Vol. 02, Issue 1, January - April 2012

Journal of Contemporary Dentistry

Official Publication

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JOURNAL OF
CONTEMPORARY DENTISTRY

Journal of Contemporary Dentistry is the official publication of the Mahatma Gandhi Mission Dental College & Hospital and issues are published in the last week of June, October and February.

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Printed at
Anitha Art Printers
29/30 Oassis Industrial Estate,
Nehru Road,
Next to Vakola Market,
Santacruz (E), Mumbai 400 055.
Tel.: 2665 2970, 2665 2978
E-mail: printing@anitaprinters.com

Editor's Message

With the heartening news of India being the world's leading economy by 2050, we are also faced with the gloom of simultaneous erosion of human values. We are bombarded daily with screaming headlines of scams in one form or the other, only pointers of declining personal standards and principles. In the literary context too, several journals of scientific nature are on the rise and with the need to score on points and credentials, there is a clamour to fulfill that need at any cost and even going to the extent of plagiarism. Writing of scientific content takes hardwork, research and loads of time and effort on the part of the authors. And there have been instances similar to a form 'literary-piracy' of reusing that content. The solution to this menace of course, are in built by systems, but require also self restraint and regulation on our part to be honest and truthful in making sure our work is original.

We at the JCD desk strive towards this goal and earnestly urge contributors to stick to these principles as we are now open to content from outside which makes it even more mandatory to pass on this message to all, within and outside of college.

A journal should be a common ground for sharing and disseminating scientific content for the benefit of the dental and medical community. And we strive to maintain that quality of work that goes within its pages. We therefore urge and call upon both staff and students to undertake work of high standards, innovation and quality that can benefit all.

MGM will soon be launching our own website wherein these Journals will be available online and can be easily downloaded. We do not intend to lock in the content but wish that the journals are freely available to all, can be accessed and used for enhancing self learning. We however hope as from my earlier plea that these may not be misused or reproduced illegally.

With this I once again thank all those who have put together this 3rd issue successfully, both contributors and committee members and hope you enjoy its content.

Dr. Jyotsna Galinde
Assoc. Dean, Post Graduate Studies
Prof & Head, Dept. Oral & Maxillofacial Surgery, MGM

ANNOUNCEMENT

In keeping with our endeavour to disseminate scientific knowledge beyond the boundaries of our institution, the Journal now invites Scientific articles from other institutions. We are happy with the response received so far and we look forward to an even bigger response in future. All contributing authors are requested to follow the author guidelines outlined and send in your articles at the specified address.

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CONTEMPORARY DENTISTRY
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JOURNAL OF
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General Information

The Journal of Contemporary Dentistry publishes original scientific papers, reviews, case reports, and method presentation articles in the field of dentistry. Original articles are published in all dentistry-related disciplines, all areas of biomedical science, applied materials science, bioengineering, epidemiology, and social science relevant to dental disease and its management. Manuscripts submitted for publication must be original articles and must not have appeared in any other publication. The publisher reserves the right to edit manuscripts for length and to ensure conciseness, clarity, and stylistic consistency, subject to the author's final approval.

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Should describe significant and original experimental observations and provide sufficient detail so that the observations can be critically evaluated and, if necessary, repeated. Articles considered as original research include, Randomized controlled trials, intervention studies, studies of screening and diagnostic test, outcome studies, cost effectiveness analyses, case-control series, and surveys with high response rate. Up to 2500 words excluding references and abstract.

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* Methods: Describes how the study was performed.

* Results: Describes the primary results.

* Conclusions: Reports what authors have concluded from these results, and notes their clinical implications.

TEXT
Introduction
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Materials and Methods

This section lists the methods used in the study in sufficient detail so that other investigators would be able to reproduce the research. When established methods are used, the author need only refer to previously published reports; however, the authors should provide brief descriptions of methods that are not well known or that have been modified. Identify all drugs and chemicals used, including both generic and, if necessary, proprietary names and doses. The populations for research involving humans should be clearly defined and enrolment dates provided.

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ACKNOWLEDGMENTS AND CONFLICTS OF INTEREST

Acknowledgments

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Use of Lasers for Smile Designing

Suchetan Pradhan*

Introduction

Advances in all ceramic materials allow practitioners to restore function and esthetics using conservative and biologically sound methods as well as promoting long term oral health. To design the optimal outcome for a patient during esthetic enhancement, the restorative dentist must seek to create a symmetrical and harmonious relationship between the lips, gingival architecture, and the positions of the natural dentate forms. [1,2]

Dental lasers enable painless, minimally invasive, more precise, and significantly more efficient completion of procedures associated with esthetic and restorative dentistry[3,4]. Gingival and osseous recontouring can be easily done to establish a harmonious and esthetic soft tissue profile[5]. Patients typically experience little postoperative discomfort when a laser is used, with faster healing resulting in greater patient acceptance.

Case Report

A 20 year old female patient came to our practice with the chief complaint of malaligned teeth and desired a more esthetic smile in a short period of time.

Clinical examination showed malposed anterior teeth with crowding, caries and staining. Right canine was labially placed and left lateral incisor was tipped labially. The lower anteriors exhibited mild crowding and both lower right and left canines were labially placed. Overall gingival asymmetry was observed. Orthodontics was advised but due to lack of time, the patient was not willing for the same and opted for a quicker technique of smile designing.

Treatment Plan

Impressions for study models and pre-operative photographs were taken (Fig1A). After careful analysis of the study models and consultation with the patient, the treatment was planned.

The treatment plan included all ceramic veneers on 11,12,14,21,23,24 and full ceramic crowns on 13,22,and 33-44 with gingival re-contouring to correct the irregular gingival architecture. Those teeth which required realignment or had large carious lesions would need endodontic treatment (11-14, 21, 22, and 24, 33-44).

The treatment plan was divided into 2 phases in which the maxillary arch would be restored first followed by the mandibular arch(Fig 3).

In the first phase, Veneer preparation was carried out on 11, 12, 14, 21, 23 and 24 with the 2780 nm Er,Cr:YSGG laser (Waterlase MD, Biolase) and tapered round end diamond points, tooth preparation for full ceramic crowns was done on 13 and 22 with diamond points(Fig 2).

The laser parameters were as follows:-

For veneer preparation – 2.5W, 25 Hz, 30% water, 30% air

Prior to making the mandibular impression, 33 and 43 were re-contoured. Impressions were made in addition silicone (Aquasil Putty and Light Body, Dentsply), shade was selected as per the patients desire to have lighter and brighter teeth. Provisional restorations were fabricated with composite resin (Charisma A1, Heraeus Kulzer)

The crowns and laminates were planned in Pressed Ceramic (IPS Empress, Ivoclar)

After 2 days, the provisional restorations were removed, teeth cleaned and restorations were tried in to check for fit, shape, colour and contour. With try in paste, the shade was judged, once the patient was satisfied with the restorations, etching of the laminates and crowns with 9.5% Hydrofluoric acid (Ultradent Porcelain etch) was carried out for 60s

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(The author wishes to acknowledge the contribution of Dr. Monica Gupta, Consultant Prosthodontist & Laser Dentist at Pradhan Dental Centre, Mumbai)

Fig 1A Pre-operative intraoral view

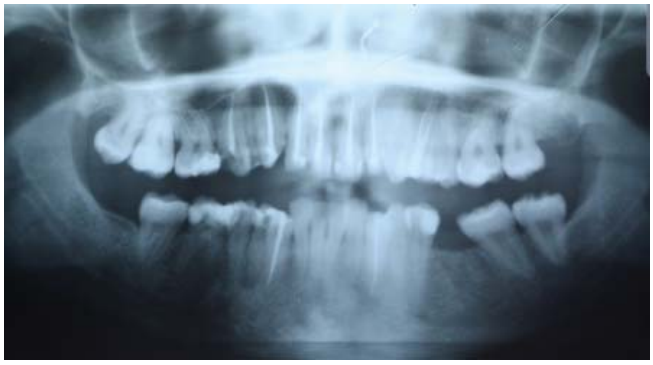

Fig 1B Pre-operative orthopantamogram

Fig- 2 -Tooth Preparation for all ceramic crowns and veneers Note the modified cusp tips of both mandibular canines

Fig 3 Maxillary restorations luted.

followed by silane (Ultradent Silane) application, bond application (Adper Single Bond Plus, 3M ESPE) and luting.Veneers and crowns were luted with light cure resin cement (Variolink, Ivoclar Vivadent), short curing was done to remove excess cement followed by full curing, contacts were checked, occlusion was adjusted.

In the second phase of treatment, the mandibular teeth were prepared for all ceramic crowns to correct the alignment of the teeth. As was discussed earlier, both mandibular canines were prominently placed labially, mandibular incisors exhibited mild crowding, mandibular right first premolar was placed lingually giving the appearance of an edentulous area and gingival profile was irregular, so gingival and osseous re-contouring was carried out in the region of the incisors using the 2780 nm, Er,Cr:YSGG laser (Waterlase MD, Biolase) (Fig4). Bone tapping was carried during the osseous recontouring procedure to ensure that ledges were not created. Examination of the biologic width was carried out before tooth preparation of 33-44.

The laser parameters were as follows:-

For Soft tissue recontouring – 1W, 20 Hz, 8% water, 11% air

For Hard tissue recontouring – 2.5W, 25 Hz, 30% water, 30% air

Tooth preparation for all ceramic crowns was carried out. Impression was made in addition silicone impression material (Aquasil Putty and Light Body, Dentsply), and sent to the laboratory for fabrication. The same shade as the maxillary restorations was taken as the patient was satisfied with the result. Provisional restorations were fabricated with composite resin (Charisma A1, Heraeus Kulzer) and patient was recalled after 2 days for try –in procedure and cementation. The crowns were planned in Zirconia (Lava, 3M ESPE)

After 2 days, healing of the tissues (Fig 5) after gingival and osseous re-contouring was excellent, temporaries were removed, teeth cleaned and restorations were checked for fit, shape, colour, and contour. As with the Maxillary restorations, after the patient was satisfied with the restorations, the protocol for luting was as follows.

The zirconia crowns were luted using resin modified glass ionomer cement (RelyX,3M ESPE). Excess cement was removed and contacts were checked. Occlusion was adjusted.

The final result showed that the definitive restoration was esthetic, maintaining form, function and harmony while keeping in mind the patient's goals (Fig6B).

Discussion

Dental lasers are widely accepted to be minimally invasive, cause less post-operative discomfort

Fig 4 - Gingival and osseous recontouring with the erbium laser

Fig 5 - Post operative healing following closed flap osseous recontouring in lower anterior region

Fig 6A- Pre-operative view

Fig 6B - Post- operative view - three days post luting

with minimal bleeding and swelling therefore they can be used as an adjunct or alternative to traditional approaches. The popularity of the 2780 nm Er,Cr:YSGG Laser is based on its dual action . It can be used on both soft tissues and hard tissues without significant thermal effects, collateral damage to tooth structure or patient discomfort.

It can also reduce post-operative sensitivity as the laser action on the dentine helps in sealing off the open dentinal tubules. Etching of the tooth surface is also achieved which helps with the retention of the restorations.

Though tooth preparation is a slightly more time consuming procedure with the laser, its advantages and benefits as enumerated cannot be ignored.

As was observed in this case, as the patient desired the treatment in a very short period of time, laser assisted preparation helped with reduced post-operative sensitivity and quicker soft tissue healing with minimal discomfort.

The choice of the restorative material also plays a vital role in the final outcome of the treatment. Though it has been observed that matching the esthetics of a pressed ceramic restoration to that of a zirconia restoration is an extremely challenging task, we were able to successfully bridge the gap and deliver a magnificent esthetic outcome.

Conclusion

All ceramic restorations are extremely popular and have been used for many years with success. Dental lasers are a very useful tool in the hand of the skilled operator inasmuch it is minimally invasive, reduces patient discomfort, therefore increases patient acceptance. This article demonstrates the combined use of all ceramic restorations and dental lasers to successfully address the esthetic concerns of a patient.

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ORIGINAL RESEARCH

A Comparative Evaluation of Marginal Fit of Crowns Fabricated by Three All Ceramic CAD-CAM Systems Using Their Respective Scanners - *An in vitro study*

Niku Agarwal[1], Sabita M. Ram[2]

Abstract

Aim: To evaluate and compare the marginal fit of crowns fabricated by three All Ceramic CAD-CAM systems using their respective scanners.Objectives:1.To evaluate the marginal fit of All Ceramic crowns fabricated using Contact scanner-Procera system. 2. To evaluate the marginal fit of All Ceramic crowns fabricated using Optical scanner-Lava system. 3.To evaluate the marginal fit of All Ceramic crowns fabricated using Laser scanner-Cercon system . 4.To compare the marginal fit of crowns fabricated by three All Ceramic CAD-CAM systems using their respective scanner-Contact scanner, Optical scanner and Laser scanner. Materials and Methods:5 crowns fabricated with Contact scanner- Procera system (Group I), 5 crowns fabricated with Optical scanner-Lava system (Group II), 5 crowns fabricated with Laser scanner-Cercon system(Group III). The marginal fit would be evaluated at two stages for each group:A- Pre-veneering stage (coping) B-Post-veneering stage (crown). Results: The mean value of marginal gap with Group IA was 27.48 +2.63 and IB was 26.13+ 0.85 and that of Group IIA was 23.27 + 0.99 and IIB 19.22 + 0.88. The mean value of marginal gap of Group IIIA was 32.80 + 2.46 and IIIB was 28.77 + 1.94. Conclusion: The marginal gap was maximum with Group III and minimum with group II amongst the three used systems. The mean marginal gap values of subgroup B were less than subgroup A.

Key Words: All Ceramic CAD-CAM systems, Contact scanner- Procera system, Optical scanner-Lava system, Laser scanner-Cercon system.

Introduction

Prosthodontists have been confronted with functional and esthetic rehabilitation of missing teeth or part of the tooth[1]. Various materials have been used for restoration but the introduction of ceramics have revolutionised this.

In response to increasing patient awareness of esthetic dental rehabilitation, the preference today is for All-Ceramic restorations, which show superior biocompatibility and similar light characteristics to the natural tooth[2]. All ceramic restorations have developed rapidly, their source being the first porcelain jacket crown fabricated by Lund in 1903. The passage of time saw emergence of newer ceramics and development in dental materials and computer science led to the invention of CAD-CAM technology[3].

A major determinant of the quality of fixed prosthodontics is close internal and marginal fit of the crowns. The fit of dental restoration depends on quality throughout the entire manufacturing process[4]. The final result is affected by multiple factors, such as preparation of the tooth, the impression, production of a dental cast, fabrication of the restoration that is the coping and the veneering method, chairside adjustment of the restoration and finally, the material and method used for cementation[5].

There are various methods of making ceramic copings. The traditional way of producing a ceramic restoration was by using the lost-wax technique. Newer techniques which have been introduced are CAD-CAM systems and copy milling units. With the CAD-CAM systems, restorations can be produced more quickly and the automation allows consistent quality[6]. CAD-CAM systems were applied to dentistry in the early 1980s.There are various methods available for digitalizing the geometry of a body into a digital form[7]. A dental surface digitalization device or scanner can be based on non-contact or contact methods where three-dimensional images are captured. Thereafter the images are transformed into a three dimensional construction file and transferred to the milling device[8].

A contact method is based on touch-probe scanning, where a sapphire stylus is in contact with the surface of the die and is moved around while registering points from the topography of the surface. The stylus is further attached to a computer, makes a blue print of the die[9]. A non-contact method uses optical systems which can be based on methods: laser and white light. Non-contact method using white light fringe pattern

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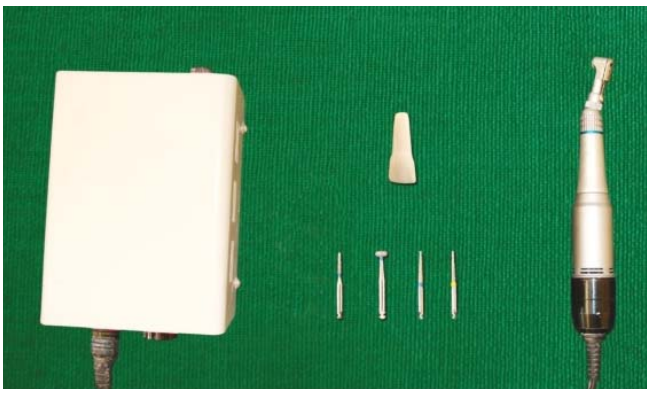


Fig.1 Materials used for master die preparation

Fig.2 Contact scanner – Procera system

Fig.3 Optical scanner - Lava system

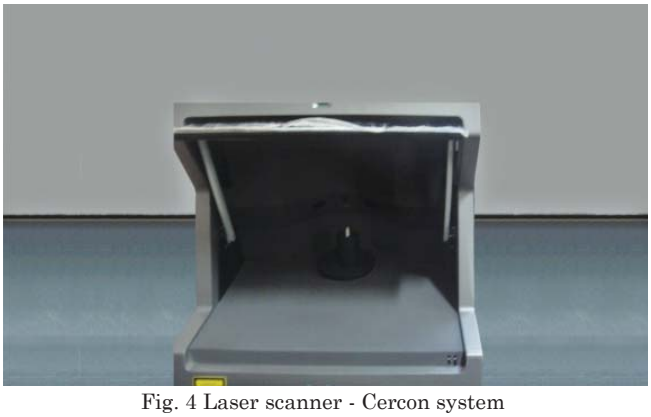


Fig. 4 Laser scanner - Cercon system

reads and measures approximately about 1,20,000 points and digitalizes it to a 3-D soft image[10].

Non-contact method using laser scanner projects the laser onto the object and digital camera registers the information. The data is digitalized and converted by the integrated computer unit using complex software algorithms. This digitalization method makes it possible to digitalize negative shapes as well as soft or brittle materials[11].

With the improvement in the ceramic technology, ceramic with better esthetics and strength have been made available. The marginal fit is one of the most important factor towards the success of a restoration[12]. Thus, how the scanning device affects the marginal fit of the restoration needs to be studied. Therefore, this study was planned to evaluate the marginal fit of All-Ceramic crowns fabricated using CAD-CAM technology with their respective scanning methods.

