Indian Journal of Dental Sciences

. . . an insight into DENTISTRY

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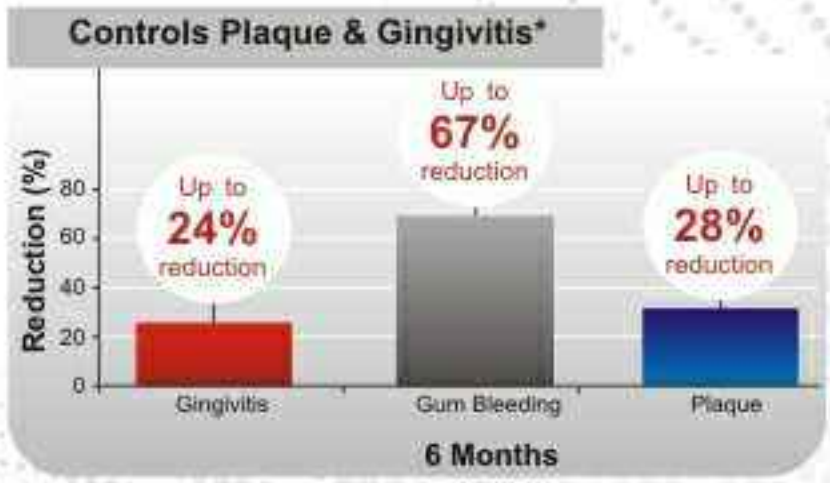

* Vs a control mouth rinse. Donald R Allen et al. Compend, 19: 20-26, 1998.

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IJDS In News

Shimla: Governor Smt. Urmila Singh stressed upon the need to maintain healthy academic atmosphere in Universities congenial for pursuing higher studies and added that quality education should be imparted to the students at University level. She urged the Vice Chancellors to play a pro active role in this direction. She also emphasized on focusing upon research activities for enriching higher education. She was addressing the North Zone Vice Chancellor's Conference here today.

Smt. Urmila Singh said that education played an important role in ensuring balanced growth of the students and added that aim of the education should not be merely employment seeking but also equipping the students with technical expertise so that they could adopt self employment ventures. Education should ensure holistic development of students, she said.

Governor urged the youth to take up self employment ventures and added that higher education should ensure employment opportunities to students. She further said that youth were playing a constructive role in nation building by becoming entrepreneurs leading to their economic empowerment.

Smt. Urmila Singh said that India had marched ahead on the path of progress in all sectors and added that rural development was essential for overall development of the country. She also stressed upon expansion of education for transforming the country as a completely developed nation. She hoped that constructive deliberations would be held in the conference which was held for the first time at Shimla.

Governor released HPU News letter, Tourism Development Journal and **Indian Journal of Dental Science.**

Shri I.D. Dhiman, Education Minister stressed upon the need to encourage Guru-Shishya tradition. He emphasized upon promoting Hind and Sanskrit languages.

Shri P.T. Chande, President, Association Indian Universities also spoke on the occasion.

Shri A.D.N. Vajpayee welcomed the Governor and others on the occasion.

Prof. H.S. Banyal, Dean of Studies HPU proposed vote of thanks.

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Indian Journal of Dental Sciences

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Supplementary Issue

To Err is Human

We have tried our best in designing and printing to provide you correct information.
But any omission error is highly regretted.
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Editorial

Dr. Vikas Jindal
Editor in Chief

Dental science has been witnessing countless change in the last decade and a half bringing in its wake a dental revolution. Consistent with these changes in dental science and modalities of treatment options available, there has also been an increase in spectrum of diseases that manifest in the oath. Oral disease which influences care has continued to grow following life style changes and fast paced life. These developments have also been posing challenges to dental practice.

Although the dental research is evolving at a rapid pace globally. During recent times, there is a remarkable progress in dentistry due to the development of newer technologies with regard to dental equipments, materials, pharmacological products and diagnostic materials. The research status in India, when compared to the Western countries remains only on paper and publications as far as dentistry is concerned. Research that remains restricted to the laboratory is not beneficial to the general public and patients in particular. This kind of research has no clinical significance.

Since the BDS course is spread over five years after the exclusion of the one-year internship, there is enough room for introducing basics of research in the undergraduate curriculum itself, which will be very useful when expanded as dissertation in post graduation.

In postgraduate program, dissertation is a requirement for appearing in university examinations. The main purpose of the dissertation is to expose the postgraduate students to the research environment. Sometimes the topics selected by the students may not be practically possible to carry out in their parent institutions, though many dental colleges imparting postgraduate program have 'research, research center, research institute and their likes' as their surname. The postgraduate students have to run pillar to post to seek permission to do their study in other places or spend huge amount of money to finish their research work. Some laboratories and institutions do not allow the postgraduate students to carry out their tests or experiments on their own, even after them paying the prescribed fees and are instructed to submit the study samples and collect the data later. The ultimate purpose of introducing them to the research is defeated in these situations.

Practicing dentistry is now entering a new era as scientific knowledge and practical experiences from various sources are being put together to combat the new trend. "Indian Journal of Dental Sciences" all said and done, is providing a platform for all of us to access this sea of knowledge and thereby equipping ourselves with the changing trends in the dental field. We need to make a scientific evaluation of the clinical benefits and then integrate the emerging technologies into a practical workflow.

Dr Vikas Jindal
Editor in Chief

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Original Article

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Comparative Evaluation of Sealing Ability Of Two Resin Based Sealers: An Invitro Stereomicroscopic Study.

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Abstract

Aim : The purpose of this study was to evaluate and compare the apical microleakage of two different resin based sealers.

Materials And Methods : Thirty extracted human maxillary single rooted teeth with intact roots were selected. The crown portion removed followed by canal preparation upto ISO size 50. The teeth were then randomly divided into two groups of fifteen teeth each for obturation. Group I -AH Plus with Cold lateral condensation, and Group II- Self etch Epiphany sealer with Resilon. Apical microleakage was assessed by dye penetration test under stereomicroscope.

Result : The result was analyzed statistically and showed that Epiphany provides a better seal as compared to AH Plus sealer. Both the groups at some level or the other exhibited some percentage of microleakage.

Conclusion : None of the methods showed a fluid-tight seal. Epiphany was the best amongst the two groups under this study. apexification. This paper describes successful treatment of two cases with open apex where MTA was used to create apical plug.

Key Words
Dye penetration, apical leakage, Epiphany, AH Plus and Resilon

Introduction

Along with a proper root canal preparation and disinfection, an effective apical sealing guarantees a long-term successful endodontic treatment.[1] It is well known that microleakage between the root canal filling and root-canal walls may adversely affect the results of root-canal treatment. Therefore, complete obturation of the root canal with an inert filling material and creation of an good apical seal have been proposed as goals for successful endodontic treatment.[2] A sealer associated with gutta-percha is generally used to achieve an impervious apical seal. Gutta-percha does not bond to the dentinal walls hence a root canal sealer is used which serves as a lubricant when inserting the gutta-percha point, as a filling material to fill the irregularities of the preparation. Two types of resin-based sealers have been introduced into the market: Epoxy-resin based AH plus and dual cure composite resin-based Epiphany sealer. Adhesion of the sealers to both obturation material and to dentin improves the sealing properties of the endodontic sealers, even if the correlation between dentin bond strength and microleakage is questioned. [1]

The aim of this in vitro study was to evaluate the sealing ability of the two recently introduced root-canal sealers by dye penetration test using stereomicroscope.

Methodology

Thirty maxillary anterior teeth with straight root canals, extracted for periodontal reasons, were selected. Roots with resorptive defects, caries, cracks, or open apices were excluded. Teeth were carefully cleaned ultrasonically to remove any calculus or soft tissue debris. The teeth were then sectioned at cementoenamel junction with a low-speed diamond disc under continuous water spray and were stored in distilled water until ready for use.

Preparation of Specimens

The canal length was visually established by placing a size 15 K-type file (Kerr, Romulus, MI, USA) into each root canal until the tip was visible at the apical foramen. Working length was established by subtracting 1 mm from this length. Instrumentation was performed by means of crown-down/step-back. The coronal half of the root canals were preflared with Gates Glidden drills in a larger to smaller sequence and the apical half of the canal was then prepared with the step-back technique. The canals were instrumented to apical size ISO 50 with 5.25% NaOCl and 17% EDTA irrigation alternatively. The samples were stored in distilled water until obturation. The teeth were then divided into two groups of 15 specimens each.

Group I -AH Plus with Cold lateral condensation

Group II- Self etch epiphany sealer with Resilon

The samples were dried using sterile paper points and each canal was checked for tug

back using ISO size 50 gutta-percha.

Group I (Cold Lateral Condensation with AH Plus)

After drying the canals, cold lateral condensation was performed by placing a master cone to the length using AH Plus sealer followed by spreader insertion and placement of additional cones. This procedure was repeated several times until wedged cones block further access to the canal. The excess cones were removed upto 2 mm below the orifice and cervically sealed with Glass ionomer cement.

Group II (Resilon Epiphany group)

Resilon master cone of ISO size 50 was selected and coated with Self etch epiphany sealer and seated into the canal. Lateral compaction was accomplished using finger spreader and Resilon accessory cones until they could not be introduced more than 2 mm into the canal. The coronal ends of the Resilon cones were seared off and were vertically compacted at the orifice of the canals. Light curing was done for 40 sec with the standard light curing unit according to the manufactuer's instructions to create immediate coronal seal and sealed with Glass ionomer cement.

After the preparation of all the samples were placed in an incubator for 48 hours at 37^0C and 100% humidity to allow complete setting of sealer.

APICAL DYE LEAKAGE

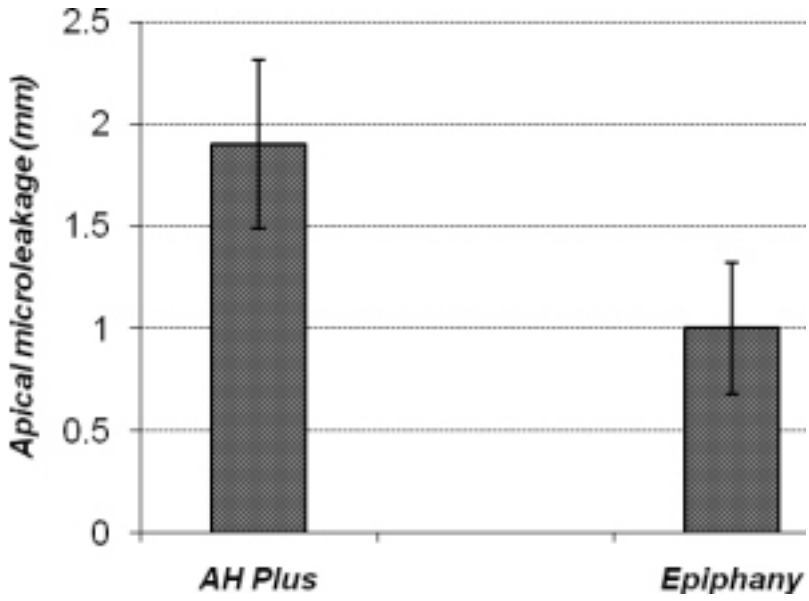
Following obturation, the root surfaces of all the samples were coated with two coats of nail paint up until the apical 2 mm. The apical 2mm were free of any resin material. The teeth were then glued from incisal edges to the lid of a petri dish perpendicularly and immersed into petri dish containing 2% methylene blue dye solution. The samples were left undisturbed for 72 hrs. The teeth were then sectioned vertically along the long axis in the bucco-lingual direction through the centre of the root using water cooled diamond disc, short of reaching the obturation material, thereby creating a stress canal. A chisel was used to wedge and split the teeth.

The samples were then observed under Stereomicroscope. The dye leakage was measured with a millimeter scale from the apical constriction to the longest point of dye penetration along the canal walls and obturation material itself.

Table 1: Evaluation of Apical Micro leakage.

Materials	Micro leakage (mm)		
	Range	Mean ± SD	95%CI
AH plus	1.00-3.50	1.90 ± 0.41	1.53-2.49
Self etch epiphany	0.50-2.00	1.00 ± 0.32	0.71-1.38
Overall significance	F=5.42; P<0.001		

Graph 1: Bar graph showing the mean level of apical leakage values of two groups.



STATISTICAL ANALYSIS

A one-way analysis of variance and post hoc tuckey test were used to seek statistically significant differences in apical leakage among the sealer groups.

RESULTS

The analysis of variance showed a statistically significant difference among the apical leakage of the two sealers ($p < 0.001$) demonstrating the influence of the type of sealer on the tightness of the apical filling. The result showed that the teeth filled with AH plus displayed a higher apical leakage (1.90 ± 0.41) than those filled with Self etch epiphany (1.00 ± 0.32).

Discussion

Preventing contamination or recontamination of the root canal system after completion of endodontic therapy is still a challenge for the dental professional. In the absence of impermeable sealing of the root canal system, failure of endodontic therapy may ensue.[3]

A superior method of sealing the apical foramen at the cemento-dentinal junction creates a favourable biological environment for periapical healing to take place by sealing of any communication between periodontium and root canal system.[4] The complete seal of the root canal system is almost impossible with currently accepted materials and obturation techniques, usually a combination of Gutta Percha and zinc oxide eugenol root canal sealer is commonly adapted practice. Ideally, the root canal sealer should be capable of producing a bond between the core material and the root dentine, effectively preventing leakage. The ZnOE sealer lack properties required as root canal sealer. The present study was carried

out to evaluate the apical sealing ability of newer resin based root canal sealers.[5]

Recent improvement in adhesive technology has led to the development of a new sealer, Epiphany that has a potential to challenge other sealers. Epiphany root canal sealant is a dual curable resin composite containing a new redox catalyst that enables optimal autopolymerization under acidic environments. The advantages of epiphany system includes high radiopacity, tissue compatibility, minimal shrinkage and resorbability of sealer when expressed periapically.[6]

In the present study, saline was used for the storage of freshly extracted teeth because it does not influence chemical and physical properties of human dentin.[7]

Single rooted premolars with single patent canals, were selected to minimize anatomical variation and allow standardization.[5] Also the teeth were resected at cemento-enamel junction using water-cooled diamond disk to simplify instrumentation and obturation.[8]

The removal of smear layer may be considered an essential step in the process of successful root canal treatment. It is well known that root filling materials penetrate better into dentinal tubules in absence of smear layer. For this reason Smear layer was removed using 5.25% NaOCl and 17% EDTA to remove the smear layer and to evaluate the penetration and adaptation of root canal filling materials in the present study.[5] However, sodium hypochlorite has been shown to adversely affect the bond strength of epiphany sealer to root dentin. Thus, EDTA is recommended to be used as final irrigant.[9]

All samples were coated with two coats of nail paint leaving apical 2 mm to prevent dye penetration through the root surface.[10]

The quality of apical seal obtained by root canal obturation material has been assessed by various methods like dye penetration, radioisotope penetration, bacterial leakage, fluorometric and electrochemical means, fluid filtration, scanning electron microscope and gas chromatography.[11] The dye penetration was used because of its simplicity, ease to perform and it does not require sophisticated materials. Methylene blue dye was used as its molecular size is similar to bacterial by-products such as butyric acid which can leak out of infected root canals to irritate periapical tissues.[12]

The root canals were evaluated using a sectioning technique. There are three advantages of sectioning technique compared to clearing technique namely, conservation of tooth substance for further analysis, considerably less time involved and lower costs.[5]

Results of the present study revealed that, Epiphany sealer exhibited the least apical leakage compared to AH plus. This may be attributed to the monoblock provided by adhesion of the filling material to the sealer which also adheres and penetrates into the dentin wall of the root canal system.[12] The low mean apical leakage could be because of the attachment of the sealer to the root canal walls by its bonding agent and adhesion of the sealer to both the obturation material and to the dentin forming a monoblock.[5]

Under the conditions of our study, none of the materials produced an effective apical seal, and most leakage occurred between the wall of the root canal and the sealer. It is often stated that leakage may be influenced by the ability of a root-canal sealer to bond to the dentinal wall or at least to maintain permanent contact with the wall.[10] In this respect we found that AH plus demonstrated maximum leakage and Epiphany exhibited the least which is similar to the studies by Emre Bodrumlu[12] and F. Kont Cobankara[2.]

Though Epiphany system exhibits monoblock effect still leakage was observed, which may be attributed to inadverdent stripping of the sealer off the canal wall during placement of cones, disruption of the maturing resin-root dentin bond during cold lateral condensation or the C-factor.[13] The manufacturer's instruction for immediate light-curing the coronal root filling to create a coronal seal may also limit flow of the resin sealer for stress relief.[6]

A study done by Tunga et al compared the sealing ability of Epiphany to AH Plus sealer and found significantly lower leakage with the Epiphany group due to increased adhesion of the sealer to the root canal walls which is in accordance with the present study.[5]

However, these findings are in contrast with the results obtained by Tay et al, where it was concluded that the quality of apical seal achieved by Resilon/Epiphany is not superior to Gutta Percha and conventional epoxy resin sealer. Discrepancies between the studies could be because of differences in methodology.[5]

The mean leakage with Resilon/Epiphany system was lower than that for gutta-percha with AH plus sealer. The difference may be because of lack of bonding between gutta-percha and sealer.[13] The sealing ability of AH Plus may also be affected by other factors; for example, AH Plus contains silicone oils and other ingredients. As all specimens were kept in 100% humidity one can speculate that oil-based materials such as AH Plus could prevent complete wetting of the root-canal wall and adhere poorly to humid dentine. This may result in poor adaptation of the material to the root-canal wall, as well as formation of voids that enhance dye penetration.[14]

The result in the present study showed that Epiphany provides a better consistent seal as compared to AH plus. However further long term studies both in vitro and in vivo with more variables are required for evaluating sealing ability of Epiphany.

Conclusion

Within limitations of our study AH plus is showing the highest microleakage while Epiphany is showing the least. Results of the present study should be interpreted with caution, and need to be investigated further.

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Comparative Evaluation Of Linear Dimensional Changes Of Four Commercially Available Heat Cure Acrylic Resins

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Abstract
Context: Heat cured acrylic resins undergo dimensional changes during polymerization. Dimensional changes which occur in the heat cure acrylic resins are shrinkage and expansion which affects the fit of the denture and occlusal relationship.
Aims: The purpose of this study was to access the linear dimensional changes of four heat cure acrylic resins before and after curing and compare the changes among four different acrylic brands.
Materials and Method: Twenty four patients irrespective of age and sex were taken and four commercially available brands were procured. After the teeth arrangement on the mandibular trial denture, two pins were fixed in central fossae of first molar on both sides and one pin in the cingulum of left central incisor. Meliodent heat cure acrylic resin was used in Group A; Trevalon heat cure acrylic resin was used in Group B; Triplex heat cure acrylic resin was used in Group C and Vertex heat cure acrylic resin was used in Group D. Linear measurements of the trial wax up before and after curing and before and after finishing and polishing were measured and compared. Collected data was analyzed with analysis of variance and't' test at 95% level of confidence (p =0.05).
Results: The maximum percentage changes were seen in cases of Group A (Meliodent) followed by Group B, Group C and Group D (Trevalon, Triplex and Vertex). Meliodent showed the highest percentage change i.e. 1.18% and Vertex showed least percentage change of 0.37 %.
Conclusion: Shrinkage occurred after curing and after finishing and polishing, which varies significantly with the four commercially available heat cure acrylic resins. Among the four different brands of heat cure acrylic resin Group D (Vertex) had the least linear dimensional changes after curing and after finishing and polishing, so that D (Vertex) could be the material of choice for fabrication of complete denture among the four brands. used to create apical plug.

Key Words
Heat cure acrylic resin, dimensional changes, complete denture

Introduction:

The introduction and use of acrylic resin as a denture base material since 1937 has revolutionized the dentistry in a big way. The resin has fine esthetic properties, excellent in color and chemically stable. It can be used with a simple technique for the construction of dentures, but the properties of acrylic resin are not ideal in all aspects. Knowledge of chemistry, physical properties, qualities, characteristics, and manipulative procedure are therefore imperative if reasonably satisfactory results have to be obtained from the use of the material. Dimensional changes which occur in heat cure acrylic resins are shrinkage and expansion which affects the fit of the denture and occlusal relationship[11.] Precise duplication of trial denture into the final prosthesis is the desired aim during processing in the laboratory. However, certain properties like dimensional inaccuracies of the materials compromise the attainment of this goal optimally. Different authors compared various resins to denture rubber by examining certain physical and mechanical properties of different materials[3, 4, 8, 10.]
Considering the importance of dimensional changes occurring during processing, the present study was undertaken to determine linear dimensional changes of four commercially available heat cure acrylic resins.

AIM AND OBJECTIVES

The present study was designed with the following aim and objectives:

1. To study the linear dimensional changes of four different brands of heat cure acrylic resins before and after curing.

2. To compare the linear dimensional changes of heat cure acrylic resin among the four different acrylic brands.

MATERIAL AND METHODS:

The study was carried on twenty four edentulous subjects, irrespective of age and sex selected from the department of Prosthodontics including Crown and Bridge, M.M. College of Dental Sciences & Research, Mullana. Thorough diagnosis and case history was recorded for each subject. For each subject four mandibular complete dentures were fabricated using four different brands of heat cure acrylic resins.

Four different brands of heat cure acrylic resins were used in this study (Fig 1).
The brand name and manufacturer's name of heat cure acrylic resins used for the study were as follows and they were grouped from Group A to group D as under:
Complete dentures were fabricated for each subject in conventional manner. For each

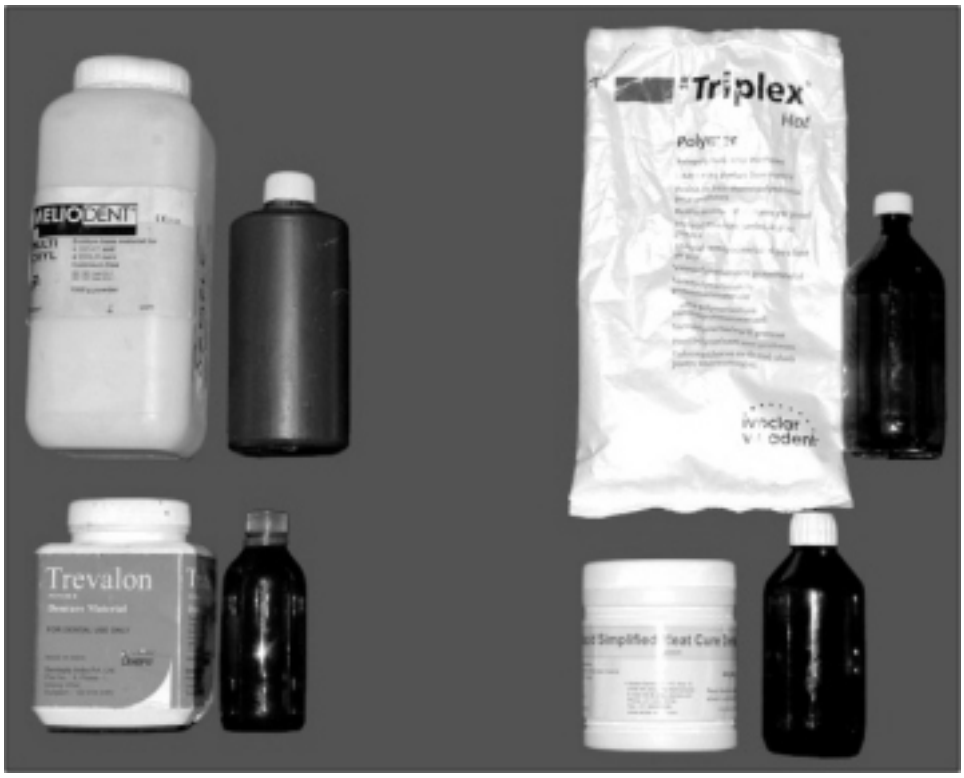

Fig 1. Four different heat cure materials used

S.No.	Product Name	Group	Name and addressee of manufacturer of heat cure acrylic resins
1.	Meliodent	A	Heraeus Kulzer GmbH & Co. KG Gruner Weg II, Hanau
2.	Trevalon	B	Dentsply India Pvt. Ltd. India
3.	Triplex	C	Ivoclar Vivadent AG, Liechtenstein
4.	Vertex	D	Vertex Dental BV, The Netherlands

subject four additional edentulous mandibular casts were duplicated to fabricate four experimental dentures one each from the four different acrylic resin used in the study. Therefore, the edentulous mandibular master cast was duplicated and four additional casts were made for each subject using reversible hydrocolloid agar material. The master cast which was used for the duplication, was used to fabricate patient's denture which was delivered to the patient at the end of the treatment. Finally, four mandibular casts for each individual subject were obtained. Following the same procedure for remaining twenty-three subjects a total of ninety six
casts were obtained. On the casts so obtained ninety six experimental mandibular dentures were fabricated. The teeth set chosen for the study had same mold. After the teeth arrangement, three stainless steel pins were fixed in mandibular denture with the help of autopolymerizing resin. Out of three pins, two pins were fixed in central fossae of first molar on both sides and one pin in the cingulum of left central incisor so that three measurements between pins can be obtained. The dentures were fabricated using standard amount of powder liquid ratio of 3:1 and curing the dentures under standardized conditions and opting for a standard routine for polishing (Fig 2).

