adjacent tissues to restore function, estheticsand speech. Oral rehabilitation of an edentulous patient is a challenge to the prosthodontist. Few patients have life-long problems with their complete dentures, such as difficulties with speech and mastica¬tion. Implant-supported prosthesis gives an opportunity to such patients to live a normal healthy life for their functional and esthetic demands. Implants are the most preferred treatment option to support and retain the fixed or removable prosthesis. Successful osseointegration enables both dentist and the patient to accept full-arch implant-supported prosthesis. Full-arch rehabilitation, a term used by many practitioners, has become a popular restorative option in prosthodontics. Full-arch implant-supported fixed prosthesis is a well-established treatment modality for edentulous patients.

The aim of this study was to present a case report on full-mouth rehabilitation with implant-supported fixed prosthesis for com¬pletely edentulous maxillary and partially edentulous mandibular arch.

Keywords: Full mouth rehabilitation, Porcelain fused to metal, Resin jig.

Conflict of interest : None.

INTRODUCTION

Edentulism is associated with compromised esthetic, functionaland psychological complications. Rehabilita¬tion of completely edentulous patient presents a challenge to the dentist. Many patients wearing conventional removable complete den¬tures face difficulty in adapting to their prosthesis because of physiological and psychological problems. The ideal goal of modern dentistry is to restore the patient to normal contour, function, comfort, aesthetics, speech, and health. Implant dentistry has the ability to achieve this ideal goal regardless of the atrophy, disease, or injury of the stomatognathic system. As a result of continued research, diagnostic tools, treatment planning, implant designs, materials and techniques; predictable success is now a reality for the rehabilitation of many challenging clinical situations. Evolution of implant-supported removable prosthesis and fixed prosthesis has become an integral part of prosthodontic treatment planning.1Success rates of fixed implant-supported prosthesis are high and postoperative complications are relatively low.2-6

CASE REPORT

A 55-year-old female patient reported to the Depart¬ment of Prosthodontics, Surendera Dental college and Research Institute with a chief complaint of missing teeth in both upper and lower arches and wanted to be replaced by fixed prosthesis to restore esthetics and speech. Intra oral examination revealed patient was a previous denture wearer. Patient was advised to undergo routine blood investigation, full mouth radiography [orthopantomogram] (Fig. 1).The patient was educated and motivated regarding implant-supported fixed prosthesis. Diagnostic impres¬sions of both maxillary and mandibular arches were made with an alginate impression. Preoperative photographs were taken for future reference. Patient reported back with normal laboratory findings. The implant sites were selected. Ten implants were selected according to the available bone for the maxillae and mandibular edentulous areas.

SURGICAL PHASE

Two-stage surgical protocol was planned and patient was asked to take antibiotics and analgesics prior to surgery. Mucoperiosteal flap was elevated all over the maxilla and previous maxillary denture was used as a template for the implant placement. Paralleling tools are placed and checked for angulations of the implant. Sequential drills were used and implants were placed in the osteotomy site and wrenched into the site until all threads are buried. Cover screws were placed. Postoperative care has been administered with antibiotics and analgesics. The patient was given instructions for maintenance of oral hygiene and use of ice pack if needed. Similar procedure was followed for the posterior mandible. The patient was recalled back after 3 months and OPG was advised again to check for osseointegration (Fig2).Based on

radiographs, the second-phase surgery was planned.

Second-stage Surgery

During second-stage surgery, midcrestal incision was placed under local anesthesia and flaps were reflected, covering screws were removed and replaced by healing abutments (Figs 3A and 3B), and suturing was done. Patient was recalled after a week for suture removal and waited for 2 weeks for healing to take place.

PROSTHETIC PHASE

An alginate impression was planned to fabricate primary cast onto which special trays were fabricated for an open tray impression technique (Fig4) and open tray implant level impression was planned for master cast because an open tray implant level impression provides accurate casts and greater flexibility for the selection and modification for a definitive abut¬ment by a laboratory technician, especially in case of mul¬tiple implants.8 During the impression procedure, healing abutments were removed from fixtures and in the maxillary impression six pick-up type open tray transfer copings were connected and tightened on each fixture with guide pins. They were splinted together with the help of flossing and pattern resin (Fig5,6) to provide a precise transfer of the spatial relationships of implants from the mouth to the master cast. Custom tray was tried intraorally for extension and open windows were sealed with modeling wax, loaded with polyvinyl siloxane elastomeric impression material in the putty consistency and light body was flowed over the copings in the mouth. The impression was then placed in patient's mouth; once material was set and impression analogs were unscrewed with the help of hex, impression was separated from the mouth (Fig 7). Implant analogs were threaded to impression copings and maxillary master cast was fabricated (Fig 8).