Materials and Instruments used for Master Die Preparation (Fig 1):

i) Typhodont Right Maxillary Central Incisor

ii) Micro-motor with contra-angle hand piece

iii)Diamond Points-

Torpedo, Wheel shaped, Tapered and Finishing points

A. Materials, Instruments and Equipments used for Fabrication of Copings by the three all Ceramic CAD-CAM Systems:

1. ALL CERAMIC COPING FABRICATED USING CONTACT SCANNER OF THE PROCERA SYSTEM

   a) Materials used for coping fabrication:

   Composition:

   Zirconium oxide (99.9%)

   Other oxide

   Colouring oxides

   b) Equipment (Fig 2):

   Contact scanner - Procera system

   Computer-controlled design digital scanning device consisting of a sapphire stylus, a rotating platform that is attached to a computer, which via modem sends the scanned image.

2. ALL CERAMIC COPING FABRICATED USING OPTICAL SCANNER OF THE LAVA SYSTEM

   a) Materials used for coping fabrication:

   Composition:

   Zirconium oxide

   Other oxide

   Colouring agents

   b) Equipment (Fig 3):

   Optical scanner - Lava system

   Optical scanner uses white light fringe pattern, reads and measures approximately about 1,20,000 points and digitalizes it to a 3-D soft image[10]

Fig.5 Ceramic veneering material

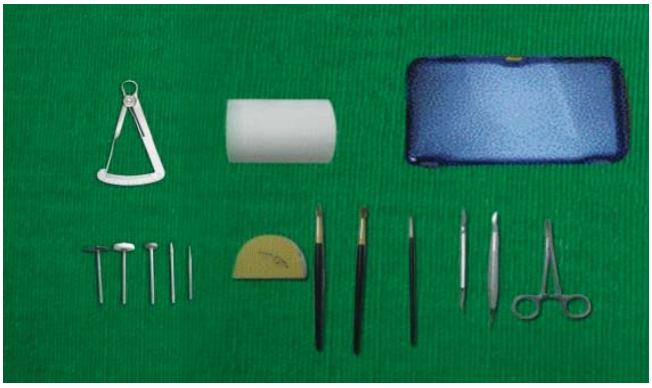


Fig.6 Instruments used for application and finishing of veneering ceramic

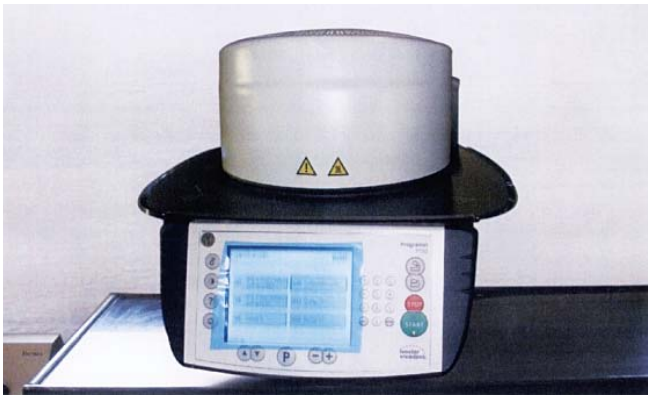


Fig.7 Ceramic furnace

Fig.8 Equipment used for evaluation of marginal fit

3. ALL CERAMIC COPING FABRICATED USING LASER SCANNER OF THE CERCON SYSTEM

a) Materials used for coping fabrication:

Composition : Yttria-stabilized tetragonal zirconia 5%, Hafnium oxide 2%, Other oxides 1%

b) Equipment (Fig 4):

Laser scanner - Cercon system

Laser scanner projects the laser onto the object and digital camera registers the information. The data is digitalized and converted by the integrated computer unit using complex software algorithms. This digitalization method makes it possible to digitalize negative shapes as well as soft or brittle materials[11].

B. MATERIALS, INSTRUMENTS AND EQUIPMENTS USED FOR VENEERING CERAMIC:

i) Ceramic material (Fig 5):
- Nobel Rondo Ceramics
- Lava Ceram Ceramics
- Cercon Ceram Ceramics

ii) Instruments (Fig 6):
- Sable paintbrushes
- Artery forceps
- Mixing pad and spatula
- Tissue paper

iii) Equipment (Fig 7):

Ceramic Furnace

C.EQUIPMENTS USED FOR EVALUATION OF MARGINAL FIT:

i) Optical Microscope (100X magnification) with Image Analyzer (Olympus GX51) (fig 8).

The software analyzes the image of the marginal gap and with the help of an in-built grid, the gap can be measured in micrometers and the results were noted.

Method

The study was divided in the following steps :

A. FABRICATION OF MASTER DIE(Fig 9,10):

Replica of the right maxillary central incisor was selected and prepared to receive a full veneer all-ceramic restoration following the biomechanical principles of tooth preparation, to achieve a master die. A rounded shoulder gingival finishing line was prepared. Care was taken not to leave any sharp line angles and point angles.

On the circumference of the root, eight equidistance points were marked from where the marginal gap of the respective sample would be measured.

Fig.9 Preparation of the typhodont Tooth

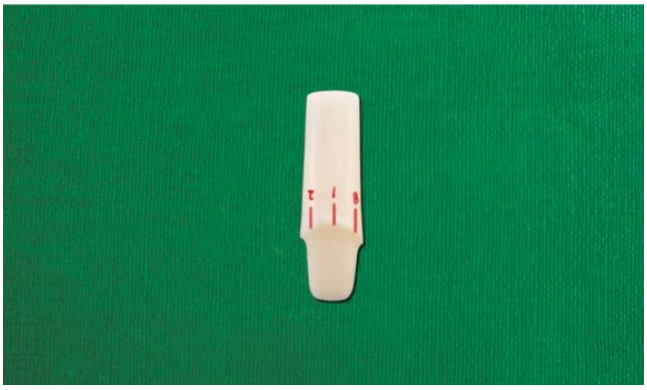


Fig.10 Master die with markings

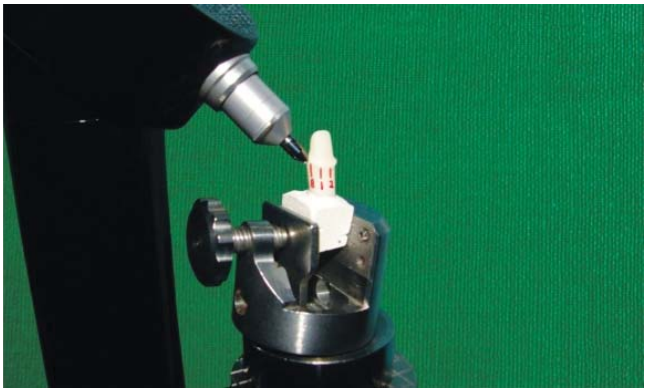


Fig.11 Scanning of master die with Contact scanner- Procera system

Fig.12 Two dimensional scanned image of the master die- Procera system

Fig.13 Computer generation of the All Ceramic CAD-CAM coping - Procera

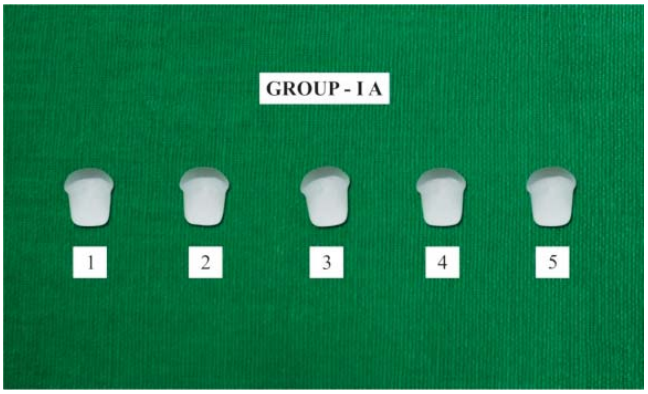


Fig.14 All Ceramic CAD-CAM Copings - Procera system

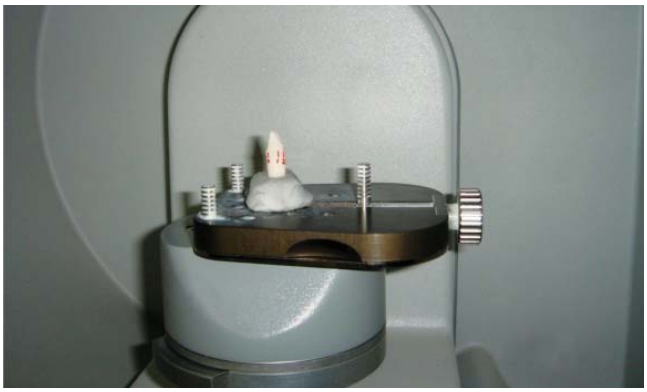


Fig15 Scanning of master die with the master die- Lava system

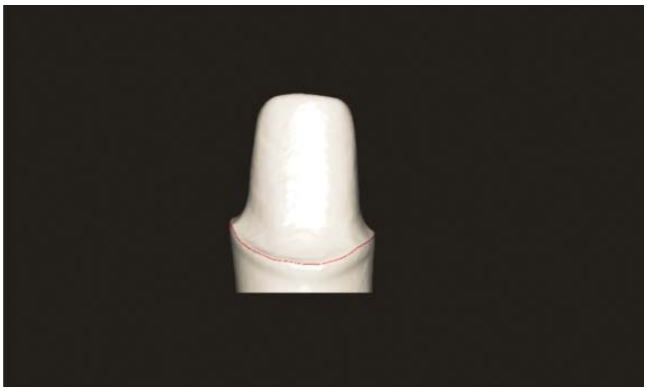


Fig16 Two dimensional scanned image of Optical scanner- Lava system

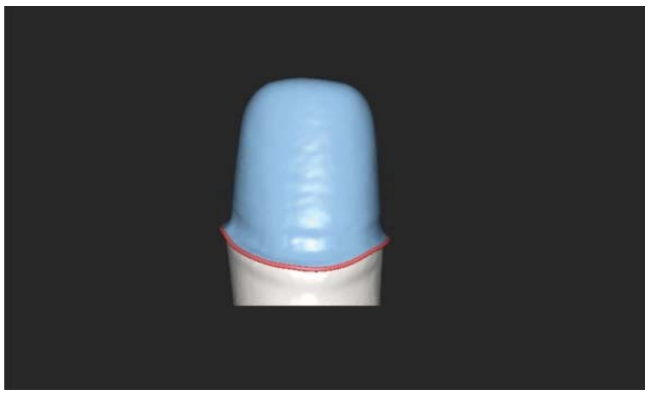


Fig.17 Computer generation of the All Ceramic CAD-CAM coping - Lava system

Fig.18 All Ceramic CAD-CAM Copings - Lava system

Fig.19 Scanning of master die with Laser scanner - Cercon system

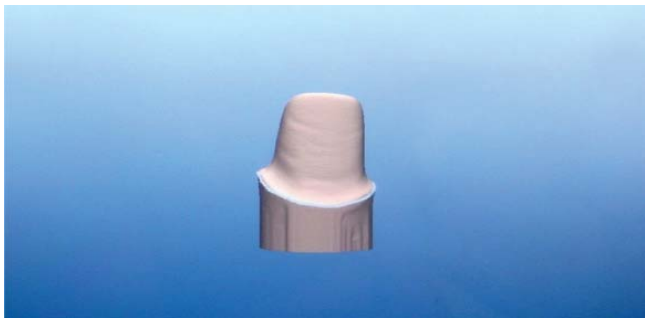


Fig.20 Two dimensional scanned image of the master die - Cercon system

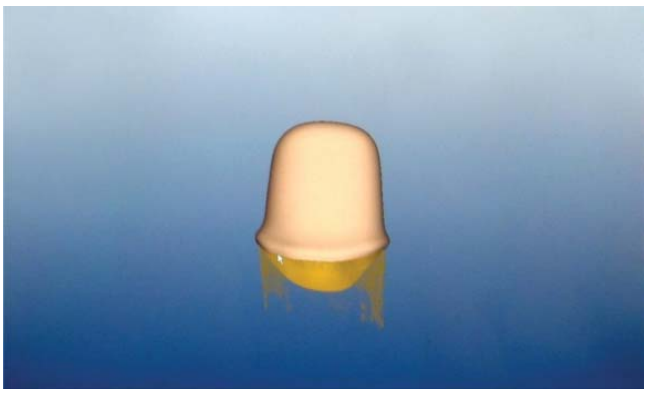


Fig.21 Computer generation of the All Ceramic CAD-CAM coping - Cercon system

Fig.22 All Ceramic CAD-CAM copings - Cercon system

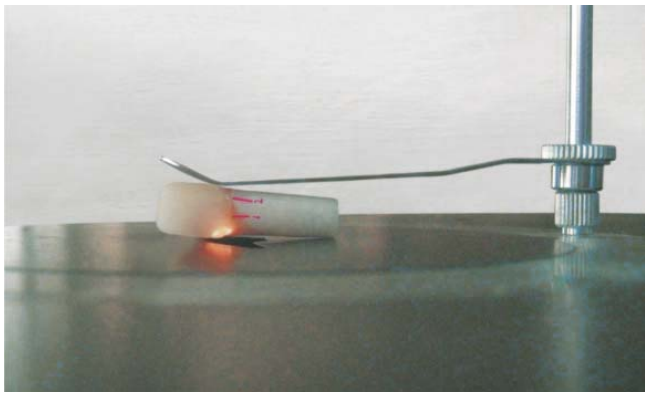


Fig.23 Evaluation of marginal fit of crown pre-veneering (coping)

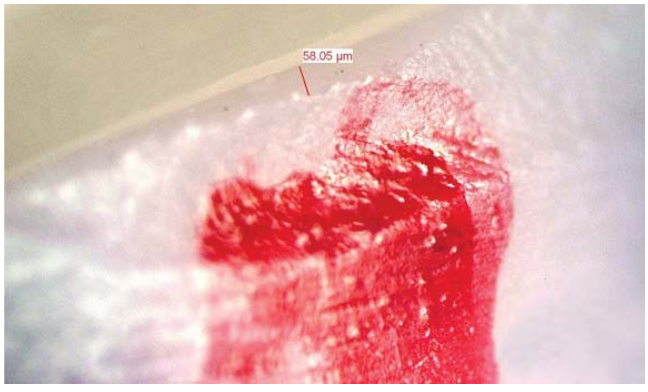


Fig.24 Image of coping captured by the image analyzer along with the measurement

B. FABRICATION OF SAMPLES:

Crowns were fabricated by each of the All Ceramic CAD-CAM system using their respective scanner and they were grouped as follows:

Group I 5 crowns fabricated with Contact scanner-Procera system

Group II 5 crowns fabricated with Optical scanner-Lava system

Group III 5 crowns fabricated with Laser scanner-Cercon System

To evaluate the marginal fit, the Groups were further divided into

Groups A: Pre-veneering stage (coping)

Groups B.: Post-veneering stage (crown)

GROUP I: All Ceramic CAD-CAM system using Contact scanner-Procera system (Fig 11, 12, 13, 14)

The Contact scanner of the Procera system was used to scan the master die.

The master die was mounted on a rotating platform in a digital scanning device that was attached to a computer. The sapphire stylus was held against the die placed on a rotating platform, with a light pressure of 20 gm to ensure close contact during the scanning process. The die was rotated, and the scanning probe, with the sapphire stylus, approached the die at a 45^0 angle[12]. At each angle of rotation, the position of the stylus was recorded and 360 readings were registered along the whole circumference of the master die. Following each complete rotation, the stylus got elevated by 200 μm, and another cycle of recording was taken until the entire preparation was digitalized.

After scanning of the master die, two-dimensional image got displayed on the computer screen. The finish line was marked by enlarging the image of the margin; with help of computer stroke commands and the software interpolated the segment between the marks.

The next step was to decide the thickness of the coping, which was kept at 400 μm as advised by the company for anterior restorations. After designing of the coping, a file was saved in the computer and was sent via e-mail to the production station in Sweden. Five copings of CAD-CAM zirconia (Procera) all ceramic system were ordered from Sweden.The copings were examined for quality control and received for the evaluation.

GROUP II: All Ceramic CAD-CAM system using Optical scanner-Lava system (Fig 15, 16, 17, 18)

The Optical scanner of the Lava system used to scan the master die.

The master die was mounted on a rotating platform in an optical scanning device Lava Scan that was attached to a computer. The rotating platform of the scanner rotates at different angles and approximately 1,20,000 data points are measured and digitalized.

After scanning the die, the three dimensional image got displayed on the computer screen. The finish line was marked by enlarging the image of the margin, with help of computer stroke commands and software Lava CAD.

The next step was to decide the thickness of the coping, which was kept at 0.4mm as advised by the company for anterior restorations. After designing of the coping, the 3D shape was milled from a pre-sintered zirconia oxide blank using hard metal tools. The milling time for the crown was 35 minutes. After the milling process got completed the manual finishing was carried out before sintering takes place. The colouring of the framework was also done before sintering process. The framework was coloured using shade guide which corresponds to Vita classic shade guide. Then fully automated, monitored sintering process was done with no manual handling in a special furnace, the Lava Therm for 11hr including heating and cooling phase at 1500oC . Five copings of CAD-CAM zirconia oxide (Lava) all ceramic CAD-CAM system were prepared and were ready for evaluation[11].

GROUP III: All Ceramic CAD-CAM system using Laser scanner-Cercon system (Fig 19, 20, 21, 22)

The Laser scanner by Cercon system was used to scan the master die.

The master die was mounted on a rotating platform and scanned using Cercon eye laser scanner. The Cercon eye scanner scans the die using a three camera system as well as a laser, for extremely precise measurements. The digital output of the Cercon eye was visualized on computer monitor and was customized using the Cercon Art CAD Module which designed the core framework in virtual 3-D. The system utilizes a unique instrument, Cercon Move, which is a 3-D navigation tool providing an easy way to visualize all the dimensions of the design on screen

Once the design phase was completed, the file was sent to Cercon Brain for milling. The milling machine milled the Cercon zirconia block which comes in two color- white and natural shade, the zirconia block used for this study was natural shade zirconia block. The sample was milled from presintered zirconia block in an enlarged size. The enlargement factor was compensated for the sintering shrinkage (18% linear). The milled sample was sintered in the Cercon Heat furnace at 1350^0C for six hours[15]. The sample was then finished and polished. Five samples were prepared, finished and polished and were ready for evaluation.