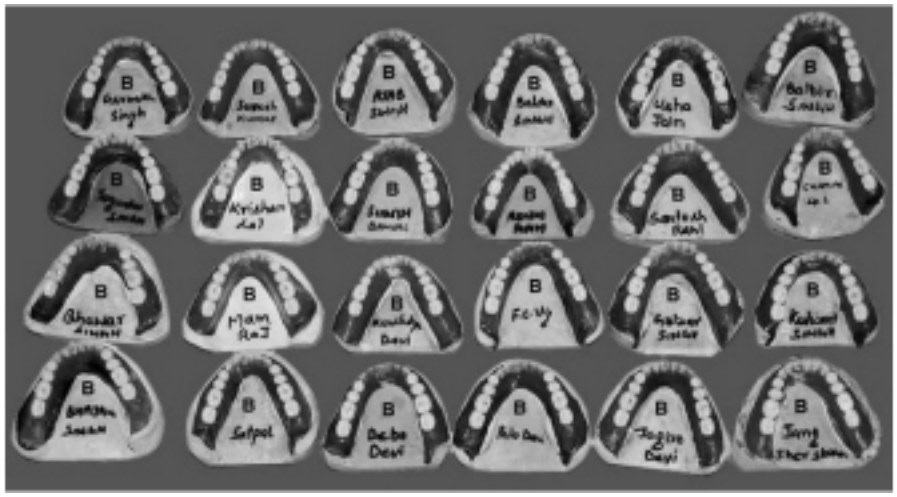

Fig 2. 24 Dentures of one group after fabrication

The tip of the stainless steel pin was marked with blue color and the marks were transferred onto the paper and the measurements were taken with the help of digital vernier caliper (Fig 3 and 4) between two points i.e. molar to molar and molar to central incisor.

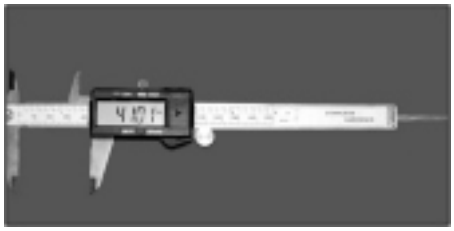

Fig 3. Digital Vernier Caliper

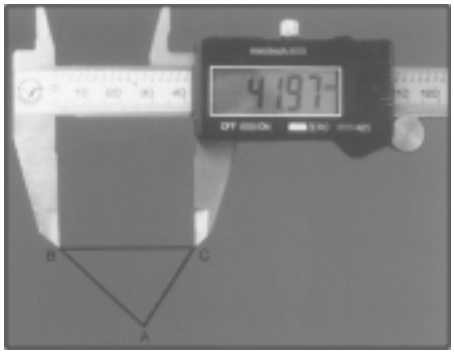

Fig 4. Measurement of marks after transferring to paper.

Measurements were made between molar pins and central incisor pin.

1. AB - Left central incisor to right molar.

2. BC - Right molar to left molar.

3. CA - Left molar to left central incisor.

The readings between these points were made thrice for each of the dentures. The mean of three readings was taken as a single

reading to reduce the error. The measurements were taken at three different stages, first after the wax up and carving of trial mandibular denture, second after curing and final reading after finishing and polishing of dentures.

TO EVALUATE THE LINEAR DIMENSIONAL CHANGES

So finally three types of readings were taken for each of the processed dentures and same procedure was repeated for remaining ninety five experimental dentures.

- The difference between pre-cured and cured experimental dentures were analyzed,
- The difference between pre-cured and after finishing and polishing were analyzed,
- The difference between cured and after finishing and polishing were also analyzed,

RESULTS:

Table 1 shows the difference in the linear dimensional changes before and after curing among the groups. The maximum percentage changes were seen in cases of Group-A (Meliodent) followed by Group-B, Group-C and Group-D (Trevalon, Triplex and Vertex). Out of all the ninety six experimental mandibular dentures corresponding to twenty four subjects, the experimental dentures cured with Group-A (Meliodent) showed the highest percentage change i.e. 1.18%. The dentures fabricated with Group-D (Vertex) showed the percentage change of 0.37% which was the least when compared between all the four heat cure acrylic resins. Group-B and Group-C (Trevalon and Triplex) showed in between the percentage values of Group-A and Group-D (Meliodent and Vertex) but in between the two, Group-B (Trevalon) had higher percentage value (0.71%) when compared to Group-C (Triplex- 0.51%). Linear dimensional changes in all groups are shown in **Table No 1.**

Table 2 - Statistical comparison of linear dimensional changes in percentage before and after curing:

ANOVA p c before curing & after curing						
	Sum of Squares	Df	Mean Square	F	P Value	sig
Between Groups	8.941	3	2.980	13.787	<0.001	HS
Within Groups	19.887	92	0.216			
Total	28.827	95				

Highly significant at 0.1% level of confidence

Table 2 shows the statistical comparison between before curing and after curing and demonstrates that the results are highly significant at 0.1% level of confidence i.e. shows considerable difference between before curing and after curing.

Linear dimensional changes before curing and after finishing and polishing:

TABLE 3 - Linear Dimensional Changes in Percentage Before curing and After Finishing & Polishing

Descriptives Linear dimensional changes in percentage(%) before curing & after finishing & polishing								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
MELIODENT	24	1.4168	0.74663	0.15240	1.1015	1.7320	0.26	3.34
TREVALON	24	0.1821	0.62631	0.12785	0.9977	1.4466	0.27	3.00
TRIPLEX	24	0.8077	0.49277	0.10059	0.5996	1.0158	0.16	2.67
VERTEX	24	0.6151	0.38564	0.07872	0.4522	0.7779	0.04	1.92

Table 3 shows the difference in the linear dimensional changes before curing and after finishing and polishing. The maximum percentage changes were seen in cases of Group-A (Meliodent) followed by Group-B, Group-C and Group-D (Trevalon, Triplex and Vertex) respectively. Out of all ninety six mandibular dentures corresponding to twenty four subjects, the dentures cured with Group-A (Meliodent) showed the highest percentage value of 1.42%. The dentures fabricated with Group-D (Vertex) showed the percent mean value of 0.62% which was the least when compared between all the four heat cure acrylic resins. Group B and Group C (Trevalon and Triplex) heat cured mandibular experimental dentures showed in between the percentage values of Group-A and Group-D (Meliodent and Vertex), but in between the two also Group-B (Trevalon) had higher percentage value (1.18%) when compared to Group-C (Triplex-0.81%).

Linear dimensional changes before and after curing:

TABLE 1 - Linear dimensional changes in percentage before and after curing.

Descriptives Linear dimensional changes in percentage (%) before & after curing								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
MELIODENT	24	1.1821	0.76092	0.15532	0.8608	1.5034	0.18	3.30
TREVALON	24	0.7182	0.44226	0.09028	0.5314	0.9049	0.09	1.65
TRIPLEX	24	0.5181	0.24972	0.05097	0.4126	0.6235	0.08	1.05
VERTEX	24	0.3734	0.16640	0.03397	0.3031	0.4437	0.04	0.64

Table 4 shows the statistical comparison between before curing and after finishing and polishing and demonstrates that the results are highly significant at 0.1% level of confidence i.e. show considerable difference between before curing and after finishing and polishing.

Table 5 and shows the difference in the linear dimensional changes after curing and after finishing and polishing. The maximum percentage changes were seen in cases of Group-B (Trevalon), followed by Group-C, Group-A and Group-D (Triplex, Meliodent and Vertex). Out of all ninety six mandibular dentures corresponding to twenty four subjects, the experimental dentures cured and finished with Group-B (Trevalon heat cured acrylic resin) showed the highest percentage value i.e. 0.46%. The denture constructed with Group-D (Vertex heat cure acrylic resin) showed percentage value of 0.25%, which were the least when compared between all the four groups of heat cure acrylic resins. Group-C and Group-A (Triplex and Meliodent heat cured mandibular dentures) showed in between the percentage values of Group-B and Group-D (Trevalon and Vertex), but in between the two, Group-C (Triplex) had higher percentage value (0.29%) when compared to Group-A (Meliodent-0.28%).

Table 6 shows the statistical comparison between after curing and after finishing and polishing and demonstrates that the results are significant at 0.1% level of confidence i.e. show difference between after curing and after finishing and polishing.

Table 4 - Statistical comparison linear dimensional changes in percentage before curing and after finishing & polishing

ANOVA p c before curing & after curing						
.	Sum of Squares	Df	Mean Square	F	P Value	sig
Between Groups	9.406	3	3.135	9.35	<0.001	HS
Within Groups	30.849	92	0.335			
Total	40.255	95				

Highly significant at 0.1% level of confidence.

Linear dimensional changes after curing and after finishing and polishing:

TABLE 5 - Linear dimensional changes in percentage after curing and after finishing & polishing

Descriptives Linear dimensional changes in percentage(%) before curing & after finishing & polishing								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
MELIODENT	24	0.2839	0.21959	0.04482	0.1912	0.3766	0.04	1.01
TREVALON	24	0.4681	0.32857	0.06707	0.3293	0.6068	0.12	1.50
TRIPLEX	24	0.2915	0.32571	0.06649	0.1540	0.4290	0.08	1.69
VERTEX	24	0.2531	0.32964	0.06749	0.1139	0.3923	0.03	1.60

TABLE 6 – Statistical comparison linear dimensional changes in percentage after curing and after finishing & polishing

ANOVA p c before curing & after curing						
.	Sum of Squares	Df	Mean Square	F	P Value	sig
Between Groups	0.683	3	0.228	2.454	<0.05	SIG
Within Groups	8.531	92	0.093			
Total	9.214	95				

Highly significant at 0.1% level of confidence

DISCUSSION:

The acrylic resin has been very successful as a denture base, as it has fine esthetic properties, excellent color stability and can be used with a simple technique for the construction of dentures. Inspite of having all these advantages, lack of dimensional stability is widely accepted as one of the disadvantages of acrylic resin dentures.

In the processing of dentures, a portion of stress produced in the plastics as they cool below this temperature is relieved when the dentures are separated from the casts, and the amount of shrinkage which occurs is proportional to the range of cooling below the second order transition temperature [1]. Komiyama and Kawara[6] stated that the stress produced by thermal contraction is relieved shortly after the denture has been removed from the mold and that stress, caused by polymerization contraction, will be relieved more gradually. They concluded that the thermal contraction stresses are of instantaneous mechanical nature, where as the stresses caused by polymerization are on a molecular level involving polymer chains. Zissis, Huggert, Harrison[12] embedded steel pins in the wax trial bases and measured distance from the outside of one pin to the outside of the other, with the help of vernier caliper having accuracy 0.001inch before and after curing.

Woelfel[10] stated a method of linear measurements on each denture (molar-to-molar) was made at various times at 22 $\pm 1^0$C. (72 $\pm$ 2^0F) with a toolmaker's microscope and were recorded to the nearest 0.0025mm. (0.0001inch). The reference marks were fine cross lines ruled on polished stainless steel pins cemented in the second molars. Posterior linear measurements instead of contour measurements were made, as shown that linear changes occurring in across the posterior portion of a denture are of significantly greater magnitude than in any other area. Also the changes occurring in the posterior region are the most important in the retention of denture because of the anatomy of the mouth and the shape of the denture. He demonstrated a very small dimensional shrinkage (0.2 to 0.5 % molar-to molar or only 0.1 to 0.2 mm) with heat cured acrylic resin dentures as they were deflasked. Some of the internal stresses from processing are released when the denture is deflasked and polished as it becomes slightly narrower from molar-to molar and flange to flange. This linear shrinkage is invariably small, less than 0.5%

(0.2 mm) slightly more on lower dentures than on uppers which are in accordance to the results of present study.

It has been reported by **Anusavice**[2] that when methyl methacrylate is polymerized the density changes from 0.945 g/cm^3 to 1.19 g/cm^3, which results in a volumetric shrinkage of 21% for pure monomer (polymerization shrinkage) during its polymerization. The mixture used for fabrication of dentures apparently contains 1/4 to 1/3 of monomer and as might be expected the volumetric shrinkage will usually range from slightly over 5% to about 7%. Based on a projected volumetric shrinkage of 7%, an acrylic resin denture base should exhibit a linear shrinkage of 2%[3].

Anthony and Peyton[1] inferred that shrinkage might be expected somewhat less in the lower dentures because of the short linear distances between the labial or buccal and the lingual borders.

The present study shows the linear shrinkage from 0.25-1.42%, which is also in accordance with the study done by **Anusavice**[2], **Noort**[7], and **Shippee**[9]. The resins were all found to shrink during the curing process. However, on immersion in water, the resins were found to expand. He reported greater shrinkage during processing than during storage in water up to 90 days.

It is assumed that curing shrinkage is entirely thermal in nature and for a given resin composition, it will depend upon the temperature at which the resin becomes sufficiently rigid to contract thermally independent of the cast or model. The present study showed significant linear dimensional changes after curing and after finishing and polishing.

SUMMARY AND CONCLUSION:

The study was carried out to study the linear dimensional changes of four different heat cure acrylic resins before and after curing, before curing and after finishing and polishing and after curing and after finishing and polishing and to compare the linear dimensional changes of heat cure acrylic resin among four different acrylic brands.
The conclusions drawn from the study are as under:

1. All the materials showed linear changes immediately after curing and after finishing and polishing.
2. Among four materials i.e. Meliodent, Trevalon, Triplex and Vertex maximum percentage changes after curing were seen in Group-A (Meliodent- 1.18%) followed by Group-B (Trevalon- 0.71%), Group-C (Triplex- 0.51%) and Group-D (Vertex- 0.37%).
3. After finishing and polishing maximum percentage changes were seen in Group-A (Meliodent- 1.41%), followed by Group-B (Trevalon- 1.18%), Group-C (Triplex- 0.80%) and Group-D (Vertex- 0.61%).
4. After curing and after finishing and polishing maximum percentage changes were seen in Group-B (Trevalon- 0.46%) followed by Group-C (Triplex- 0.29%), Group-A (Meliodent- 0.28%) and Group-D (Vertex- 0.25%).
5. Among four materials compared, Group-D (Vertex) showed the least percentage changes after curing and after finishing and polishing (0.37% & 0.25%).

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Treatment Of Gingival Hyperpigmentation By Scalpel Surgery And Electrosurgery : A Split Mouth Design

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Abstract
Gingival hyperpigmentation is mostly caused by the physiologic deposition of melanin by melanocytes. In "Gummy Smile" Patients, melanin gingival hyperpigmentation causes an esthetic problem and may cause physiologic disturbances. Methods to remove gingival hyperpigmentation vary but here in this present case report a split mouth design was used to compare scalpel surgery and electrosurgery procedures.

Key Words
Depigmentation, Gingiva, Scalpel surgery and Electrosurgery Procedures

Introduction:

The color of the attached and marginal gingival is generally described as pink. It is determined by several factors, including the number and size of blood vessels, epithelial thickness, quantity of keratinisation and pigment within the epithelium.

Gingival hyperpigmentation occurs as a diffuse, deep-purplish discoloration or as irregularly shaped brown and light brown patches. The distribution of oral pigmentation in black individuals is as follows: gingival = 60%; hard palate = 61%; mucous membranes = 22% and tongue = 15%. [1]

Melanin hyperpigmentation of gingiva usually does not present as a medical problem, but many patients may consider their black gums to be unaesthetic. This problem is aggravated in patients with a "gummy smile" or excessive gingival display while smiling. Gingival depigmentation is a periodontal plastic surgical procedure whereby the gingival hyperpigmentation is removed or reduced by various techniques. The foremost indication for depigmentation therapy is the demand by a person for improved esthetics.

Demand for cosmetic therapy of gingival hyperpigmentation is common. Various methods as gingivectomy,[2] gingivectomy with free gingival autografts,[3] acellular dermal matrix allografts,[4] electrosurgery,[5] cryosurgery,[6] abrasion with diamond bur,[7] and various types of lasers[8] have been used for cosmetic therapy of gingival melanin depigmentation.

The present case report compares two techniques i.e., a simple and effective surgical depigmentation using scalpel on one side and electrosurgery on contralateral side in a split mouth design.

Case Report

A 20 year old female patient had a chief complaint of having unesthetic, diffuse, dark-brown to black gingival discoloration in the labial aspect of the maxilla and mandible (Fig. 1).

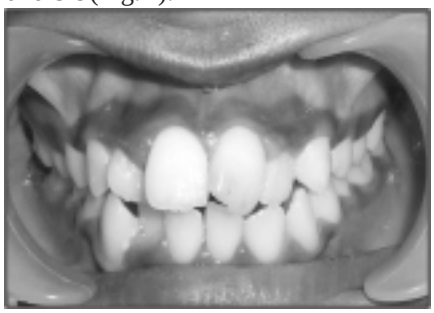

Figure 1. Pre-operative picture of 20 year old female complaining of black coloured gums.

The depigmentation treatment procedure was carried out in the department of Periodontics, Rama Dental College Hospital, Research Centre, Kanpur, Uttar Pradesh, India.

A scalpel surgery with bur abrasion on one side and electrosurgery on contralateral side was planned to perform the depigmentation. The entire procedure was explained to the patient and written consent was obtained. A complete medical, family history and blood investigations were carried out to rule out any contraindication for surgery. Local anesthesia was infiltrated in the maxillary anterior region from premolar to premolar (Lignocaine with adrenaline in the ratio 1:100000 by weight).

Electrosurgery technique was performed with the needle electrode, supplemented by the small, ovoid loop or diamond-shaped electrodes for festooning. A blended cutting & coagulating (fully rectified) current was used. In all the steps the electrode was activated and moved in a concise "shaving" motion. Extreme care was exercised to avoid contacting the tooth surface. For hemostasis, the ball electrode was used (Fig. 2).

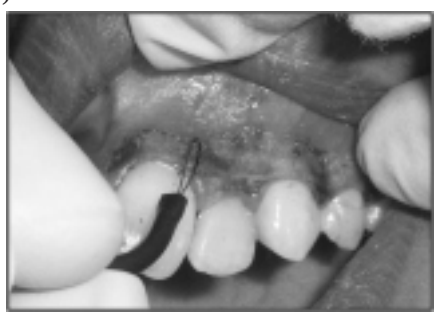

Figure 2. Electrosurgery being used to remove the pigment layer in maxillary anterior gingiva (21 to 24).

On contralateral side a Bard Parker handle with a No. 15 blade was used to remove the pigmented layer. Pressure was applied with sterile gauze soaked in local anesthetic agent to control hemorrhage during the procedure. After removing the entire pigmented epithelium along with a thin layer of connective tissue with scalpel, abrasion with diamond bur was done to get the physiological contour of the gingival, the exposed surface was irrigated with saline. While using the bur minimal pressure was applied with feather light brushing strokes and without holding bur in one place. Care was taken to see that all remnants of the pigment layer was removed (Fig. 3).

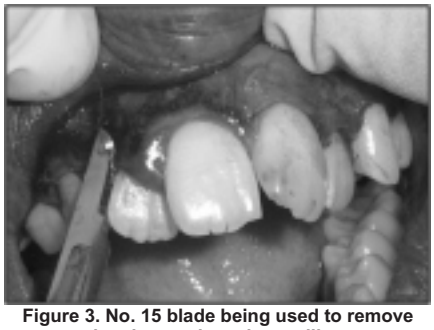

Figure 3. No. 15 blade being used to remove the pigment layer in maxillary anterior gingival (11 to 14)

Post-surgical instructions were given to the patient along with antibiotics (Amoxicillin 500 mg, thrice daily for five days) and Antiinflammatory Analgesics (Ibuprofen and Paracetamol thrice daily for three days). The patient was advised to 0.2% chlorhexidine gluconate mouth wash 12th hourly for one week.

The patient was reviewed at the end of one week. The healing process was proceeding normally and it was quite uneventful on scalpel surgical area than compared to electrosurgical area and patient did not report any discomfort. The patient was asked to continue the chlorhexidine mouth wash for another week. At the end of one month, re-epithelization was complete and healing was found to be satisfactory. Patient had no complaints of post-operative pain or sensitivity. The gingiva appeared healthy and no repigmentation was observed (Fig. 4).

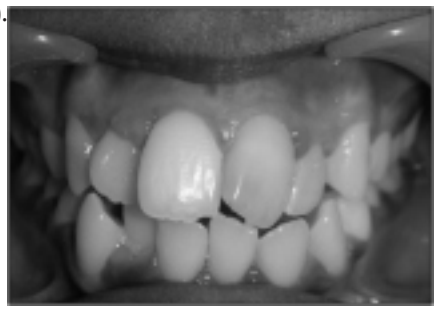

Figure 4. Six months post-operative picture showing healthy gingiva with no recurrence.

Discussion

Oral pigmentation occurs in all races of man. There are no significant differences in oral pigmentation between males and females. The intensity and distribution of pigmentation of the oral mucosa is variable, not only between races, but also between different areas of the same mouth.

Melanin pigmentation was is frequently caused by melanin deposition by active melanocytes located mainly in the basal layer of the oral epithelium. Pigmentation can be removed for esthetic reasons. Different treatment modalities have been used for this purpose.[4] The selection of a technique for depigmentation of the gingiva should be based on clinical experience, patient's affordability and individual preferences.

Scalpel surgical technique is highly recommended in consideration of the equipment constraints that may not be frequently available in clinics. It is known that the healing period for scalpel wounds is faster than other techniques.[9]

Electrosurgery requires more expertise than scalpel surgery. Prolonged or repeated application of current to tissue induces heat accumulation and undesired tissue destruction. Contact with periosteum or alveolar bone and vital teeth should be avoided.[10]

Post surgical repigmentation of gingiva has been previously reported. Repigmentation is described as spontaneous and has been attributed to the activity and migration of melanocytic cells from surrounding areas. In the present case no incidence of repigmentation was observed at the end of one month. The case is being followed up to estimate further the extent and rate of pigmentation.

Conclusion

The depigmentation procedure was successful and the patient was satisfied with the result. Hence we conclude that depigmentation of hyperpigmented gingiva by scalpel surgery with bur abrasion is simple, easy to perform, cost effective and above it all it causes less discomfort. On the otherhand electrosurgery procedure provided blood free working area and achieving contouring and festooning was easy with various electrodes. As far as healing was concerned, it was relatively better with scalpel surgery compared to electrosurgery at the end of one week but no difference was found at the end of one month.

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Replantation of an Avulsed Incisor: A Case Report

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Abstract
Management of tooth avulsion in the permanent dentition often presents a challenge. Such injuries should be recognized and treated expeditiously because several studies support a more likely favorable prognosis with timely and appropriate initial management. This article describes the management of an avulsed maxillary permanent incisor that had been air-dried for about 2 hours.

Key Words
Avulsion, Replantation, Splinting, Clinical Management

INTRODUCTION

The term "dental avulsion" describes a clinical situation in which the tooth is completely displaced out of its socket following a traumatic impact[1]. Of all the dental injuries avulsion is by far the most serious because not only it severes the pulpal blood supply but it also expose the cells of the PDL to the external environment[2].

It accounts for 0.5% to 16% of traumatic injuries in the permanent dentition. Avulsion of permanent teeth occurs most often in children 7 to 9 yrs. old, an age when the relatively resilient alveolar bone provides only minimal resistance to extrusive forces, and maxillary central incisors are the teeth most commonly affected[3]. Management of avulsion of the permanent dentition often presents a challenge. If the tooth is replanted promptly with a vital PDL, functional PDL healing can occur [4-10]. The extraoral period significantly affects the outcome, influencing PDL vitality11. Clinical studies have shown that the prognosis is best for teeth replanted within 5 minutes after avulsion[11-15].

Pulpal necrosis always occurs after an avulsion injury. While the necrotic pulp itself is of no consequence, the necrotic tissue is extremely susceptible to bacterial contamination. It revascularization does not occur or effective endodontic therapy is not carried out, the pulp space will inevitably become infected. The combination of bacteria in the root canal and cemental damage on the external surface of the root results in an external inflammatory resorption that can be very serious and lead to the rapid loss of tooth[16]. Nevertheless, if managed properly, avulsed teeth with a vital PDL can be replanted and will remain functional for some years[17]. This article describes the management of patient with an avulsed maxillary right central incisor.

CASE REPORT

A 30 year old male presented to the Department of Conservative Dentistry and Endodontics with dental traumatic injury after falling from a two wheeler. The accident resulted in avulsion and Ellis Class I fracture of maxillary right central incisor (Fig. 1) at the time of accident.

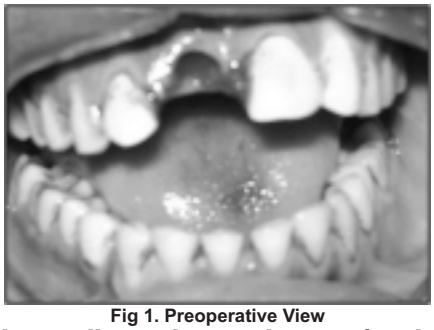

Fig 1. Preoperative View

The maxillary right central incisor found at the site of accident was stored in milk and brought to the clinic the same morning at the time of presentation. Examination of the avulsed tooth revealed that the crown and root was intact (Fig.2).

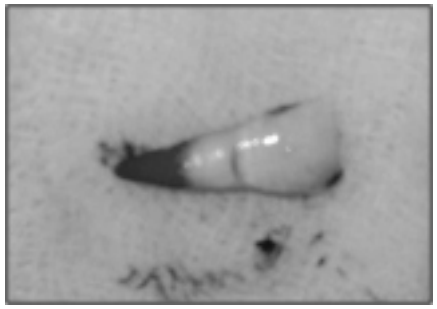

Fig 2. Avulsed 11

Radiographs and clinical examination was done to rule out any other hard tissue injury. He had no other injuries and his medical history was uneventful.

The available treatment options were explained to the patient, and it was decided to replant the avulsed incisor as an intermediate treatment. Local anesthetic was administered and the blood clot removed from the socket. The tooth was then replanted into its socket. Splinting was done with a 0.018 inches stainless steel orthodontic wire bonded to the teeth with composite (Fig. 3).