For mandibular impression closed tray impression technique was chosen. The teeth present were prepared. Four pick-up type transfer copings were connected and tightened on each fixture. The impression was made in a stock tray with polyvinyl siloxane elastomeric putty impression material (Zhermark) and placed in patient's mouth; once material was set and impression copings were unscrewed and lab analogues were screwed to the copings and were placed in respective places (Fig.7 B).Denture bases and occlusal rims were fabricated for jaw relation record.Resin jig was fabricated with the help of pattern resin in the cast with definitive abutments in place and verified clinically (Fig9,10) for marginal discrepancy. After confirmation of pattern resin jig clinically, articulation was done (Fig11).

Cobalt–chromium (Co-Cr) metal framework was fabricated and trial was carried out in patient's mouth, following which, interocclusal record was made with metal framework. Shade selection was done and ceramic build up was carried out according to template and bisque trial was done in patient's mouth; occlusal adjustments were carried out with articulating paper, temporary cementation was done with the help of zinc oxide eugenol cement followed by glazing of the prosthesis and verified again for occlusion. The final cementation was done by securing the abutment access hole with glass ionomer cement (Fig. 12A, B). Postoperative photographs were taken and postdelivery instructions were given regarding oral hygiene and good maintenance of the prosthesis (Fig13).

DISCUSSION

Treatment of partial and total edentulism with dental implants has evolved into a predictable procedure for majority of patients and is expected to play a significant role in oral rehabilitation. Surgical placement of dental implants is a well-documented treatment for edentulism. Treatment success rates are high and postoperative complications were relatively modest. Successful implant treatment involves osseointegration of implants that are placed in ideal positions for fabrication of a dental prosthesis. Periodic clinical assessment of the implant fixture, prosthesis, and surrounding tissue is critical for clinical success.

CONCLUSION

Availability of a fixed treatment option is a remarkable advancement in prosthodontics. It is one of the dentistry's most

gratifying treatment modalities, but it demands considerable skill and judgement and a high degree of patient commitment and understanding.In the present case report, the patient was fully satisfied with the treatment outcome compared to his previous conventional denture.

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FIGURES

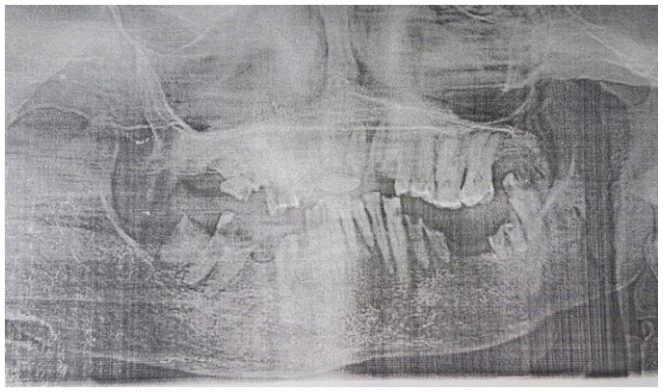

Fig 1:Pre operative OPG

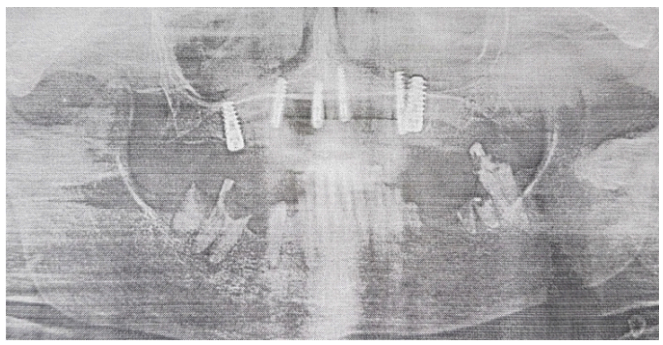

Fig 2 A : Maxillary implants placed.

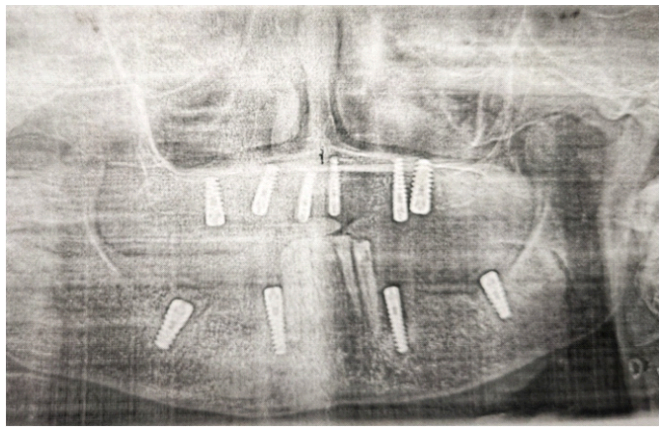

Fig2 B: Post- operative OPG.