Fig.25 Application of veneering ceramic

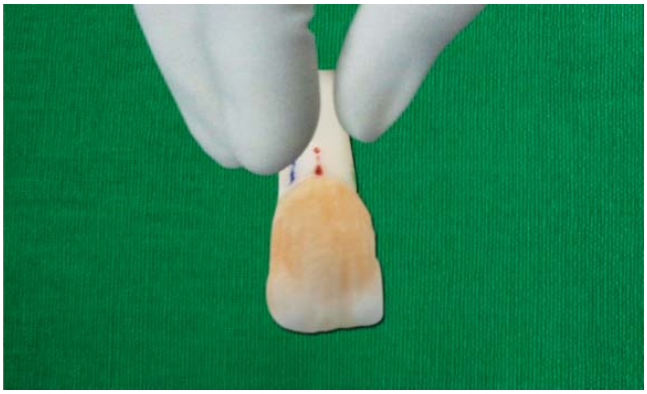


Fig.26 Ceramic build-up

Fig.27 Firing of the veneering ceramic

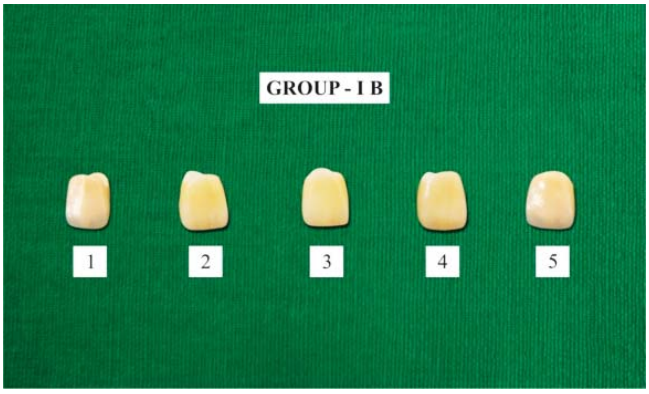


Fig.28 All Ceramic CAD-CAM crowns - Procera system

C. EVALUATION OF MARGINAL FIT OF CROWNS AT PRE-VENEERING STAGE (COPINGS) (Fig 23, 24):

Crowns of groups I, II, III at the preveneering stage (copings) were placed on the master die and secured in position with adhesive plaster tape to prevent displacement. The marginal fit was evaluated, by placing it on the Optical Microscope table. Measurements were made at eight predetermined points marked on the circumference of the root. The image of the marginal gap between the coping and master die was focused under the microscope of 100X magnification. The image was then captured on the computer screen. Image analyzer with the inbuilt grid facilitated the measurement of gap between the coping and the master die. The readings were noted and analyzed statistically.

D. APPLICATION AND FIRING OF VENEERING CERAMIC OVER COPINGS(Fig 25, 26, 27, 28, 29,30):

All the copings were cleaned by a steam jet cleanser just prior to the ceramic build up. The ceramic build up was done for each group using the respective ceramic material as per the manufacturers' instructions.

The crowns of each group were then subjected to firing cycles in the ceramic furnace programmed at temperature specific to each of the system.

Group I- B : - Ceramic Build up was done with Nobel Rondo Ceramic material.

Group II-B : - Ceramic Build up was done with Lava Ceram Ceramic material

Group III-B: - Ceramic Build up will be done with Cercon Ceram Ceramic material

E. EVALUATION OF MARGINAL FIT OF CROWNS AFTER APPLICATION AND FIRING OF VENEERING CERAMIC(Fig 31, 32):

The crowns were placed on the master die and secured in position with adhesive plaster tape. The marginal fit was evaluated in the similar manner as for copings. The measurements were made at the same predetermined points for each crown. The readings were noted and analyzed statistically.

RESULTS

The observations were statistically analyzed to comparatively evaluate the values obtained. The student ' t' test was applied to the data to test separate differences by permutation and combinations. Student's unpaired 't' test was also used to analyze and compare each group with the other groups individually and decide whether their comparisons were statistically significant.statistical analysis. The

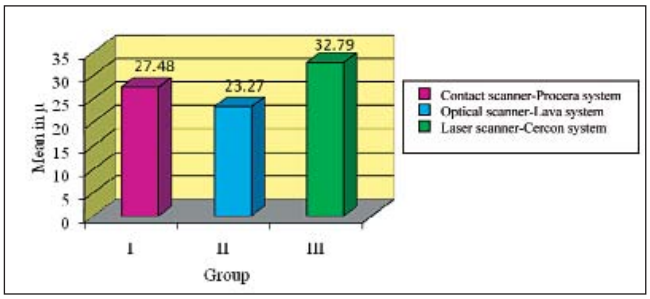
mean value of marginal gap with Group IA was 27.48 +2.63 and IB was 26.13+ 0.85 and that of Group IIA was 23.27 + 0.99 and IIB 19.22 + 0.88. The mean value of marginal gap of Group IIIA was 32.80 + 2.46 and IIIB was 28.77 + 1.94. The marginal gap was maximum with Group II. The mean marginal gap values of subgroup B were less than subgroup A.

Tables

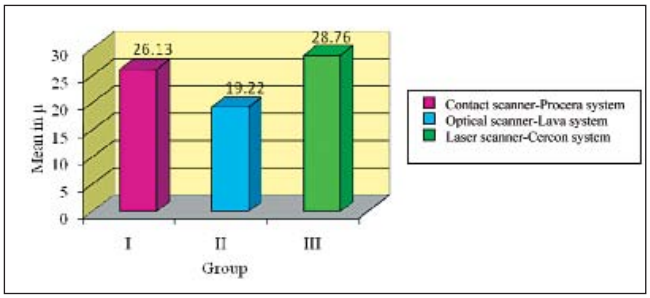
MEAN AND STANDARD DEVIATION VALUES

GROUPS	A		B	
	Mean Value µm	Standard Deviation	Mean Value µm	Standard Deviation
I	27.48	2.63	26.13	.85
II	23.27	.99	19.22	.88
III	32.80	2.46	28.77	1.94

Graph: THE MEAN VALUES OF MARGINAL DISCREPANCY FOR GROUP I, II AND III, PRE-VENEERING



Graph 1



Graph 2

Discussion :

The marginal fit of restorations is of particular interest and is an important quality criterion for the evaluation of dental restoration. The presence of marginal discrepancies in the restoration exposes the luting agent to oral fluids, leading to more rapid rate of cement dissolution[21]. The resultant micro leakage permits the percolation of liquids, food, oral debris and other substances that are potential irritants for vital pulp[22], thus leading to poor prognosis of the restoration[22-26].

This study was planned to evaluate and compare the marginal fit of All Ceramic crowns fabricated by the three scanning systems, namely Contact scanner (Procera CAD-CAM system), Optical scanner (Lava CAD-CAM system), Laser scanner (Cercon CAD-CAM system) as per the manufacturer's instructions. The marginal fit was evaluated at eight predetermined points marked on circumference of the root of the master die, under an optical microscope at 100x magnification.

The error incurred at each step of the fabrication of the crowns would either compound or offset the previous errors. Although the number of steps involved in the fabrication of the samples were not a direct indication of the quality of the marginal integrity. One may suggest that the more steps involved and the more sensitive techniques, the more likely it is that the technical errors would occur.

The results of this study showed that significant differences were found among the systems suggesting that the different fabrication procedure accounted for the marginal discrepancy of the ceramic systems. Fabrication of the Contact scanner (Procera CAD-CAM system) all ceramic samples were done by digitalization of the master die. The data input was determined by the sensitivity of the probe, which has a mean shape related error of 27.48 µm in a complete revolution. The stylus of the scanner approaches the die at a 45º angle. At each angle of rotation the position of the stylus is recorded and 360 readings are registered.

Evaluation of All Ceramic crowns fabricated by Optical scanner (Lava CAD-CAM system) reported a marginal discrepancy of a mean of 23.27 µm, which included the inaccuracies caused by the CAD-CAM system. The rotating platform of the scanner rotates at different angles and approximately 1,20,000 data points are measured and digitalized.

Evaluation of All Ceramic crowns fabricated by Laser scanner (Cercon CAD-CAM system) reported a marginal discrepancy of a mean of 32.80 µm. The Cercon Eye Laser scanner scans the die using three camera system and a laser. An instrument-Cercon Move then navigates around the die to get 3D visualization of all the dimensions.

Out of these three systems the Contact scanner[11] works on a touch probe technique at 45º angle, where 360 readings are taken, the Optical scanner rotates at different angles and takes 1,20,000 readings[13] whereas, the Laser scanner works on three camera and a laser, and an instrument Cercon Eye navigates to get the readings[13]. Thus the variations in the

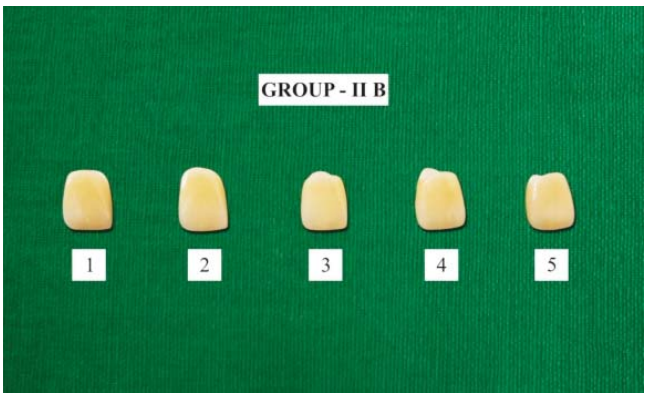


Fig.29 All Ceramic CAD-CAM crowns - LAVA system

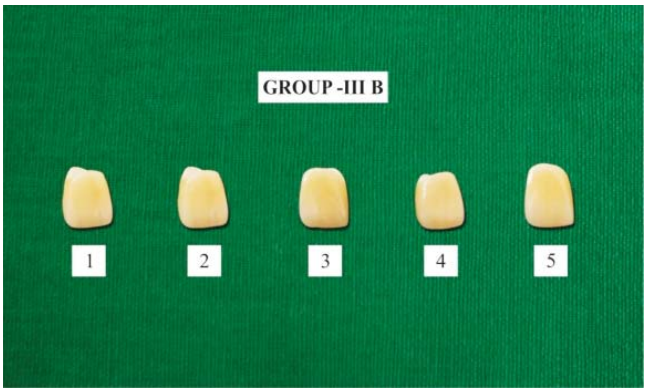


Fig.30 All Ceramic CAD-CAM crowns - Cercon system

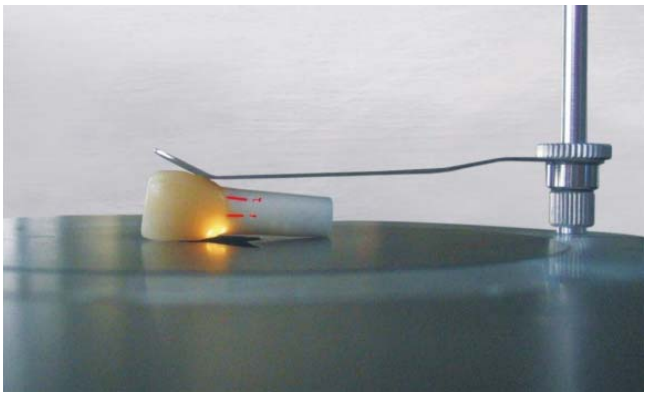


Fig.31 Evaluation of marginal fit of crowns post-veneering

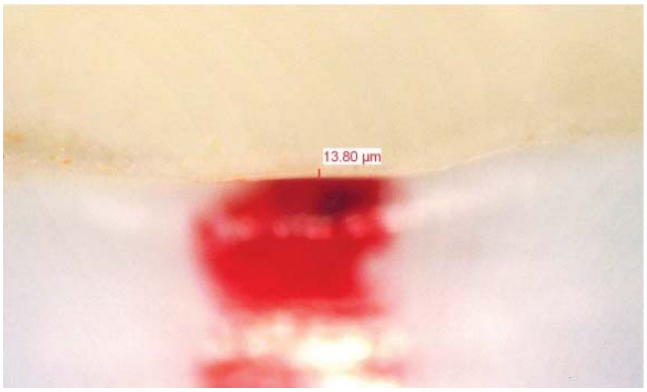


Fig.32 Image of crown captured by the image analyzer along with the measurement

marginal discrepancies of the All Ceramic crowns could be attributed to the above mentioned factors.

The results of this study suggested that the mean marginal discrepancy of the systems follows in descending order: Optical scanner (Lava CAD-CAM system), Contact scanner (Procera CAD-CAM system), Laser scanner (Cercon CAD-CAM system). However according to a consensus between various authors that marginal openings below 120 µm are clinically acceptable[26], the mean of marginal discrepancy recorded in all the three systems were in accepted clinical range.

It was also observed that the marginal discrepancy of all the three systems was reduced after application and firing of veneering ceramic. Though this difference was statistically insignificant, an explanation for the same is based on the physical properties of the materials[22]. There is an inward compressive contraction of the veneered ceramic layer. This could have lead to the resultant decrease in the marginal discrepancy of the All Ceramic crowns. Similar observation was obtained by Buchanan in his study on the two metal ceramic systems. There was a decrease in the marginal gap of the samples after ceramic firing due the contraction of opaque ceramic layer[23, 24].

The mean marginal discrepancy of 30.12 µm of the CAD-CAM zirconia (Procera) samples in this study was not in agreement with the findings of Sulaiman and Chai[24] who found a mean marginal discrepancy of 83µm, Suafrez and Pablo[11] who found mean marginal gap of 71µm with a rounded shoulder finish line design. Albert and Mowafi[25] also reported the mean marginal discrepancy of 54µm. Conversely, Quantas and Oliveria[17] who found the mean marginal discrepancy before cementation as 25µm, which supports the results of this study.

Similar study was done by Florian Beuer, Michael Naumann, Wolfgang Gernet, John A. Sorensen in the year 2008 to compare the precision of crowns fabricated with Procera zirconia CAD-CAM system and Lava CAD-CAM system. Mean gap dimensions at the marginal opening for Lava and Procera were 15(+/- 7) µm and 9(+/- 5) µm respectively. However, within the limitation of the study, the results suggest that the accuracy of both investigated systems is satisfactory for clinical use[26].

Limitations of the Study

An explanation for disagreement with similar studies[14,11,17,26] could be the variation in the method used for fabrication and measuring the discrepancies as well as variation in the number of readings taken for each sample. This study was limited by the fact that it was an evaluation with a limited sample size. Further studies regarding the influence of different

luting cements on the marginal fit of all ceramic crowns are required. The scanning system are specific to the company. Thus inherent drawback of the system may not be in the hand of the operator.

Conclusion

The study was conducted to evaluate and compare the marginal fit of crowns fabricated using three All Ceramic CAD-CAM systems using their respective scanners.

Within the limitation of the in-vitro study, the following conclusions were drawn:

1. The marginal fit of All Ceramic CAD-CAM crowns fabricated by Contact scanner was better than the Laser scanner but less than the Optical scanner.
2. The marginal fit of All Ceramic CAD-CAM crowns fabricated by Optical scanner was better than the Laser scanner and Contact scanner.
3. The marginal fit of All Ceramic CAD-CAM crowns fabricated by a Laser scanner had less accurate marginal fit when compared with both Contact scanner and Laser scanner.
4. The minimum marginal discrepancy was achieved with Optical scanner (Lava) All Ceramic CAD-CAM system and the maximum marginal discrepancy was recorded with Laser scanner (Cercon) All Ceramic CAD-CAM system, however they were in the accepted clinical range.

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Treatment of bilateral furcation involvements with bonegraft and bioabsorbable barriers

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Abstract

Bilateral furcation involvements are a common occurrence .This case demonstrates the surgical treatment of bilateral furcation involvement at a single appointment. This article presents successful management of bilateral class II furcation involvement affecting lower molars with particulate bonegraft (betaTCP + HA) and guided tissue generation(GTR) bioabsorbable membrane. This article reiterates the fact that class II furcations are ideal cases for therapy bone graft +GTR and respond favorably to this therapy. Further treatment at a single appointment is more convenient and time saving for both the patient and the operator when the patient is deemed compliant to follow post operative instructions.

Key Words : Furcation, Bonegraft, guided tissue regeneration, flap debridment, guided tissue regeneration.

Introduction:

Treatment and management of teeth with furcation involvements is one of the most challenging problems confronting dentists. One major reason for this is improper access to these areas, hence performing excellent oral hygiene is difficult and time consuming therefore, the cooperation of patient gets weaker and consequently a poor prognosis is provided for the treated tooth.

Furcation involvements are classified in several ways: Glickman[1] classified these defects into four groups. Lindhe[2] used degrees 1-3 in this classification. Tarnow and Fletcher[3] classified these defects according to the probable vertical depth from the roof of furca apically. Two more classifications according to the remaining bony walls[4] and morphology of ledges and remaining bone have been done[5].

Furcation involvement can be treated by following techniques:

1. Scaling, root planning and gingival curettage for grade I furcation involvement[1,2] .
2. Furcationoplasty (odontomy + osteotomy) for grade I and initial grade-II furcation involvements [(1,2)] .
3. GTR for initial grade II furcation and Bone grafting for advanced grade II furcation and initial grade III furcation[1, 2.]
4. Tunnel preparation (tunneling) Root resection, hemisection, and bicuspidisation[1,2] for grade IV furcations.

Graft materials generally include, bone grafts[7,8] and non-bone materials[9]. Guided tissue Regeneration technique (G.T.R.) by using resorbable and unresorbable membrane such as Gortex [3-6,10,11].

These techniques are used on upper and lower jaws. In 1976, it was theorized that the type of tissue that predominates in the healing wound would determine whether the response is one of repair or regeneration[12].