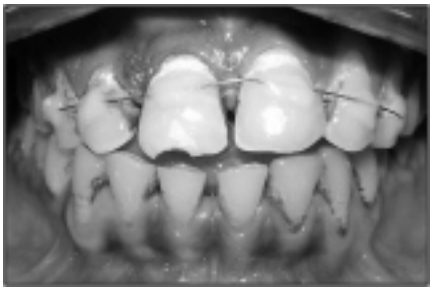

Fig 3. Splinting Done From 13 To 23

Another radiograph was obtained to confirm proper positioning of the replanted incisor. A 5 day course of Amoxicillin was prescribed, and the patient was referred to the medical practitioner for an anti-tetanus booster.

The patient was seen again at 1 week and at that time endodontic treatment was started. After 2 weeks endodontic treatment was completed (Fig.4)

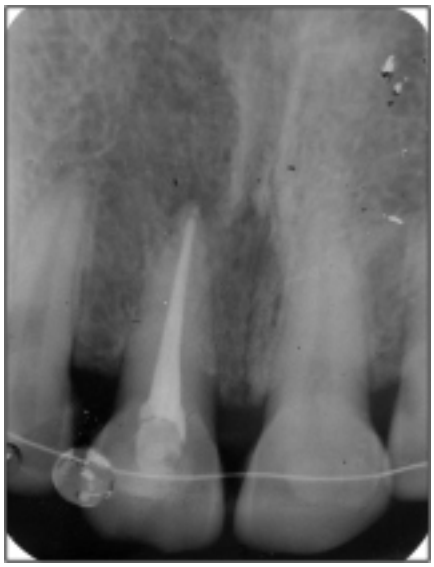

Fig 4. Iopa After Root Canal Treatment

and splint was removed. Mobility of the teeth had reduced. Esthetic treatment for Ellis Class-I fracture was done with tooth colored resins.

DISCUSSION

Relative to other tooth injuries, avulsion is a more serious assault on the gingiva, the PDL and the pulp[18]. It has been reported that successful management of the avulsed tooth begins as soon as possible at the accident site. Extraoral time is important in determining the success of tooth re-plantation. Studies have shown that the prognosis of replanted teeth is best if re-plantation is carried out within 5 min. after avulsion[19-21]. In the case presented here extraoral time was less than 2 hrs, so it was anticipated that the chance of pulpal and PDL healing would be good.

Where the tooth cannot be replanted immediately the tooth should be stored in an appropriate medium such as normal saline, milk, saliva, hanks solution or water [22]. In this case the tooth was kept in milk. It was reported that milk is shown to maintain vitality of PDL cells for 3 hrs being relatively bacteria-free with pH and osmolarity compatible with vital cells[19].

Splinting is required routinely after replantation of avulsed teeth[3]. A splinting technique that allows physiologic movement of the tooth during healing and that is in place for a minimal time period results in a decreased incidence of ankylosis [23-26]. Semi-rigid (physiologic fixation for 7-10 days is recommended[23, 26]. The splint should allow movement of the tooth should have no memory (so the tooth is not moved during healing) and should not impinge on the gingival and / or prevent maintenance of oral hygiene in the area. In this case splinting was done for a period of 2 weeks during which endodontic treatment was carried out. Systemic antibiotics are often recommended after replantation, but their effectiveness in preventing root resorption is questionable[27]. To date the value of antibiotic therapy in replantation has been demonstrated only in the experimental setting[28, 29]. Andreasen and others[11], in their prospective study, showed that systemic antibiotics had no effect on periodontal healing clinically.

Follow up evaluation was done at 1, 3 and 6 months after replantation. Radiographic evaluation showed no signs of external resorption (Fig.5, 6, 7, 8).

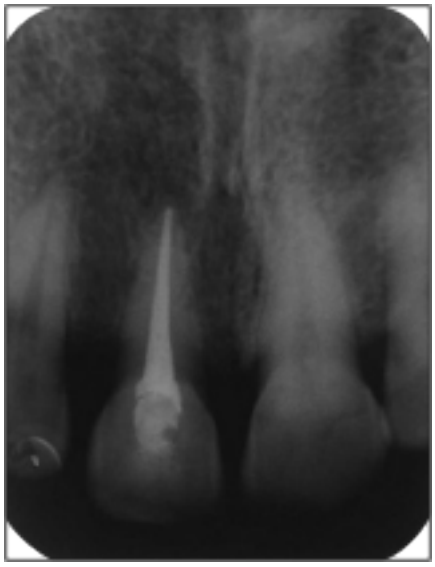

Fig 5. 1 Month Recall Radiograph

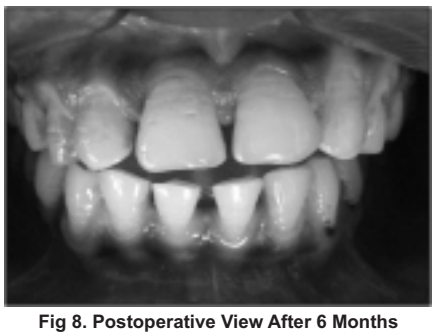

Fig 8. Postoperative View After 6 Months

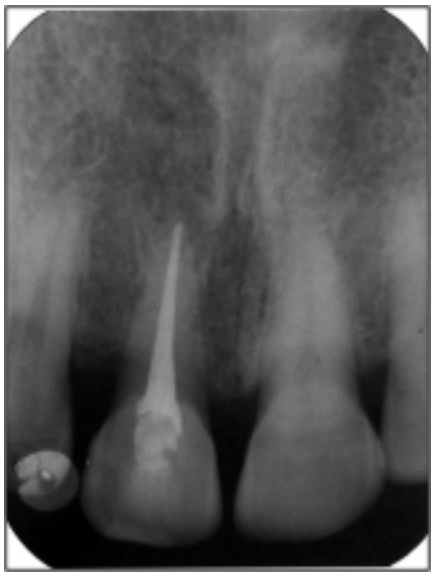

Fig 6. 3 Months Recall Radiograph

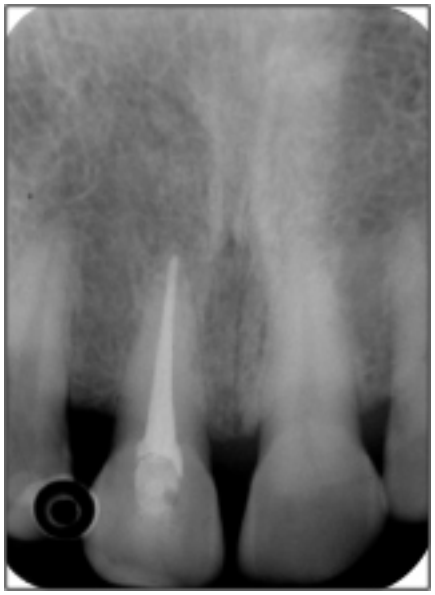

Fig 7. 6 Months Recall Radiograph

CONCLUSION

Prevention and management of dental trauma should be recognized as an acute emergency. Prompt and early presentation for dental management in cases of avulsion is very important. Replantation can restore the patients esthetic appearance and occlusal function shortly after the injury, and the replanted teeth can remain functional for years.

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Randomised 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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Up to 1000 words excluding references and abstract and up to 8 references. A short communication contains only a short report of the case (only pertinent details) and a short discussion and references upto a maximum of 8. Number of figures should be restricted to a maximum of 6.

Case reports

Only New / interesting / very rare cases can be reported. Cases with clinical significance or implications will be given priority, whereas, mere reporting of a rare case may not be considered. Up to 2000 words excluding references and abstract and up to 10 references.

Review articles

Systemic critical assessments of literature and data sources. Up to 3500 words excluding references and abstract.

Letter to the Editor

Should be short, decisive observation. They should not be preliminary observations that need a later paper for validation. Up to 400 words and 4 references.

Announcements of conferences, meetings, courses, awards, and other items likely to be of interest to the readers should be submitted with the name and address of the person from whom additional information can be obtained. Up to 100 words.

Authorship criteria

All persons designated as authors should qualify for authorship, and all those who qualify should be listed. Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content. One or more authors should take responsibility for the integrity of the work as a whole, from inception to published article. The name and order of the authors cannot be changed once the article is provisionally accepted.

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Mineral Tri Oxide Aggregate Used As Apical Plug In Open Apex Cases - A Review And Case Report

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Abstract
Root canal treatment in teeth with wide open apices with periapical infection is difficult to treat and to obtain a good apical seal is more challenging. Several materials and procedures have been recommended to induce the root end barrier formation. Inducing apical barrier formation by conventional treatment with calcium hydroxide will require many appointments and not accepted by many patients.MTA has been used for pulp capping, pulpotomy, apical barrier formation in teeth with open apices, repair of root perforations, and root canal filling. Numerous studies have been published regarding various aspects of MTA as root end material. MTA has been successfully used for one visit apexification. This paper describes successful treatment of two cases with open apex where MTA was used to create apical plug.

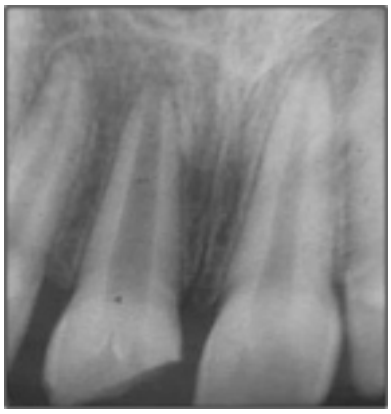
Key Words
Mineral Trioxide Aggregate, Open Apex, Portland cement, Apical plug, Apexification, Open Apical foramina

Introduction

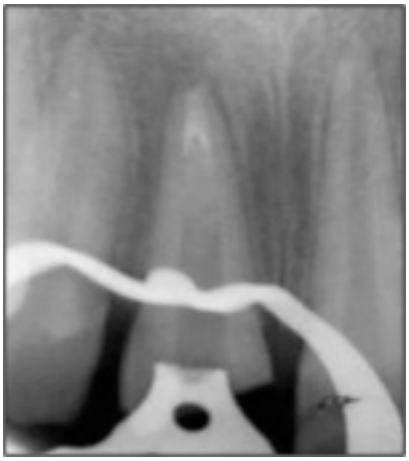
Mineral trioxide aggregate (MTA) was developed at Loma Linda University in the 1990s as a root-end filling material. MTA was first described in the dental scientific literature in 1993 [1] and was given approval for endodontic use by the U.S. Food and Drug Administration in 1998.[2] It received acceptance by the US Federal Drug Administration and is commercially available as ProRoot MTA (Tulsa Dental Products,Tulsa,OK, USA). Two commercial forms of MTA are available (ProRoot MTA) as the grey (GMTA) and white forms (WMTA) and MTA-Angelus (Angelus, Londrina,PR,Brazil) is without calcium sulphate.MTA consists of 50%-75% calcium oxide and 15-25% silicon dioxide, these two together form70-95%of the total mix Investigations have found that lower amounts of iron, aluminum, and magnesium are present in white MTA than in grey MTA. MTA material when mixed produce tricalcium silicate($(CaO)_3SiO2$, tricalcium aluminate($(CaO)_3.AlO_3$, Di Calcium silicate($(CaO)_2SiO_2$,Tetra calcium alumino ferrite($(CaO)_4$. MTA also contians $Al_2O_3.Fe_2O_3$ Gypsum $CaSO_4.2H_2O$, bismuth oxide, and trace amounts of SiO_2, CaO, MgO, K_2SO4, and Na_2SO_4 [3-5]. Hydration of the powder results in a colloidal gel composed of calcium oxide crystals in an amorphous structure: 33% calcium, 49% phosphate, 6% silica, 3% chloride and 2% carbon. This gel solidifies into a hard structure in less than three hours6. Mineral trioxide aggregate (MTA) was developed and recommended initially as a root-end filling material and subsequently has been used for pulp capping, pulpotomy, apexogenesis, apical barrier formation in teeth with open apices, repair of root perforations, and as a root canal filling material. Ideally a root end filling material should be nontoxic, non-carcinogenic, non-genotoxic, biocompatible, insoluble in tissue fluids, and dimensionally stable. MTA is a bioactive material[7] that promotes hard tissue formation[8]and is biocompatible. The first MTA material was described as a fine hydrophilic powder composed predominantly of calcium and phosphorus ions, with added bismuth oxide to provide radiopacity greater than dentin[9]. The MTA product powder is mixed with supplied sterile water in a 3:1 powder/liquid ratio and it is recommended that a moist cotton pellet be temporarily placed in direct contact with the material and left until a follow-up appointment. Upon hydration, MTA forms a colloidal gel that solidifies to a hard structure in approximately 3-4 hrs [5, 9] with moisture from the surrounding tissues purportedly assisting the setting reaction1. Hydrated MTA products have an initial pH of 10.2, which rises to 12.5 three hours after mixing [4, 9]. The setting process is described as a hydration reaction of tricalcium silicate (3CaO·SiO2) and dicalcium silicate (2CaO·SiO2), which is said to be responsible for the development of material strength[5]. It has a compressive strength equal to zinc oxide eugenol with polymer reinforcement (Caulk IRM Intermediate Restorative Material, Dentsply,York, Pa.) and all-purpose lining and cement (SuperEBA, Harry J. Bosworth, Skokie, Ill.) but less than that of silver amalgam. It is available commercially as ProRoot MTA (Dentsply Tulsa Dental, Tulsa, Okla) and has been advocated for use in vital pulp therapy.[10-14]

Case Reportc (Case -1)

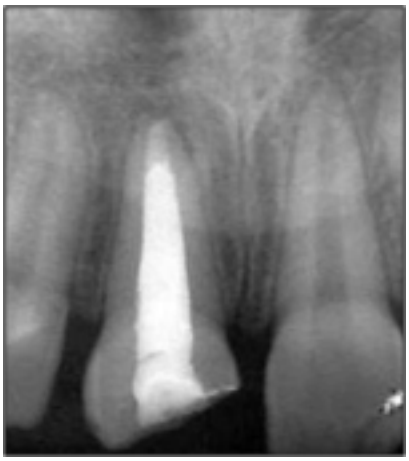
A 26 year male patient reported to department of conservative dentistry and endodontics, Darshan Dental College & Hospital, Udaipur with history of fracture and discoloured tooth #21. Patient gave history of fracture at the age of 7 or 8 years and gave no history of pain or swelling, radiographic examination revealed fractured tooth with open apex and no periapical changes (fig1).



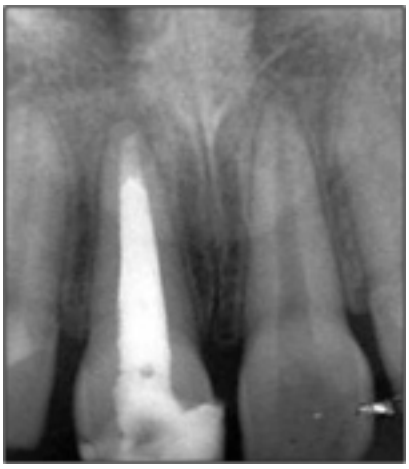
It was decided to seal the open apex with MTA and obturate the root canal. Access opening was made, the working length was estimated and the canals prepared to obtain smooth canal walls. The apex was sealed to about 4mm using MTA (fig 2).



Wet sterile paper point was placed in the canal and temporary restoration was placed. Patient was recalled the following day for obturation. Custom made gutta-percha cone was made and the canal was obturated using lateral condensation technique (fig 3).



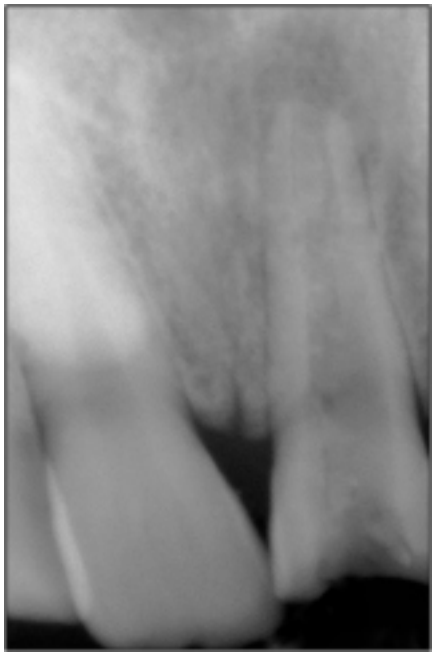
Patient was recalled after 6 months an evaluated for prognosis (fig 4).



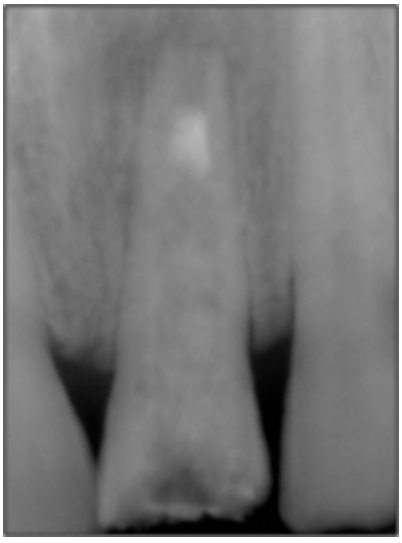
Six months follow up of case showed hard tissue formation at apex indicating good prognosis.

Case -2

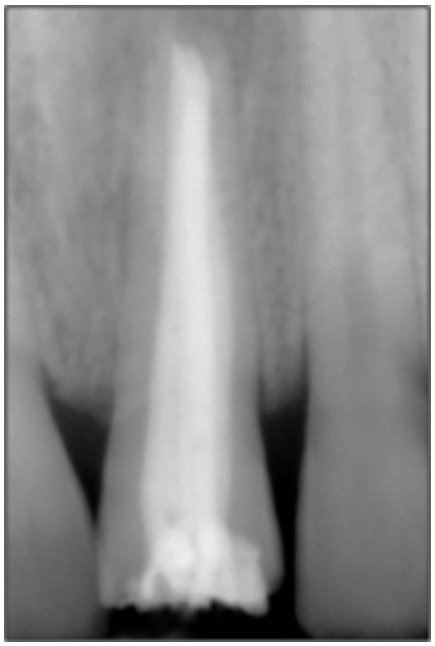
A 25 year old male patient reported to department of conservative dentistry and endodontics Darshan Dental College & Hospital, Udaipur with fractured and discoloured tooth # 21. Patient complained of fractured tooth, pain, swelling and pus discharge. Patient gave history of fall in childhood, patient does not remember the exact age. Patient gave history of swelling and pus discharge since one month. Radiographic examination revealed periapical changes (fig-1a).



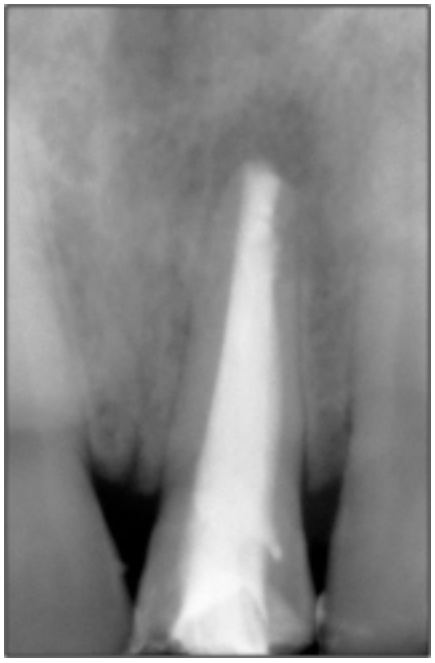
Access opening was done and drainage established .The canal was irrigated with normal saline and calcium hydroxide was placed as dressing, after 3 dressings the apex was closed using MTA(fig-2b)



and canal obturated with custom made gutta-percha cone using lateral condensation technique(fig-3c).



Patient recalled after a month for check up showed periapical healing(fig-4d).



Procedure of placement of MTA

The tooth was isolated using a rubber dam and accessed. Magnification was used to facilitate all endodontic procedures on the tooth. The canal was gently debrided using large hand files and copious amounts of 5.25% sodium hypochlorite and saline irrigation. The working length was established and confirmed with radiographs. The canals were prepared to

make parallel and smooth walls and dried. Mineral trioxide aggregate (M.T.A.) was introduced into the canal using a amalgam carrier and compacted with plugger to form an apical stop approximately 4-5mm thick. A radiograph was exposed to confirm adequate placement of M.T.A. The blunt end of a large paper point was moistened with water and left in the canal to promote setting of cement. A cotton pellet was placed in the chamber and the tooth restored with temporary cement. Patient was recalled after 3 days and accessed, the patient had remained asymptomatic and the tooth was isolated and accessed for complete setting of cement. A hand plugger was lightly tapped against the M.T.A plug to confirm a hardened set. The canal was obturated using custom made gutta-percha. The tooth was restored with glass ionomer cement and a recalled to check prognosis of tooth and further treatment

Discussion

A conventional approach to treat teeth with open apices is by use of calcium hydroxide and inducing apical barrier formation, during such treatment follow-up period the immature tooth is prone to fracture or re-Infection. Calcium hydroxide induced apexification requires 3 months to 24 months period15 Long term calcium hydroxide has also been reported to weaken the root structure16.MTA is gaining popularity for use as a apexification material with good physical and biological properties 7,8. In the present case1, there was no peri apical infection and patient insisted on treatment for discoloured tooth .Calcium hydroxide induced apexification was not possible as patient was not willing for the prolonged treatment procedure, hence MTA was considered as the best alternative. Case 2 had draining sinus and periapical infection hence calcium hydroxide was used to reduce infection and MTA was used as it has property to set in presence of moisture17.the presented cases showed that MTA can be used for root end restoration in cases with open apex and periapical infection. Follow up of cases showed periapical healing and formation of hard tissue in apical end of root of affected tooth. Al-Kahtani et al. 18 has recommended in his study placement of a 5-mm apical barrier of MTA in cases of apexification, as this allows excellent seal, and provides sufficient material thickness to prevent it from being displaced. Threma plasticized gutta-percha is usually recommended in these cases with thin walls but custom-made gutta-percha can also be used depending on the thickness of walls. In the present case both cases were obturated with custom made gutta-percha points as there was enough thickness of dentine. Placement of MTA has been considered in these cases as it is effective as an apical barrier and its application results in predictable apical closing, reduced treatment time and a reduced number of exposures to radiographs. Follow up after treatment of the case is of utmost importance to study the success of the treatment. In the present case 6 months of follow-up, the clinical and radiographic appearance of the teeth showed resolution of the periapical lesions and hard tissue formation at apex. The presented cases showed, placement of an apical barrier using MTA is an alternative to conventional long-term calcium hydroxide therapy.

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Case Report

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One-stage Surgical Alveolar Augmentation (PAOO) For Rapid Orthodontic Movement. A Case Report.

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Abstract
Corticotomy found to be effective in accelerating orthodontic treatment. Corticotomy facilitated orthodontics advocated for comprehensive fixed orthodontic appliances in conjunction with full thickness flaps and labial and lingual corticotomies around teeth to be moved. Bone graft should be applied directly over the bone cuts and the flap sutured in place. Tooth movement should be initiated two weeks after the surgery, and every two weeks thereafter by activation of the orthodontic appliance. Orthodontic treatment time with this technique will be reduced to one-third the time of conventional orthodontics. Alveolar augmentation or labial and lingual cortical plates were used in an effort to enhance and strengthen the periodontium, reasoning that the addition of bone to alveolar housing of the teeth, using modern bone grafting techniques, ensures root coverage as the dental arch expanded. Corticotomy facilitated orthodontics is promising procedure but only few cases were reported in the literature. The case report highlights the PAOO technique and the treatment of a 24 year old male.

Key Words
Corticotomy facilitated orthodontics; Rapid orthodontics; Accelerated osteogenic orthodontics; Regional acceleratory phenomena; Periodontally accelerated osteogenic orthodontics

Introduction

An increasing number of adult patients have been seeking orthodontic treatment, and a short treatment time has been a recurring request. As result a number of surgical techniques have been developed because the surgical injury of the cortical bone adjacent to the area of desired tooth movement has been reported to initiate biochemical changes leading to rapid tooth movement[1].

Wilcko et al. introduced surgical orthodontic therapy which included the innovative strategy of combining corticotomy surgery with alveolar grafting in a technique referred to as Accelerated Osteogenic Orthodontics (AOO) and more recently to as Periodontally Accelerated Osteogenic Orthodontics (PAOO)[2-5]. Significant acceleration in orthodontic tooth movement has been extensively reported following a combination of selective alveolar decortication and bone grafting surgery, with the latter being responsible for the increased scope of tooth movement and the long-term improvement of the periodontium. This conventional corticotomy approach consists of raising full-thickness flaps and using a bur to create cortical incisions. Then an allograft is placed at the sites needing the bone expansion necessary for proper orthodontic tooth movement. This intentional injury to the cortical bone results in a modification of the bone metabolism, leading to a transient state of osteopenia, described as rapid acceleratory phenomenon (RAP). RAP was demonstrated at the alveolar bone level following corticotomy and would be responsible for rapid tooth movement.

Case Description

A 24-year-old male was referred to orthodontic consultation for deep bite and retro-positioned lower incisors which were not allowing maintenance of oral hygiene in the lingual aspect of the lower incisors and attrition of the lower incisors. He strongly expressed the demand for a rapid completion of her treatment, citing professional and personal reasons. His dental history included regular dental visits and complete oral prophylaxsis.

Extraoral and intraoral examination

The patient showed a symmetrical face and a normal soft-tissue profile with normal vertical facial height **(Figure1a-c).**

The temporomandibular joints were within normal limits. The lips were competent at rest with adequate vermillion display. Patient presented with a class I molar and canine relationship. The incisors presented with relationship similar to that of seen class II division 2 relationship. The overjet was 0mm, and the overbite was ~100% of lower incisor coverage.When smiling, he exhibited 100% of maxillary incisal display.