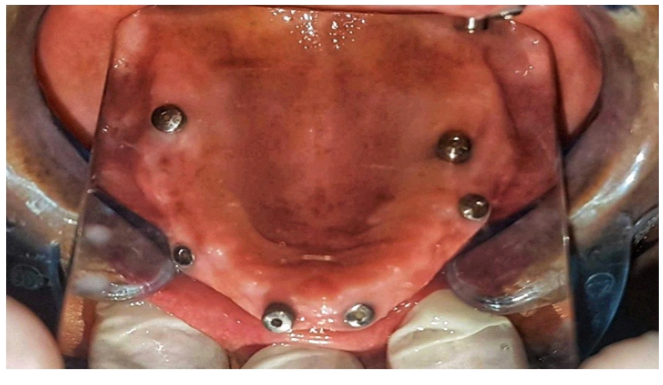

Fig3 A: Healing abutments in place

Fig3 B: Healing abutments in place

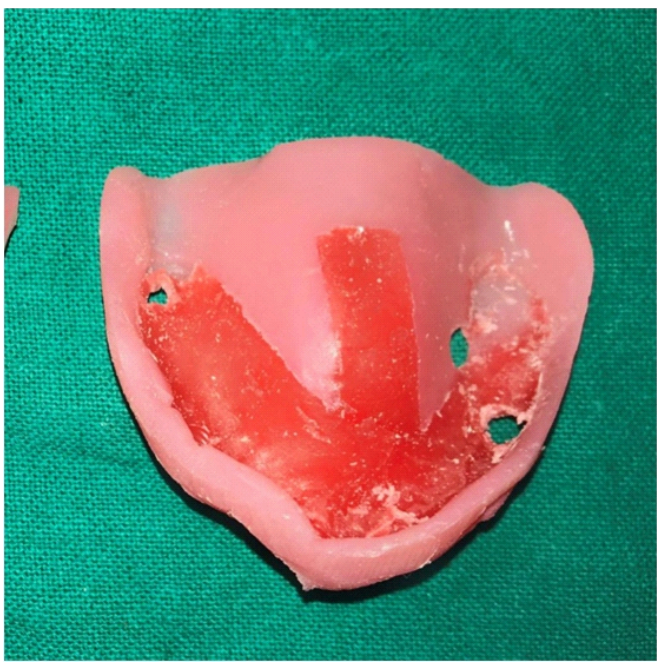

Fig4: Custom tray fabricated with open windows for maxilla.

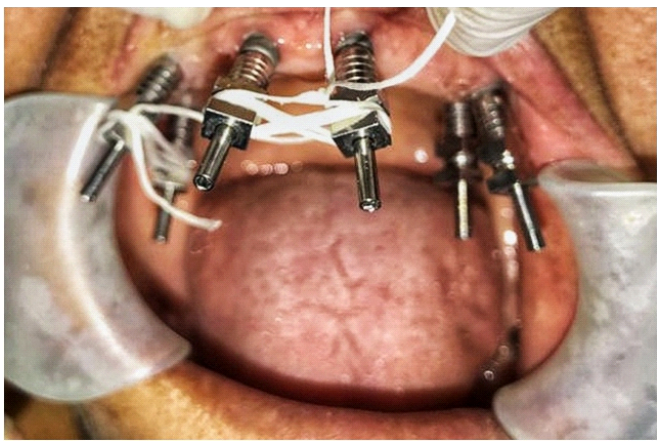

Fig5: Impression copings in place Flossing of impression copings

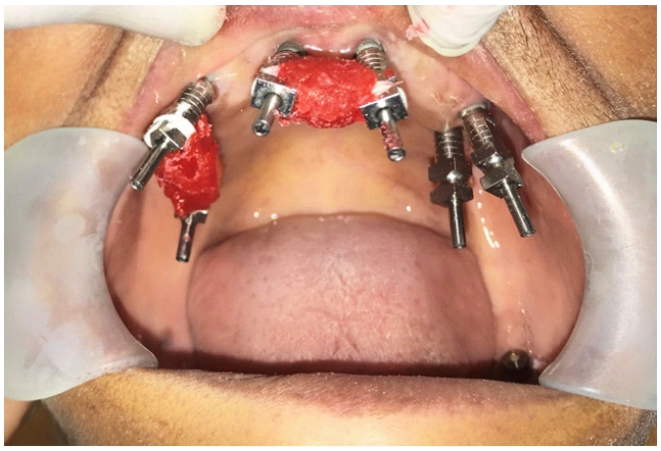

Fig6: Impression copings splinted together with pattern resin.