Guided tissue regeneration (GTR) therapy introduced in 1980s has been widely used to regenerate lost periodontium from periodontal disease. Both human and animal studies have demonstrated various degrees of regeneration of bone and attachment apparatus[13–16].

The case report deals with treatment of bilateral gradeII furcation (by Glickmans classification) with bioabsorbable barriers and bonegraft for regeneration

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Fig 1 Preoperative Evaluation of 46

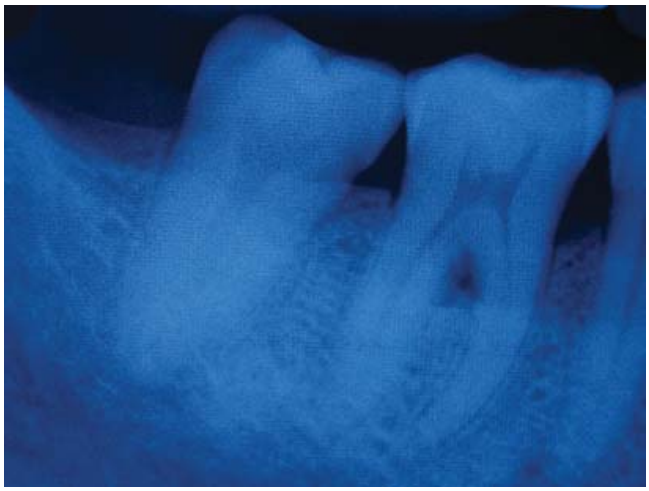

Fig 2 Preoperative IOPA of 46

Fig 3 Incision with 46 region

of furcation defects in lower molar region the results of which are monitored by radiographic evaluation.

Case report:

A 52 year old male in good general health was referred

Fig 4 Furcation Defect with 46 exposed

to the department of Periodontics M.G.M. Dental College and Hospital Navi Mumbai for Periodontal treatment. After clinical and radiographic evaluation a case of generalized chronic periodontitis was diagnosed with bilateral class II furcation defects in lower 46 and 36 molars (fig 1 & fig12). The lamina dura was thickened.(fig 1 and fig 2 and fig 13). Both the molars showed Grade one mobility with and significant bone loss in the furcation area. The molars were checked for facets and a record of the occlusion and contact points was made. No facets were observed but heavy contacts were seen on the teeth. The teeth were vital. Phase I therapy was completed with equilibration of the occlusion which was given immense importance

The phase II or the surgical phase was initiated after a period of one month The patient was administered of local anesthesia bilateral block for lower molars, Intrasulcular and releasing incisions were given (fig 3) and a mucoperiosteal flap was elevated (fig 4). After complete removal of granulation tissue root surface are thoroughly scaled and planned using gracey curettes followed by micro ultrasonic tips. After homeostasis,

Fig 5 Bone Graft Placed with 46

the bone defect was recorded by Nabers probe. The defect was eliminated by grafting the furcation region with bonegraft (betaTCP + HA)(fig 5). Bioabsorbable GTR membrane (Periocol) was subsequently placed (fig 6) .The flap was sutured by silk #4/0 (fig 7) and covered by a surgical dressing (fig8) for 10 days followed by surture removal (fig 10 and fig 15). Elaborate post operative instructions were given and the patient put on antimicrobials and chlohexidine mouthrinse. Patient was evaluated radiographically and clinically after a week and subsequently every month (fig 11 and fig 14). Excellent bone fill was reported immediately postoperatively after one week but reduced slightly after one month. This remained unchanged at the six month follow up.

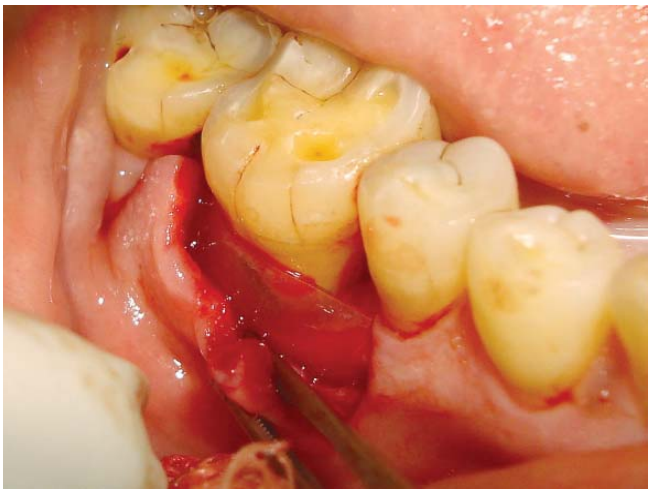

Fig 6 GTR Membrane Placed with 46

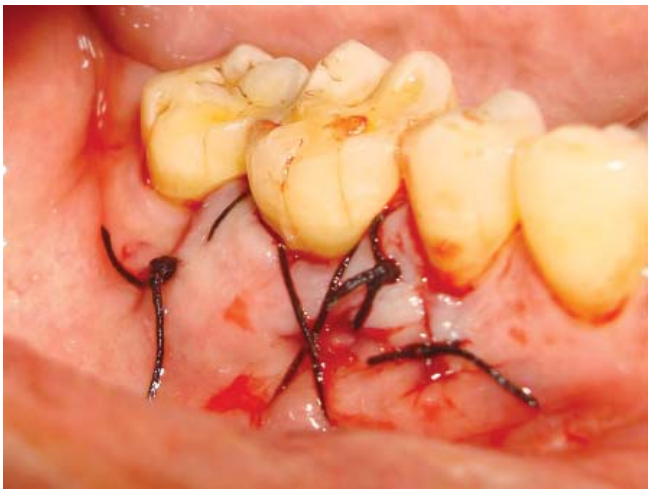

Fig 7 Sutures Placed with 46

Fig 8 Dressing Given with 46

Discussion:

The most favourable treatment therapy for advanced grade II furcation is GTR + bone graft in mandibular molars and interproximal defects. Clinical observations of GTR have shown more favor able outcomes in mandibular grade II furcations and facial grade II maxillary defects compared to limited success in other grade II or grade III defects[12]. Clinical studies have shown that GTR can improve the response of class II furcation defects to therapy by means of pocket reduction, gain in clinical attachment levels and bone defect fill. The improvement in these clinical parameters plus the potential of creating new attachment leads to the consideration of GTR

Fig 9 1 Week Recall

Fig 10 1 Week post operative IOPA

Fig 11 One Month post operative Recall IOPA

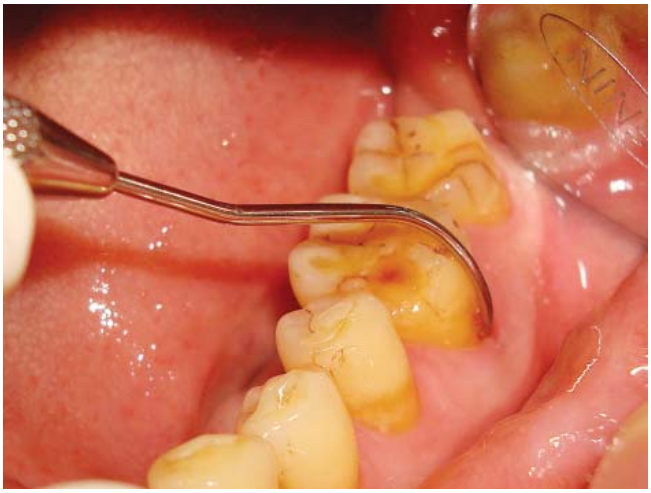

Fig 12 Preoperative Defect with 36

Fig 13 Preoperative IOPA with 36

as the treatment of choice in this type of periodontal defect. GTR has offered better results than open-flap debridement or bone replacement grafts alone in mandibular grade II furcation[14].

The regeneration of grade II furcation lesion, although possible, is not considered a totally predictable

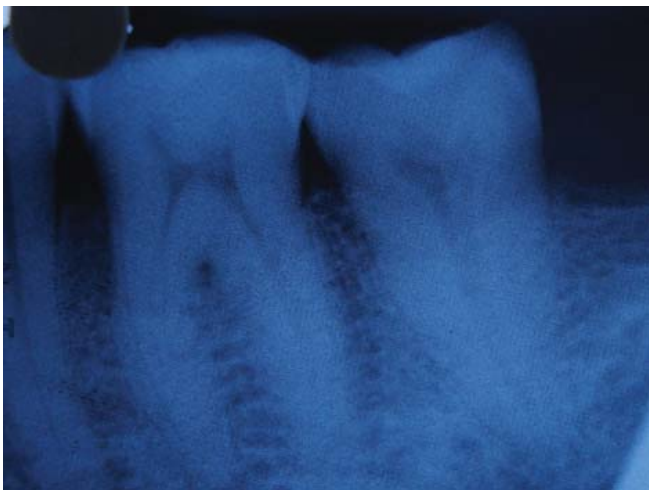

Fig 14 One Month post operative Recall IOPA with 36

Fig 15 Soft Tissue Healing with 36

procedure, especially in terms of complete bone fill[15]. Despite achieving significant positive gains in new attachment using GTR, consistently successful treatment of furcation defects with membrane techniques remains a challenge. Furcation morphology may restrict access for adequate debridement and root instrumentation and may have a reduced source of available cells and blood supply from the periodontal ligament and bone defect. One important factor for successful regeneration at furcation and non-furcation sites is the amount of periodontium that remains apical and lateral to the defect. Coronal migration of cells originating from the periodontal ligament and bone marrow spaces is particularly critical to the healing outcome following periodontal regenerative procedures in furcation defects. These and other factors may account for variability in the response to regenerative therapy in grade II furcation.

To increase the predictability and clinical success of regenerative therapy, factors related to the patient, furcation, surgical treatment, and postoperative period should be considered. Slight bone loss was observed in the furcation during the healing. It could

be contemplated that better plaque control or a more elaborate occlusal therapy may have prevented the same.

Conclusion:

It should be noted that there are many factors acting collectively that influence the final outcome of GTR in grade II furcations. The clinician should consider aborting surgery if a multitude of minor negative factors are present in the same patient. Alternatively, if GTR is performed, a less favorable prognosis is to be anticipated. Wherever possible, adverse factors should be modified to improve the prognosis. For example, tobacco cessation and space-maintaining devices should be used in poorly space-maintaining defects. Implementation of these changes may result in better predictability and an improved regenerative response.

Further standardizing the numerous factors that influence the regenerative status would lead to a better prognosis and a better final therapeutic result.

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Extrafollicular Adenomatoid Odontogenic Tumour

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Abstract

Adenomatoid Odontogenic Tumour (AOT) is an unusual benign tumour unique to maxillofacial area, with a tendency to involve the tooth bearing areas of both the jaws and accounting for 3% of all the odontogenic tumours. Diagnosis of the tumour is sometimes intriguing owing to its variable clinical and radiographic presentation. One such variable and relatively rare presentation of extrafollicular type of adenomatoid odontogenic tumour in anterior maxilla of an eighteen year old female has been discussed in this paper which can be refreshing for the practitioner.

Keywords : Adenomatoid Odontogenic Tumour, Extrafollicular type

INTRODUCTION

Adenomatoid odontogenic tumour (AOT) is a relatively uncommon distinct odontogenic neoplasm that was first described by Steensland[1,2] in 1905 and by Dreibladt in 1907, as a pseudoadenoameloblastoma.[3,4] Harbitz[5,6] in 1915 described it as a cystic adamantinoma. In 1948 Stafne[3,7] considered it a distinct entity. Unal et al[1,8]produced a list containing all nomenclatures for AOT reported in the literature. The tumour was named as adenoameloblastoma, adenoameloblastic odontoma, ameloblastic adenomatoid tumor, epithelial tumour associated with developmental cysts, adamantinoma, pseudoadenomatous ameloblastoma, epithelioma adamantinum or teratomatous odontoma before being currently defined as AOT. Philipsen and Birn[5,9]proposed the widely accepted and currently used name Adenomatoid Odontogenic Tumour in 1969, a term that was adopted by the first edition of WHO classification of odontogenic tumours in 1971.

The tumour appears as an intra- extra oral swelling in the maxilla and is sometimes referred to as " Two-thirds tumour" because it occurs in the maxilla in about 2/3 cases, about 2/3 cases occurs in young females, 2/3 cases are associated with an unerupted tooth and 2/3 of the affected teeth are canines[5,10]. According to Philipsen and Reichart[1,3,11,12], AOT appears in three clinico-topographic variants: the follicular type (accounting for 73% of cases), which has a central lesion associated with an embedded tooth; the extrafollicular type (24% of cases), which has a central lesion and no connection with the tooth; and the peripheral variety (3% of cases). As histogenesis of AOT is still uncertain, there has been a long debate as to whether it represents anomalous hamartomatous growth, or is a true benign neoplasm[5].

This paper presents an extrafollicular variant of adenomatoid odontogenic tumour, provides a refresher for general dental practitioner about the diagnostic aspects of this tumour and discusses the various presentations of this lesion.

CASE REPORT

An 18year old female reported with a painless swelling of anterior maxilla since approximately 18 months. Clinical examination revealed a well circumscribed firm growth in the buccal and palatal areas of gingiva extending from the distal surface of left maxillary lateral incisor to mesial aspect of canine displacing the teeth away from each other (Figure 1). Aspiration was negative and radiographic examination revealed a radiolucent lesion between lateral incisor and canine separating the two teeth without any root resorption (Figure 2). No evidence of any impacted tooth on the radiograph or any teeth missing on clinical examination was found. Based upon the clinical differential diagnosis of central giant cell granuloma or central ossifying fibroma, the lesion was enucleated under local anaesthesia, sent for histopathological examination and diagnosis. Surgical exposure of the lesion revealed cortical perforation and destruction of buccal cortical

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Fig 1 Preop Photograph showing the lesion

Fig 2. Preoperative Intraoral Periapical radiograph of the patient showing the extent of the lesion

plate. The teeth adjacent to the lesion were extracted owing to the bone loss distal and mesial to lateral incisor and canine respectively. The patient was followed for 25 months without any recurrence.

Grossly, the lesion was found to be a well-defined mass 25 X 15 mm in size surrounded by a well formed fibrous capsule (Figure 3). Histological examination showed numerous proliferation of cuboidal to columnar cells arranged in sheets and in some areas whorls, strands or cords of 1-2 cell thickness scattered

Fig 3. Excised tumour mass

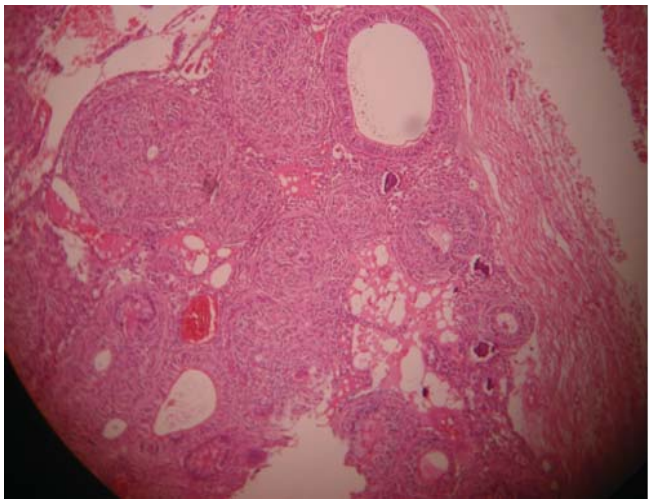

Figure 4. Histopathology of the lesion showing proliferation of cuboidal to columnar cells scattered in scanty connective tissue stroma

in scanty connective tissue stroma. Varying amounts of duct like structures were also seen with lumen of varying sizes lined by cuboidal to columnar cells with polarized nuclei located away from the lumen. Most of the lumen appeared to be empty with no eosinophilic material. Small amounts of dystrophic calcifications were seen between the ductal structures especially in the periphery of the lesion. Rest of the connective tissue stroma was loose and comprised of blood vessels and extravasated blood in some areas (Figure 4).

Discussion

AOT is a rare, slow growing, benign, odontogenic, epithelial tumours which usually arise in the second or third decade, the mean age being 13.2 years (range 3 until 28 years) and the female : male ratio being 2.3 : 1. AOT is usually located in the anterior maxilla (maxilla : mandible = 2.6 : 1); it produces a slow growing swelling without pain. The tumour growth may cause displacement of teeth

rather than root resorption. AOTs comprise only 0.1% of tumors and cysts of the jaws. Philipsen et al[1] reported that theyaccount for 3 to 7 % of all odontogenic tumors, 1.2% in Caucasian and 9% in black African patients. Information regarding incidence and prevalence of individual odontogenic tumors is still not available[13].

The origin of AOT is controversial[5,11,12,16]. Some support the idea that the lesion is a developmental outgrowth or hamartoma while others consider it to be neoplastic growth of odontogenic epithelium. The 1971 WHO classification stated: "It is generally believed that the lesion is not a neoplasm"[5]. However, Glickman et al,[5] concluded that "such a controversy is irresolvable because sound arguments can be advanced in favour of and against both hypotheses. The arguments are based on personal bias rather than on scientific evidence"

Due to its varied clinical and radiographic presentations, preoperatively, AOTs have been diagnosed as various types of disease[13]. Radiographically they frequently resemble dentigerous or follicular cysts. The radiolucency associated with AOT may extend more apically than that of a dentigerous cyst as seen in the present case. Irregular root resorption is seldom reported[5]. The varied picture of this tumour often confuses the practitioner thus misguiding them.

Clinical features generally focus on complaints regarding a missing tooth. The tumours are upto 1.5 to 3 cm, but larger lesions have been reported in the literature[13]. However, the rare peripheral variant occurs primarily in the gingival tissue of tooth-bearing areas[1]. They usually appear unilocular radiographically, but a few cases of multilocular radiolucency have been reported. Multiple AOT-like jawbone lesions were reported in a case by Larsson[13, 14]. AOT lesions may often appear completely radiolucent; however, they contain fine specks of dystrophic calcifications or tooth material like enamel, dentin, enamel and dentin, cementum, dentin and cementum, a feature differentiating AOT from dentigerous cysts[13]. In the present case, only dystrophic calcification was seen.