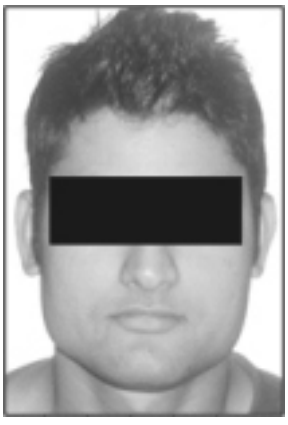


Figure 1a

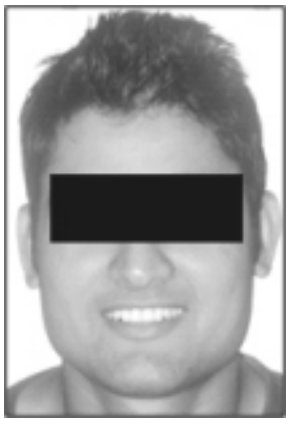


Figure 1b

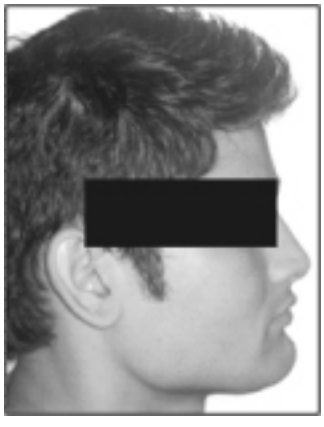


Figure 1c

The maxillary dental midline was coincident with the facial midline and maxillomandibular midlines were concordant **(Figure 1d-f).**

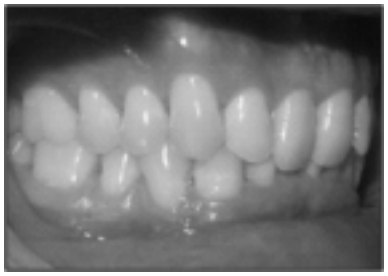


Figure 1d

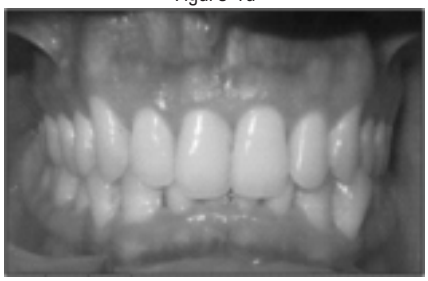


Figure 1e

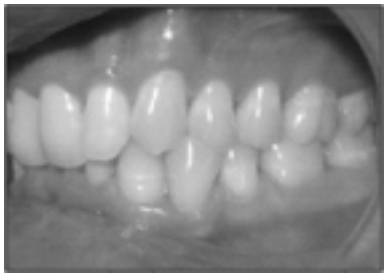


Figure 1f

The maxillary and mandibular arch forms were U-shaped maxillary arch had 3mm of crowding while mandibular arch presented 6 mm of crowding with few rotated teeth **(Figure 2a,b).**

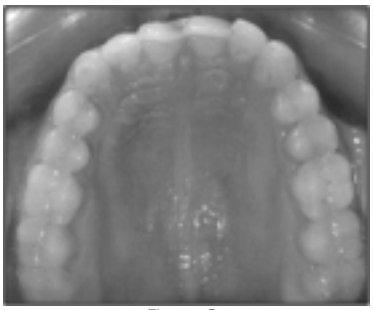


Figure 2a

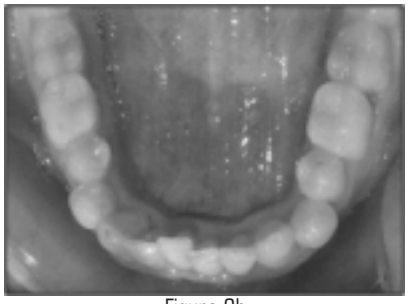


Figure 2b

The curve of Spee was 3 mm, and the periodontium was healthy.

From a skeletal standpoint, he had a class I pattern with normal lengths maxilla and mandible, a hypodivergent mandible, reduced lower anterior facial height and retroclined upper and lower incisors.

Treatment Objectives

The goal of the treatment was to resolve the crowding in both arches, open the bite, to correct the incisor relations and maintain class I dental relationship that would be pleasing to the patient and decrease treatment duration. The patient was offered the conventional orthodontic treatment as well as an innovative treatment combining comprehensive orthodontic care with periodontal surgery (PAOO) to accelerate tooth movement. In this procedure, a bone graft was also planned in the area where expansion was needed to expand the bony envelop in the direction of tooth movement and increase periodontal support to improve long-term stability in areas where relapse commonly occurs following orthodontic expansion. Because the patient sought a short treatment time, the orthodontic treatment coupled with PAOO was chosen.

Surgical Technique

The fixed orthodontic appliance (Gemini 22 slot brackets, MBT prescription, 3M) was placed with standard technique onto the upper arch only, consisting of second premolar to second premolar brackets and bands with buccal tubes on 1st molars. Alignment and leveling was initiated with round NiTi wires. The surgery was performed 2 week following placement of the fixed orthodontic appliance.

On the day of surgery, orthodontic archwire was removed and patient was asked to perform mouth-brushing. 2grams of amoxicillin was taken by the patient 30 minutes prior to the surgery. On the dental chair chlorhexidine mouthwash was performed by the patient. After local anesthesia, full thickness buccal flap was raised from mesial of 15 to mesial of 25 with crevicular incisons maintaining the interdental papillae. Vertical release incisions were performed inter-proximally between 14-15 & 24-25 **(Figure 3a).**

Bony prominences on the canine roots were leveled with help of straight diamond burrs. Corticotomy was done on the exposed bone surface with help of round diamond burrs mounted on a reduction mircomotor hand-piece under copious amount of irrigation **(Figure 3b, c).**

Demineralized freeze-dried bone allograft was mixed with saline and formed into a thick paste. The graft was packed onto the modified bone surface **(Figure 3d).**

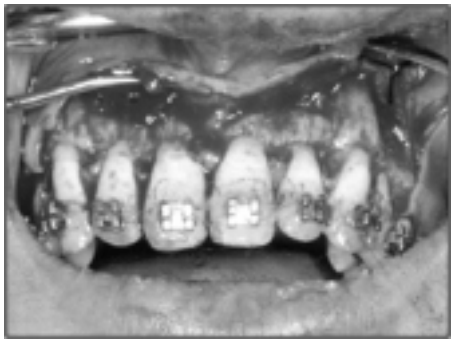
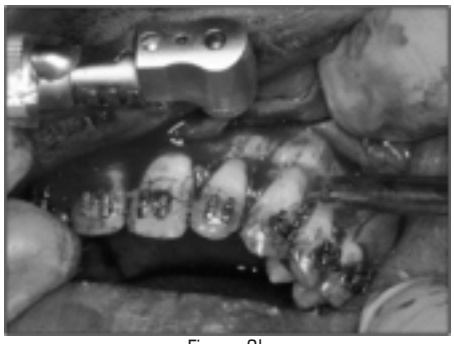


Figure 3a



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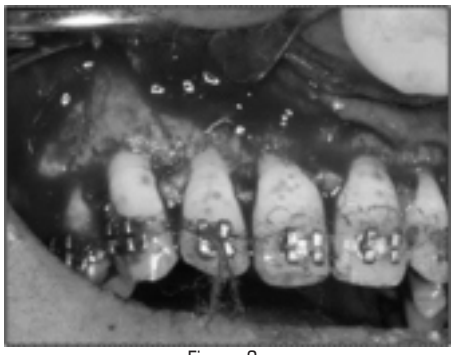


Figure 3c

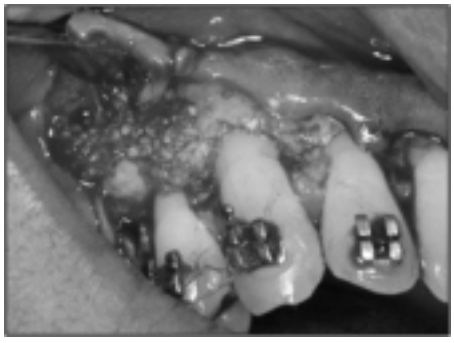


Figure 3d

Flaps were positioned and sutured with silk sutures **(Figure 4).**

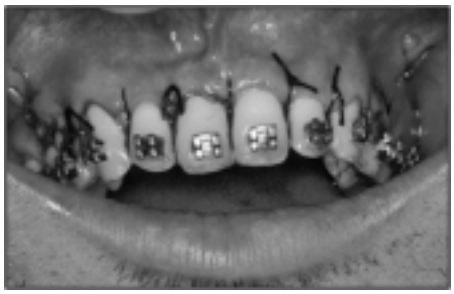


Figure 4

Orthodontic archwire was secured back into the brackets.

Patient was instructed to apply local cold fomentation intermittently for first 12 hours after the surgery. He was also instructed to only take cold diet for 24 hours. Amoxicillin coverage was to continue for 3 more days. Rigorous brushing in the area of surgery was advised against for the 1st week. Check up was scheduled for the next day.

Treatment Progress

The patient reported using only two tablets of the NSAID after surgery. No swelling, bruising, or severe discomfort was associated with this procedure. The patient could resume oral physiotherapy 24 hours after the surgery. The periodontal healing was optimum with minimal to no scarring at 2 weeks.

During the first 6 to 10 weeks of orthodontic treatment, the maxillary arch was fully leveled and aligned using increasing size of nickel titanium alloy wires (0.014, 0.016, 0.018, 0.016 x 0.022). Bite opening and arch expansion was achieved with reverse curved stainless steel wire and stoppard steel wire.

In the following six weeks adequate maxillary arch expansion and bite opening was achieved so as to allow the bonding of the mandibular arch. 2 weeks following the bonding of the mandibular arch corticotomy surgery was planned and executed in a manner similar to that of the maxillary arch. The only differences was that the mandibular archwire was not removed from the bracket as there ease of excess to the anterior alveolus **(Figure 5a-c, Figure 6).**

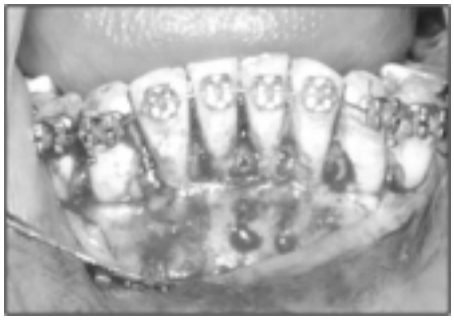
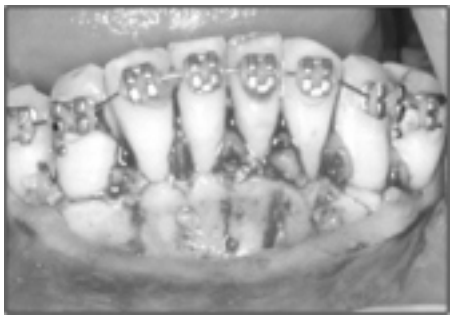


Figure 5a



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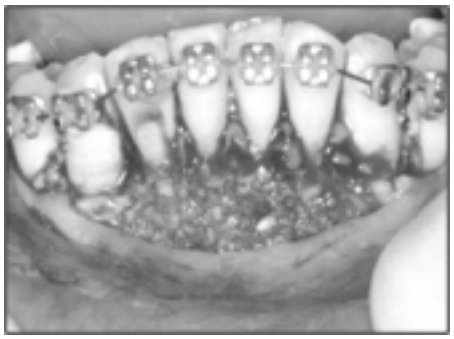

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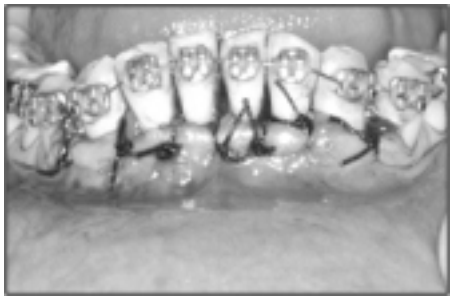


Figure 6

During the course of treatment **(figure 7),**

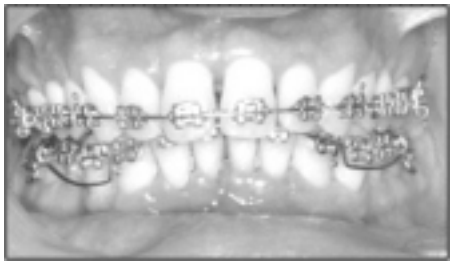


Figure 7

a sharp increase in tooth mobility was observed, resulting from the transient osteopenia induced by the surgery. Also important to emphasize is that higher forces are applied to the teeth as compared with conventional orthodontic treatment to maintain mechanical stimulation of the alveolar bone and the osteopenic state, allowing for rapid treatment.

Treatment Results

After 26 weeks of active treatment, sequential de-bonding was performed. The brackets on the premolars were removed to allow them settle into occlusion. 4 weeks later complete appliance was removed and a fixed lingual retainer was inserted from premolar to premolar on both arches. To maintain the bite, circumferential retainer with anterior bite plane was given to the patient to be worn 24 hours **(figure 8a-e).**

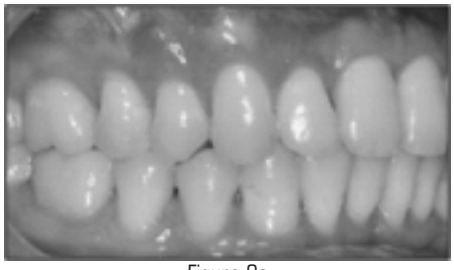
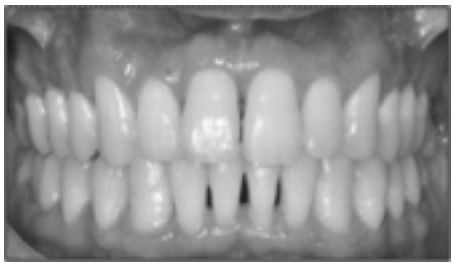


Figure 8a



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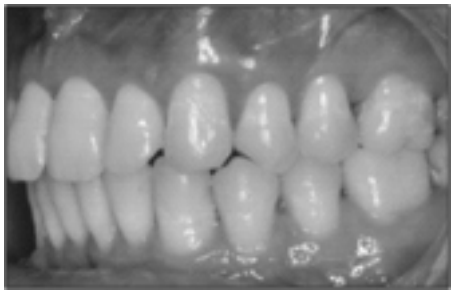

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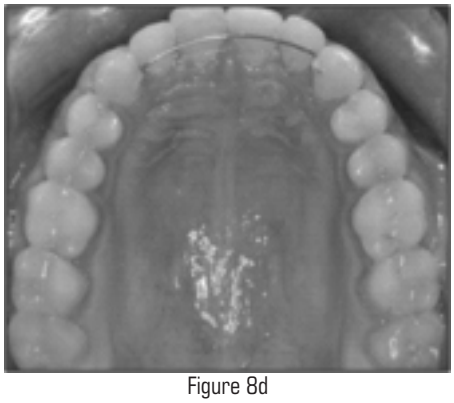
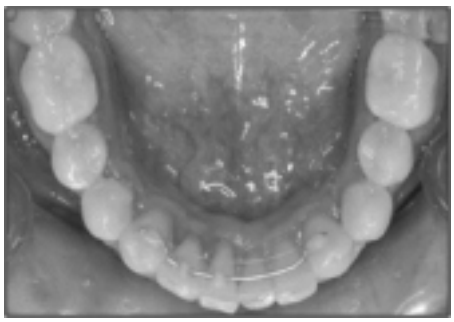


Figure 8d



Comments

It is of paramount importance for the orthodontist and surgeon to understand that the surgically induced high tissue turnover is restricted to the immediate proximity of the surgical cuts creating what might be referred to as a localized spatio-temporal window of opportunity. Attention must be given to perform the bony incisions only around the teeth where tooth movement is planned. As such, the relative anchorage value of the teeth away from the surgical site remains high and anchorage value of teeth adjacent to the surgical site is low. Rapid acceleratory phenomenon (RAP) is transient, but continuous mechanical stimulation of the teeth would prolong the osteopenic effect induced by the procedure. Hence, it is imperative to see the patient and adjust the orthodontic appliance every 2 weeks.

Conclusions

PAOO is an innovative, technique to achieve rapid orthodontic tooth movement. This novel technique also allows the possibility for hard- and/or soft-tissue augmentation, leading to an enhanced periodontium and an increased scope of tooth movement. PAOO proves to be efficient from both the patients' and clinicians' standpoints and offers the advantages that should lead to greater acceptance in the dental community.

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Case Report

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Intraosseous Calcifying Epithelial Odontogenic Tumor - A Case Report

Abstract

Odontogenic tumors constitute a group of heterogeneous disease derived from epithelial, mesenchymal and/or ectomesenchymal elements. The CEOT is a benign, though occasional locally invasive, slow-growing neoplasm occurring as intraosseous (94%) and extraosseous (6%) variants. CEOT shows a relative frequency of 1-2%. The extraosseous variant is diagnosed slightly earlier (mean age 34.4 years) than the intraosseous type (mean age 38.9 years). Both variants have an almost 1:1 gender ratio. The intraosseous CEOT shows a maxilla:mandible site ratio of 1:2 and are mainly located in the premolar/molar region. CEOT originates from the complex system of dental laminae or remnants thereof. Histologically, the CEOT is characterized by the occurrence of sheets, nests and masses of polyhedral, eosinophilic epithelial cells which may show cellular abnormalities including giant cell formation and nuclear pleomorphism. Some cells increase in size and produce a homogeneous, eosinophilic, 'amyloid-like' substance which may become calcified and which may be liberated as the cells break down.

Key Words

TUMOUR, CALCIFICATION, ODONTOMA EPITHELIUM PINDBORG

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Introduction

The calcifying epithelial odontogenic tumor is a benign odontogenic tumor of epithelial origin that accounts for approximately 1% of all odontogenic tumors[1]. The calcifying epithelial odontogenic tumour was first described as a distinct entity by Pindborg (1958)[2]. The origin of this neoplasm is not clearly known, although it is generally accepted to be derived from oral epithelium, reduced enamel epithelium, stratum intermedium or dental lamina remnants[1]. Evans (1966)[3] has suggested that the tumour is a variant of ameloblastoma, but, as Abrams and Howell (1967)[4] have pointed out the calcifying epithelial odontogenic tumour differs from it by having no preameloblasts or stellate reticulum.

In the ultrastructural study done by Anderson, Kim, and Minkowitz (1969) the tumour cells showed features which were commonly seen in epidermal cells in accordance with origin from the enamel organ or oral epithelium.[5]

It is more common in the posterior part of the mandible of adults in the fourth to fifth decades. There is no gender predilection. It is characterized by squamous epithelial cells, calcifying masses, and homogeneous acellular material admixed with the tumor epithelium and stroma that have been identified as amyloid.[6]

In this article we are presenting a case report of an elderly female patient having tumor on right side of maxilla.

CASE REPORT

A patient 60yrs female, reported to our department with the chief complaint of swelling on right upper back teeth region since 1month. Swelling was progressively increasing in size and was painful from the last 15-20 days. There was mild pain and associated white watery discharge intra orally from the swelling on pressure application. Patient gave history of extraction with respect to posterior teeth around 20 yrs. back.

Extraoral examination showed facial asymmetry and a bony hard swelling on the upper right back tooth region.

Intra oral examination revealed an ovoid, bony hard swelling which was non-tender on palpation. Overlying surface was normal with ulceration at one point. Patient is completely edentulous.

On aspiration, needle entered the tissue but did not aspirate anything.

Radiographic investigations included OPG and CT scan. OPG well defined radiolucent lesion with multiple foci. CT scan revealed large expansile bony lesion arising likely from alveolar process of maxilla (Fig 1).

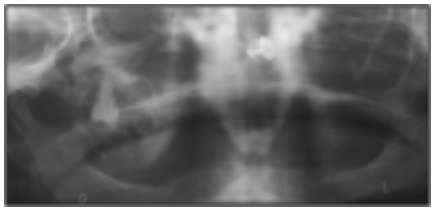

Fig.1 OPG showing well defined radiolucent lesion with multiple foci on right maxilla.

An incisional biopsy was performed and microscopic examination revealed proliferation of polyhedral shaped epithelial cells with eosinophilic cytoplasm which demonstrated mildly nuclear pleomorphism. We observed calcifications which were in the form of Liesegang rings.

DISCUSSION

The calcifying epithelial odontogenic tumor, also known as a Pindborg tumor or CEOT, is an odontogenic tumor first recognized by the Dutch pathologist Jens Jorgen Pindborg in 1955. It was previously described as an adenoid adamtoblastoma, unusual ameloblastoma and acystic odontoma. Like other odontogenic neoplasms, it is thought to arise from the epithelial element of the enamel origin namely epithelial rests of dental lamina or reduced enamel epithelium.[7]

It is a benign, slow growing, but invasive neoplasm. The incidence of calcifying epithelial odontogenic tumor is only 1%. It is more common in the posterior mandible of adults[8], typically in the 4th to 5th decades. There is no sex predilection but it is more common in whites. It appears clinically to be a slowly enlarging painless mass. In the maxilla it can cause proptosis, epistaxis and nasal air way obstruction. Its recurrence rate is 10-15%.[9] Franklin and Pindborg reported a recurrence rate of 14%.[10] It is considered to have a recurrence rate much lower than the recurrence rate for ameloblastoma.[7]

It has two types: Intraosseous ceot and extraosseos ceot. The intraosseous type appears radiographically as an irregular, uni- or multilocular radiolucent area containing radiopaque masses which increases in size and opacity with time. Some 60% of intraosseous CEOT are associated with an unerupted tooth (or odontoma). CEOT shows a relative frequency of 1-2%. The extraosseous variant is diagnosed slightly earlier (mean age 34.4 years) than the intraosseous type (mean age 38.9 years). Both variants have an almost 1:1 gender ratio.[8]

Radiographically, these lesions can be radiolucent, but they more characteristically are mixed lucent and opaque masses, exhibiting a snow-driven appearance.

Histologically, the CEOT or Pindborg tumor is composed of polyhedral epithelial cells with scanty stroma. The closely packed cells demonstrate nuclear pleomorphism. Variable amounts of an homogenous material is seen. This has been shown to be amyloid or a similar substance. [11,12,13] However, calcification is an important feature and sometimes it cannot be seen. In some cases clear cell nests may be observed.[8,11,14,15] The first two features are necessary for the diagnosis. We observed, especially in the peripheral areas of the tumor, the polyhedral shaped cells w[illegible]ch d[illegible]m (F

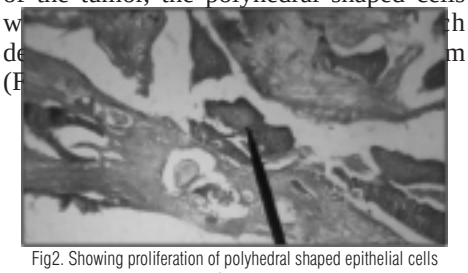

Fig2. Showing proliferation of polyhedral shaped epithelial cells in the form of sheets. Calcifications are also seen.

We observed calcifications in the form of Liesegang rings.

Histological variants including CEOT with cementum-like components, clear-cell CEOT (15 cases reported so far), CEOT-containing Langerhans' cells, combined epithelial odontogenic tumour (CEOT/AOT) and CEOT with myoepithelial cells.[12]

The treatment of this lesion is complete

surgical excision. The recurrence rate for CEOT is 4%. The lesion is slow growing and requires long-term follow-up monitoring for recurrence (at least 5-10 y). No cases of malignant transformation are reported.

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Mandibular Swelling – Can It Be Multiple Myeloma?

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Abstract
Multiple myeloma is a debilitating malignant hematological disease, characterized by multicentric proliferation of plasma cells in bone marrow. The incidence of multiple myeloma is 4.5/10,000/yr with median age at diagnosis between 63-70 yrs. Manifestation of multiple myeloma in jaw bone is not rare but involvement of mandible as first bone and diagnosis being made by oral surgeons are infrequent. Present article is about a 58 yr old female patient with the chief complain of right side facial swelling and intermittent moderate pain. Incisional biopsy revealed multiple myeloma and subsequent treatment with radiotherapy and chemotherapy followed. It stresses upon the fact that as oral surgeons / dental health professionals we may be the first one to diagnose systemic diseases in early stages.

Key Words
multiple myeloma ,swelling, malignant, plasma cells,incisional biopsy

INTRODUCTION

Multiple myeloma is a debilitating malignant hematological disease, characterized by multicentric proliferation of plasma cells in bone marrow. The incidence of multiple myeloma is 4.5/10,000/yr with median Age at diagnosis between 63-70 yrs. The mortality is 4.1/10,000/yr[1].The term multiple myeloma was given by RUSTIZKY in 1873[2]. Usually the patient presents with renal failure, bone pain, fatigue, and recurrent infections due to immunosupression.The involvement of mandible is infrequent but is even rarer to be involved as first bone. More than 30%of patients with multiple myeloma develop osteolytic lesions in jaw[3]at some stage of progression .The mandibular lesions are more common in the posterior region of the mandible and pain may be the only initial symptom of disease. From radiological prospective multiple myeloma can present in varied way including:

a) bone with no changes or alteration
b) multiple punched out radiolucent lesion
c) generalized bone rarefaction and osteoporotic alterations[3].

The Diagnosis is based upon the evaluation of bone marrow, plasma cell infiltrate, evaluation of lytic bone lesions, detection and evaluation of monoclonal (M-) component by serum and urine protein electrophoresis1. The Present article presents the case of patient with multiple myeloma which was detected incidentally.