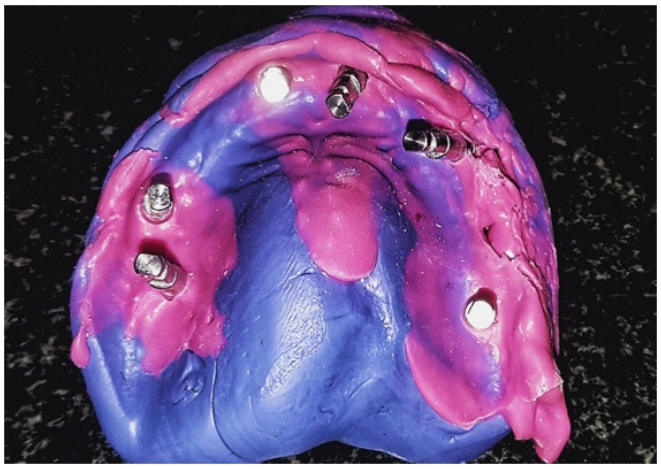

Fig7 A:Open tray impression for maxilla with lab analouges

Fig7 B: Closed tray impression for mandible after tooth preparation.

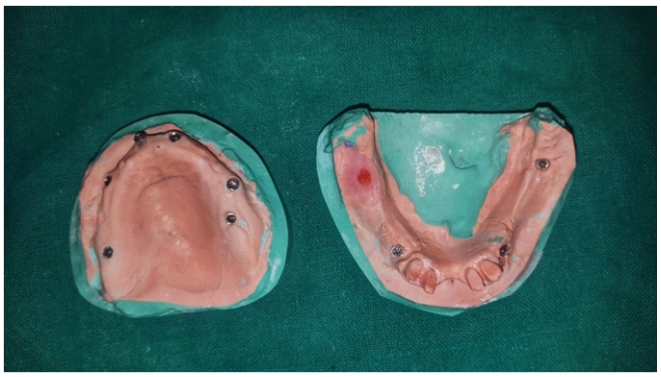

Fig 8: Definitive casts for maxilla and mandible with analouges in place.

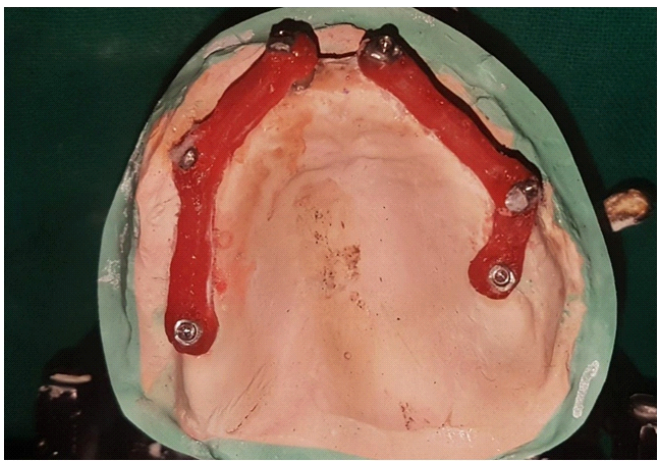

Fig9: Resin jig fabrication on maxillary definitive cast.

Fig10: Resin jig verification with definitive abutments

Fig11: Articulation .

Fig12 A: Final prosthesis verified for occlusion

Fig12 B: Final prosthesis verified for occlusion

Fig13: Postoperative view of the patient

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Case Report

MACRO-STRUCTURAL AND ROOT CANAL SYSTEM VARIATIONS OF PERMANENT MANDIBULAR MOLARS. A CASE SERIES

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ABSTRACT

There are more chances of finding morphological variations in mandibular molars and premolars though all categories of teeth may have extra roots and/or canals. Anatomical variations with as many as 2-4 separate roots, extra canals are seen in mandibular molars. This series described cases of mandibular molars with three roots, five canals, C-shaped canal and single root with one canal that were instrumented using various file system. Failure to recognize these anatomical variations lead to inadequate removal of pulpal tissues and microorganisms from the pulp canal system which ultimately leads to failure of endodontic treatment. Clinicians should be aware of these variations and should have knowledge to facilitate the endodontic procedure, and avoid 'missed' canals.