Both types of central intraosseous tumours produce a corticated radiolucency, sometimes with radiopaque specks. The follicular type is usually initially diagnosed as a dentigerous or a follicular cyst. According to Philipsen et al.[3,11], the extrafollicular type usually presents as a unilocular, well-defined radiolucency found between, above or superimposed on the roots of erupted teeth and often resembling a residual, radicular, globulomaxillary or lateral periodontal cyst. The peripheral type usually presents as a gingival swelling, located palatally or lingually relative to the involved tooth. Dare et al1,[15] found that intraoral periapical radiographs allow perception of the radiopacities in AOT as discrete focii having a flocculent pattern within radiolucency even with minimal calcified deposits while panoramic often do not. Those calcified deposits are seen in approximately 78% of AOT. Jham et al[13,17] reported a case of AOT arising from the periodontal ligament.

Table 1. Unusual findings seen in our case related to typical features of an adenomatoid odontogenic tumour (AOT)

Typical features of most AOT	Unusual findings in our case
Cortical penetration rare[18]	Cortical perforation seen
Unilocular radiolucency associated with an impacted unerupted tooth[18]	Not associated with impacted or or unerupted teeth

Since AOT is a benign tumor that presents with a non-aggressive biologic behavior, progressive growth, small frequency of recurrence, absence of invasion, and the frequent presence of a connective tissue capsule, the treatment should consist of enucleation and curettage[19]. If the follicle of the tooth is found intact, it can be easily separated from the tumour; it may be possible to remove the lesion while leaving the teeth in place, as described by Toida and others[3]. For periodontal intrabony defects caused by AOT, guided tissue regeneration with membrane technique is suggested after complete removal of the tumor1. Enucleation and curettage is the most common treatment modality for this tumour and recurrence is extremely rare. The prognosis is excellent.

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Telescopic Overdenture with Customized Double Copings- A Simplified Approach to Preventive Prosthodontics

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Abstract

Preventive Prosthodontics emphasizes the importance of any procedure that can delay or eliminate future prosthodontic problems. The conventional modality of treatment for partially edentulous arches with presence of a few teeth, was either to render them completely edentulous by extracting the remaining teeth and providing complete dentures, or restoring them with removable partial dentures. An overdenture with support of few remaining teeth can also be provided as a good alternative. Various attachments and types of overdentures can be fabricated on the retained teeth or roots. The telescopic crowns for the overdenture can be given as a successful attachment. This article presents the simplified technique of telescopic overdenture using customized double copings for the overdenture abutments.

Key Words - Telescopic Overdenture, Preventive Prosthodontics, Double Copings

Introduction:

Preserving a few teeth to reduce the problems at a later date needs a good consideration of avoiding complete edentulous phase of elderly patients. Overdenture treatment is essentially a preventive prosthodontic concept as it attempts to conserve few remaining natural teeth and associated structures[1]. There are two physiologic tenets related to this treatment, the first concerns the continued preservation of alveolar bone around the retained teeth[2], while the second relates to the continuing presence of periodontal sensory mechanism[3] that guide and monitor gnathodynamic functions. Overdentures help to partly overcome many of the problems posed by conventional complete dentures like progressive bone loss, poor stability and retention, loss of periodontal proprioception and low masticatory efficiency[4]. Removable dentures attached by means of telescopic anchors are regarded to be a good clinical solution. This kind of prosthesis in patients with reduced residual dentition gives an opportunity to minimize destructive rotational and horizontal occlusal forces by directing them more axially.

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Telescopic crowns were initially introduced as retainers for removable partial dentures (RPDs) at the beginning of the 20th century. They were also known as a double crown, crown and sleeve coping (CSC), or as Konuskrone, a German term that described a cone shaped design. These crowns consisted of an inner or primary telescopic coping permanently cemented to an abutment, and a congruent detachable outer or secondary telescopic crown rigidly connected to a detachable prosthesis. Primary copings were designed to protect the abutment from dental caries and thermal irritations and also to provide retention and stabilization to the secondary crown. The secondary crown engaged the primary coping to form a telescopic unit and served as an anchor for the remainder of the dentition.

There are a number of overdenture attachments available which can be used to enhance retention, stability and support. However these options are expensive, time consuming and need complex laboratory procedures, a customized double copings fabricated for overdenture in a simplified technique which is presented here in the case report.

Case report:

A 52 year old female patient reported to the department of Prosthodontics, Crown &Bridge and Oral Implantology with the chief complaint of difficulty in chewing due to missing teeth and lack of esthetics (fig.1). Patient gave history of loss of teeth due to decay. On intraoral examination maxillary teeth present were 11, 12, 13, 16, 21, 22 and 23. Maxillary anterior teeth were peridontally sound but tooth 16 was in compromised condition and needed extraction. In mandibular arch teeth present were 37, 35, 33, 43 and 45 and which were in good healthy

condition excluding 37 which needed extraction. The edentulous ridge was favorable with firm attached keratinized mucosa. There was loss of vertical dimension of occlusion.TMJ was normal. There was no relevant medical history.

Fig 1 Preoperative

Impressions in irreversible hydrocolloid material were made to obtain diagnostic casts. They were articulated on a semiadjustable articulator taking the facebow, the vertical and centric jaw relation records. The radiographs were taken to evaluate the condition of the teeth to be retained for overdenture.

Treatment plan:

Considering the existing condition of the patients remaining teeth and financial constrains, it was decided to fabricate an acrylic partial denture for the maxillary arch and telescopic overdenture with customized double copings for the mandibular arch. The final plan was discussed with and agreed by the patient.The required preprosthetic procedures were carried out which included,extraction of #16, 37, Oral prophylaxis and endodontic treatment of #35, 33, 43 and 45 to be used for overdenture abutments.

Preparation of abutment teeth for copings:

Fig 2 abutment teeth preparation for primary copings

Fig3 milling of primary copings

Fig4 primary copings ready for cementation

Fig5 Cemented primary copings

A new set of diagnostic impressions and casts were obtained and mounted with vertical dimension and centric relation records. Modifications of abutment teeth were planned on diagnostic cast to evaluate the space for double copings. Once this was confirmed the abutment teeth 45, 43, 33 and 35 were prepared to receive the primary copings with a larger modified shoulder (fig.2). It was ensured that all the preparation were parallel to each other with a 6^0 taper using 6^0 taper diamond. The finish line was kept equigingival. Retraction was done by gingival retraction cord impregnated in astringent. Special tray was fabricated in self acrylic resin. Impression was made in addition silicon mono phase (aquasil, Dentsply). Cast was poured in die stone.

Fabrication of primary copings:

Wax patterns were prepared on the individual abutment and placed on a surveyor with the carving tool to modify the surfaces and make them parallel to each other. The finish lines on the wax patterns were kept as a modified shoulder to receive secondary copings.

The parallelism and finish lines were critical for frictional resistance and retention of secondary copings.

The wax patterns were sprued, invested and casted with NiCr alloy. After retrieving, copings were finished and placed on milling surveyor to get the final parallelism (fig.3). They were polished and kept ready for cementation (fig.4).

Cementation of primary coping:

The copings were checked for their fit and marginal integrity. They were cemented with glass ionomer cement taking all the required precaution and following protocol (fig.5).

Secondary copings:

Impression of the abutment teeth with cemented primary copings was made in elastomeric monophase impression material in a special tray and cast was poured in die stone.

Wax patterns for secondary copings were fabricated on individual die. The margins of secondary copings were carved to fit the shoulder of the primary copings. They were sprued, invested and casted. These copings were retrieved and finished. The secondary copings were checked intraorally for fit and margins (fig.6).

Denture fabrication:

Secondary copings were spot luted to the primary copings so that they remain stable while making final impression for the fabrication of complete denture.

Fig 6 secondary copings ready for pick up

Fig 7 Secondary copings picked up in denture

Fig 8 post operative view with overdenture

Final impressions were made in special tray using addition silicon monophase elastomeric impression material. Jaw relation records, teeth arrangement and try in were done following conventional method. Both maxillary partial denture and mandibular overdenture were processed. The dentures were

finished and polished. Maxillary partial denture was inserted. Later mandibular overdenture was placed without the secondary copings. It was checked for extensions, retention, stability and occlusion. The secondary copings were cleaned and sandblasted to enhance better adhesion with denture base material. The impression surface of the denture was roughened in the area of where secondary copings were required to be housed. The secondary copings were placed on the respective primary copings on abutments. The self cured acrylic rein was mixed and placed in the trough of the abutments in the mandibular denture and placed over the secondary copings which were in position intraorally.

The resin was allowed to partially set and denture was removed and checked for the position of the secondary copings (fig.7). It was repositioned intraorally and resin allowed to set completely. After removal of denture the excess resin was trimmed off. Denture was finished, polished and inserted. Occlusion was once again checked and adjusted. Post insertion instructions were given to the patient (fig.8).

Discussion:

It is a documented fact that after the loss of teeth, the residual alveolar ridge undergoes rapid loss in all dimensions. The phenomenon of residual ridge resorption (RRR) following removal of teeth has been well observed[5],[6]. While the bone loss following the removal of teeth is stated to be rapid, progressive, irreversible and inevitable, it is equally well observed that bone is maintained around standing teeth and implants[7] .Overdenture treatment constitutes essentially a preventive prosthodontic concept as it endeavors to preserve the few remaining teeth and the supporting structures[1]. The number of teeth may be less and not healthy to support a fixed partial denture or unsuitable to support a removable partial denture can often be usefully conserved and suitably modified to act as abutments under overdenture for useful span of time[8,9].

The retained teeth for overdenture can be preserved with or without attachments. Simply covering the prepared abutment teeth do protect them. With placing attachments the retention of the overdenture can also be enhanced[10].

In this case a simple approach to the overdenture with double copings custom made by laboratory milling of the primary coping and secondary coping placed in the denture was a simple option for fabricating overdenture.

Summary

Overdenture abutments needs to be preserved for as long a period as possible. This helps in maintaining the bone and health of the tissues. The double coping prepared indigenously and custom made for individual cases would make attachments for overdenture easy and cheaper.

Although the telescopic overdenture is not a panacea, if fabricated well with good clinical and laboratory expertise, maintained with excellent care, then each telescopic overdenture treatment can be a successful one.

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Radix Entomolaris

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Abstract

Variation of root canal anatomy is always a challenge for accurate diagnosis and successful endodontic therapy. A thorough knowledge of most common anatomic characteristics and their possible variations is essential for the clinician. The hard tissue repository of the human dental pulp takes on numerous configurations and shapes. These aberrations occur so often that they can be considered as normal anatomy. Radix entomolaris (RE) is one such aberration where an extra root is present on the distolingual aspect of mandibular first molar (molar with 3 roots). This article presents one case report of mandibular first molars with extra roots which was successfully treated.

Key Words - Radix entomolaris, endodontic treatment, anatomic variations

Introduction

The treatment of the entire root canal system is essential to maximize the possibility of obtaining success in the endodontic therapy. It is necessary for the clinician to have a thorough knowledge of the dental anatomy as well as of its variations.[1] It is known that the mandibular first molar can display several anatomical variations. The majority of Caucasian first molars are two-rooted with two mesial and one distal canal [2, 3]. In most cases the mesial root has two root canals, ending in two distinct apical foramina. Or, sometimes, these merge together at the root tip to end in one foramen. The distal root typically has one kidney-shaped root canal, although if the orifice is particularly narrow and round, a second distal canal may be present [4]. A number of anatomical variations have been described in the mandibular first molar: Fabra-Campos[5, 6] and Bond[7] reported the presence of three mesial canals and Stroner[8] noted the presence of three distal canals. Like the number of root canals, the number of roots may also vary. An additional third root, first mentioned in the literature by Carabelli[9], is called the radix entomolaris (RE)[10]. This supernumerary root is located distolingually in mandibular molars, mainly first molars (Fig. 1). An additional root at the mesiobuccal side is called the radix paramolaris (RP). The identification and external morphology of these root complexes, containing a lingual or buccal supernumerary root, are described by Carlsen and Alexandersen[11, 12].

In spite of high prevalence of RE in certain races, its incidence among the Indian population is found to be low and only 5.97%[13]. This case report is about the detection and management of radix entomolaris (RE) in a mandibular first molar during its root canal treatment.

Case Report

A 35-year-old male patient reported to the dental office with complaints of pain on chewing in right posterior tooth. On clinical examination, there was a gross decay in mandibular right first permanent molar (46). Tooth was tender on percussion. Radiographically the presence of widened periodontal ligament space (PDL) in the mesial roots and the presence of a third root between the mesial and distal roots were evident (Fig.2). The condition was diagnosed as chronic periapical periodontitis and the treatment plan was endodontic therapy followed by full coverage restoration.

Under local anaesthesia with 2% lidocaine access opening was done in 46. The first distal canal was found slightly away from the center (buccally) indicating the presence of the other canal on the lingual side. Upon visual inspection with a microscope (OPMI Pico, Zeiss, Zventem, Belgium), a dark line was observed between the distal canal orifice and the distolingual corner of the pulp chamber floor. At this corner overlying dentin was removed with a diamond bur with a noncutting tip (Diamendo, Dentsply Maillefer) and a second distal canal orifice was detected (Fig. 2). The access cavity preparation was modified from a triangular to trapezoidal outline form and the fourth canal was located. The root canals were explored with DG16 endodontic explorer and the patency of the canals was verified with a size 10 K

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Fig 1

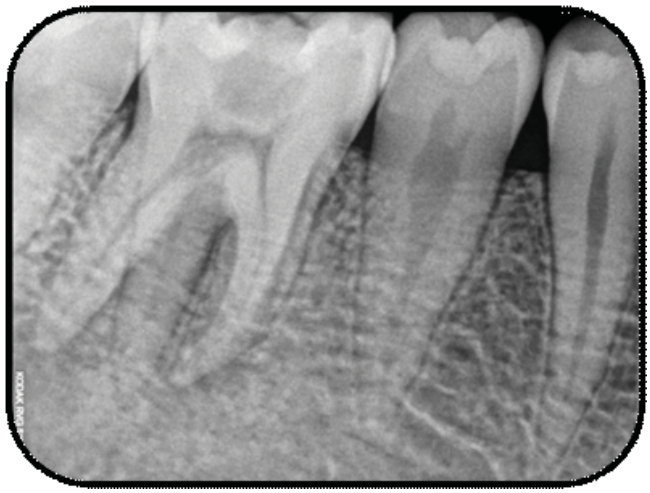

Fig 2: Preoperative X-ray

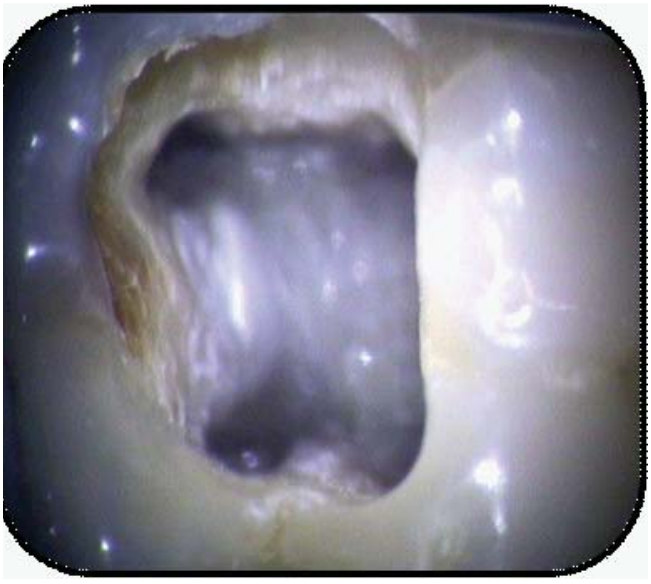

Fig 3: Access cavity

file. The canal length was determined electronically using Root ZX II (J Morita, USA) and the root canals were shaped with ProTaper rotary instruments (Dentsply Maillefer). During preparation, File Eze (Ultradent Products Inc., South Jordan, UT) was used as a lubricant and the root canals were disinfected with a sodium hypochlorite solution (2.5%). Calcium hydroxide (RCCal , Prime dent, India) intracanal medicament given and patient was recalled after 7 days.

At next appointment patient was asymptomatic. Master cone radiograph revealed proper fitting of

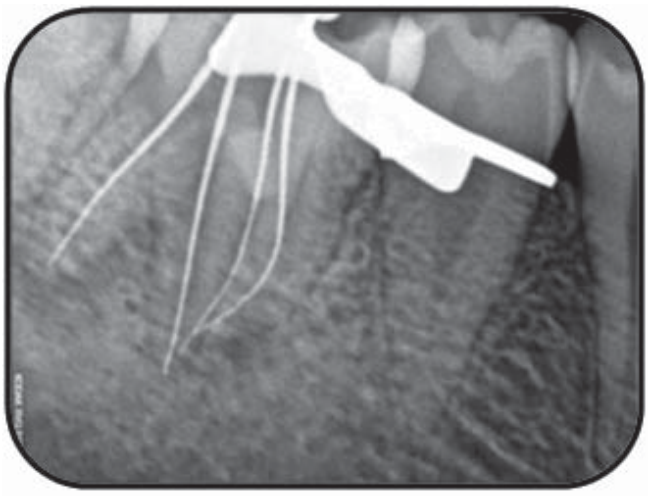

Fig 4:Working length determination

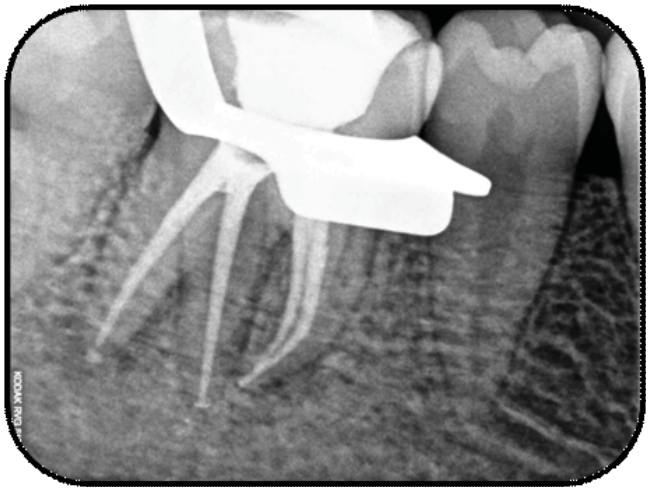

Fig 5 : Obturation

and obturated with 6% gutta percha points and AH plus sealer (Dentsply DeTrey, Konstanz, Germany) using lateral condensation technique (Fig.5). The access cavity was restored with Type IX GIC (Fuji) cement.