CASE REPORT

A 58 Yr old female patient reported in Department of Oral and Maxillofacial surgery (S.R.D.C) with the prime complain of right side facial swelling and intermittent moderate pain. Swelling was present for last 3 months and patient had earlier consulted a general surgeon who suggested them to consult an Oral Surgeon. Patient's personal family and medical histories were non contributory to her problem. There was no history of severe pain, paresthesia or loss of function. On extra oral examination, a single swelling of size approximately 3×2.5 cm involving left body region of mandible extending from premolar region anteriorly to angle region posteriorly was evident. There was no change of color of overlying skin neither there was any visible pulsation, bleeding on discharge. On palpation swelling was firm, nontender, nonpulsatile, non fluctuant with diffused margins.

Intraorally swelling size was 2.5 x 2 cm and was almost obliterating buccal sulcus. The overlying mucosa was stretched but there was still no change of color. Buccal cortex was expanded bucco lingually but more on buccal side. The OPG **(fig 1)**

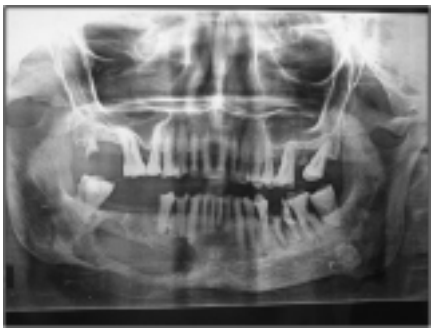

Fig 1 : Opg Revealing A Well Connected Multilobular Radioluency Extending From Roght Third Molar Region To Canine Of Same Side.

revealed a well connected multilobular radiolucency extending from right third molar region to canine of same side. Superioinferiorly radiolucency extended from just below upper border to 1cm above lower border dipping to height of just .5 cm above lower border in second molar region immediately anterior to angle. Margins were distinct, well demarcated, no sclerotic border present and there was no resorption of root apices seen either. Extractions were carried out in same area long back without any complications.

As a routine protocol, an incisional biopsy of lesion was planned under general anesthesia (as patient was very apprehensive), two unit of blood was administered as patient was anaemic to raise Hb levels to 10 gm %. A representative sample of tissue was taken and sent for histopathology in two different labs. Patient again reported three days after biopsy with toxic, weak and stressed out looks and high grade fever along with increased swelling of mandible. Patient was admitted immediately and managed with 3rd generation cephalosporins. In due course of time all routine and some specific investigations were conducted again. Patient's Hb came back to 8gm% and ESR was substantially raised, meanwhile histopathology reports from both labs arrived stating that sheets of malignant plasma cells showing eccentric nuclei and stippled chromatin were present suggesting plasma cell dyscrasia (fig 2).

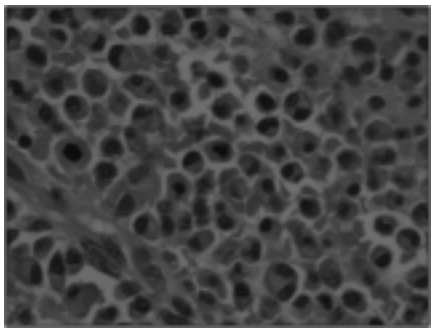

Fig 2 : Microscopie View Showing Sheets Of Malignant Plasma Cells Showing Eccentric Nuclei And Stippled Chromatin Were Present Suggesting Plasma Cell Dyscrasia.

Immediately skull and pelvic region radiographs were taken and we saw 4 to5 characteristic punched out lesions in skull (fig 3, 4).

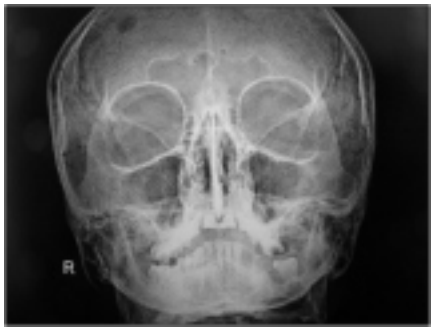

Fig 3 : Pa View Of Skull Showing Characteristic Punched Out Lesions In Skull.

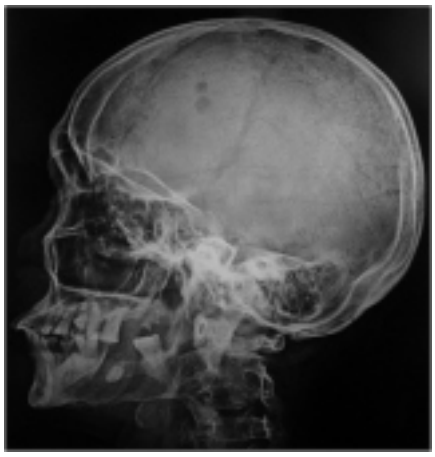

Fig 4 : Lateral Skull Radio Graph Showing 4 To 5 Characteristic Punched Out Lesions In Skull.

Patient was immediately referred to higher center where diagnosis for multiple myeloma was confirmed according to standard laid down diagnostic criteria and was advised to go for adjunctive radiotherapy and chemotherapy.

DISCUSSION

B- cell lymphoid tissue neoplasms can broadly be classified in three types
a)multiple myeloma
b) solitary plasmacytoma
c) extramedullary plasmacytoma[4,5.]
Multiple myeloma presents in disseminated form, in several bone while solitary bone plasmacytoma is confined to single bone. Extramedullary plasmacytomas consisting of soft tissue masses of plasma cells may occur at almost any site on the body.

Most common symptoms of multiple myeloma is bone pain specially in lumbar vertebrae region. Approximately 70% of multiple myeloma patients come with pain in bones but in present case, though intermittent, mild, vague pain was present but it was not among chief complaints .Kyle[6] in his review also reported that bone pain (58%) along with fatigue related to anaemia (32%) were most common. Other systemic manifestations include pathological fracture, weight loss, fever, renal failure, diarrhea, hypercalcemia and infections. Clinical manifestations in maxillofacial region includes gingival hemorrhage, odontalgia, paresthesia, tooth mobility, migration, swelling and sometimes pathologic fractures.

Radiographically most common finding has been punched out radiolucencies without sclerotic borders. Borders are distinct but there is no definitive cortical margin. Skull lesions are present in almost 50% of patients[7].It has often been described as "punched out" or en "moth eaten" appearance. Multiple investigations including complete hemogram to ascertain anemia, leukemia or thrombocytopenia is carried out .ESR too is usually elevated in these cases.

The diagnostic criterion for multiple myeloma includes;

a) presence of more than 10% of plasma cells on examination of bone marrow and monoclonal proteins in serum or urine[8.]
b) Detection and evaluation of monoclonal component by serum and urine protein electrophoresis, quantification of IgA, IgG, IgN immunoglobulins.
c) Evaluation of lytic bone lesions
d)Biological assessment to differentiate symptomatic and asymptomatic multiple myeloma.

Treatment has been combination use of chemotherapy and radiotherapy but in recent years preferred treatment is giving initial course of induction chemotherapy consisting of thalidomide-dexamethasone regimens and then autologous stem cell transplantation[6.]Although treatment is not certain in nature but it definately increases survival time.

In present case, we did an incisional biopsy keeping in mind all sorts of differential diagnosis yet it did not originally include multiple myeloma or plasma cell dyscrasia which was the diagnosis we reached eventually.

CONCLUSION

Early diagnosis of multiple myeloma is

pivotal to increased survival time of patient. A thorough knowledge of maxillomandibular manifestations of multiple myeloma and other metastatic disease is a must for any dental health professional. This case emphasize that while we make differential diagnosis we should keep all factors in our mind like biochemical investigations, radiographs, clinical symptoms and we should be elaborate in diagnosis before we go for excision of any lesion. Another aspect is that we should corelate systemic condition with local symptoms. We may conclude, as incisional biopsy is important before excision of big oral lesion so is open differential diagnosis before biopsy so that we can diagnose some of fatal systemic diseases in early stage through their oral manifestations. We as oral surgeons may be helpful in diagnosing some of the systemic diseases in early stages to prevent fatal results.

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When reporting experiments on human subjects, indicate whether the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional or regional) and with the Helsinki Declaration of 1975, as revised in 2000 (available at http://www.wma.net/e/policy/17-c_e.html). Do not use patients' names, initials, or hospital numbers, especially in illustrative material. When reporting experiments on animals, indicate whether the institution's or a national research council's guide for, or any national law on the care and use of laboratory animals was followed.

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Nanocomposites - A Step Towards Improved Restorative Dentistry

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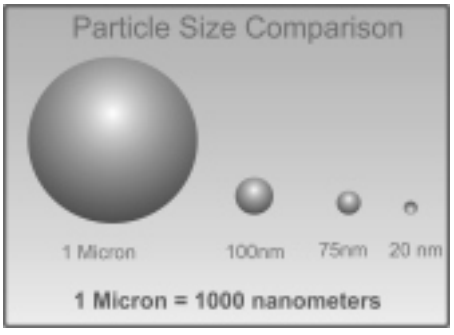
Abstract
One of the real breakthrough in restorative dentistry has been the development of resin- based composite technology. Today composite resins have widely dominated the field of aesthetic dentistry for both anterior and posterior restorations. Still, polymerization shrinkage and low strength are considered as one of the most challenging problem in the application of dental composite in restorative techniques. It has been the topic of exploration to develop low shrinkage dental composite resins over past decades. A major hault in developing low shrinkage dental composite materials is their inferior mechanical properties to clinical use. The demand for improved aesthetic restorations has led to the development of several new restorative materials in market. Recently, nanocomposites materials utilizing nanofillers are being used extensively to produce restorative materials with improved adhesive, aesthetics and mechanical properties compared to earlier composites. The aim of this article is to review improved properties and clinical applications of nanocomposites in restorative dentistry.

Key Words
nanocomposite, nanofiller, nanohybrid, resin-based composite, polymerization shrinkage

INTRODUCTION

The demand for aesthetic and functional restorations has been simplified by the development of resin-based composites. The potential for greater application of resins came about with the introduction of the Bisphenol A glycidyl methacrylate, or Bis-GMA, by R.L. Bowen in the early 1960s. While the Bis-GMA formulations developed by Bowen were a major move in the right direction, the effort fell short of clinical success. [1] Since their arrival in dentistry, its chemical structure has changed dramatically, to overcome the problem of shrinkage, thermal expansion, and low strength. Inorganic filler size is the critical area that can be manipulated to improve its properties. The early generation of composites proved to be failure for posterior restorations due to their poor wear resistance, rough surface and high rate of polymerization shrinkage. This was due to large particles size of fillers. In 1970's , microfilled composites composed of colloidal silica, with small particle size fillers 0.04 ì m were developed to improve wear resistance and produce a lustrous surface. However, they could not attain higher degree of filler loading which lead to expansion of resin matrix. Therefore they have poor mechanical properties and are avoided in high stress areas. Till now, the market is mainly dominated by hybrid composites since their arrival in 1980's. Hybrid composites were developed by combining glass particles with fillers of various sizes (aluminosilicates, quartz or barium aluminosilicate silica glasses) to provide better strength and smooth finish. [2]

Several improvements are still going on to produce materials of adequate clinical success . Continued effort in reducing the size of fillers to improve properties has led to development of dental composites based on nanotechnology. Nanotechnology also known as molecular engineering is the production of functional materials and structures in the range of 0.1 to 100 nanometers by various physical and chemical methods. A nanomer is 1/1,000,000,000 (one-billionth) of a meter or 1/1000 of a micron (fig:1).



The newly available nanomaterials are nanocomposites and nanohybrids. Nanocomposites use nanometer-sized particles throughout the resin matrix, whereas nanohybrids take the approach of combining nanometer-sized particles with more conventional filler technology. Both approaches can provide good composite materials, but the nanohybrid approach still may suffer from the loss of larger particles and the potential loss of initial gloss.[3]

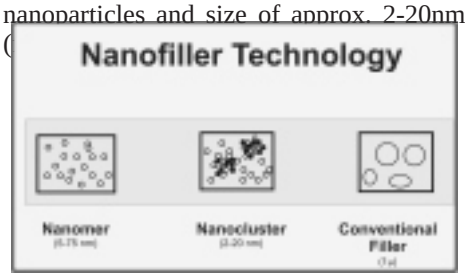
Nanocomposite restorative materials have excellent aesthetics, polishability and very low degree of polymerization shrinkage. The development of the nanofilled composite restorative materials that have enhanced aesthetic features of high translucency and lustre still maintaining strength and wear resistance provides clinicians a reliable option for anterior and posterior restorations.[4]

Nanotechnology in composites

To effectively know the use and rationale of a specific composite resin system it requires an overview of the system's infrastructure. The infrastructure of composite resins consists of three basic phases - the organic phase (matrix), the dispersed phase (filler) and the interfacial phase (coupling agent).[5]

The organic phase or matrix of this composite resin system consists of blend of monomers that include Bis-GMA (Bisphenol-A-glycidyl methacrylate), UDMA (Urethane dimethacrylate), and Bis-EMA (Bisphenal-A-polyethylene glycol diether dimethacrylate). TEGDMA (Triethylene glycol dimethacrylate) is added to control viscosity. Matrix components also include an initiator (e. g, benzoyl peroxide for chemical activation or camphoroquinone for visible light activation), polymerization inhibitors (to extend working time and storage stability), opacifiers, and various pigments. [6,7,8] The dispersed phase or the filler particles provide strength and reinforcement to the matrix. [9,10] Currently nanofillers, the smallest filler particles are widely used in dentistry. The adoption of small nanoparticle fillers technology has noticeably improved many of the properties of composite resins. Nanoparticles are available in two forms: a single nanomer particles and a group of nanoparticles (nanocluster).[4]

The nanomer particles are individual filler particles mainly spheroidal in shape. The size of nanomer-sized filler is 5-75nm as compared to the size of approx. 1 micron for conventional fillers. Nanoclusters are loosely agglomerated collections of these nanoparticles and size of approx. 2-20nm (



The introduction of these nanosized particles allows for an increased filler loading that ultimately provide improved clinical performance through increased polishability, increased wear resistance, reduced polymerization shrinkage, and increased fracture resistance. As the particle concentration depends on the viscosity, the filler loading that can be attained 69% by volume and 84% by weight, results in reduced polymerization shrinkage and shrinkage stress. The interfacial phase or coupling agent consists of a bifunctional coupling agent that can connect the resin matrix and the inorganic filler. The most commonly used coupling agents are organosilanes.

The particle size and quantity are two crucial factors when determining how to best utilize the restorative materials. Alteration of the filler component remains the most significant development in the evolution of composite resins, because the filler particle size, distribution, and the quantity incorporated dramatically influence the mechanical properties and clinical success of composite resins. In general, the mechanical and physical properties of composites improve in relation to the amount of filler added. Many of the mechanical properties depend on this filler phase, including compression strength and/or hardness, flexural strength, elastic modulus, coefficient of thermal expansion, water absorption, and wear resistance.

Nanotechnology manufacture composite resin with nanofiller particles that are quiet small, can be dissolved in higher concentrations, and are polymerized into the resin system with molecules designed to be compatible when coupled with a polymer, and provide unique characteristics (physical, mechanical, and optical). [11] Adhesion of restorative biomaterials to the mineralized hard tissues of the tooth is a controlling factor for improving the marginal adaptation and seal, in addition enhancing the longevity and reliability of the adhesive restorations. The particle size of conventional composites are very dissimilar to the structural sizes of the hydroxyapatite crystal, dentinal tubule, and enamel rods, that there is a potential for loss of adhesion between the macroscopic (40 nm to 0.7 nm) restorative material and the nanoscopic (1nm to 10 nm in size) tooth structure. [12] Nanocomposite resin system has the ability to improve this continuity between the tooth structure and the nanosized filler particle to provide a good marginal seal between the mineralized hard tissues of the tooth and these improved restorative biomaterials.

Manufacturing approach with bottom-up approach

Nanotechnology has reintroduced the focus on manufacturing newer and smaller materials. Traditional manufacture of filler particles for dental composites has required the comminution of larger particles of quartz, glass, or ceramics through grinding or milling to small particle size. But this process can not reduce the filler particle size below 100 nm (1 nm=1/1000 µm) in diameter. To overcome this problem, direct molecular assembly, or "bottom-up" processes that involve synthetic chemical processes is used. It is the assembly of these materials into progressively larger structures and then transform them into nanosized fillers suitable for a dental composite.[4]

DISCUSSION

Providing laudable advantages of tooth structure conservation, improved biomechanical properties and metal-free alternative, direct composite resin restorations are now routinely used in restorative dentistry. [13] Composite resins were first recommended for use in posterior teeth restoration more than two decades ago. While the early formulations were characterized by numerous problems, the most significant were polymerization shrinkage, marginal adaptation, inappropriate proximal contact and secondary caries still persist for many practitioners.

Recently, a new concept based on nanofillers in composite resin has developed. Due to improvement in both esthetic and physicomechanical properties, nanocomposites are becoming the popular esthetic and durable restorative materials in clinical practice. In addition it has directed the clinician's attention toward more conservative and non-invasive treatments. [14] Nanocomposites, where nanosized reinforcements (fillers) are dispersed in the base material (matrix), offer a novel class of composites with superior properties and added functionalities. The color change in a composite restorative material may be easily related to the nature of its resin matrix. The presence of low TEGDMA content in nanocomposites may its limit water uptake and, consequently, less staining. Filler particle size and distribution have been also shown to play an important role in this context. [15] Some studies have reported high surface roughness of composites, even after finishing and polishing, due to irregularly arranged inorganic filler particles, which could result in easier staining over time. [16,17]Surface gloss is another factor playing an important role on the appearance of tooth-coloured restorative resins.[18] Proper finishing and polishing should establish a smooth, glossy surface texture with optimum restoration contour facilitating the removal of plaque. [19-21] Especially

restorations in close contact to gingival tissues require surface smoothness for optimal gingival health. The size and composition of the filler particles of the restoratives determine the material's ability to be finished and polished, thus the smoothness of the restoration.[22]

Another phenomenon that contributes to aesthetic restorations is the translucency of disperse nanoparticles. Since the particles are smaller than wavelength of visible light, absorption does not occur and light shines through it. There is also greater scattering of light with the small sized nanoparticles as compared to a larger-particle composite. More scattering of light produces excellent blending of the restoration (the "Chameleon effect") and gives it a life-like effect. In addition, the resins made with this type of small particles give the restoration a better finish, which is observed in its surface texture, and the likelihood of the material's biodegrading over time is reduced. This technology has also achieved sufficiently competent mechanical properties for the resin to be indicated for use in the anterior and posterior segments thus making them "universal" composites. It should also be mentioned that the lower size of the particles leads to less curing shrinkage, creates less cusp wall deflection and reduces the presence of microfissures in the enamel edges, which are responsible for marginal leakage, colour changes, bacterial penetration and possible post-operative sensitivity.[23,24]

Under controlled wear conditions, it was found that nanocluters are formed by fusing or sintering these nanometer-sized particles and only very small, individual nanometer-sized particles can break from the clusters. The nanoclusters are designed to fracture only during wear conditions, rather than be plucked out. Thus, a smoother finish and higher gloss is retained. In comparison, a hybrid is comprised of large, micron-sized particles that, when plucked out or broken off, leave voids that significantly reduce initial polish. The initial gloss of these hybrids can be very impressive clinically. But with time and wear, individual particles of conventional hybrids are plucked from the resin matrix resulting in a reduction of gloss on the surface. It is suggested that the long-term polishing retention arises from the exposed nanoparticle fillers in the resin matrix during wear, tooth brushing, or polishing. These fillers may act as a nano-polishing medium on the surface of the composite providing long-term retention of gloss. [25] These nanocomposite restoratives have also proven to have the strength comparable to a hybrid. This is because of its high-filler loading and advanced resin matrix that result in improved strength measurements like compressive, flexural, diametral strength and fracture toughness needed for posterior restorations. It was also shown that different formulations of nanocomposites display similar or even better results regarding compressive strength and fracture toughness than conventional composite materials. [26]

The polymerization shrinkage in composite resin is reported to be 1.4% to 1.6%. The low shrinkage value of nanocomposites is due to the low shrinkage epoxy resin and strong interfacial interactions between resin and nanoparticles.

As the interparticle dimension in nanocomposite decreases, the loadbearing stress on the resin is reduced, inhibiting crack formation and propogation. The spheroidal shape of the nanofillers provides smooth and rounded edges, distributing stress more uniformly throughout the composite resin. This phenomenon has been termed the "roller bearing" effect, and is said to improve the sculptability and handling characteristics.

Recently, nanoparticles of calcium phosphates were synthesized and incorporated into dental resins. [27,28,29] The high surface area of the nanoparticles, coupled with strong reinforcement fillers, resulted in composites with stress-bearing and Ca and PO4 releasing capabilities. Its strength was 2-3 times higher than previously-known Ca-PO4 composites and resin-modified glass ionomer. This composite may have the potential to provide the necessary combination of load-bearing and caries-inhibiting capabilities.[30]

CONCLUSION

Nowadays, composites have unquestionably acquired a prominent place among the restorative materials employed in direct techniques. The recent integration of nanoparticles represents the continued research in the profession toward the ideal composite material. Earlier it was often difficult to achieve aesthetics as well as mechanical stability with resin- based composites. Adding nanoparticles into dental composite has imparted extraordinary physical properties, in reference to strength and durability, long term polish retention and high surface gloss beyond what current restorative materials offer. In the ending note it can be concluded, that the long standing wait for a universal restorative material in dental application may be considered over with the advent of nanocomposites.

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Laugier-hunziker Syndrome: A Review

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Abstract
Pigmentation is frequently encountered in the oral mucosa. Focal lesions usually need an in-depth examination to exclude a melanoma, while diffuse lesions often have no specific histological features and do not generate prognostic perplexity. However, diagnosis of these lesions is important because they could be a sign of diseases with systemic implications such as Peutz-Jeghers syndrome or adrenal insufficiency. Laugier-Hunziker syndrome (LHS) is a rare acquired macular hyperpigmentation of oral mucosa and lips frequently associated with longitudinal pigmentation of the nails. The pathogenesis is unknown, but no systemic involvement or malignant predisposition has been described, so the correct clinical identification avoids the need for detailed and potentially hazardous investigations and treatment.

Key Words
Pigmentation, Laugier-Hunziker syndrome, Peutz-Jeghers syndrome.

INTRODUCTION

Pigmentation is both the normal and abnormal discoloration of oral mucous membrane. It has multifactorial etiology. Most of the pigmentation is physiologic but sometimes it can be a precursor of severe diseases. A practical approach in a clinical situation is to examine whether the pigmentation presents as focal or as diffuse lesions **(Table)**[1].

Table. Causes of focal and diffuse oral pigmentation

Focal	Diffuse
Amalgam or graphite tattoo	Addison's disease
Hemangioma	Drugs
Melanoacanthoma	Amiodarone
Melanoma	AZT (Zidovudine)
Melanotic macule	Bleomycin
Nevus	Busulfan
	Chloroquine
	Clofazamine
	Cyclophosphamide
	Doxorubicin
	Ketoconazole
	Minocycline
	Oral Contraceptives
	Phenothiazines
	Tetracyclines
	Laugier-Hunziker syndrome
	Metals (poisoning)
	Bismuth
	Lead
	Mercury
	Silver
	Peutz-Jeghers syndrome
	Physiologic (racial)
	Post inflammatory
	Smoking

Sometimes the clinical presentation of pigmentation together with a thorough medical and family history, as well as history of onset, duration, and progression of the pigmentation, guides us to make a suggestive diagnosis. The clinical behavior of focal oral pigmented lesions ranges from benign, requiring no treatment, to highly malignant. Therefore, a biopsy is usually required for accurate diagnosis of a focal pigmented lesion[2].

Oral pigmentation caused by systemic diseases is usually diffuse and multifocal and has no specific histologic features. Although a solitary pigmented lesion may cause more suspicion, it should be kept in mind that diffuse oral pigmentation may be the first manifestation of an underlying systemic disease1. It has been associated with a variety of endogenous and exogenous etiologic factors. Most pigmentation is caused by five primary pigments. These include: melanin, melanoid, oxyhemoglobin, reduced haemoglobin, and carotene. Others are caused by bilirubin and iron. Melanin pigment irregularities and color changes of the oral tissues could provide significant diagnostic evidence of both local and systemic disease[3].

Laugier-Hunziker pigmentation (LHP) is an acquired disorder of hypermelanosis and involves the lips, oral mucosa, nails and acral areas in varying combinations that was first described by Laugier and Hunziker in 1970[4]. LHP may resemble various disorders characterized by mucocutaneous pigmentation. Differentiation from these disorders is essential as a few of them imply associated systemic disorders. LHP was initially thought to be restricted to European countries, now it has been reported from many parts of world, including India[5,6,7].

PATHOGENESIS

The cause of this rare disease is yet unknown. Ultrastructural studies reveal an increase in the number and size of mature melanosomes located in the cytoplasm of basal keratinocytes and dermal melanophages[8]. Some authors suggest that functional alteration of the melanocytes in the form of an increase in the synthesis of melanosomes and their subsequent transport to the basal layer cells may give rise to hyperpigmented lesions[1,9].

CLINICAL FEATURES

The onset of the condition is usually in early or mid adult life; the mean age of patients is 52.3 Women are affected more often than men, and most reported cases have been in whites. Neither familial association nor any associated systemic diseases have been reported, to date. LHS is mainly a disease of Caucasians and most of the reported cases have been from the European countries[8].

The pigmentation consists of slate to dark brown lenticular (lens-shaped) or linear macules, solitary or confluent, with well-

defined or indistinct margins. The lesions are located most often on the buccal mucosa and on the lips[1.] Other locations include the hard and soft palate, the tongue, and, more rarely, the gingiva or floor of the mouth. Pigmented macules may also occur on the neck, thorax, abdomen, perineal and perianal region, sclera and esophagus[10,11.]