INTRODUCTION

All categories of teeth may have extra roots and / or canals. However, chances in premolars and molars are comparatively higher.1It is very important for clinicians to be able to identify these anatomical differences. Failing to identify the differences would make the whole process worthless even though clinicians follow every single principles and guidelines for endodontic treatment. This finally results in incomplete removal of pulpal tissues and microorganisms from the pulp canal system. This potentially is one of the major causes of unsuccessful endodontic treatment.2 The complexity of the root canal system results in highest risk of missing anatomy. 1So every clinician should have a thorough knowledge of root canal morphology of the tooth being treated. Mandibular molars have various morphologic variations such as taurodontism, supernumerary root, single root, extra canals and C-shaped canal system.3,4 Although, they generally have two roots, mesial and distal, a supernumerary root is sometimes found either on distolingual or on mesiobuccal aspect of tooth. This macrostructure was first mentioned in the literature by Carabelli (1844)and was later termed as Radix Entomolaris (RE) if present in distolingual aspect and Radix Paramolaris (RP) in mesiobuccal aspect. It can be found in the first, second and third mandibular molars.2 The three-rooted mandibular first molar is generally present in Mongolian traits (5 to more than 30%). But, a small percentage of less than 5 appears in other populations like in white Caucasian, African, Eurasian and Indian populations.5The bilateral incidence of a symmetrical distribution is from 50 to 67%.2 Although mandibular first molar commonly has two canals in the mesial root: mesiobuccal (MB) and mesiolingual (ML), sometimes a small percentage of 1% to 13.3% has a middle mesial (MM) canal in the groove between the mesiolingual and mesiobuccal canals.6,7 Out of 145 teeth studied, Fabra-Campos found 2.75 % of the mandibular first molars had five canals. 3 Depending on the method used for detecting the third mesial canal, its prevalence ranged from 0% to 36%.8 A mandibular second molar with three roots is a rare clinical entity9 that was reported to be about 13% in the study of De Pablo et al and 2% in the study by Manning SA.10,11The prevalence was reported to be 2% in Iranian population12, 4% in Jordanian population.13 Another unusual root canal morphology found primarily in mandibular second permanent molars is C-shaped root canal system which on transverse section is shaped like the letter C. However, it is not always necessary to be C-shaped from orifice to apical foramen. If any arbitrary cross section is present in a C shaped root canal configuration, it is defined as the C-shaped root canal system. This condition was mentioned in the literature by Cooke and Cox in 1979.14The prevalence of 2.7 was reported in Caucasian population,4 31.5% in Chinese,15 and 32.7% in Koreans.16 It has been concluded that C-shaped canal system is more frequently found in Asians than in other racial groups.17 Morphological variations of roots and root canal systems need not always be in the form of extra root and extra canals. There can be fewer numbers of roots and root canals than the normal root canal anatomy. Root fusion resulting in a single root, conical or C-shaped form, has an incidence of about 21.8%.18 The aim of this present case series was to evaluate the variations in roots and canal system in mandibular molars.

CASE SERIES

All the cases were presented to the Department of Conservative Dentistry and Endodontics, Universal College of Dental Surgery, Bhairahawa, Nepal with non-contributory medical history.

Case No. 1: Permanent mandibular first molar with radix entomolaris

In this case, from the clinical and radiographic findings (Figure 1a), diagnosis of necrotic pulp; chronic apical abscess was made in tooth 46 and endodontic treatment was started. The standard triangular access was modified in a more trapezoidal form. Pulpal floor was examined with DG 16 endodontic explorer* that revealed four canal orifices. All the canalswere prepared with Hyflex CM files† with crown down technique. Obturation was done using cold lateral condensation technique.(Figure 1b).

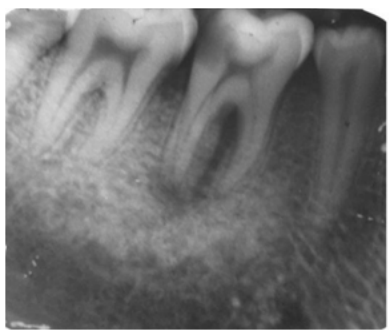

Fig 1 a. Preoperative IOPA

Fig 1 b. Post obturation IOPA showing 4 canals

Case No. 2: Permanent mandibular first molar with middle mesial canal

Diagnosis of symptomatic irreversible pulpitis in tooth 36 was made (Figure 2a) and endodontic treatment was started. After access opening, the groove joining the MB-ML canals and DB-DL canals were troughed. Pulpal floor was examined with DG 16 endodontic explorer which revealed three canal orifices in mesial root and two orifices in distal root (Figure 2b). The intraoral periapical radiograph revealed five canals (Figure 2c). All the canals were prepared with Hyflex CM files with crown down technique and obturation was done with lateral condensation technique (Figure 2d).