Discussion

The success of endodontic therapy depends on the root canal morphology to some extent. Many anatomical variations of mandibular molars have been documented in the literature. Morpho-anatomic changes in teeth may be divided according to the site of their occurrence; i.e., tooth crown, roots and root canals. Third root anomalies may develop during bud morpho differentiation as a result of a developmental aberration of both ectoderm and mesoderm[14].

A classification by *Carlsen* and *Alexandersen* describes four different types of RE according to the location of the cervical part of the RE.[15]

Type A and B - Distally located cervical part of the

RE with two normal and one normal distal root components, respectively.

Type C – Mesially located cervical part,

Type AC - Central location, between the distal and mesial root components.

This classification allows for the identification of separate and nonseperate radix entomolaris.

According to the classification of *De Moor et al*, based on the curvature of the separate RE variants in bucco-lingual orientation, three types can be identified.[16]

Type I - refers to a straight root/root canal,

Type II - refers to an initially curved entrance which continues as a straight root/root canal.

Type III - refers to an initial curve in the coronal third of the root canal and a second curve beginning in the middle and continuing to the apical third.

Unusual anatomy of the mandibular first molar is reported in several studies. The presence of two distal roots is rare but does occur. This additional root can usually be found distolingually, and was recently mentioned in the literature by De Moor et al1 as "radix entomolaris" (RE)[17]. The prevalence of three-rooted mandibular first molars in extracted teeth, according to published literature, is given in Table 2[18].

Table 2 – Survey of available studies: Prevalence of three rooted mandibular first molars

Study	Year	Prevalence (%)	Population
Taylor	1899	3.4	United Kingdom
Tratman	1938	5.8	Chinese
Tratman	1938	0.2	Indians
Turner	1971	5.8	American Indian
Skidmore and Bjorndal	1972	2.2	Caucasians
Yones et al	1990	2.92	Saudi
Loh	1990	7.9	Chinese
Yew and Chan	1993	21.5	Chinese
Gulabivala et al	2001	10.1	Burmese
Gulabivala et al	2002	13	Thai
Huang et al	2007	21.7	Taiwanese
Tu et al	2007	17.77	Taiwanese
Schafer et al	2009	0.68	Germans
Garg et al	2010	5.97	Indian

Apart from the awareness about the possible existence and the racial prevalence of RE, it can be detected by thorough inspection of pretreatment radiographs, especially those taken from different angles. Intra-oral periapical radiographs may serve as an important aid in identifying RE[19]. It is suggested that the radiographs double periodontal ligament images or unclear view of distal root/canal indicate the possibility of RE[20]. In the present case, all the radiographs taken during the root canal procedure were clearly suggestive of RE and prevented the need for further investigations like cone-beam computed tomography and 3-dimensional reconstruction which are useful to study the morphology of RE in a noninvasive manner.

The presence of and RE or an RP has clinical implications in endodontic treatment. The (separate) RE is mostly situated in the same buccolingual plane as the distobuccal root, and resultant superimposition of both roots can appear on the preoperative radiograph, resulting in an inaccurate diagnosis. A thorough inspection of the preoperative radiograph and interpretation of particular marks or characteristics, such as an unclear view or outline of the distal root contour or the root canal, can indicate the presence of a 'hidden' RE. To reveal the RE, a second radiograph should be taken from a more mesial or distal angle (30 degrees). Clinical inspection of the tooth crown and analysis of the cervical morphology of the roots by means of periodontal probing can facilitate identification of an additional root. An extra cusp (tuberculum paramolare) or more prominent occlusal distal or distolingual lobe, and lingual pulp chamber wall can be explored with DG 16 explorer to reveal overlying dentin or pulp roof remnants masking the root canal entrance. The calcification, which is often situated above the orifice of the RE, has to be removed for a better view and access to the RE. However, care should be taken not to remove and excessive amount

of dentin on the lingual side of the cavity and orifice of the RE. A severe root inclination or canal curvature, particularly, in the apical third of the root (as in a type III RE), can cause shaping aberrations such as straightening of the root canal or a ledge, with root canal transportation and loss of working length resulting. The use of flexible nickel-titanium rotary files allows a more centered preparation shape with restricted enlargement of the coronal canal third and orifice relocation. Therefore, after relocation and enlargement of the orifice of the RE, initial root canal exploration with small files (size 10 or less) together with radiographical and electronic root canal length determination, and the creation of a glide path before preparation, are step-by-step actions that should be taken to avoid procedural errors.

The presence of and RE or an RP has clinical implications in endodontic treatment. The (separate) RE is mostly situated in the same buccolingual plane as the distobuccal root, and resultant superimposition of both roots can appear on the preoperative radiograph, resulting in an inaccurate diagnosis. A thorough inspection of the preoperative radiograph and interpretation of particular marks or characteristics, such as an unclear view or outline of the distal root contour or the root canal, can indicate the presence of a 'hidden' RE. To reveal the RE, a second radiograph should be taken from a more mesial or distal angle (30 degrees). Clinical inspection of the tooth crown and analysis of the cervical morphology of the roots by means of periodontal probing can facilitate identification of an additional root. An extra cusp (tuberculum paramolare) or more prominent occlusal distal or distolingual lobe, and lingual pulp chamber wall can be explored with DG 16 explorer to reveal overlying dentin or pulp roof remnants masking the root canal entrance. The calcification, which is often situated above the orifice of the RE, has to be removed for a better view and access to the RE. However, care should be taken not to remove and excessive amount of dentin on the lingual side of the cavity and orifice of the RE. A severe root inclination or canal curvature, particularly, in the apical third of the root (as in a type III RE), can cause shaping aberrations such as straightening of the root canal or a ledge, with root canal transportation and loss of working length resulting. The use of flexible nickel-titanium rotary files allows a more centered preparation shape with restricted enlargement of the coronal canal third and orifice relocation. Therefore, after relocation and enlargement of the orifice of the RE, initial root canal exploration with small files (size 10 or less) together with radiographical and electronic root canal length determination, and the creation of a glide path before preparation, are step-by-step actions that should be taken to avoid procedural errors.

Conclusion

Clinicians should be aware of these unusual root morphologies in the mandibular first molars in

Indian population. The initial diagnosis of a radix entomolaris or paramolaris before root canal treatment is important to facilitate the endodontic procedure, and to avoid 'missed' canals. Pre-operative periapicals radiographs exposed at two different horizontal angles are required to identify these additional roots and its root canal orifice will result in a modified opening cavity with extension to the distolingual. The morphological variations of the RE in terms of root inclination and root canal curvature demand a careful and adapted clinical approach to avoid or overcome procedural errors during endodontic therapy.

Acknowledgements

The authors would like to thank Dr Sabita Ram,Dean Dept. of M.G.M Dental College, Navi Mumbai for supporting me for the publication. Also I would like to thank Dr.Vanitha Shenoy & Dr.Richard Pereira for helping me throughout the publication.

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Reattachment of the Original Crown Fragment

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Abstract

Crown fracture is the most common type of dental injuries. One of the options of management of crown fracture is fragment reattachment, whenever intact tooth fragment is available after trauma. The fragment reattachment procedure presents a conservative, simple and esthetic alternative. This article presents two case reports of restoration of fractured maxillary central incisor using fragment reattachment.

Key Words: Fragment reattachment, Tooth fragment, Crown fracture, Dental trauma

Introduction:

In the permanent dentition, crown fracture is the most common type of dental injuries. And the teeth most commonly affected are anterior teeth, especially the maxillary central incisors. Whereas the mandibular central incisors and the maxillary lateral incisors are less frequently involved.[1] Several factors influence the management of coronal tooth fractures, including extent of fracture, endodontic involvement, alveolar bone fracture, pattern of fracture and restorability of fractured tooth, associated root fracture, soft tissue status, presence/absence of fractured tooth fragment and fit between fragment and the remaining tooth structure, occlusion, esthetics, finances, and prognosis.[2-4]

One of the options for managing coronal tooth fractures is the reattachment of the dental fragment when it is available. Reattachment of the original tooth fragment provides several advantages over other forms of dental restoration following crown fracture.[4-6] An intact enamel-dentin fragment is the sole indication for reattachment.[5] In case of uncomplicated crown fracture, fragment reattachment can be carried out immediately. Whereas in complicated crown fractures, management of the pulp either in the form of pulp curettage and placement of liner, pulpotomy or root canal treatment need to be performed before fragment reattachment.[5] Presented here are two cases of fragment reattachment carried out following root canal treatment. Fragments restored esthetics and function adequately and remained intact during recall visits.

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Case 1

A boy aged 12 year reported with the chief complaint of fracture of upper front tooth. Patient had a fall from bicycle 3 days back and had fractured his tooth. On examination 11 had complicated crown fracture (Figure 1 & 2). Patient's parents were able to retrieve the fractured fragment (Figure 3) and carried it wrapped in cotton. IOPAR in relation to 11 revealed no root or alveolar bone fracture (Figure 4). Fractured fragment was trial seated to confirm a precise fit. Root canal treatment followed by fragment reattachment was planned.

Fractured fragment was stored in saline to prevent dehydration. Following conventional root canal treatment (Figure 5), gutta-percha was removed 1mm below the CEJ and GIC lining was placed above it. A short bevel on enamel was prepared all around on the remaining tooth structure using tapered fissure bur (TC -26, Mani Inc, Japan) as well as on the fragment. An additional internal dentinal groove was placed on the tooth fragment. Fractured area of the tooth, access cavity and fragment were acid etched with 37% phosphoric acid for 15 seconds. After thorough rinsing with copious flow of water and gentle air drying of all the etched surfaces, bonding agent (Adper Single Bond, 3M ESPE,St. Paul, MN) was applied to the etched surfaces of fragment and the tooth was light cured for 10 seconds. The access cavity was restored with composites (Tetric N- cream , Ivoclar vivadent, NY, USA)using incremental technique. Following this composite was filled into the internal dentinal groove and a thin layer of composite was applied

Fig 1: Complicated Crown fracture with 11

Fig 2 - Occlusal view - pulp involvement following crown fracture with 11

Fig 3: Fractured Fragment of 11

over the fragment surface. Fragment was carried and approximated with the tooth surface under finger pressure. Excess resin extruding from fracture line was removed with scalpel blade. Correct positioning of the fractured segment was confirmed and light cured labially and ligually for 20 seconds each. Fracture line was finished and polished with composite polishing kit (Optrapol,Ivoclar vivadent, NY, USA) and the interproximal contacts were finished with polyester abrasive polishing strips (Pulp Dent, Switzeland). Reattached fragment restored esthetics and function remarkably well (Figure 6) and provided great psychological comfort to the patient and parents.

When patient reported back after 1 yr 2 months reattached fragment was intact. Fracture line showed minimal discoloration. Polishing with composite

Fig 4: IOPA with 11 following RCT

Fig 5: Fragment reattached with 11

polishing kit removed the stains and restored the appearance.

Case 2

A -13- year old female patient reported with fracture of maxillary left central incisor (21). Patient gave history of fracture while-playing with her friends in school premises 2 hours back. On examination 21 had complicated crown fracture with pulpal involvement (Figure 6 & 7). Patient's parents were able to retrieve

Fig 6: Complicated crown fracture with 21

Fig 7: Occlusal view- pulp involvement following crown fracture with 21

Fig 8: Fractured fragment of 21 stored in milk

the fractured fragment and carried it in milk (Figure 8). No root or alveolar bone fracture was evident on the radiograph.

Since patient reported just 2 hours after the trauma, Cvek's pulpotomy was carried out. Approximately 1 mm outer layer of exposed pulp was removed using

Fig 9: Hemostasis achieved following pulp curettage

Fig 10: Calcium hydroxide lining placed over the pulp

Fig 11: Trial seating of fractured fragment following pulp curettage

round diamond points and sharp spoon excavator. Pulp was irrigated with saline and hemostasis was achieved by placing wet cotton pellet under pressure for 30 seconds(Figure 9). Hard setting calcium hydroxide lining (Dycal, Dentsply Caulk,Milford,USA) was placed over the pulp (Figure 10). A thin protective Glass Ionomer lining (GC corp, Type III) was placed over the calcium hydroxide. Fractured fragment was trial seated to confirm precise fit (Figure 11).

Fig 12: Fragment reattached with 21

Circumferential enamel bevel was placed over the fragment and the tooth. An internal dentin groove was prepared on the fragment for additional retention. This was followed by same steps as described in case 1 with acid etching, rinsing, drying, bond application, reapproximation using composite, finishing and polishing of composite. Reattached fragment restored esthetics and function extremely well (Picture 12). Reattached fragment remained intact at 6 months and 1yr follow up. Radiographs showed no sign of periapical pathology.

Discussion

An intact enamel-dentin fragment is the sole indication for reattachment. That is, the majority of the enamel margin should be present so that the fragment can rest firmly against the fracture surface when it is tried against the fractured tooth. Small defects, however, can be restored with composite resin at the time of or following the bonding procedure. Moreover, if the fragment is in 2 pieces, these fragments can be bonded together prior to bonding the final fragment.[5]

The fragment reattachment has several advantages over other direct or indirect restoration techniques [4-6]

- It is esthetically superior as it results in exact restoration of crown and surface morphology and preserves incisal translucency
- Abrades at the same rate as adjacent teeth.
- Chair time for the completion of the restoration is minimal compared to other direct and indirect restorations
- Stress resistance is similar to that of an intact tooth, thus , preferred to composite restoration in case of repeated trauma
- Positive emotional and social responses from patients
- Economical

One of the common problems at recall visits could be discoloration of the composite at fracture line which might require occasional polishing.[6] Initial color disharmony, if any, between fractured fragment and the tooth because of desiccation of the fragment is present, gets resolved on its own.[7]

Fragment debonding is another problem, which is inconvenience to the patient as well as clinician. Fracture strength is an important factor in preventing fragment debonding and determining the success of fragment reattachment. Assortments of techniques of tooth and fragment preparation have been advocated to improve fracture strength of the attached segment.

- Use of a V-shaped enamel notch [8]
- Placement of a circumferential bevel [10,11]
- Placement of an external chamfer at the fracture line after bonding[11]
- Internal groove [10,12]
- Leaving a superficial over contour of restorative material [13]

Combination of these can be used to improve fracture strength. Reis et al (2001), have shown that buccal chamfer recovers 60.6% of the fracture strength. Whereas over contour and internal dentin groove technique nearly achieved intact tooth fracture strength recovering 97.2% and 90.5% respectively. However, simple reattachment recovered only 37.1% of intact tooth fracture resistance.[13] In our cases we used circumferential beveling and internal dentin groove as additional retentive features to enhance fracture resistance. Since our first case had complicated crown fractures, following root canal treatment we filled pulp chamber with composite resin to act as inner reinforcement.

While fragment debonding represents a practical inconvenience, it has no impact on pulpal vitality since debonding occurs as a cohesive failure within the bonding resin and not in dentin. Thus the fracture surfaces of teeth with debonded fragments are glossy from retained resin plugs within the treated dentin. For this reason, the dentin must be freed of bonded resin, (e.g. with a slurry of pumice and water) prior to rebonding of fragment.[5]

Reports and clinical experience suggest that reattachment of fractured crown segment with modern adhesive system have fair chance of success.[6, 11,12, 14- 16]

Conclusion

Reattachment of the tooth fragment is the best treatment option for restoring fractured coronal segment whenever it is available and intact. In recent years due to remarkable advancement of adhesive systems and resin composites has made reattachment procedure no longer a provisional restoration.

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Orthodontic Treatment: The Soft Tissue Paradigm

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Abstract

Since turn of the 20th century orthodontic diagnosis and treatment planning has been based on the Angle paradigm that considers ideal dental occlusion 'nature's intended ideal form'. The orthodontist's task is to seek balance between the patient's aesthetic demands, functional efficiency and structural harmony. The soft tissues largely determine the limitations of orthodontic treatment, from the perspectives of functions and stability, as well as aesthetics. Therefore orthodontist must plan treatment within the patient's limits of soft tissue adaptation and soft tissue contours. This is a case report showing a well finished case keeping in mind the emerging soft tissue paradigm in diagnosis and treatment planning.

Paradigm, a universally accepted scientific truth which at any given time best explains a natural phenomenon.[1] A paradigm can be thought of as the foundation on which a scientific structure is erected, with each brick representing new findings and insights. This appositional phase of scientific progress is quite slow and proceeds until a new and revolutionary paradigm is proposed and accepted, replacing the old paradigm. Usually science advances incrementally by virtue of the cumulative effort of investigators, each adding knowledge by accretion to the currently accepted model or paradigm. In this progression the truth of today become the myths of tomorrow. Practitioners of scientific discipline are generally resistant to accept new paradigm. Nonetheless after a paradigm shift has occurred a veritable explosion of new ideas and information occurs, leading to rapid advances in the field.[2]

For 100 years orthodontic theory and practice has been based on the Angle's paradigm.[3] This model is predicted on a belief system which assumes that nature intends for all adults to have perfectly aligned dental arches, each containing 16 teeth that should mesh in ideal articulation with the teeth in the opposing jaw. When such "natural" dentitional state occurs, the face also should be in perfect harmony and balance and the stomatognathic system should function ideally.