Nail involvement is seen in about 60% of the patients; it consists of pigmented longitudinal bands of varying width and intensity in 1 or more of the fingernails and/or toenails without nail dystrophy. Baran et al. proposed three types of nail pigmentation in LHS: (i) isolated longitudinal streaks of varying degrees of pigmentation1 to 2 mm in width, (ii) 2 to 3 mm double longitudinal streaks, and (iii) homogenous pigmentation of the radial or ulnar half of the nail[12.] Rarely, the pigmentation may spread from the proximal nail fold into the surrounding skin, a phenomenon known as Hutchinson's sign, which is associated with malignancy but also with benign lesions such as recurring junctional nevus. The hyperpigmentation associated with LHS occurs spontaneously and may progress slowly or remain stable. There are neither systemic findings nor genetic factors associated with the syndrome[1.]

HISTOPATHOLOGY

Histologically, the pigmented lesions in LHS show epithelial acanthosis and increased melanin pigmentation in the basal layer of the epithelium. Melanophages are seen in the upper lamina propria and dermis. Melanocytes are normal in number, morphology, and distribution[1.]

Epidermal and epithelial basal layer pigmentation is common in skin and mucosal lesions, respectively, with pigment- laiden melanophages evident in the papillary dermis. One report describes abundant melanin “free” in the papillary dermis[13.]

Acanthosis of the epidermis is emphasized in several cases; saw tooth or elongation of rete ridges is noted in 2 cases[14,15], whereas no elongation of epidermal rete ridges is described in other cases[16,17.]

Two recent reports demonstrated increased intraepidermal melanocytosis in the lesions of LHP, with one report also describing significant cellular atypia of intraepithelial melanocytes from a macular lesion on a sun-exposed area[18,19.]

DIFFERENTIAL DIAGNOSIS

The differential diagnosis of LHP includes Peutz- Jeghers syndrome (PJS), LAMB syndrome and LEOPARD syndrome. Intraepidermal melanocytic hyperplasia has been identified in the pigmented macules of all these syndromes.

LAMB syndrome is characterized by lentigines of the skin and mucosa, atrial and mucocutaneous myxomas, and multiple blue nevi, while LEOPARD syndrome is characterized by lentigines, electrocardiographic abnormalities, ocular hypertelorism, pulmonic stenosis, abnormalities of genitalia, retardation of growth, and deafness[4.]

The Peutz-Jeghers syndrome (PJS) shares most clinical features with LHS and must be ruled out in case of diffused oral pigmentation because it may be associated with an increased incidence of gastrointestinal as well as genital and mammary tumors. PJS is an autosomal dominant inherited disease with a high degree of penetrance characterized by intestinal polyposis and melanotic macules, particularly of the face and mouth[20.]

The differential diagnosis between PJS and LHS may be hampered by overlapping clinical and histological features. However, some characteristics may help to differentiate the two syndromes: the appearance of the lesions in infancy or early childhood and the presence of family hyperpigmentation or intestinal polyposis, or pigmentation also on the face, hands, and feet, suggest PJS, while LHS can be assumed when both oral and nail pigmentations are present[21.]

Other differential diagnosis include: Addison's disease is an endocrine disorder due to an insufficient production of cortisol and aldosterone that can present with diffuse hyperpigmentation of the skin and mucous membranes. The oral manifestations are primarily due to an increased level of circulating adrenocorticotropic hormone (ACTH) and may be the first sign of the disease, so the exact interpretation of the lesions is mandatory for prompt diagnosis and to institute appropriate therapeutic strategies. No clinical signs of systemic symptoms such as fatigue, weight loss, and cardiovascular or gastrointestinal disorders were found in our patient, and her plasma levels of cortisol and ACTH were normal[22.]

Albright’s syndrome is genetic disorder of bones, skin pigmentation, and hormonal problems with premature sexual development. Pigmentary changes are not pathognomonic but may include irregular often unilateral truncal pigmentation (caf´e-au-lait macules),macular lip, and genital pigmentation. No nail pigmentation has been reported. The syndrome manifests in childhood and this excludes the possibility of such pathology in our patient[22.]

Diffuse oral pigmentation may also be associated with systemic intake of drugs such as tetracyclines, antimalarials, amiodarone, chemotherapeutic agents, oral contraceptives, phenothiazines, azidothymidine, and ketoconazole. A correct diagnosis will resolve the drug-induced oral mucosal pigmentation following the suspension of the causative drug[23.]

Smoking may produce oral pigmentation called smoker's melanosis, is usually confined to the anterior attached gingival and not associated with pigmentation in other parts of the body[24.]

TREATMENT AND PROGNOSIS:

No literature reports have described a progression of LHS to oral cancer, and therefore all cases must be simply followed up without any specific treatment[25.] The reported treatment options include Q-switched Alexandrite laser, Q-switched Nd-Yag laser, and cryosurgery[26,27.]

In conclusion, LHS rare syndrome probably not well known among general dentists. Dentists should therefore be familiar with the Laugier-Hunziker syndrome as a benign condition not requiring treatment. When a patient presents with diffuse oral pigmentation, detailed history taking and thorough clinical examination including fingernails will establish the diagnosis and exclude local or systemic diseases requiring medical management.

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Periodontal Medicine-Oral Systemic Interrelation

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Abstract
Periodontal disease refers to the inflammatory processes that occur in the tissues surrounding the teeth in response to bacterial accumulations, or dental plaque, on the teeth. The bacterial accumulations cause an inflammatory response from the body. The chronic and progressive bacterial infection of the gums leads to alveolar bone destruction and loss of tissue attachment to the teeth. A growing body of scientific evidence has shown that severe periodontitis may enhance susceptibility to certain important systemic diseases and conditions, for example, cardiovascular disease, diabetes mellitus, adverse pregnancy outcomes, and pulmonary infections. Therefore, patients diagnosed with periodontal disease may be at higher risk due to a compromised immune system. Dental and medical practitioners should be aware of the clinical implications of these inter-relationships and treat affected patients in collaboration for better oral and general health.

Key Words
Periodontal disease, cardiovascular disease, diabetes mellitus, adverse pregnancy outcome, pulmonary infection.

Introduction

For decades, physicians and dentists have paid close attention to their own respective fields, specializing in medicine pertaining to the body and the oral cavity, respectively. However, recent findings have strongly suggested that oral health may be indicative of systemic health. Currently, this gap between allopathic medicine and dental medicine is quickly closing, due to significant findings supporting the association between periodontal disease and systemic conditions such as cardiovascular disease, type 2 diabetes mellitus, adverse pregnancy outcomes, and osteoporosis (1).

Periodontitis, one of the most common diseases of humans, is an infectious condition that can result in the inflammatory destruction of periodontal ligament and alveolar bone. In light of the extensive microbial plaques associated with periodontal infections, the chronic nature of these diseases, and the exuberant local and systemic host response to microbial assault, it is reasonable to hypothesize that these infections may influence overall health and the course of some systemic diseases (2).

The term Periodontal Medicine, as first suggested by Offenbacher (1996), can be viewed as a broad term that defines a rapidly emerging branch of Periodontology focusing on the wealth of new data establishing a strong relationship between periodontal health or disease and systemic health or disease. This means a two-way relationship in which periodontal disease in an individual may be a powerful influence on an individual's systemic health or disease as well as the more customarily understood role that systemic disease may have in influencing an individual's periodontal health or disease (3). The possibility that morbidity and mortality from systemic diseases may be reduced by improving periodontal health makes it imperative that this relationship be examined more closely (4).

Nature of periodontal disease as infectious burden to systemic health

It is estimated that 104 normal or commensal microbes reside on the surfaces of teeth, prosthetic implants, dentures, dental restorations, and the mucosal epithelia lining the oral cavity, respiratory tract, gastrointestinal tract, and urinary tract. The oral cavity contains almost half the commensal bacteria in the human body-approximately six billion microbes representing 300 to 500 species (5). In certain conditions, some of these micro-organisms may become opportunistic species that contribute to local and/or systemic infections. It is known that the oral microbial ecosystem is highly dynamic and the oral cavity faces a constant challenge of opportunistic infections and various oral complications of systemic diseases and disorders (6).

Periodontal lesions are recognized as continually renewing reservoirs for the systemic spread of bacterial antigens, Gram-negative bacteria, cytokines, and other proinflammatory mediators (1, 7). In a patient with moderate-to advanced periodontitis and a relatively complete dentition, it has been estimated that the total area of pocket epithelium in direct contact with subgingival biofilms is surprisingly large, being approximately 72 cm2- the size of the palm of the human hand (8).

Oral, especially periodontal, infections have been regarded as a source of focal infections for a long time. Miller originally published his 'focal infection theory' in 1891, indicating that "micro-organisms or their waste products obtain entrance of parts of the body adjacent to or remote from the mouth (5)."

Three different mechanisms by which oral bacteria may contribute to non-oral diseases have been described (9):

(1) Metastatic infection caused by translocation of bacteria;

(2) Metastatic injury related to microbial toxins; and

(3) Metastatic inflammation due to immune injury.

The focal infection concept has recently been given more attention by the dental and medical communities. This is largely due to improvements in methods of sampling, cultivation, and identification of bacteria that revealed the presence of micro-organisms well known to be oral colonisers in a variety of infected non-oral sites (10). It is also possible that periodontal bacteria or their products can directly invade the periodontal tissues. This represents a distinct mechanism by which periodontal disease-associated bacteria may gain access to the systemic circulation (2).

Moreover, periodontal diseases may also exacerbate existing heart conditions. It is known that poor dental hygiene and periodontal or periapical infections may produce bacteraemias even in the absence of dental procedures (5). Bacteremias can be provoked by mastication and oral hygiene procedures such as toothpicking, flossing and toothbrushing.The extent to which bacteremia of oral origin occurs appears to be directly related to the severity of gingival inflammation. Thus, the best means to prevent bacteremia from the oral cavity is the maintenance of periodontal health (2).

Organ Systems and Conditions Possibly Influenced by Periodontal Infection (11)

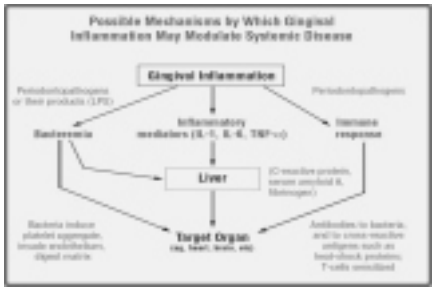
Cardiovascular System:
Atherosclerosis
Coronary heart disease
Angina
Myocardial infarction

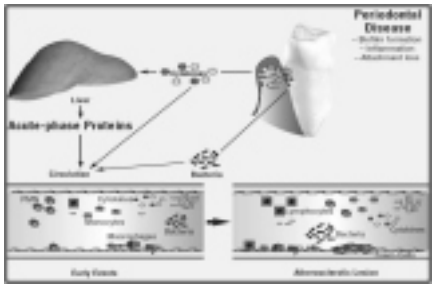
Endocrine System:
Diabetes mellitus

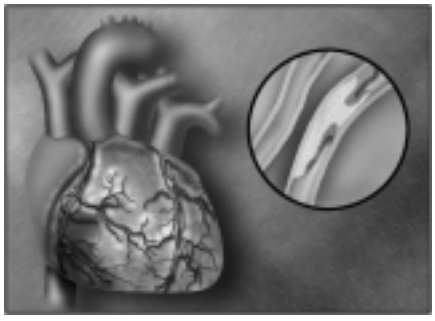
Reproductive System:
Preterm low birth-weight babies
Acute bacterial pneumonia

Respiratory System:
Chronic obstructive pulmonary disease

Cardiovascular diseases and Periodontal disease:
Cardiovascular disease (CVD) is a common cause of death, accounting for 29% of deaths worldwide (12). Estimates from the year 2002 show that more than 70 million Americans were diagnosed with one of the forms of CVD, which include high blood pressure, coronary heart disease (myocardial infarction and angina pectoris), peripheral arterial disease, and stroke, with atherosclerosis as the principal cause of all CVDs. Atherosclerosis is thus responsible for 50% of all mortality in the United States, Europe, and Japan (13). After adjustment of other risk factors, studies indicate that severe periodontal disease is associated with a 25% to 90% increase in risk for CVD (14). One study showed that 91% of patients with CVD demonstrated moderate to severe periodontitis, while 66% of cardiologically healthy patients had periodontitis. The same study showed a statistically significant correlation between coronary artery disease and periodontitis (15).







Periodontal disease & cardiovascular disease

Periodontal diseases might affect heart disease through the mechanism of oral bacteria, bacterial toxins, and induced inflammatory mediators entering the blood stream and contributing to chronic, systemic vascular challenge, directly resulting in platelet aggregation, adhesion, and vasculitis, with the subsequent cholesterol deposition, thromboembolic events, and atheroma formation (4, 8). Another possibility is that the inflammation caused by periodontal disease induces inflammatory cell infiltration into major vessels, vascular smooth muscle proliferation, vascular fatty degeneration, and increasing plaque build-up, which contribute to swelling and thickening of the arteries (5). These events may lead to atherosclerosis and atheroma formation, and result in obstruction of normal blood flow, restricting the amount of nutrients and oxygen required for the heart to function properly, and eventually increase the risk of heart attacks.

In addition, CVD and periodontal diseases have a number of common characteristics and may share a similar causative pathway through a hyper-inflammatory phenotype, for example, increased release of inflammatory cytokines and relevant mediators (4).

Whatever mechanisms are involved, it is evident that periodontitis may affect the host's susceptibility to systemic disease through subgingival biofilms acting as reservoirs of gram-negative bacteria and creating transient bacteremia, through release of microbial toxins and through a reservoir of inflammatory mediators. In parallel, all these factors are capable of predisposing the host to vascular changes or disorders. Further studies are required to find ways of intercepting these pathological changes, which may involve developing new generations of antimicrobial, anti-inflammatory, anti-infective or antithrombotic therapeutic agents (16).

Diabetes mellitus and Periodontal disease:
Diabetes mellitus is a metabolic disorder characterized by hyperglycaemia due to the defective secretion or activity of insulin. The condition affects more than 16 million people in the United States (17). Diabetes mellitus can be divided into three classifications according to signs and symptoms: type 1, type 2, and gestational. Type 1 diabetes mellitus results from the destruction of beta-cells within the islets of Langerhans of the pancreas, which leads to complete insulin deficiency. Type 2 diabetes mellitus ranges from insulin resistance progressively leading to pancreatic beta-cell failure. Lastly, gestational diabetes mellitus is a glucose intolerance that begins during pregnancy. The number of adults diagnosed

with type 2 diabetes worldwide is expected to grow from 135 million in 1995 to approximately 300 million in 2025 (18). People with type 2 diabetes constitute 90% of the diabetic population (19).

It has been known for years that patients with uncontrolled diabetes have a high risk for periodontal diseases (5). While in recent years, at least one study has shown a two-way relationship between periodontal disease and diabetes mellitus. Increasing scientific evidence shows that acute infections may alter the endocrinologic-metabolic status of the host, thus leading to difficulty with glycaemic control. Periodontal infection may adversely influence glycaemic control in diabetes and decrease insulin-mediated glucose uptake by skeletal muscle, resulting in poor glycaemic control. Moreover, induced production of pro-inflammatory mediators in periodontal disease also mediates insulin resistance and reduces insulin action (8). It is conceivable that unresolved periodontal disease could also increase blood sugar, contribute to increased periods of time when the body functions with high blood sugar, and make it harder for patients to control their blood sugar, putting poorly controlled patients with diabetes at a higher risk of the complications of the condition (5).

It has been shown that periodontal treatment directed at elimination of pathogenic species and controlling inflammation may have a positive impact on glycaemic control by restoring insulin sensitivity in poorly controlled patients with diabetes, possibly by suppressing glycosylation of proteins, formation of advanced glycation end-products, and activities of matrix metalloproteinases and other inflammatory mediators (8). Recent studies have shown that effective control of periodontal infection in patients with diabetes may reduce the level of advanced glycation end-products in the serum (20). In this regard, prevention of periodontal diseases and control of established periodontal diseases should be considered an integral part of diabetes control (19).

Adverse pregnancy outcomes (PLBW) and Periodontal disease:

Preterm low-birth weight (PLBW), as defined by the 29th World Health assembly in 1976, is a birth weight of less than 2500 grams with a gestational age of less than 37 weeks. Low birth weight can be a result of this short gestational period and/or retarded intrauterine growth (1). Preterm and / or low birth weight (PT/LBW) continues to be a significant cause of infant morbidity and mortality. PT/LBW is associated with risk for mortality in the first year of life, with developmental problems in childhood, and with risk of several diseases in adulthood (21). The prevalence of preterm birth varies from 6% to 15% of all deliveries, depending on the population studied, and the prevalence has risen in recent years (22). It is known that various risk factors, such as older (greater than 34 years) and younger (less than 17 years) maternal age, inadequate prenatal care, smoking, drug and alcohol abuse, hypertension, genitourinary tract infection, diabetes mellitus, and multiple pregnancies contribute to adverse pregnancy outcomes (4, 5, 23).

Periodontal Disease & Adverse Pregnancy Outcome

However, the recognised risk factors alone do not wholly account for the high prevalence of preterm low-birth-weight infants. An important factor contributing to this problem is the effect of maternal burden of infection such as bacterial infection of the genitourinary tract and bacterial vaginosis (5, 24, 25). Other than local infection of the genitourinary tract, potential infections distant from the placental complex or the genitourinary tract, due to an indirect action of translocated bacterial products such as lipopolysaccharide (LPS) and/or the action of maternally induced inflammatory mediators may adversely affect pregnancy outcomes (5, 25, 26). Therefore, periodontal disease might be a newly considered risk factor of adverse pregnancy

Periodontal pathogens, being gram-negative anaerobic bacterial species, may cause inflammation of the placental membrane. Bacterial lipopolysaccharide triggers release of a variety of biologically active mediators [(eg: interleukin I-beta (IL-1?), tumor necrosis factor-alpha (TNF-?) & prostaglandin E2 (PGE2)] which may contribute to premature labour. Periodontal infections may also impair foetal growth and trigger increased levels of biological fluids that induce preterm labour. Case control studies showed that preterm deliveries were 7.5-fold more common in women with severe periodontal disease than in those with good periodontal health. Women whose periodontal condition worsens during pregnancy have an even higher risk of having a premature baby (5). Hence, periodontal disease has the potential to influence preterm low birth weight through an indirect mechanism involving inflammatory mediators or a direct bacterial assault on the amnion (27).

Respiratory diseases and Periodontal disease:

The pneumonias are a group of diseases caused by a wide variety of infectious agents, including bacteria, mycoplasma, fungi, parasites, and viruses, resulting in infection of the pulmonary parenchyma. Pneumonia can be a life-threatening infection, especially in the elderly and immunocompromised patient and it is a significant cause of morbidity and mortality in patients of all ages. It is also possible that other pulmonary diseases may be adversely influenced by oral conditions. Chronic bronchitis is an inflammatory condition associated with excessive tracheobronchial mucous production sufficient to cause cough with expectoration for at least 3 months of the year for 2 or 3 successive years. Emphysema is the destruction of the air spaces distal to the terminal bronchiole with destruction of the alveolar septa. Chronic obstructive pulmonary disease (COPD) is characterized by chronic obstruction to airflow due to chronic bronchitis and / or emphysema. It is possible that aspiration of (oral) bacteria may exacerbate the course of COPD (2)

It is known that one of the most common routes of infection for bacterial pneumonia is aspiration of oropharyngeal contents (28). Oral bacteria have been implicated in the pathogenesis of this disease and, in this regard, dental plaque might be an important reservoir for these potential pathogens (29). It has been shown that bacteria that grow in the mouth and throat can be aspirated into the lower respiratory tract and lungs to contribute to respiratory diseases such as pneumonia or worsening lung conditions. A recent epidemiological study showed that people with poor oral hygiene were 4.5-fold more likely to have chronic respiratory

disease than those with satisfactory oral hygiene (5). A 25-year longitudinal study showed that alveolar bone loss due to periodontal diseases at baseline was an independent predictor of chronic obstructive pulmonary disease incidence (30). However, there is no strong evidence that periodontal diseases directly cause chronic obstructive pulmonary disease. Rather, periodontal disease may be an indicator of risk for lung disease, and these two disease conditions may share a common host susceptibility factor related to an underlying inflammatory response trait (4). Perhaps aspiration of saliva into which oral bacterial antigens, lipopolysaccharide and enzymes have been released promotes inflammation and infection of the lower airway. It is also possible that host-derived mediators such as cytokines and prostaglandins, which are elevated in the saliva of subjects with periodontal disease, promote lung inflammation and infection if aspirated into the lower airway. The possibility that bacteria in oral biofilms influence respiratory infection suggests that good oral hygiene may prevent the aspiration of large numbers of oral bacteria into the lower airway and thus prevent initiation or progression of respiratory infection in susceptible individuals. Further studies are required to verify the importance of oral conditions in the pathogenesis of lung diseases such as COPD (16).

Suggestions for the treatment of patients with systemic diseases or conditions (5)

Cardiovascular diseases:

Patients with CVD and those known to be at risk for CVD, from family history or from examination, for example, hypercholesterolaemia, should be advised to have a comprehensive periodontal examination and to undergo appropriate periodontal treatment as indicated on the basis of dental history and the findings of a periodontal examination. The importance of long-term control of periodontal diseases should be part of comprehensive health education for such patients.

Diabetes mellitus

Patients with diabetes, especially those for whom control of the disease proves to be difficult and those at risk of developing the disease, should be advised to have a comprehensive periodontal examination and to undergo appropriate periodontal treatment as indicated. Physicians should recognise periodontitis as a complication of diabetes mellitus and as a condition that, if left unresolved, can complicate the management of diabetes mellitus. From a dental point of view, patients with diabetes mellitus should have a functioning dentition maintained or receive adequate oral rehabilitation for good function.

Pregnancy

Expectant mothers should be advised to have a comprehensive periodontal examination prior to pregnancy or as soon thereafter as possible and preventive periodontal care should be instituted to prevent pregnancy gingivitis. Appropriate periodontal treatment at a suitable stage of pregnancy should be delivered to pregnant women with active periodontitis to help reduce the risks of adverse pregnancy outcomes.

Pulmonary diseases

Patients with chronic obstructive pulmonary diseases and those at risk of developing such diseases should be advised to have a comprehensive periodontal examination and to undergo appropriate periodontal treatment as indicated.

Dentist and doctor collaboration for better health

The advent of so-called periodontal medicine will promote a strong collaboration of dental professionals and medical professionals for better diagnosis and treatment across specialities. With medical doctors and dentists working closely together, more patients with systemic diseases are likely to be successfully treated, and patients will benefit from predictable treatment regimens to save and rehabilitate their dentition. The promotion of health and management of disease should require interdisciplinary education, updated knowledge and treatment strategies, and state-of-the-art health care delivery. While recognising and upholding the separateness of the dental and medical professions and sustaining and expanding the body of knowledge and practice that has developed since the foundation of dentistry as a separate profession from medicine, further integration of dental and general medicine requires a better communication between dentists and medical doctors, and more responsibilities and effective team approaches in the clinical management of their shared patients for better oral health and general health (5).

Conclusion

Extraordinary progress is being made in understanding the relationship between periodontal disease and systemic health. Periodontitis, one of the oldest and most common diseases of humans, was once generally believed to be an inevitable consequence of aging. However, we have learned over time that not all people, nor all populations, are at equal risk of developing periodontitis. An increasing body of epidemiological and experimental work has helped to identify specific risk factors and risk indicators, permitting better understanding of what makes an individual more susceptible to periodontal disease. This new knowledge gives increasing emphasis to the important role that systemic factors, diseases, and conditions may play in the causation and progression of periodontal disease. Dentistry has also become more cognizant of the extent to which behavioral factors play a role in risk. One goal of such investigations is that they may enable us to better identify individuals susceptible to periodontal disease in order to more effectively prevent and treat the disease (4).

The advent of periodontal medicine may also change the traditional objectives of periodontal treatment. The evaluation of success may shift from one focused on preventing attachment loss to one focused more on measurable reductions in the bacterial infection burden or reducing the levels of inflammatory mediators at involved sites. Oral health is an important component of general health, and individuals with periodontitis may be at risk for other diseases as well. The future of dental practice will be dramatically altered if subsequent research confirms that periodontal disease is a true risk factor for systemic disease and that the initiation or progression of these medical conditions can be reduced by periodontal treatment (4).

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Game Of Genes In Health And Disease

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Abstract
Genetics is the study of heredity, the process by which characters are passed from parents to their offsprings, so that all offsprings resemble their parents. The characteristics in the organism, thus, depend upon the kind of genes or DNA they receive from their parents. Mutation is any sudden heritable structural change in DNA.

Key Words
genes genetics DNA RNA

INTRODUCTION

The term genetics was introduced by Bateson in 1906, derived film Greek word Gene, which means 'to become' or "to grow into" therefore genetics is the science of 'coming into being'. Genetics is the study of heredity, the process by which characters are passed from parents to their offsprings, so that all offsprings resemble their parents. This phenomenon of transmission of characters from parents to the offsprings is called *Heredity*[1].

According to the concept of genetics, heredity is controlled by large number of genes that are located on chromosomes which are called *Hereditary Vehicles.* Chromosomes are composed of deoxyribonucleic acid (DNA) and protein. The characteristics in the organism, thus, depend upon the kind of genes or DNA they receive from their parents[2].

During 1930s, biochemical and biophysical methods were first applied to study the chemical nature of a gene. This led to the new branch of genetics- *Molecular Biology*[2].

Due to the close association and interdependence between genetics and molecular biology the term *Molecular Genetics* is now used. It is that branch of biology that is concerned with the study of genetic material, deoxyribonucleic acid (DNA), its replication to produce more DNA, its transcription into ribonucleic acid (RNA), and the translation of RNA into protein in the form of polypeptide chains[1].