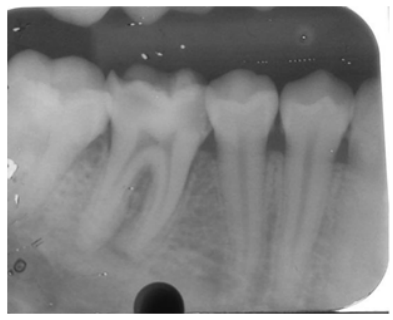

Fig 2 a. Preoperative IOPA

Fig 2 b. Intraoral view showing mid mesial canal

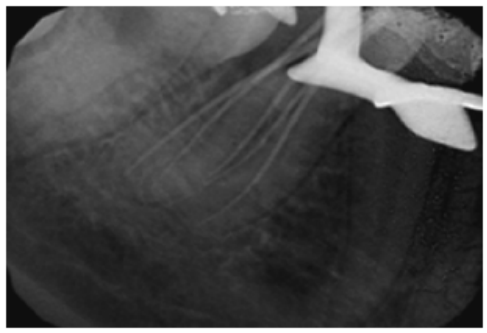

Fig 2c. IOPA showing 3 mesial canals

Fig 2d. Post obturation IOPA

Case No. 3 Permanent mandibular second molar with radix entomolaris

In this case, diagnosis of asymptomatic irreversible pulpitis was made in tooth 37 (Figure 3a). Observation via a conventional access cavity revealed the presence of 3 canal orifices, 2 mesial and 1 distal. On diagnostic radiograph, a third root was seen between the mesial and distal root. So, on suspect of extra canal, the dentinal map in the floor of the chamber was traced and explored using a DG 16 endodontic explorer. At the distolingual corner, an overlying dentin was removed and a second distal canal orifice was detected (Figure 3b). Canals were prepared using hybrid technique and obturated using cold lateral compaction technique (Figure 3c).

Fig 3 a. Preoperative IOPA

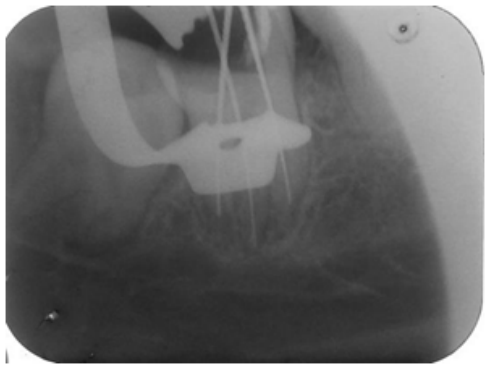

Fig 3 b. IOPA showing 3 roots

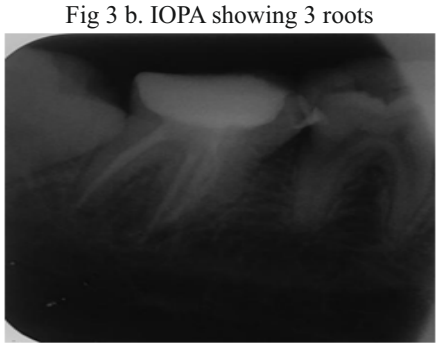

Fig 3c. Post obturation IOPA

Case No. 4 Permanent mandibular second molar with C-shaped canal configuration

From the clinical and radiographic findings, diagnosis of symptomatic irreversible pulpitis; symptomatic apical periodontitis was made in tooth 47 (Figure 4a). On exploration of pulp chamber, two canal orifices were recognized that were connected by connecting slit (Figure 4b). Working length radiograph showed that both the canals were joined at the apical third of the root (Figure 4c). Then cleaning and shaping was done using hybrid technique and obturation was done using thermo plasticized compaction technique (Figure 4d).