Orthodontists have traditionally viewed structural discrepancies as the primary limitations of treatment. In reality, the soft tissues more closely determine therapeutic modifiability.[2] The boundaries of dental compensation for an underlying jaw discrepancy are established by several aspects of soft tissue relationships and functions:

1 . Pressures exerted on the teeth by the lips, cheeks, and tongue[4]
2. Limitations of the periodontal attachment
3. Neuromuscular influences on mandibular position.
4. The contours of the soft tissue facial mask
5. Lip-teeth relationships and anterior tooth display during facial animation[5, 6]

Orthodontists have taken a century not necessarily to learn but to accept that the soft tissues largely determine the limitation of orthodontic treatment. As time passed, it became clear that even an excellent occlusion was unsatisfactory if it was achieved at the expense of proper facial proportions. Not only were there esthetic problems, it often proved impossible to maintain an occlusal relationship achieved by prolonged use of heavy elastics to pull the teeth together as Angle and his followers had suggested. Extraction of teeth was reintroduced into Orthodontics in the 1930's to enhance facial esthetics and achieve better stability of the occlusal relationships.

Many authors have suggested utilizing soft tissue analysis as a reliable guide for occlusal treatment and attendant soft tissue changes.[7-18] Arnett and Bergman presented the Facial Keys to Orthodontic Diagnosis and Treatment Planning as a three-dimensional clinical blueprint for soft tissue analysis

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and treatment planning.[7, 8]

The increased attention to soft tissue and de-emphasis on perfection, combine to form a biologically driven paradigm that will better serve Orthodontics in the twenty-first century. It is initially an unsettling shift in mindset for at least two reasons:

1. It represents a philosophical "180-degree turn" in the orthodontic conceptual framework.
2. Because orthodontics does not yet have morphometric tools for evaluating soft tissues that are comparable in quality and accuracy with tools for measuring dental and skeletal components. (Table 1)

Table 1: Angle versus Soft Tissue Paradigms: A new way of looking at treatment goals

Parameter	Angle paradigm	Soft tissue paradigm
Primary treatment goal	Ideal dental occlusion	Normal soft tissue proportions and adaptations
Secondary goal	Ideal jaw relationships	Ideal soft tissue proportions define ideal hard tissues
Hard / soft tissue relationships	Ideal hard tissue proportions produce ideal soft tissues will be OK	Clinical examination of intra-oral and facial soft tissues
Diagnostic emphasis	Dental casts, cephalometric radiographs	Clinical examination of intra-oral and facial soft tissue
Treatment approach	Obtain ideal dental and skeletal relationships	Plan ideal soft tissues relationships and then place teeth and jaws as needed to achieve this
Function emphasis	TM joint in relation to dental occlusion	Soft tissue movement in relation to display of teeth
Stability of result	Related primarily to dental occlusion	Related primarily to soft tissue pressure/equilibrium effects

Pre Treatment Fig. 1

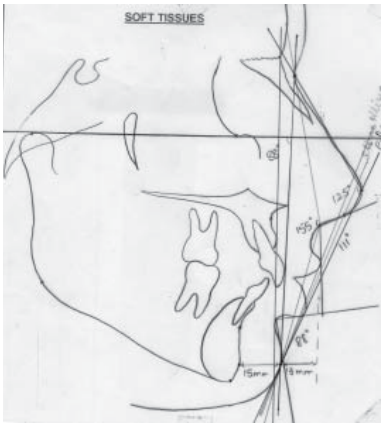

Fig 2

Case Report

The chief complaint of the 21 year old patient was malaligned teeth. Patient had insisted in not taking the teeth too much back as she had witnessed her colleague's treatment.

Pre-treatment

Pretreatment photographs Fig 1 show that the patient is having a pleasing profile with normal class I soft tissue relations except the lower lip is slightly everted due to the presence of anterior deep bite. The intraoral findings show Class I molar relation on both sides, canine relation as Class I on right side whereas end-on on the left side, overjet and overbite of 5mm and 9mm respectively with lower midline shifted to left side by 1mm and lower anterior crowding as 7mm. The case is diagnosed as mild skeletal Class II Angle's Class I molar relation with moderate anterior crowding.

Cephalometric analysis Fig 2 show normal nasolabial angle and increased mento-labial angle due to increased overbite. The upper and lower lip thickness is normal. Patient was treated with upper second and lower first premolar extraction.

Discussion

All the aims and objectives of the treatment are achieved. The patient had mild skeletal class II with dentoalveolar Class I and good soft tissue profile. Therefore Kesling's setup was done before formulating treatment plan. Extraction of upper second premolars helped us maintaining the good soft tissue profile by not allowing excess retraction of upper anteriors. Fig3 Thus the favored nasolabial angle can be maintained with little or not so significant change in the parameter. Excess anterior retraction causes the upper lip to fall back inadvertently thereby giving senile appearance. Also these spaces were utilized to correct the deep bite

Post-treatment

Fig 3

Fig 4

present. Fig 4 Elimination of deep bite by intruding upper anteriors relieved the lower lip-trap like situation which was leading to deep mentolabial sulcus and provided better soft tissue relations. Extraction

of lower first premolars was useful in releiving the crowding in the lower anterior region. Also the midline and the asymmetric archforms were corrected. First premolar extractions were the right choice in the mandibular arch as these teeth lie closer to the area of concern (giving priority to the crowding in anterior region and midline shift).

Fig 5

Post-treatment lateral cephalogram superimposition (Fig 5)showed adequate amount of torque in the anterior teeth. Prognosis for stability of the results is good as Class I canine and adequate interincisal angles are achieved. Also presence of excellent interdigitation in the posterior segments shall maintain the functional efficiency.

Conclusion

Fig 6

As a result of the paradigm of health care evolving from a disease-oriented focus to a wellness model, orthodontics now is viewed more clearly as a health service dedicated to establishing both emotional and physical wellness. Malocclusion of the teeth is not a disease; rather, it is a disability with a potential influence on physical and mental health, and appropriate treatment can be important for the patient's well-being. Soft tissue relationship of the patient has to be given fair amount of weightage during the treatment plan and while evaluation of the results achieved. Fig. 6

The operational goal of orthodontics is to obtain optimal proximal and occlusal contact of the teeth (occlusion) within the framework

of normal function and physiologic adaptation, acceptable or improved dentofacial esthetics and self-image, and reasonable stability. In some cases these goals may be at cross-purposes, and orthodontists must navigate the area between where they feel most comfortable professionally and where patient input guides them.

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Desmoplastic Ameloblastoma

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Abstract

According to the WHO (2005) classification of odontogenic tumors, Desmoplastic Ameloblastoma is recognized as a variant of ameloblastoma. This rare entity differs from the other forms of ameloblastoma in its anatomical location, morphology, and radiographic appearance. Due to its unusual clinic-pathological presentation, this tumor mimics various odontogenic as well as non odontogenic neoplasms. We are presenting a rare case of desmoplastic ameloblastoma in the maxilla in a 53 year old male with regards to its clinical and radiographical and histological viewpoints.

Keywords: Ameloblastoma, Desmoplastic ameloblastoma

Introduction

Ameloblastoma is a most common odontogenic tumor that usually exhibits aggressive behavior. It causes severe expansions of the cortical bones and may have high recurrence rate[1]. It may cause mobility and displacement of teeth as well as root resorption[2]. Follicular, plexiform, acanthomatous, desmoplastic are histological variants of ameloblastoma.[3] Desmoplastic ameloblastoma was first described by Eversole et al in 1984.[4] As compared the classical type of ameloblastoma ,this tumor exhibits differences in anatomical distribution, histological appearance and radiographic findings. Maxillary anterior region is a common site of tumor location. Radiographically, it appears as a mixed radiopaque/radiolucent lesion with soap bubble or honeycomb appearance. Histologically it shows pronounced desmoplasia containing epithelial islands, nests and cords.[5]

In this case report we have an unique opportunity to discuss a rare case of desmoplastic ameloblastoma along with its clinical, radiological, histological features and differential diagnoses.

Case Report

A 53 year old male patient reported to MGM Dental College and Hospital Kamothe with the chief complaint swelling in upper left anterior region of since last six month. Initially it was smaller in size and gradually increases to present size. On examination extra oral (Fig-1) diffuse swelling was present on left midface region. The borders of swelling were indistinct, overlying surface was normal skin and on palpation it is firm in consistency. Intra orally (Fig-2) swelling was present on the buccal and palatal aspects of maxillary left anterior region measuring approximately 2×1 cm and 3×2 cmrespectively. Radiographically (Fig-3) the orthopantomogram showed mixed radio-opaque and radio-lucent lesion with ill-defined borders extending from 22 to 26 with the roots of 24 and 25 is deflected distally.

Fig1. Diffuse extra oral swelling on left maxilla.

Fig 2. Intra orally tumor involving buccal and lingual side

Fig3. mixed radioopaque/ radiolucent areas having ill defined border with root displacement of 24,25.

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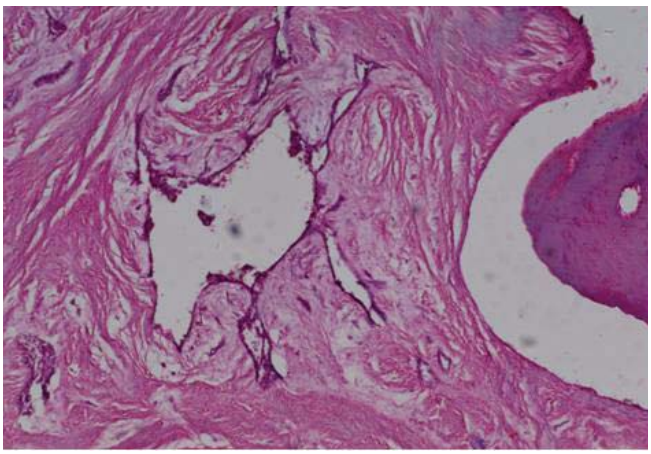

Fig4. Kite shape arrangement of island with cyst formation.

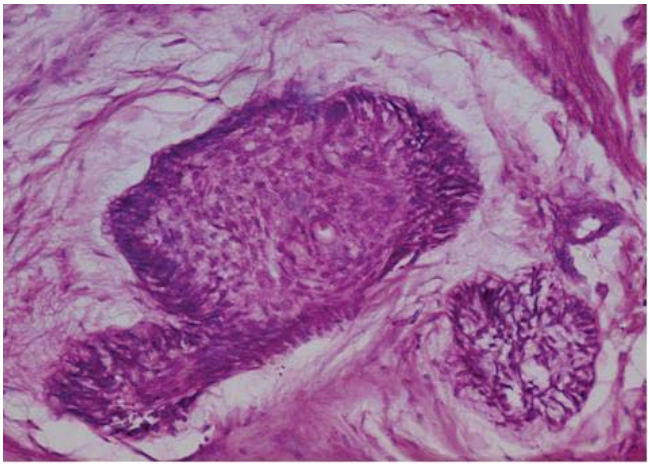

Fig5. Solid form of island with individual cell keratinization.

Histologically (fig 4,5) H & E stained soft tissue section showed presence of irregular epithelial odontogenic islands scattered within densely fibrous connective tissue. The epithelial island showed flattened cells to columnar cells with reversed polarity at the periphery. The center of islands showed hypercellularity with squamous differentiation. Some follicles showed thin cell lining with cystic degeneration in center.

Discussion

Ameloblastoma is a rare odontogenic tumor accounting for around 1% of all the cysts and tumors in the jaws.[6] The desmoplastic ameloblastoma is an unusual variant of ameloblastoma, which has a low occurrence rate and is characterized by marked stromal desmoplasia. These tumours were most commonly found in 3rd to 5th decade of life with a high predominance among males and relative higher frequency of occurrence in Asians.[7]The striking difference in the anatomic location i.e. occurrence in the anterior-premolar region of maxilla/mandible, unusual radiologic presentation of mixed radiolucency-radiopacities with ill-defined borders and distinctive histopathology of extensive stromal desmoplasia with scattered odontogenic epithelium makes it a distinct clinicopathologic entity.

The radiographic appearance of Desmoplastic Ameloblastoma is usually indicated by a mixed radiolucent/radiopaque lesion having diffuse borders similar to a fibro-osseous lesion or malignant tumor.[8,9] Radiographic appearance may be attributed to the infiltrative growth pattern of tumour cells into surrounding marrow spaces and simultaneous vigorous osteoblastic activity.[10]

Histopathologically, desmoplastic ameloblastoma are nonencapsulated tumours with extensive collagenous stroma or desmoplasia containing small islands and nests of ameloblast cells. They have little tendency to mimic ameloblasts and the typical palisading pattern may be absent.[11,12,13] The follicles tend to be morphologically irregular or compressed.[14] Desmoplastic ameloblastoma must be histologically differentiated from ameloblastic fibroma, odontogenic fibroma and squamous odontogenic tumour.[15] Waldron and El Mofty[11] described the histological appearance of desmoplastic ameloblastoma as small ovoid islands and narrow cords of odontogenic epithelium widely separated by dense, moderately cellular, fibrous, and connective tissue. Although columnar cells with reverse polarity within the epithelial islands are present, they are not the dominant feature. Spicules of mature lamellar bone trabeculae have been reported in intimate contact with the tumor where invasion has been demonstrated. This histologic finding may indicate the potential for local invasion, and accounts for its distinct radiographic imaging. In our case the tumor showed compressed, follicular ameloblastic islands scattered randomly in a stroma showing extensive desmoplasia and osteoplasia characterized by metaplastic woven bone formation .

Desmoplastic ameloblastoma may have a propensity to recur with a frequency equal to that of other types of ameloblastoma.[16, 17] Recurrence rate of conventional mandibular ameloblastomas treated by curettage ranges from 33.3% to 90%, whereas for those affecting the posterior maxilla it appears to be 100%.[18,19] Curettage is an inappropriate treatment for ameloblastomas of the posterior maxilla because recurrence is inevitable and difficult to treat. Such tumours should be excised with an extensive margin of apparently unaffected bone on the first attempt.[19]

Desmoplastic ameloblastoma may exhibit a more aggressive behavior than other types of ameloblastoma. Various facts about this lesion may suggest its aggressiveness:

– A potential to grow to a large size

– The common location in the maxilla that may produce an early invasion to adjacent structures;

– The diffuse radiographic appearance and the histologic finding of bone invasion.

It is almost impossible to find the exact interface of the lesion with normal bone, making it especially difficult to be treated surgically.[19]

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Herpes Zoster involving Trigeminal Nerve

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Abstract

Herpes zoster is a common acute viral infection caused by reactivation of Varicella-Zoster virus. Acute pain of herpes zoster lowers the quality of life and interferes with day to day activities. We report a case of herpes zoster in a 68 year old, healthy male patient in which the prodromal symptoms started as toothache. This case highlights the importance of a thorough dental history and examination in patients with toothache.

Key Words: Herpes zoster, Trigeminal nerve, toothache.

Introduction

Herpes zoster is an acute neurodermic viral infection of the dorsal root ganglia of the spinal cord or the extramedullary cranial nerve ganglia.[1] It is caused by reactivation of varicella zoster virus (VZV) which lies dormant in the sensory ganglia after an earlier episode of chickenpox and involves the dermatome supplied by the sensory nerve that arises from the ganglion.[2]

Herpes zoster (HZ) is predominantly a disease of the middle-aged and elderly. From 5 to 10 cases per 1,000 persons are seen between the sixth and eighth decades of life.[3] The thoracolumbar trunk (especially T3 to L3) is most commonly affected. HZ may affect cranial nerves, and the trigeminal nerve is then the most frequently affected (18.5%-22% of total cases). Trigeminal nerve involvement is usually unilateral and limited to a single division, more often the first (ophthalmic). Oral manifestations appear when the second or third division is affected.

Prodromal pain may occur along the distribution of the trigeminal nerve few days before the vesicular eruptions and this pain may mimic toothache or pulpitis[4]. HZ of the trigeminal nerve is associated with painful vesicles of the skin and oral mucosa of the affected branch of the nerve. Characteristically, the condition presents as a painful unilateral vesicular rash, usually restricted to the distribution of a sensory nerve.

HZ affecting the oral and maxillofacial region may pose a significant diagnostic challenge and should be considered in the differential diagnosis of those presenting with atypical odontalgia[5].

We report a case of HZ affecting the second and third division of trigeminal nerve.

Figure 1 A, B: Frontal & Lateral view of face demonstrating facial swelling with erythema and vesicular lesions over the distribution of the right maxillary and ophthalmic branches of the trigeminal nerve.

Case Report

68 years old male patient reported with the chief complaint of pain, ulceration and burning on right side of mouth & vesicles on right side of face since 8 days.

Patient was apparently all right 10 days back. The vesicular eruption on the right side of face was preceded by history of toothache and pain in the same region for which he had been prescribed medications by a local dentist. He also experienced ulcerations in right side of oral cavity preceded by vesicles. There was history of fever, swelling over face along with pain. Patient gave no history of any topical application or insect bite, no history of recent exposure to chicken pox or any similar eruption elsewhere on the body.

On extra oral examination (Figure 1 A, B), facial asymmetry was noted due to swelling over right side of face extending, supero-inferiorly from infraorbital region to lower border of mandible, antero-posteriorly

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from ala of nose to pre-auricular region and also involving the right orbit leading to closure of right eyelids. Erythema and vesicular lesions were seen over right infraorbital region, right cheek and right side of nose and upper lip. Right eye was closed due to bulk of the swelling. On palpation, swelling was tender & soft in consistency. Right sub-mandibular lymph nodes were palpable, two in number, tender, firm, mobile, 1x1cm in size approximately.

On intraoral examination, irregular shallow ulcerations were seen spread over the right buccal mucosa extending from the angle of the mouth, involving the lower mucobuccal fold also involving the right side of the hard palate till the midline. (Figure 2) Clinical examination of dentition was done to rule out dental cause of pain. Generalized gingival inflammation and recession was noted. Teeth on right quadrant of upper jaw gave a normal response to vitality testing using electric pulp tester.

Complete blood count was within normal limits. ELISA for HIV was negative. These investigations ruled out immunosupression. Specific diagnostic test of Tzanc smear was not done and on the basis of clinical signs, a final diagnosis of Herpes zoster involving maxillary and ophthalmic division of trigeminal nerve on right side (V1, V2) was given.

Patient was advised following medications - Tab Acycovir 800mg, five times a day for 7 days, Cap Phexin 500mg, three times a day for 5 days, Tab Combiflam twice a day for 5 days, Hexidine mouth wash, T Bact Cream (Mupirocin 2 %) for local application on face, twice a day.