DISCUSSION

STRUCTURE OF DNA

The three dimensional structure of DNA was deduced by James Watson and Francis Crick in the year 1953. DNA molecule is composed of two long, parallel, polynucleotide chains, which are twisted in the form of a double helix with sugars and phosphates forming its backbone[3]. DNA consists of 2 different classes of nitrogenous bases:

* 2 Purines-Adenine (A) and guanine (G) &
* 2 Pyrimidines- Cytosine (C) and thymine (T) (uracil in RNA).

The two strands are complementary and have an antiparallel orientation held together by hydrogen bonds between A or G of one chain and T or C of the other respectively **(Fig. 1).**

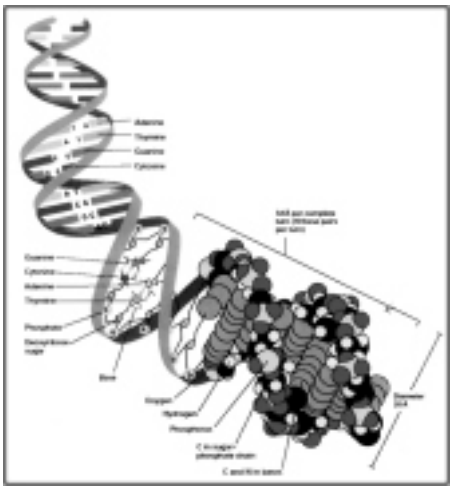


Fig. 1 Double helical structure of DNA.

- DNA precursors contain the pentose deoxyribose and the RNA precursors contain ribose instead. NUCLEOSIDE: Sugar + Nitrogenous base
- The nucleosides can serve as elementary precursors for DNA or RNA synthesis only when they become complexed with a phosphate group to form a nucleotide. NUCLEOTIDE: Sugar + Nitrogenous base + phosphate
- This phosphate group, is bound to the 5' carbon of the pentose sugar on one nucleotide, and bound to the 3' carbon of the sugar of the next nucleotide, so that a series of 5'-3' phosphate linkages, holds the nucleotides together along the length of the polymer.
- The phosphate bonds also called phosphodiester bonds are covalent bonds and so are extremely strong.

Types of DNA[3,4]

1. A- DNA- Right handed, with 11 base pairs per helical turn.
2. B- DNA- Right handed, with 10 base pairs per helical turn.
3. C- DNA and E- DNA- Right handed with slightly different configuration. Seen under very special environmental circumstances.

4. Z- DNA- Left handed, with 12 base pairs per helical turn. **(Fig. 2)**

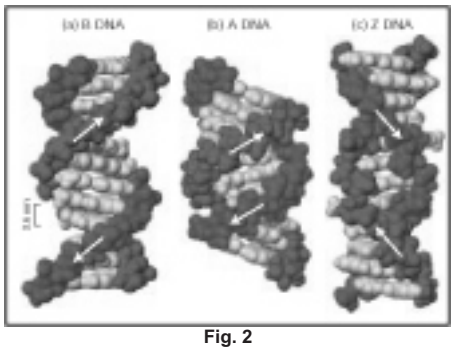


Fig. 2

Since the two chains are complementary, each synthesizes a second chain identical to one from which it had been separated, and the end result is two complete chromosome molecules, each identical to the original, this is referred to as *Semiconservative replication.* **(Fig. 3)**

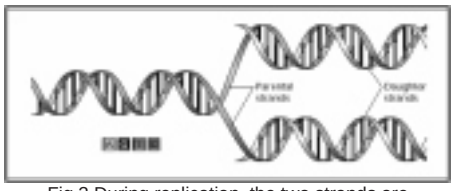


Fig.3 During replication, the two strands are unwound and used as templates to produce complementary strands. The outcome is two copies of the original double helix, each containing one of the original strands and one new daughter (complementary) strand.

STRUCTURE OF GENE

Gene is a segment of DNA that codes for a particular protein. There are two types of gene in the human genome:

1. Non-coding genes - will be transcribed but not translated (RNA genes).

2. Coding genes - will be transcribed and translated (Protein coding).

Genetic code[5,6]
The genetic code is the set of rules by which information encoded in genetic material is translated into proteins.

Salient features of genetic code [6,7]:
- Triplet i.e. comprises of 3 nitrogenous bases.
- Commaless i.e. there is no punctuation between the adjacent codons.
- Genetic code is universal. i.e., the same amino acids are coded for by the same codons, in all organisms studied, from bacteria to man.
- It has non-overlapping sequences.
- Genetic code is degenerate i.e. most amino acids are coded for by more than one triplet. This multiple system of coding is known as degenerate system. **(Fig.4)**

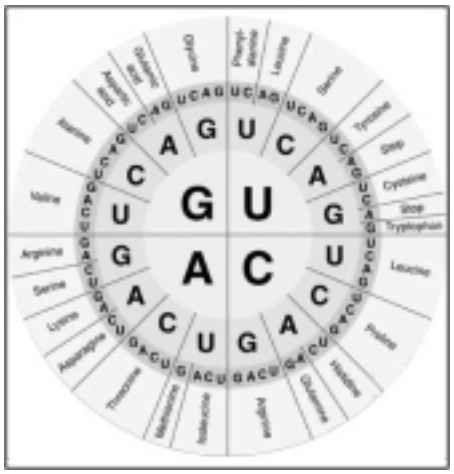


Fig.4 Genetic Code

DNA directs the synthesis of proteins which are molecules made up of amino acids arranged in a specific linear sequence. As there are 20 different amino acids, it is necessary for DNA to provide a code for each one of these. DNA has only 4 nitrogenous bases, which, taken one at a time, could code for only four amino acids. If two sequential bases would code for one amino acid there would be 4 x 4 or 16 possible combinations which are inadequate for 20 amino acids. The sequence in which amino acids are incorporated into a polypeptide chain is determined by the order of the corresponding triplets of bases. The coding region begins with the initiation codon, which is normally ATG. It ends with one of three termination codons: ATT, ATC, ACT. The synthesis of a polypeptide chain "Stops" when these codons have been read through.

RNA[5]
RNA (ribonucleic acid) - is composed of a single polynucleotide chain. It is synthesized on a DNA template by a process known as transcription which takes place in the presence of the enzyme RNA polymerase. **(Fig. 5)**

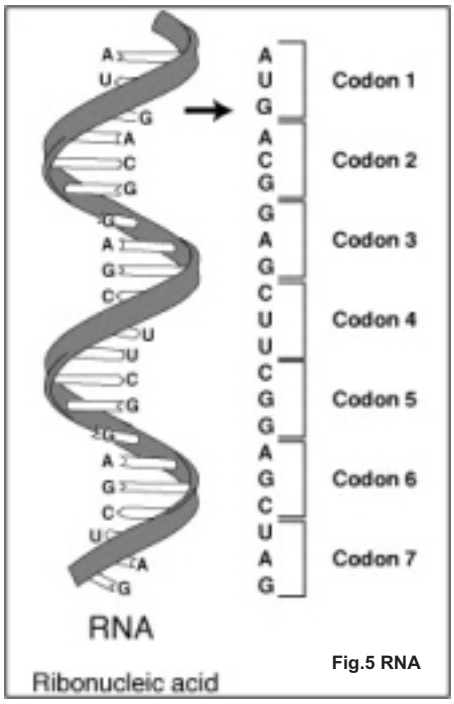


Fig.5 RNA

Three types of RNA concerned with protein synthesis: Messenger RNA, Transfer RNA and Ribosomal RNA.

Messenger RNA (mRNA):
It is produced in the nucleus. It represents a strand complementary to the DNA template; with the difference that uracil replaces thymine. It passes out from the nucleus to the cytoplasm and it dictates the sequence in which amino acids are incorporated into a polypeptide.

Transfer RNA (tRNA):
It is also known as **soluble RNA** (sRNA) or as **adaptor RNA.** It is concerned with bringing amino acids from the cytoplasm to their required places along the mRNA template. The tRNA molecule has an **anticodon** which is complementary to and reads a specific codon on the mRNA chain. The amino acid-tRNA complex is placed in the correct position on the linear mRNA molecule by the matching of codon and anticodon.

Ribosomal RNA (rRNA):
Ribosomes are made up of protein and nonspecific RNA (rRNA) in about equal proportions. The ribosomes are concerned with **reading the code** on mRNA and bringing amino acid-tRNA units into line at the appropriate codons. Ribosomes adhere to mRNA and then proceed along it. Ribosomal enzymes form peptide bonds between the **amino** acids. Once the peptide bond is formed, the polypeptide chain

breaks off from its ribosome. A ribosome takes about 10 seconds to read the length of an mRNA molecule.

Introns: In a single gene, there are five or more silent regions, the effects of which never appear in the final gene product, known as 'Introns'.

Exons: The functioning inter-intronic regions are called exons.
Introns are removed from the initial RNA formed by transcription and the exon-sequences are precisely joined or spliced together, by a process called **mRNA splicing,** to form a functional messenger RNA (mRNA). **(Fig. 6)**

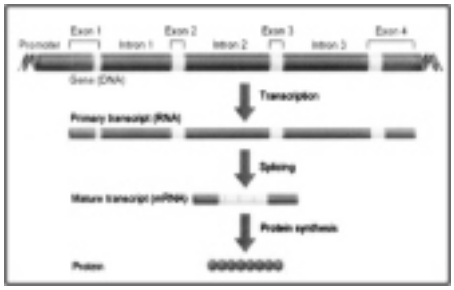


Fig.6 mRNA splicing

MUTATIONS
Mutation is any sudden heritable structural change in DNA. It also refers to the process by which a gene undergoes a structural change.
Mutations may be subdivided according to:[8, 9, 10]

A). Cause of mutation
1) Spontaneous mutations
2) Induced by exogenous agents

B). Type of change brought about by a mutation
1) Genome mutations (numerical chromosomal aberrations)
2) Chromosome mutations (structural chromosomal aberrations)
3) Gene or point mutation (alteration in the DNA at the molecular level)

C). Place at which a mutation occurs
1) Somatic mutations (occurring in body cells)
2) Germ cell mutations (occurring in germ cells - gametes)

SPONTANEOUS MUTATIONS[9]
- The mutational change may occur spontaneously, i.e. without exposure to mutagenic agents, or it may be induced by such mutagenic agents, eg. penetrating ionizing radiation or chemicals like mustard gas etc.

CHROMOSOMAL DISORDERS[8, 9, 10]
- These diseases are the result of the addition or deletion of entire chromosomes or part of chromosomes. Major chromosome disorders are characterized by growth retardation, mental retardation and a variety of somatic abnormalities. For eg. Down syndrome, caused by trisomy of chromosome 21. Clinically significant chromosomal abnormalities occur in nearly 1% of live born babies and accounts for about 1 % of pediatric hospital admission and 2.5% of childhood disease.

Types of chromosomal abnormalities:

I. Numerical
a) Euploidy: exact multiples of haploid no. of chromosomes. E.g. Diploid (46).

b) Polyploidy: multiples of haploid number of chromosomes other than diploid.
Triploidy - 69 chromosomes,
Tetraploidy - 92 chromosomes

c) Aneuploidy: chromosome number differing by 1 or more from an exact multiple of the haploid number.
Monosomy - loss of single chromosome,
Trisomy - gain of homologous chromosome
Tetrasomy - gain of 2 homologous chromosomes

II. Structural
a)Translocation: transfer of genetic material from one chromosome to another

Reciprocal - is formed when a break occurs in each of 2 chromosomes with the segments being exchanged to form 2 new derivative chromosomes.

Robertsonion - is a particular type of reciprocal translocation in which the breakpoints are located at or close to centromeres of 2 acrocentric chromosomes.

b)Deletion/Deletion: loss of part of chromosome resulting in monosomy for that segment.

Microdeletion- deletions of only a few genes at closely placed loci and are very small.

Ring chromosomes - when a break occurs on each arm of a chromosome leaving 2 sticky ends on the central portion which reunites as a ring.

c) Insertion: a segment of one chromosome becomes inserted into another chromosome.

d) Inversions: is a 2-break rearrangement involving a single chromosome in which a segment is reversed in position.

Pericentric: if the inversion segment involves the centromere.

Paracentric: if it involves only one arm of chromosome.

f) Isochromosomes: loss of one arm with duplication of the other E.g.: Turner's syndrome

g) Duplication: presence of a portion of chromosome more than once in a gamete or more than twice in a zygote.

III. Different cell lines (myxoploidy)
a) Mosaicism: Defined as presence in an individual or in a tissue of two or more cell lines which differ in their genetic constitution but are derived from single zygote. E.g.: Down's syndrome, Duchenne muscular dystrophy

b) Chemarism: Defined as the presence in an individual of two or more genetically distinct cell lines derived from more than one zygote. [Word 'chimaera' derived from Greek mythological monster which had a head of a lion, body of a goat and tail of a dragon].

SINGLE GENE DISORDERS/ POINT MUTATION[9]
- They are the alteration in the DNA at molecular level caused by a single mutant gene with a large effect on the patient's health. They account for approximately 5 - 10 % of pediatric hospital admissions and childhood mortality.

Examples:
a). Familial breast cancer and hereditary colon cancer occurs 1 in 300 individuals.

b). Sickle cell anemia occurs, 1 in 400 blacks in U.S.A.
- Mutations can also occur in genes on the mitochondria chromosomes, which are inherited in a uniquely maternal fashion.

Subclassification of gene or point mutation (Fig. 7):

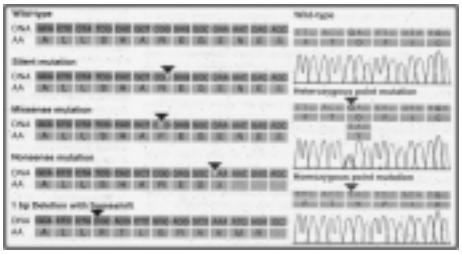
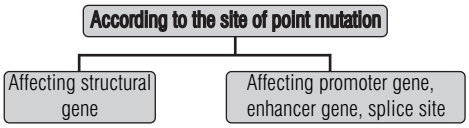
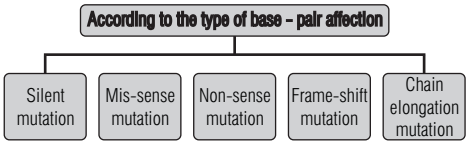


Fig.7 Examples of mutations. The coding strand is shown with the encoded amino-acid sequence.





Silent mutations: Because of the degeneracy of genetic code, many single base pair mutations do not change the amino acid sequence thereby exercising no effect. Such mutations are called silent substitutions.

Mis-sense mutations: These are type of base-pair substitutions which produce a change in a single amino acid.

Non-sense mutations: The base-pair substitutions which produce one of the three stop codons in the mRNA, altering the length of polypeptide either by shortening or lengthening.

- When a purine base is substituted for a pyrimidine base, it is called **transversion.**
- Substitution of one purine base for another purine base or a pyrimidine base for another pyrimidine base is known as **transition.**

Frame shift mutation: When deletion or insertion of base-pair is not a multiple of three, such insertions or deletions alter all the downstream codons.

POLYGENIC OR MULTIFACTORIAL DISORDERS[9]

- Results from the interaction of multiple genes, some of which have a major effect, but many of which have a relatively minor effect. Examples of such disorders are diabetes mellitus, hypertension, coronary heart diseases, schizophrenia, cleft lip and palate, congenital heart diseases etc.
- These diseases accounts for 25-50% of pediatric hospital admission and approximately 25-35% of childhood mortality.

SOMATIC CELL GENETIC DISORDERS[9]

- In the above three categories, there is abnormality in DNA of all cells in the body including germ cells and can be transmitted to subsequent generations.
- Cancer is a consequence of mutations in genes that control cellular growth; the most common genetic disease.

CONCLUSION

DNA molecule is composed of two long, parallel, polynucleotide chains, which are twisted in the form of a double helix with sugars and phosphates forming its backbone. Mutation is any sudden heritable structural change in DNA. Types of mutation include point mutations, deletions, insertion, rearrangements and duplications. The effect can be produced at any stage in transcription or translation.

In point mutations the change is in one base pair of the DNA molecule. Deletions can remove part of a gene, and if a deletion affects only part of a codon this will alter a reading frame, which results in a marked effect on transcription and subsequent translation. An example of this is a deletion in the dystrophin gene leading to a frame shift, resulting in Duchenne's muscular dystrophy. Sickle cell anaemia is an example in which a simple point mutation leads to modification of the mRNA.

The study of genetically determined conditions in which the defective enzyme alters the expected effect of a drug is termed pharmacogenetics.

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Saliva A Revolutionary Approach In Diagnosis

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Abstract
Saliva offers an alternative to serum as a biologic fluid that can be analyzed for diagnostic purposes and has a number of advantages. The aim of this article is to emphasize the use of whole saliva as a diagnostic tool. Whole saliva can be collected non-invasively, and by individuals with limited training. No special equipment is needed for collection of the fluid. Diagnosis of disease via the analysis of saliva is potentially valuable for children and older adults. As a diagnostic fluid, saliva offers many advantages over serum.

Key Words
Saliva, Serum, salivary glands, diagnostic fluid.

INTRODUCTION

Saliva is a clear, slightly acidic mucoserous exocrine secretion. Whole saliva is a complex mix of fluids from major & minor salivary glands & gingival crevicular fluid, containing oral bacteria & food debris. It is a unique fluid and interest in it as a diagnostic medium has advanced exponentially in the last 10 years. The most commonly used laboratory diagnostic procedures involve the analyses of the cellular and chemical constituents of blood. Other biologic fluids like urine, sweat and saliva are also utilized for the diagnosis of disease, but saliva offers some distinctive advantages. Whole saliva can be collected non-invasively, and by individuals with limited training. No special equipment is needed for collection of the fluid. Diagnosis of disease via the analysis of saliva is potentially valuable for children and older adults.

DISCUSSION

Saliva can be considered as gland-specific saliva and whole saliva. Gland-specific saliva is secretions of individual salivary glands: parotid, submandibular, sublingual, and minor salivary glands whereas whole saliva is a mixture of oral fluids and includes secretions from both the major and minor salivary glands.

The collection and evaluation of the secretions from the individual salivary glands are primarily useful for the detection of gland-specific pathology, *i.e.*, infection and obstruction. However, whole saliva is most frequently studied when salivary analysis is used for the evaluation of systemic disorders. Saliva can be collected with or without stimulation. Stimulated saliva is collected by masticatory action (*i.e.*, from a subject chewing on paraffin) or by gustatory stimulation (*i.e.,* application of citric acid on the subject's tongue (1). Stimulation obviously affects the quantity of saliva; however, the concentrations of some constituents and the pH of the fluid are also affected. Unstimulated saliva is collected without exogenous gustatory, masticatory, or mechanical stimulation. Unstimulated salivary flow rate is most affected by the degree of hydration, but also by olfactory stimulation, exposure to light, body positioning, and seasonal and diurnal factors. The best two ways to collect whole saliva are the draining method, in which saliva is allowed to drip off the lower lip, and the spitting method, in which the subject expectorates saliva into a test tube (2).

Some systemic diseases affect salivary glands directly or indirectly, and may influence the quantity of saliva that is produced, as well as the composition of the fluid. These characteristic changes may contribute to the diagnosis and early detection of these diseases.

Analysis of saliva may be useful for the diagnosis of:

1.Systemic Diseases-
- a.hereditary disorders
- b.autoimmune diseases
- c.malignant diseases
- d.infectious diseases,

2.Viral diseases (including HIV)

3.Assessment of therapeutic levels of drugs and the monitoring of illicit drug use

4.The Monitoring of Hormone Levels

5.Diagnosis of Oral Disease with Relevance for systemic Diseases.

Hereditary disease like coeliac disease, cystic fibrosis show changes in salivary composition but because of the lower sensitivity saliva is not used for diagnosis.
Sialochemistry may also be used to assist in the diagnosis of *autoimmune diseases* such as Sjögren's syndrome (SS). A consistent finding is increased concentrations of sodium and chloride. This increase is evident in both whole and gland-specific saliva (3). In addition, elevated levels of IgA, IgG, lactoferrin, and albumin, and a decreased concentration of phosphate were reported in saliva of patients with SS (4). Other salivary changes associated with SS include an elevated concentration of â2 microglobulin, although differences exist

between patients. In addition, elevated lipid levels and increased concentrations of cystatin C and cystatin S have been observed. Increased salivary concentrations of inflammatory mediators-*i.e.*, eicosanoids, PGE_2, thromboxane B2, and interleukin-6-have also been reported. The most important aspect of salivary diagnosis for this disease is evaluation of the reduced quantity of saliva. Cut-off values of 0.1 mL/min for resting whole saliva and 0.5 mL/min for stimulated saliva may be considered as indicative of salivary gland hypofunction (5). But, this reduced salivary flow, although is not pathognomonic for SS.

Salivary analysis may aid in the early detection of certain *malignant tumors* such as squamous cell carcinoma, breast cancer etc. p53 is a tumor suppressor protein which is produced in cells exposed to various types of DNA-damaging stress. p53 antibody can also be detected in the saliva of patients diagnosed with oral squamous cell carcinoma (SCC), and can thus assist in the early detection of, and screening for, this tumor (6).

Elevated levels of recognized tumor markers c-erbB-2 (erb) and cancer antigen 15-3 (CA15-3) were found in the saliva of women diagnosed with breast carcinoma, as compared with patients with benign lesions and healthy controls (7). CA 125 is a tumor marker for epithelial ovarian cancer. Elevated salivary levels of CA 125 were detected in patients with epithelial ovarian cancer as compared with patients with benign pelvic masses and healthy controls (8). Tumor markers that can be identified in saliva may be potentially useful for screening for malignant diseases.

Saliva may be used in the detection of *infectious diseases* like Helicobacter pylori and Shigella infection. Furthermore, the detection of pneumococcal C polysaccharide in saliva by ELISA may offer a valuable complement to conventional diagnostic methods for pneumococcal pneumonia.

The antibody response to infection is the basis for many diagnostic tests in virology. Saliva contains immunoglobulins that originate from two sources: the salivary glands and serum. The predominant immunoglobulin in saliva is secretory IgA (sIgA), which is derived from plasma cells in the salivary glands, and constitutes the main specific immune defense mechanism in saliva. In contrast, salivary IgM and IgG are primarily derived from serum via GCF, and are present in lower concentrations in saliva than is IgA. Antibodies against viruses and viral components can be detected in saliva and can aid in the diagnosis of acute viral infections, congenital infections, and reactivation of infection.

Saliva was found to be a useful alternative to serum for the diagnosis of viral hepatitis. Saliva may also be used for determining immunization and detecting infection with measles, mumps, and rubella (9). The detection of antibodies in oral fluid samples produced sensitivity and specificity of 97% and 100% for measles, 94% and 94% for mumps, and 98% and 98% for rubella, respectively, in comparison with detection of serum antibodies for these viruses (10).
For newborn infants, the salivary IgA response was found to be a better marker of rotavirus (RV) infection than the serum antibody response. Salivary levels of anti-dengue IgM and IgG demonstrated sensitivity of 92% and specificity of 100% in the diagnosis of primary and secondary infection, and salivary levels of IgG proved useful in differentiating between primary and secondary infection (11).

Studies have demonstrated that the diagnosis of infection with the human immunodeficiency virus (HIV) based on specific antibody in saliva is equivalent to serum in accuracy, and therefore applicable for both clinical use and epidemiological surveillance. As compared with serum, the sensitivity and specificity of antibody to HIV in saliva for detection of infection are between 95% and 100%. Analysis of antibody in saliva as a diagnostic test for HIV (or other infections) offers several distinctive advantages when compared with serum. Saliva can be collected non-invasively, which eliminates the risk of infection for the health care worker who collects the blood sample. Furthermore, viral transmission via saliva is unlikely, since infectious virus is rarely isolated from saliva. Saliva collection also simplifies the diagnostic process in special populations in whom blood drawing is difficult, *i.e.*, individuals with compromised venous access (*e.g.*, injecting drug users), patients with hemophilia, and children. Several salivary and oral fluid tests have been developed for HIV diagnosis (12).

Saliva has been proposed for the *monitoring of systemic levels of drugs.* A fundamental prerequisite for this diagnostic application of saliva is a definable relationship between the concentration of a therapeutic drug in blood (serum) and the concentration in saliva. For a drug to appear in saliva, drug molecules in serum must pass through the salivary glands and into the oral cavity. Saliva is useful for the monitoring of drugs such as anti-epileptic drugs, amphetamines, anti-cancer drugs, barbiturates, benzodiazepines, cocaine, phencyclidine (PCP), and opiods (13).

Measurements of *salivary hormone levels* are of clinical importance if they accurately reflect the serum hormone levels or if a constant correlation exists between salivary and serum hormone levels. More recent studies supported the use of salivary diagnosis for the evaluation of clinical problems associated with progesterone, estradiol, insulin, cortisol, aldosterone, and testosterone hormones.

The monitoring of gland-specific secretions is important for the differential diagnosis of diseases that may have an effect on specific salivary glands, like obstruction or infection.

It has been suggested that salivary nitrate, nitrite, and nitrosamine may be related to the development of oral and gastric cancer. Increased consumption of dietary nitrate and nitrite is associated with elevated levels of salivary nitrite. Higher levels of Saliva can be used for the detection of oral candidiasis, and salivary fungal counts may reflect mucosal colonization. Saliva may also be used for the monitoring of oral bacteria. Increased numbers of Streptococcus mutans and Lactobacilli in saliva were associated with increased caries prevalence and with the presence of root caries. Saliva can serve as a vector for bacterial transmission, and also as a reservoir for bacterial colonization. Detection of certain bacterial species in saliva can reflect their presence in dental plaque and periodontal pockets (14). Saliva may also be used for periodontal diagnosis, due in large part to contributions from GCF.