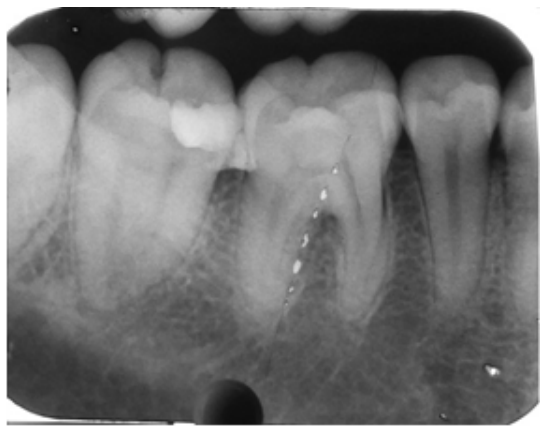

Fig 4 a. Preoperative IOPA

Fig 4 b. Intraoral view showing C-shaped canal configuration

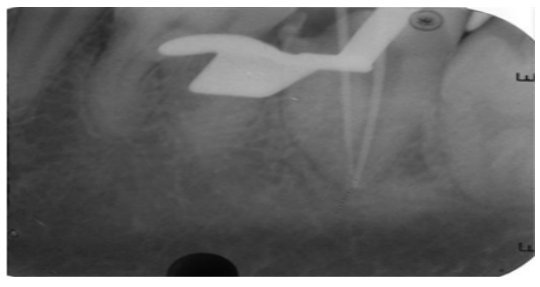

Fig 4 c. IOPA showing C-shaped canal configuration

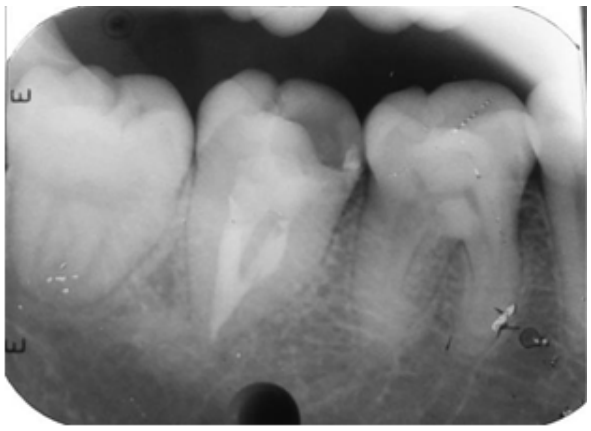

Fig 4 d. Post obturation IOPA

Case No. 5 Permanent mandibular second molar with single root and single canal

In this case, tooth 47 was given metal ceramic crown after restoring the tooth. Diagnosis of symptomatic irreversible pulpitis was made (Figure 5a). Standard access cavity was prepared that uncovered a huge canal orifice at the center of the pulp chamber. Diagnostic IOPAR revealed a single root and canal. Cleaning and shaping was done using a step back technique using ISO K file and obturated with gutta-percha using cold lateral compaction technique (Figure 5b).

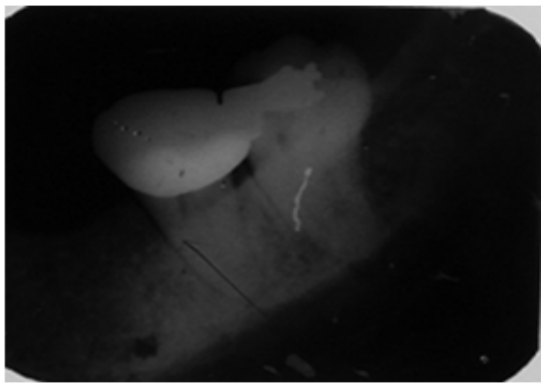

Fig 5 a. IOPA showing single rooted mandibular 2nd molar

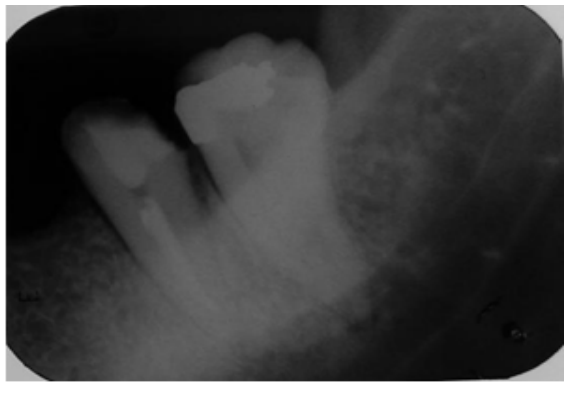

Fig 5 b. Post obturation IOPA

DISCUSSION

This series describes the various morphological variations that can be present in mandibular molars. The 3-rooted mandibular first molar reported here had 1 mesial root with 2 canals and 2 distal roots with one canal in each. Similar canal configuration was present in mandibular second molar also. Though 4 canals are common in mandibular first molar, the presence of 2 distal roots is not so common.19 If the third root is present in disto-lingual aspect, then it's called RE and if on mesio-buccal aspect, it's called RP. 2 Carlsen and Alexandersen described the identification and external morphology of these roots with a lingual or buccal supernumerary root.20The RE mostly has: Vertucci type I canal configuration; is smaller than disto-lingual root and is curved which poses challenges during endodontic treatment.21,22 Many authors have reported mandibular first molar with RE but mandibular second molar with RE is extremely rare.9Various classifications of Radix entomolaris had been given by different authors on different basis. On the basis of buccolingual variations by De Moor et al.21, on the basis of morphological characteristics by Calberson et al. 23 The etiology behind the formation of RE is still unclear; but it could be related to external factors during odontogenesis or to penetrance of an atavistic gene or polygenetic system in dysmorphic roots. In eumorphic roots, racial genetic factors influence the more profound expression of a particular gene that results in more pronounced phenotypic manifestation.2RE in mandibular second molar is a dysmorphic alteration (rare or unusual morphological alteration) even in ethnic populations with high prevalence of RE in mandibular first molars.24Although the prevalence is equal in both male and female, but it is more frequently found on left side.25 Mostly DB and DL roots superimpose on standard buccal-to-lingual projection radiograph which increases the possibility of missing canal during endodontic treatment. Besides this, it has been found to be a contributing factor to localized periodontal destruction. So, in order to avoid these complications, an accurate diagnosis is always mandatory.26 A 20° projection of x-ray beam from the mesial and 20° from the distal along with standard projection reveals the basic information regarding the anatomy of tooth.The