Table 1: Clinical stages of Herpes Zoster:

PHASES	FEATURES
PRODROME	• Intense pain • Sensitive teeth • Otitis media • Initial viral replication ↓ Acute ganglinitis ↓ Neuronal necrosis
ACUTE	• Cluster of vesicles on erythematous base ↓ Pustular ↓ Ulcerate • Along the path of affected nerve & terminate at midline
CHRONIC	• Post herpetic neuralgia

Figure 2: Intra-oral clinical photographs showing unilateral, ulceration and erythema affecting the hard palate.

Ophthalmology consultation was sought for examination of eye lesions and the patient was advised - Ciprofloxacin 0.3% eye ointment 6 times / day, Ecotears 6 times / day, recalled after 2 weeks.

On telephonic conversation with the patient after 2 weeks, he reported to be absolutely all right without any complaints.

Discussion

Zoster occurs during the lifetime of 10% to 20% of individuals, and the prevalence of attacks increases with age. Our case was 68 years old.

The majority of HZ infections involve the thoracic and lumbar dermatomes; however, approximately 18 to 22% of patients present with infections involving any of the three branches of the trigeminal nerve[5]. Trigeminal nerve involvement in HZ is usually unilateral and limited to a single division, more often the ophthalmic division; however, in our case the maxillary and ophthalmic divisions were involved; this is rare (1.7% of cases)[6].

Oral manifestations appear when the second (maxillary) or third (mandibular) trigeminal divisions are affected. Frequently the intraoral lesions are associated with cutaneous lesions affecting the corresponding area innervated by the affected sensory nerve as present in our cases.

Reactivation of the latent residual virus occurs after a variable latent phase of between 5 and 40 years in 15% of the patients and results from waning specific cellular immunity. The possible precipitating factors include trivial trauma, physical and mental stress, radiotherapy, surgery and old age.[7]

Patients with HZ may progress through three stages: prodromal stage, active stage (also called acute stage) and chronic stage.[8-10] (Table 1)

The prodromal stage presents as sensations (described as burning, tingling, itching, boring, prickly)

occurring in cutaneous distribution of the dermatome and is believed to represent viral degeneration of nerve fibrils. During this period, if branches of the trigeminal nerve are affected, odontalgia and pulpal necrosis may occur. It is proposed that the reactivated virus may travel the length of the nerve, infect the pulp vasculature lead to infarction and necrosis. In our case the patient reported of pain in mouth and toothache before onset of vesicular eruptions. Furthermore, these symptoms may present up to 1 month before the acute mucocutanous lesion, and pose significant diagnostic difficulties.[8-10]

The active stage is characterized by the emergence of the rash which is nearly always accompanied by systemic upset. The characteristic skin rash progresses from erythematous papules and oedema to vesicles and finally to pustules within 1 to 7 days which dry and crust and are exfoliated over 2 to 3 weeks leaving erythematous macular lesions that may scar. Lesion on the tip of the nose is a sign that the nasociliary branch of the fifth cranial nerve is involved suggesting the potential for ocular infection. In these cases, referral to an ophthalmologist is mandatory as seen in our case.

Diagnostic difficulties may be encountered when the vesicular rash does not occur (zoster sine herpete). It is during the active or 'eruptive' phase that HZ is at its most contagious and could pose a significant cross infection risk.[8] Oral lesions occur with trigeminal nerve involvement and may be present on the movable or bound mucosa. The lesions often extend to the midline and frequently are present in conjunction with involvement of the skin overlying the affected quadrant as seen in our case. The Individual lesions present as 1- to 4-mm white opaque vesicles, which rupture to form shallow ulcerations. Involvement of the maxilla may be associated with devitalization of the teeth in the affected area; however our case did not have this finding.

The chronic stage is only seen in approximately 10% of all patients with HZ, and is termed post-herpetic neuralgia. It is described as a brief recurrent shooting or shocking allodynia, with a constant, usually deep pain, lasting beyond the period of healing of the active skin lesions. It may persist for years and is a significant cause of morbidity. However our case did not report of any symptoms after healing of the lesions. Although post-herpetic neuralgia is the most common complication of HZ, other complications include neurological disorders, ophthalmologic, cutaneous and visceral complications. Periapical lesions, root resorption, tooth exfoliation and alveolar osteonecrosis have also been reported in association with HZ infection.[8-10]

Although HZ is a self-limiting condition and resolution is usually complete, treatment is indicated in some cases to reduce the acute symptoms of pain and malaise, to limit the spread and duration of the skin lesions and to prevent complications. The pharmacological approach is based on symptomatic relief and antiviral therapy. For many years, aciclovir (ACV) has been the antiviral drug of choice for the treatment of VZV infections. Recently, other antiviral agents such as valaciclovir and famciclovir have been developed to overcome the low oral bioavailability of ACV and its limited and less predictable effect in preventing the development of post-herpetic neuralgia, as well as to provide a more favorable dosage regime.[8] Antiviral therapy should be initiated as early as possible, especially when patient factors that may complicate the manifestations of the condition are expected.[11]

Conclusion

A case of HZ affecting the trigeminal nerve is reported. This case highlights the importance of a thorough dental history and examination in patients with toothache. In those presenting with atypical ondontalgia, HZ should be considered in the differential diagnosis. The cardinal problem posed by herpes zoster in immunocompetent adults is pain. Herpes zoster acute pain lowers quality of life and interferes with activities of daily living. A clinician can reduce pain and improve quality of life with early antiviral therapy and scheduled analgesics.

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Florid Cemento-Osseous Dysplasia

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Abstract

Florid cemento-osseous dysplasia (FCOD) is an uncommon benign multifocal dysplastic lesion affecting the jaws that consists of cellular fibrous connective tissue with bone and cementum like tissue. It is most commonly seen in middle aged black woman although it can occur in Caucasians and Asians. A case of FCOD in a 63 year old Indian woman with unique radiographic and clinical presentation is reported.

Key words: FCOD, Fibroosseous dysplasia, cemento-osseous dysplasia.

Introduction:

Florid cemento-osseous dysplasia, periapical cemento-osseous dysplasia, and focal cemento-osseous dysplasia have been designated by the World Health Organization as cemento-osseous dysplasias (1, 2). The cause of these lesions is unknown[3]. Classification of cemento-osseous lesions of the jaws has long been a complex and controversial dilemma for pathologists[4]. Currently, no universally accepted classification exists. A large group of these lesions exhibits sufficiently distinctive clinico-radiographic and histologic features to be separated into a specific category labelled as florid cemento-osseous dysplasia (FCOD). These cases have been reported under a variety of diagnoses including multiple cemento-ossifying fibromas, sclerosing osteitis, multiple enostosis, multiple osteomas, periapical cementoblastoma, Paget's disease of the mandible, gigantiform cementoma[5], chronic sclerosing osteomyelitis[4], sclerotic cemental masses of the jaws, and multiple periapical osteofibromatosis. Non-epithelium lined cyst formation associated with FCOD was first reported by Melrose et al[6] in 1976 and followed by several reports.

The current classification of cementooseous lesions, formulated in 1992 by the World Health Organization (WHO)[7], is based on age, sex, and histopathologic, radiographic, and clinical characteristics, as well as location of the lesion. This classification includes cemento- ossifying fibroma, benign cementoblastoma, and the group of the cemento-osseous dysplasias. Periapical cemental dysplasia and florid cemento-osseous dysplasia, which have also been reported under the term "gigantiform cementoma[8]," are included in the latter group. This disorder appears to be limited to the jaws and is often asymptomatic. The gigantiform cementoma or florid cemento-osseous dysplasia, usually affects middle aged black women. It is a benign fibro-osseous lesion, typically involving multiple sites and frequently symmetric in distribution. It is not unusual to find extensive lesions in all 4 posterior segments of the jaws[4] and is a more extensive manifestation of the same lesion present in periapical and focal cemento osseous dysplasia[4]. When the lesions are large, jaw expansion and facial deformity may be apparent. The lesions have an avascular nature.

Radiographically, a mixed radiolucent and radiopaque appearance is the common finding. The lesions appear lobular and irregularly shaped and progress from radiolucent to radiopaque lesions over time. It is common to note these lesions in all four quadrants of the jaws [2, 9, 10]. Involved areas of the jaw may undergo expansion.

Histologically, the radiopaque lesions that are present appear to consist of an osteoid and cementum-like material, with fibroblasts being associated with the trabeculae of the calcified material[2]. Simple bone cysts and inflammatory cells may also be associated with the lesions. Unless symptoms are noted, no treatment is normally rendered. Once infected the patient become symptomatic, and treatment of the secondary infection is very difficult, and antibiotics are often not effective [9,10].

Case Report:

A 63 years old female reported to the department of oral and maxillofacial surgery with swelling in the upper jaw since 4 to 5 years[fig1 &2]. History revealed that the swelling had started in left upper posterior

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f Fig 1: Clinical photograph of the patient showing swelling on the left side of the cheek.

Fig 2: Intraoral photograph of the patient showing lobulated mass and buccal expansion in the maxilla.

region which progressively increased to involve the anterior region and extended upto the tuberosity on right side. History of spontaneous exfoliation of few teeth in the involved area and intermittent episodes of sinuses with pus discharge was present.

Extraoral examination revealed that the patient had prominent malar bones and frontal bossing. Swelling was present in the maxillary alveolar region extending from left tuberosity to right buttress region. Buccal and palatal expansion was present. Surface appeared lobulated with overlying mucosa of normal color and texture. Premolars on left side showed displacement. Molar teeth on left side were missing. On palpation the swelling was hard and nontender. Involved teeth were found vital.

Fig.3: OPG shows irregular radiopacities mixed with poorly defined radiolucency from upper left third molar to right tuberosity

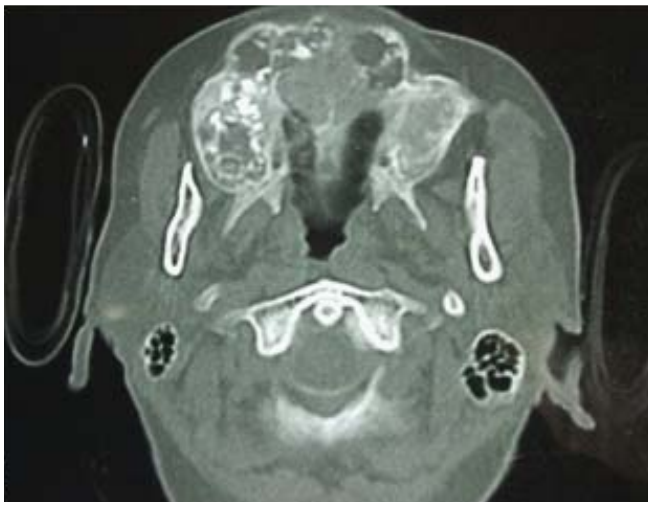

Fig 4: Axial CT showing mixed hypo & hyperdense masses extending from right tuberosity to left tuberosity with Buccal & Palatal expansion

Orthopantamogram [fig 3] revealed irregular radiopacities in tooth bearing alveolar areas mixed with the poorly defined radiolucency from left third molar to right first molar. Most of involved teeth showed hypercementosis. Masses appeared to be separated from root apices. The maxillary sinus and mandible did not show any involvement.

Computed tomography (CT) axial and coronal sections revealed poorly defined mixed hypo and hyperdense masses, with cloud-like appearance involving maxilla extending from right to left tuberosity[fig 4&5]. There was buccal and palatal expansion and the lesion showed lobulated surface. Coronal sections revealed that the maxillary sinuses were normal with minimal fluid levels. These sections also showed the classic ground glass appearance of the malar bones, bones of the cranial vault including the parietal and temporal bones. However, the patient had no history of headache or signs of cranial nerve involvement. The blood chemistry showed that serum alkaline

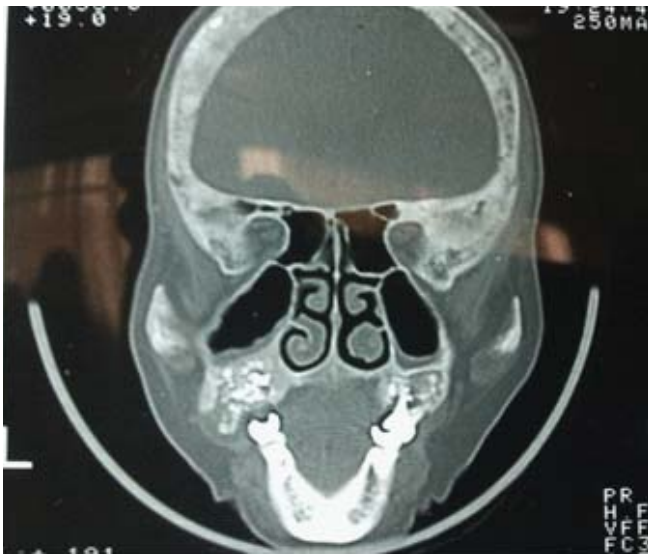

Fig.5: Coronal CT showing ground glass appearance with thickening of bones of cranial vault, malar bones & mixed radiolucency & radiopacity in the buttress region

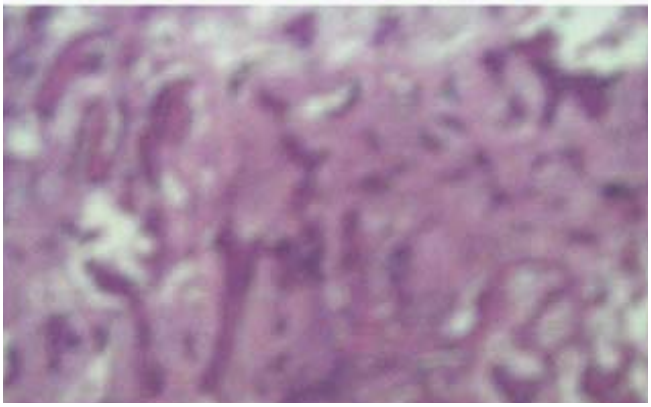

Fig.6: Cementum like substance with relatively acellular structure are scattered among areas of fibrous stroma.

phosphatase was raised [1469U/L]. Incisional biopsy was done. Histopathologically the tissue showed mixture of woven bony trabeculae and cementum like calcifications with areas of loose fibrocollagenous stroma. Osteoblastic rimming and reversal lines were seen in bony trabeculae. The stroma between the islands of cementum like substance was poorly vascularized [fig 6]. The microscopic findings were compatible with the diagnosis of FCOD.

Though CT findings suggested the possibility of a craniofacial fibrous dysplasia occurring concomitantly with FCOD, considering the extensive nature of involvement of craniofacial fibrous dysplasia and the lack of the symptoms, it was decided to address only the FCOD component. The latter lesion showed recurrent episodes of infection and progressive expansion warranting surgical excision. Mucoperiosteal flap was raised and the lesion with involved teeth was excised form the left tuberosity to right first molar region. The bone was found to be soft, vascular and was interspersed with areas of calcification. As the lesion showed no well defined boundaries, care had to be taken during excision to ensure that the floor of the maxillary sinus was not breached. Postoperative healing was uneventful and histopathology report confirmed the diagnosis of FCOD. Patient after one year of follow up showed good healing and no evidence of recurrence.

Discussion:

Florid cemento-osseous dysplasia is a rare benign lesion arising from elements of the periodontal ligament4 and is strictly localized to the tooth bearing areas. Many lesions have to be differentiated from FCOD, and dental imaging can be used to discriminate between FCOD and other lesions that may exhibit a similar sclerotic appearance on conventional radiographs. Odontogenic tumors, especially cemento-ossifying fibroma, generally exhibit more bucco-lingual expansion than does FCOD11. Dental imaging may be helpful in differentiating fibro-osseous lesions from odontoma, in which the CT number for enamel is higher than that for cementum. Cementoblastoma characteristically is fused to the tooth apices. In hypercementosis, the cemental substance lies in continuity with the dental root, whereas in florid cemento-osseous dysplasia or gigantiform cementoma, it is separated from the periodontal space. This latter feature is clearly evident in the radiograph of this patient. Differential diagnosis of FCOD must also include sclerosing osteomyelitis, which can be a complication of the disease[12]. However etiopathogenesis is not clear, Some authors attribute the pathogenesis of FCOD to the proliferation of the fibroblasts present in the periodontal ligament, while, few think that it may arise from the remnants of the cemetum left after the extraction of the teeth. Some contribute the etiologic factors to the slight trauma, such as deepbite and trauma from occlusion [13]. Waldron et al. [14] have proposed that reactive or dysplastic changes in the periodontal ligament might be a cause for the disease. Radiographic appearance depends upon the stage of development and maturity of the lesion. At proliferative stage, lesion appears radiolucent and in the later stages it appears as dense radiopaque masses appearing at the apices of teeth or tooth bearing posterior region of mandible and maxilla. Histopathologically , FCOD is composed of a proliferating fibrous connective tissue stroma containing foci of cementum along with the presence of osteoid or bone. More advanced lesions show an increase in mineralization. In FCOD large sclerotic masses are formed that are hypocellular and extremely dense with small marrow spaces and few haversian systems.

In our case the diagnosis of FCOD was made clinco-

radiologically and histopathologically. Possibly because of spontaneous exfoliation of teeth, sclerotic masses were exposed to the oral cavity resulting in recurrent infection and pus discharge . This case was unusual as there was presentation of concomitant Craniofacial fibrous dyslplasia and FCOD but as the former component was asymptomatic, patient was kept under observation for the same.

The management of FCOD is twofold. In asymptomatic patients it is probably wise to keep the patient under observation without surgical intervention 4. Because the onset of symptoms is usually associated with exposure of the sclerotic masses to the oral cavity, biopsy or elective extraction of teeth in the involved area should be avoided. It would be impractical to completely resect the lesion because it usually occupies most of the mandible and maxilla. When surgical intervention is indicated, a remodelling resection is recommended for esthetic reasons. When the patient is symptomatic secondary to a tooth pain, the tooth may be managed endodontically by avoiding extractions. Cases with secondary predisposed factor of infection are difficult and complicated to manage.

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