Human saliva contains proteins that can be informative for disease detection and surveillance of oral health.

CONCLUSION

Saliva offers an alternative to serum as a biologic fluid that can be analyzed for diagnostic purposes. Analysis of saliva can offer a cost-effective approach for the screening of large populations, and may

represent an alternative for patients in whom blood drawing is difficult, or when compliance is a problem. Due to its many potential advantages, salivary diagnosis provides an attractive alternative to more invasive, time-consuming, complicated, and expensive diagnostic approaches. Several diagnostic tests are commercially available and are currently used by patients, researchers, and clinicians.

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Indices Of Assessment Of Root Resorption.

Abstract
Root resorption is one of the main complication of orthodontic treatment.The onset and progression of root resorption are associated with risk factors related to the orthodontic treatment such as duration of the treatment, the magnitude of the force applied., the direction of the tooth movement, the method of force of application.Patient related risk factors are individual susceptibility on a genetic basis, some systemic diseases, anamolies in root morphology, dental trauma and previous endodontic treatment. The present study reviews the various the various indices devised sofar for root resorption following orthodontic treatment

Key Words
Root Resorption, Orthodontic Treatment, Dental Trauma, Cementoclasts, Index

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Introduction:
Root resorption associated with orthodontic treatment has been recognised as a clinical problem since 1920's.It is an undesirable sequel of orthodontic treatment leading to permanent loss of tooth structure from root apex.Its pathogenesis is associated with removal of necrotic tissue from the areas of periodontal ligament that have been compressed by orthodontic load. Loss of apical root structure is unpredictable and is irreversible when it extends into the dentine.

The assessment of root resorption should be simple and easily applicable.The morphological assessment of root resorption should also be associated with clinical signs and symptoms. Literature is full with number of root resorption indices, but no index has included root resorption with associated clinical features. The present literature reviews the existing indices and also develops an index which includes the measurement of root resorption with associated clinical signs and symptoms

1. Indices of the root resorption in vital permanent teeth was studied by Samuel Hemley.[1]
In spite of the difficulties involved in differentiating the degree of root resorption, it was felt that some arbitrary division was important so that not only the incidence but also the degree of root resorption should be measured.
Different degree of root resorption was noted:

1st stage: There was merely blunting of apices of teeth

2nd stage: There was loss of apices to the extent of from slight to that involving less than one third of the length of root.

3rd stage: Extent of the root resorption was approximately one third of the root.

4th stage: Resorption would exceed one third of the root.

2. Indices by Nassler and Malone[2]
Amount of the periapical root resorption in the roentgenogram of each tooth was assessed in the following manner:

Degree Description Or Type of resoption

0. No evidence of resorption.

1. Resorption questionable. Root outline intact but there appears to be minute areas of spotty resorption. Lamina Dura is interrupted and periodontal membrane widened.

1+ Root apex definitely blunted and resorbed for at least 1 mm to about 2mm. Lamina dura interrupted and periodontal membrane widened about the apical area of the root

2+ Resorption of the root apex for at least 2mm to 4mm. lamina dura. Interrupted and periodontal membrane widened.

3+ Resorption of root 4mm ½ of the root length.

4+ More than ½ of the root resorbed.

5+ Root resorption definitely related to the root canal therapy (degree not assessed)

6+ Root resorption definitely related to the periapical infection (cysts,etc)

8. Not diagnosable (roentenogram of poor quality)

9. Tooth marring.

This method of rating the amount of root resorption was similar to but more detailed than the one employed by Hemley S.

3. Phillips[3] evaluated each tooth using the following criteria for estimating the amount of apical root loss

Slight: Minimal blunting of the root apex.

Moderate: Upto approximately ¼ th the root length

Excessive: Over ¼ the root length loss.

Questionable: Possible traces of resorption not positively identifiable because of distortions due to film placement or differences in x-ray cone angulation.

4. Classification given by DeShields[4]:

Apical Resorption of the maxillary incisors was evaluated by the following classification:

Grade 0- No resorption.

Grade 1- Possible resorption. There was some indistinctness of apical outline.

Grade 2- Definite resorption. The apical outline was definitely irregular but the root was not shortened.

Grade 3- Mild apical blunting.The reduction in the root length was less than 3mm.

Grade 4- Moderate apical blunting. The root was reduced in length, more than 3mm but less than 1/3 the root length.

Grade 5- Severe blunting, more than 1/3 of the original root length was lost.

5. Root resorption index by Vonder Ahe et al[5]

Arbitrary standards defining various levels of severity of root and resorption were chosen to conform the three groups used previously by Phillips and Stucki

Group 1: Slight or minimal blunting of root apices

Group 2: Moderate or upto approximately ¼ the root length loss.

Group 3: Excessive or over 1/4th root length loss.

6. Indices by Plets et al[6]

The apical anatomy of the maxillary central incisors was also evaluated and graded according to the most common apical configuration observed. The classes were as follows

1. Normal, regular and definite apical outline.

2. Irregular, break in continuity or irregular outline

3. Angular, definite angular discrepancy to the apex.

4. Rounded or flat, either round or flat appearing with either angular or rounded borders.

If the apex has characteristics of the two classes the more severe class was recorded.

Class 1 is normal. Class 2 to Class 4 shows progressively greater amounts of root loss. This system is supplemental to the use of root length to the total tooth length ratios.

7. Root resorption in patients was classified according to four categories by Newman[7]

0- No resorption or shortening.

1- Questionable root shortening

2- Definite root shortening but not severe

3- Severe shortening

8. Root resorption indices according to Goldson and Henrikson[8]

0- No visible resorption

1- Irregular root contour probably caused by resorption.

2- Root resorption as oblique resorption in the apical 1/3 rd of the root. The resorption surface or surfaces do not cut the midline of the tooth.

3- Root resorption apically less than 2 mm. The resorption surface cuts the midline of the tooth.

4- Same as three combined with the oblique resorption within the apical third if the root.

5- Root resorption apically 2mm to 1/3 rd of the root.

6- Same as five combined with oblique resorption within apical third of the root.

7- Root resorption 1/3 rd to the 2/3 of the root

8- Root resortion more then 2/3 rd of the root.

9- Short root rounded apically with even root control.

10- Manifest root resorption but not measurable because of unsuitable projection

11- Unevaluable roetengenogram.

9. In Odenrick's[9] Study apical root resorption was recorded and graded by using the following index.

0- no sign of root resorption.

1- Irregular apical root contour

3- Resorption less than 2mm

5- Resorption from 2mm to 1/3 of root length.

7- Resorption of 1/3 rd to 2/3 of root length.

10. Index by Levender and Malngrem[10] :

1. Irregular root contour

2. Less than 2mm root resorption (minor)

3. 2mm to 1/3 rd of the root length loss (severe)

4. Exceeding 1/3rd of root (extreme)

After reviewing the literature it was found that all the root resorption indices considered the length of the roots only but from clinical aspect crown and root length ratios are to be considered. Therefore an index was designed that took into the consideration the root crown ratio. IOPA radiographs are to be taken using the paralleling technique and without bending the film.

Root resorption index considering crown and root length ratio associated with clinical symptoms:

1- Normal and definitive outline.

2- Irregular outline.

3- Angular resorption.

4- Rounded or flat apex and crown root ratio is nearly equal 1:1.2.

5- Marked resorption, crown root ratio 1:1.

6- Severe resorption, crown root ratio 1 :< 1 and tooth is symptomless and no mobility present.

7- Extensive root resorption, crown root ratio 1 :< 1, symptomatic tooth but no mobility.

8- Functional impairement leading to failure crown root ratio 1 :< 1, symptomatic tooth with mobility.

Conclusion:

The root resorption index developed can be very useful in Clinical studies because it takes into consideration the Clinical sign and symptoms associated with root resorption, since in most of the cases the root resorption due to treatment may not be so severe, so as to decrease the longevity and the functional capacity of the involved teeth.

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IJDS in News

Friday, September 30, 2011

Shimla: Governor Smt. Urmila Singh stressed upon the need to maintain healthy academic atmosphere in Universities congenial for pursuing higher studies and added that quality education should be imparted to the students at University level. She urged the Vice Chancellors to play a pro active role in this direction. She also emphasized on focusing upon research activities for enriching higher education. She was addressing the North Zone Vice Chancellor's Conference here today.

Smt. Urmila Singh said that education played an important role in ensuring balanced growth of the students and added that aim of the education should not be merely employment seeking but also equipping the students with technical expertise so that they could adopt self employment ventures. Education should ensure holistic development of students, she said.

Governor urged the youth to take up self employment ventures and added that higher education should ensure employment opportunities to students. She further said that youth were playing a constructive role in nation building by becoming entrepreneurs leading to their economic empowerment.

Smt. Urmila Singh said that India had marched ahead on the path of progress in all sectors and added that rural development was essential for overall development of the country. She also stressed upon expansion of education for transforming the country as a completely developed nation. She hoped that constructive deliberations would be held in the conference which was held for the first time at Shimla.

Governor released HPU News letter, Tourism Development Journal and **Indian Journal of Dental Science.**

Shri I.D. Dhiman, Education Minister stressed upon the need to encourage Guru-Shishya tradition. He emphasized upon promoting Hind and Sanskrit languages.

Shri P.T. Chande, President, Association Indian Universities also spoke on the occasion.

Shri A.D.N. Vajpayee welcomed the Governor and others on the occasion.

Prof. H.S. Banyal, Dean of Studies HPU proposed vote of thanks.

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Oral Complications And Its Management During Radiotherapy

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Abstract
Cancer is a class of diseases in which a cell or a group of cells display uncontrolled growth, invasion, and sometimes metastasis . The term head and neck cancer refers to a group of biologically similar cancers originating from the upper aerodigestive tract, including the lip, oral cavity , nasal cavity, paranasal sinuses, pharynx, and larynx. 90% of head and neck cancers are squamous cell carcinomas , originating from the mucosal lining (epithelium) of these regions. Radiation therapy is the most common form of treatment along with surgery and chemotherapy. There are different forms of radiation therapy, including 3D conformal radiation therapy, intensity-modulated radiation therapy, and brachytherapy, which are commonly used in the treatments of cancers of the head and neck. There are both acute and long-term sequelae of radiation therapy (RT) for head and neck cancer (HNC) that occur because of effects on normal tissues. Radiotherapy-induced oral complications are complex, dynamic pathobiological processes that lower the quality of life and predispose patients to serious clinical disorders. Radiotherapy-induced damage in the oral mucosa is the result of the deleterious effects of radiation, not only on the oral mucosa itself but also on the adjacent salivary glands, bone, dentition, and masticatory musculature and apparatus.

Dental surgeons should organize and implement preventive and therapeutic strategies in the management of various complications due to radiotherapy. The clinical features, diagnosis and management of various complications are discussed here. The present article mainly presents a brief overview of the whole programme of oral evaluation and proper care before, during & after the radiotherapy managing all the common problems involved.

Key Words
Head and neck cancer,Radiotherapy,Oral mucosa

Introduction

A patient who is undergoing radiotherapy for head & neck carcinoma (HNC) suffers from many oral complications. The national institute of health in a consensus development statement estimated that as many as 400,000 patients developed oral complications as a result of cancer treatment[1]. Generally these oral complications are painful and increase the agony of the patient who is already distressed (NIH 1989). Early dental intervention and counselling is the best way to minimize these oral complications[2]. Ideally, the dental examination and necessary dental treatment should be performed prior to the onset of definitive cancer treatment[3]. During the initial dental appointment, patient should be made to understand about the short and long term effects[4, 5] of radiation to the head and neck. Additionally, the patient should be told about increased susceptibility to oral infections and muscular fibrosis which severely limits the ability to open mouth, making dental procedures difficult to perform[6].

Adverse effects of radiotherapy:-

Usually within the 1- 2 weeks of fractionated radiation treatment[7] the salivary gland tissue which is included in the field of radiation suffers a permanent loss of function .This may ultimately lead to xerostomia or a decreased salivary flow. Saliva has a crucial role to play in the maintenance of oral homeostasis. The complex mixture of protein, glycoproteins, mucins, and ions help prevent dental caries, promotes remineralization of early carious lesions, buffers acid generation by oral bacteria, and prevents other types of oral infections[8]. Protein such as salivary peroxidise, lysozyme, and lactoferrin are antibacterial agents and limit the growth of cariogenic bacteria[8].

Histatins, a family of salivary proteins, have potent antifungal properties which limits the growth of oral yeast. Salivary gland also secretes immunoglobulins A & M which specifically acts against oral cariogenic bacteria[8].

Pre- radiation phase:

Preventive and Therapeutic Dental care

Frequent dental examination is essential to reduce the risk & severity of oral complications. Full mouth or panoramic x-rays are the necessary part of comprehensive clinical examination of the periodontium and oral soft tissues[9, 11]. To start with, an assessment of the patients' oral hygiene is made. This data acts as the base line for monitoring the effects of radiation therapy. Dental prophylaxis is done[9], and reviewed as quickly as possible. Patient education regarding the need for meticulous oral hygiene and frequent follow-up must be stressed.

Definitive restorations should be done in the case of caries.If the caries is extensive and involves pulp but the prognosis is good,Root

canal treatment should be done. If the prognosis is poor, the tooth should be extracted[3]. A healing period of at least 10 days to 3 weeks should be present, in the case of extractions, before radiation therapy begins[4.] Extractions should be done as atraumatically as possible and antibiotic coverage should be given[10.]

Periodontally involved teeth exhibiting moderate to severe mobility should also be considered for removal. If there is any doubt regarding the prognosis of the tooth, extractions should be done because extraction following radiation treatment will present an increased risk of osteoradionecrosis[4, 10.] It must also be remembered that wound healing will be compromised, and extensive periodontal treatment following radiation will be contraindicated[11.]

Preradiation prosthetic care:

The severity of resulting mucositis[12] will limit the patient's ability to tolerate the prosthesis during therapy. The patient must be cautioned that continuously wearing the dentures may be a source of mucosal irritation and should be advised about periodically resting the mucosa. If the denture or prosthesis is ill-fitting temporary relining materials should not be used to reline it because surface porosity and abrasiveness of these materials make hygiene procedure difficult and serve as a potential reservoir for fungal growth thereby increasing mucosal discomfort.

Dentate patients with metallic crowns or fixed partial dentures in the treatment field may suffer significant irritation to adjacent soft tissue as a result of backscatter. This problem can be minimised with the use of custom made, soft plastic stent.

In case of dental implants placed in the mouth, radiation therapists generally decide to go for the removal of implants positioned in the treatment fields.
Xerostomia: Patients with reduced salivary flow also have an increased incidence of oral fungal infections and salivary gland infections[13.] Preventive measures should be undertaken in patients with decreased salivary function.

Radiation phase:

Mucositis
One of the earliest complications of radiation therapy is the development of mucositis. The soft tissues in the treatment field, after a week or two, demonstrate a moderate amount of erythema. As radiation continues, the mucosa may exhibit varying degrees of desquamation and frank ulceration, resulting in pain and dysphagia which make it difficult for the patient to eat a well balanced diet leading to significant weight loss and malnutrition .The possible solutions are as following:

- Patient should be advised to eat small amount of meals four to six times daily rather than three big meals.
- Intake of easy to swallow nutritious fluids like soups, milk shakes and curd should be increased.
- Psychological counselling.

Acute mucositis[12] begins during the second or third week of radiation therapy and subsides within 8 to 10 weeks once treatment is completed. Good oral hygiene is perhaps the best way to reduce the complications. Frequent daily cleaning of the teeth and oral rinse with a combination of salt and sodium bicarbonate[2] in water or dilute solutions of hydrogen peroxide and water have a soothing effect on the affected areas. Other therapies have included rinsing with Benadryl elixirs sucrafate solutions, and topical anaesthetics.

Loss of taste:

Loss of taste is the most common side effect accompanying radiation to the tongue and palate during 1-2 weeks after radiotherapy which gradually returns back to normal after the course is completed. The most common contributing factors are damaged taste buds, disrupted innervations and decreased salivary flow[2.]

Xerostomia:

Changes in the quantity and quality of saliva as a result of radiation have been well documented in the dental literature[5.] Beginning with the first course of treatment, salivary flow rates decrease, eventually reaching as low as 1% of normal[7.]
Xerostomia may be caused by radiation therapy and drugs, severing of salivary duct and gland (accidental or intentional), decreased liquid intake or stress and anxiety. Measures taken to reduce the severity of xerostomia are[5, 13]

- Radiation stents [14]can be fabricated to shield the ipsilateral side when unilateral radiation treatment is required. Another method of limiting radiation to salivary gland is conformal and **intensity-modulated irradiation technique** (IMRT) [15] .This technique targets the lesion while sparing the major salivary glands from radiation. This technique shows fewer xerostomia complaints, better quality of life and decreased loss of function of salivary glands than in patients with conventional radiotherapy.
- Patient should be encouraged to maintain an adequate fluid intake and remain hydrated to prevent bacterial infections of the glands.
- Tongue coating, due to xerostomia, impairs the taste. To overcome this, tongue should be cleaned two or three times daily with a bicarbonate soda solution.
- Sticky foods such as chocolates and pastries (cariogenic) should be avoided.
- Artificial salivary substitutes are prescribed.
- Caffeine- containing beverages, Alcohol or strong flavours should be avoided.
- Sugar free candies, gums & mints (containing xylitol) should be used.
- Secretagogues i.e. pilocarpines[16], Anethole trithione & cevimeline acts by stimulating the functioning of salivary gland tissue.
- Sugarless antifungal agents such as nystatin powder and clotrimazole vaginal troches[13] can be used to treat infections; any intraoral acrylic prosthesis used by an infected patient must be soaked in an antifungal agent.
- Salivary glands should be evacuated daily by gentle massage, sucking on sugarless candies[13], and wiping the oral cavity with glycerine swabs .This helps in preventing mucous plug formation and subsequent salivary gland infections.
- Slight modifications in the patient's medication regimen can reduce the degree of complaints due to medication-induced dryness normally salivary flow declines at night. So taking a medication that reduces flow in the morning or dividing medication doses when possible may improve oral comfort and reduce xerostomia[5, 13.]
- Amifostine[13, 7] is an oxygen scavenger that may protect salivary glands from free radical damage during radiation therapy. It has a broad spectrum of cyto-protective and radio- protective function which reduces xerostomia during head and neck radiation therapy. However it requires intravenous drug administration.

Dental caries:

Decreased flow of saliva generally results in aggressive dental caries. One of the most effective methods of treating this condition is through the daily use of tropical applications of fluoride [5]. Both stannous and sodium fluoride have been used in a variety of forms[3] with significant success. One additional advantage of stannous fluoride is that it has an antimicrobial effect, reducing ***s. mutans*** counts. Sodium fluoride, [3, 5] because of its higher pH, is less irritating to the compromised soft tissue and is substituted for the stannous form for patients who complain of a burning sensation when using the stannous gel. Gels used with the tray cover all tooth surfaces than either fluoride rinses or gels applied with a brush. Some authors have proposed that the use of a tray as a carrier simplifies the fluoride application procedure and improves patient compliance, achieving a better overall effect[3,5.]

Clinical experience has demonstrated that discontinuing the fluoride application, even for short period of time, may result in renewed cariogenic activity.

Trismus & fibrosis:

Trismus may begin shortly after radiation begins. Patients suffering with tumours of the palate, nasopharynx, and maxillary sinus are most likely to develop trismus. If unmanaged, trismus makes eating difficult and various dental clinical procedures almost impossible. The primary treatment is essentially to exercise the muscles involved. Bite openers or exercise devices like tongue blades are provided to the patients. Improvement is generally short-lived and reappears over a period of even a few hours. Therefore, exercising at regular time intervals is mandatory to avoid the severity of trismus.

Chronic trismus gradually converts into fibrosis of the muscles and at this late stage, stretching of muscle is not favoured as a solution. Exercise must begin early in treatment regimen.

Shielding and positioning stents[14]

To minimise the morbidity & its effects on the soft tissues associated with radiotherapy stents are used.These are mainly of two types-

I. Positioning stents[14;]

These stents lower the tongue and keep the mandible and maxilla in an open position. Maxillary structures such as palate, upper gingiva, and buccal mucosa are therefore spared of radiation hazards.

II. Shielding stents[14;]

It is used to protect uninvolved adjacent structures when electron beam therapy is given. It is known that 1 cm thickness of a Lipowitz alloy (Cerro bend, Cero metal Products, Bellefort, PA) .It is a eutectic alloy of 50% bismuth, 26.7% lead, 13.3% tin, and 10% cadmium by weight. The lead effectively reduces an 18 Mev electron beam by approximately 95%. The metal is only effective, however when electrons are used.

Post radiation phase: Maintenance of oral hygiene

Acute mucositis & loss of taste will subside gradually over a period of 6-8 weeks. The length of time necessary for recovery is dependent on the severity of damage to the soft tissue (may take months to recover). The loss of salivary function is permanent, and salivary flow rates have been proved to decrease with time. As a result, oral tissues will remain dry and uncomfortable. So the patient has to maintain meticulous oral hygiene, with daily rinsing mouthwashes and regular use of salivary substitutes[13.] Daily topical application of fluoride is done to restrict the cariogenic activity. Tooth decay leading to pulpal pathosis can be a serious problem in the radiated patient since extraction of the involved teeth is a complicated undertaking.

Candidiasis:
During or following radiation, most common infection is due to candida albicans .This results in generalised inflammation involving the palate & cheeks. The irradiated tissue may exhibit some erythema but lack whitish patches generally associated with candida.

Management:-

a) Clotrimazole or nystatin rinses are prescribed if culture test is positive along with appropriate antibiotics in case of bacterial infection.

b) Meticulous oral hygiene and frequent rinsing with salt and soda or diluted solution of water.

c) Candida may be harboured in or on the surface of dentures or obturators and play a role in chronic reinfection. Soaking prostheses in an antifungal solution or dilute hypochlorite for complete dentures have proven to be effective preventive measures.

Trismus & fibrosis:

Trismus and fibrosis will continue following radiation therapy which will increase in severity with time. This condition will only improve with constant exercise regimen[20.] Exercise should be performed deliberately at regular intervals followed by periods of rest[14, 20.] The more frequent and diligent the exercise regimen, the more beneficial the result.

Osteoradionecrosis:

Osteoradionecrosis (ORN) [4] is a condition of nonvital bone in the site of radiation injury. ORN can be spontaneous, but it most commonly results from tissue injury. The cause is related to the hypovascular, hypocellular, and hypoxic conditions that exist in bone following radiation. The main contributing factors are trauma, type of radiation, dosage & tissue volume involved. ORN is more common in the mandible than in maxilla[4.]

Management:-

Initial treatment should always be conservative. The lesion should be carefully cleansed and any small, sequestered bony fragments are carefully removed[17.] Oral hygiene procedures are reviewed and the patient is asked to rinse frequently with dilute hydrogen peroxide or a salt and soda solution in an effort to keep the area moist and clean[17.] Dentures are relieved over the affected area and soft plastic mouth guards have also been used as protective devices. Topical packing of the area with zinc oxide or various antibiotics has been recommended[15, 17.] Following initial treatment frequent visit at regular intervals to a dentist is recommended. When sequestra are evident, they may be judiciously removed and the areas kept smooth to avoid irritation to surrounding tissues. The dentist must be aware that these relatively asymptomatic lesions will take an

extended period of time to heal.

If the conservative treatment does not work the patient is referred for hyperbaric oxygen therapy[17]. In 1983, Marx demonstrated successful resolution of mandibular ORN in 58 patients using a staged protocol with HBO and surgery. Substantial portions of the mandible may be removed leading to discontinuity defects. Mandibular reconstruction using micro vascular surgical techniques may be necessary to restore patient function. Hyperbaric oxygen has proven to be an effective method of managing the patient with ORN[17], solving a difficult, frustrating problem.

Post- radiation prosthodontic care:

Patient treated with radiotherapy suffer substantial changes to the oral mucosa and are often require new complete or partial dentures. Ideally, the oral soft tissue must be adequately healed before necessary prosthodontic procedures can be initiated[18]. There are suggestions that a latent period of at least 6 months to one year should be provided[18]. However, the ultimate treatment plan depends upon the clinician who takes into account all the factors.

Dental extractions:

A conservative approach is advised in regard to extraction of teeth after radiation[10]. Extraction should only be considered after careful evaluation. Extremely mobile, periodontally compromised teeth can be safely removed with minimal risk of developing ORN. In situations involving single tooth, endodontics should be considered as an alternative approach even when the tooth is considered nonrestorable. Teeth located in areas not included in the radiation fields can be extracted safely.

Conclusion:

The cancer patient who is to receive or has received curative doses of radiation to the head and neck presents a challenge for the dentist. The importance of patient compliance should be emphasized. The dentist has to take a huge challenge because treatment provided in this stage can have life long effects. They must also have an understanding of basic radiation and dental oncology techniques and their own limitations but need not be trained specialists to justify their involvement in the management of oral health of this unique group of patients. In most instances, routine dental treatment provided by the patient's general dentist in a prudent way is satisfactory enough.

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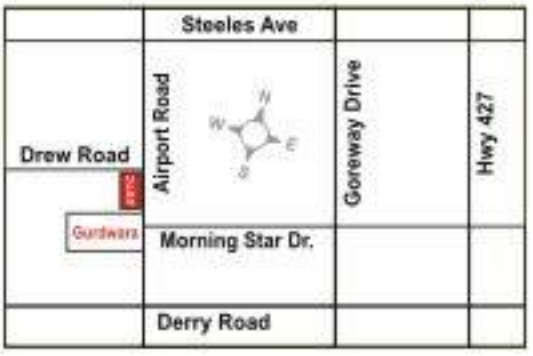

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