buccal object rule [Clark's rule or the same lingual, opposite buccal (SLOB rule)] may help to determine the position of a lingual root9but still multiple intraoral radiographs do not guarantee the identification of all relevant anatomy.22Three-dimensional imaging overcomes this major limitation by allowing the visualization of the third dimension while at the same time eliminating superimpositions.27Besides radiological diagnosis, clinical inspection is also equally important and should also be done thoroughly.2 The standard triangular access should be modified in a more trapezoidal form22 If the orifice of RE canal is not clearly visible after the removal of pulp chamber roof, a more thorough inspection of the pulp chamber floor and wall is needed - especially in the distolingual region. This has become easier with the advancement of loupes and surgical operating microscope. A dark line on the pulp chamber could indicate the precise location of the orifice which could be occluded by secondary or calcified dentine. This calcification has to be removed for a better view and access to the RE.9 The presence of three root canals in the mesial root of mandibular first molar has been reported by different authors. If the third canal is present, it is found centrally between the MB and ML root canals. The diameter of this canal is smaller than that of the other two mesial canals and depends upon age because of apposition of dentine. Dentinal vertical apposition formed inside the root canal cavity due to secondary dentine apposition during tooth maturation forms root canals. This third canal is formed by same process.28 Pomeranz et al. 28described three morphological variations of these canals in relation to the other main mesial root canals. The third middle mesial canal is defined as “Independent” if the canal originated as a separate orifice and terminated as a separate foramen; “Confluent” if converging to one of the other two main mesial canals and terminating at a common apical foramen; and “Fin” when an endodontic instrument passes to the buccal or lingual canals from the third middle canal. It has been reported that the orifice of the MM canal was always located close to the ML canal. In this case report, the mandibular first molar with three mesial canals have confluent anatomy which is the usual anatomical configuration.8 The middle mesial canal in mandibular first molar presented here converge to ML canal to terminate at a common apical foramen. Another variation of root canal system is C-shaped canal configuration. Keith & Knowles were the first to depict a C-shaped root canal but they did not assign any specific terminology to the morphological anomalies they observed. It was first analysed in detail by Nakayama in 1941, who gave it the name 'gutter-shaped root'.14Then Tratman termed this morphology the 'horse-shoe reduction form' which can be frequently observed in Asian individuals. This condition was described for the first time in literature by Cooke and Cox in 1979, after which the terms 'C-shaped root' and 'C-shaped root canal' have been commonly used by researchers and clinicians worldwide.14It is usually present in mandibular second molars. However, mandibular premolars, maxillary molars and mandibular third molars may also possess this variation.29It happens due to the failure of fusion of Hertwig's epithelial sheath in furcation area. Failure to fuse on buccal side results in the formation of lingual groove and on lingual side results in buccal groove but failure on both sides result in formation of a conical or prism-shaped root.30Because the fusion is not uniform, a thin interradicular ribbon connects the two roots together.29The pulp chambers of the teeth with this canal system have greater apico-occlusal width with a low bifurcation resulting in a deep pulp chamber floor. It shows broad, fan-shaped connection from the coronal to the apical third of the canal.9 Various classifications of C-shaped canal systems have been given by various authors. Melton et al.30classified C-shaped canals based on their cross-sectional shape. Fava et al.31modified Melton's method into five categories. Furthermore, he also classified C-shaped roots according to their radiographic appearance into three types. In this case report, mandibular second molar with C-shaped canal system has the pulp chamber floor of Type I and radiographic configuration of Type I that have a mesial and a distal canal that merged into one before exiting at the apical foramen. Another variation is the presence of single root and single canal in mandibular second molar.18Conclusion

The clinician must be aware of all the morphological variations that can be found in mandibular molars which directly affect the probability of success. The initial diagnosis should be done

thoroughly. CBCT along with the operating microscope and ultrasonic tips are useful tools in the diagnosis and success of root canal therapy.

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Discussion/Conclusion: This section should relate the results section to current understanding of the scientific problems being investigated in the field. Description of relevant references to other work/s in the field should be included here. This section also allows the authors to discuss the significance of the results. This section should end with answers/questions that arise as a result of the author's work.

Figures: Illustrations must be numbered and cited in the text in order of appearance and submitted electronically (at least 300 DPI in .TIFF format). Each registration (including its corresponding legend) must be on a separate page. Illustrations, photographs and radiographs must be submitted electronically.

Legends for illustrations should use Arabic numerals corresponding to the illustrations. When symbols, arrows, numbers or letters are used to identify parts of the illustrations, identify and explain each one clearly in the legend. Explain the internal scale and identify the method of staining in photomicrographs.

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1. West JD, Oates TW. Identification of stability changed for immediately placed dental implants. Int J Oral Maxillofac Implants 2007;22:623-30.

Book Reference Style:

1. Lee JS, Kim JK, Park YC, Vanarsdall RL. Applications of orthodontic mini implants. Chicago: Quintessence 2007.
2. Baumgartner JC. Pulpal infections including caries. In: Hargreaves KM, Goodis HE (Eds). Seltzer and Bender's Dental Pulp. Chicago: Quintessence 2002:281-307.

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Review articles: It is expected that these articles would be written by individuals who have done substantial work on the subject or are considered experts in the field. A short summary of the work done by the contributor(s) in the field of review should accompany the manuscripts.

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