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MESSAGE



It is heartening for me to know that the Mithila Minority Dental College & Hospital is bringing out its Journal, for providing the multitude of needful information about Bachelor of Dental Science Programme which is being conducted under the aegis of this Department.

Conducting a professional programme like BDS in a predominantly under-developed region like Mithilanchal is daunting and challenging task. This is primarily because education systems and practices have undergone sea level changes over the past years, so much so that at times it becomes pretty difficult to cope with some of their basic pre-requisites for an institute situated at places far flung from the educational conglomerates.

I am happy to note that amidst all such constraints the BDS Programme of our University has been able to carve out a distinct place for itself in the galaxy of Dental Science in the country.

Hope and trust, in the days to come greater attention would be paid to facilitate Dental-academic interface so as to have better feel of the ground realities calling the shots in the highly competitive education world especially in the field of Dental Science.

As the Vice-Chancellor of L. N. Mithila University, Darbhanga, I wish all the best to all the aspirants of BDS programme of the Institute.

(S. K. Singh)

Vice-Chancellor

MESSAGE FROM THE MANAGING DIRECTOR

“Somewhere, something incredible is waiting to be known.” Carl Sagan

Wishing you all a very happy New Year and warm greetings from MMDCH. I am really glad that a new issue of JODH is getting published. I sincerely believe it will be a good forum for exchange of informations related to recent happenings in Dentistry and will be informative and useful to all related to the Dental field. I would happy to see more and more of original research articles being published. With the renewed, redesigned and reimaged version of the Journal which from now onwards will be available on the net as well will definitely pave a wider path for scientific exchange of thoughts and evolve as a more assertive medium for excellence in Dentistry. That is all about rebirth and potential and the promise of tomorrow.

While technology efficiently delivers news stories to our desktops, laptops and mobile devices, Journals are all about context—how ideas and images are presented in relation to one another and within a larger point of view. I am sure the Editor Prof (Dr) Dipto De and his team has done a good job and I appreciate their untiring efforts and I am sure the Journal will keep the readers absorbed.



I. Shaukat

*Managing Director
Mithila Minority Dental College & Hospital,
Darbhanga, Bihar.*

MESSAGE FROM THE EDITOR IN CHIEF

“Research is to see what everybody else has seen and to think what nobody else has thought.”

- Albert Szent Gyorgyi

Greetings to all,

It gives me immense pleasure to introduce this inaugural edition of the Journal of Oral and Dental Health to the dental professional fraternity. This journal is an excellent dedication to the professional development of dentistry in the Republic of India as well as the South East Asian region of countries engaged in research of various Sciences associated with Dental & Oral health. This Journal is an official publication of the Mithila Minority Dental College & Hospital, Darbhanga (Bihar) affiliated to the State run Lalit Narayan Mithila University, Darbhanga, Bihar State (India) established and administered by the State Govt. of Bihar State. This journal has been encouraged & supported by all specialty societies and various eminent personalities in Dental & Oral Health Sciences Research.



JODH is an Open Access, double blind peer-reviewed, bimonthly journal in the field of public health sciences. The aim of the journal is to stimulate debate and dissemination of knowledge in the public health field in order to improve efficacy, effectiveness and efficiency of public health interventions to improve health outcomes of populations.

The primary objectives of the Journal are to advance the science and art of dentistry & Public Health, to encourage scientific research and to improve and enhance the general standard of dentistry. We hope to provide the dental community with an educational tool, which monitors and reports the latest developments.

In today's era of advancement, the menace of plagiarism has reared its ugly head, enticing research professionals to achieve instant success. This issue has serious implications especially for the budding research professionals. We, as a research community, must take the collective responsibility of nipping this issue in the bud.

We invite all researchers, specialists and clinicians from various disciplines of dentistry, to share their knowledge to improve knowledge of the sciences. Their valuable contributions will continue to advance this publication and help attain the objectives.

The creation of JODH has only been possible with the help of numerous people. Chiefly I want to thank the editorial board for responding so positively to my requests for help in launching JODH. Thanks to the various people who have acted as anonymous peer reviewers and also those who have assisted with editorial support. My gratitude to the Founder Chairman of Mithila Minority Dental College & Hospital and the leadership of this journal, the Chief Patron – Acharya Shaukat Khail his invaluable guidance. Finally, special thanks to the Patron of the Journal as well as Managing Director of MMDCH Mr. Imbesat Shaukat who has been repeatedly available with advice: his wise counsel is most appreciated.

On behalf of the editorial board members, I appreciate the valuable constructive criticisms received in relation to this premier issue. We admit that the Journal would not have come into existence, had it not been for the joint efforts and support of our colleagues in the endodontic and other dental professions.

Dr. Rohit M. Miglani, MDS
Editor in Chief

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Principal
Mithila Minority Dental College & Hospital,
Darbhanga (Bihar)

MESSAGE FROM THE EDITOR

“The important thing is not to stop questioning. Curiosity has its own reason for existence. One cannot help but be in awe when he contemplates the mysteries of eternity, of life, of the marvelous structure of reality. It is enough if one tries merely to comprehend a little of this mystery each day.”

Albert Einstein

Greetings from the Editors desk. It gives me immense pleasure to bring out another fresh issue of our Journal. Emphasis as always has been given to the quality of each article so that the readers will get enriched with newer information. We have tried to incorporate almost all disciplines of dentistry and delighted to receive articles from various states of the country. It has been our cherished dream since inception of the Journal to make it online for throughout accessibility. Thanks to our Managing Director

we have been able to achieve that from this issue. The articles of our previous issues will be available in the archive section on the net. I express my gratitude to the Hon'ble Vice chancellor, L.N.Mithila University Dr S.K.Singh for his warm wishes. I sincerely thank all contributors for their cooperation. I also thank and appreciate the efforts of the Reviewers and Advisors for their valuable opinions and suggestions. We look forward for any feedback for the betterment of the Journal.



Prof (Dr) Dipto De

*Executive Editor
Journal of Oral & Dental Health*

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Effect Of Pre And Post Operative Application Of 10% Carbamide Peroxide On Marginal Leakage Of Amalgam And Composite Restorations

Abstract

Background: The purpose of this study was to evaluate the effect of pre and post operative bleaching with 10% carbamide peroxide on marginal leakage of amalgam and resin composite restorations. **Materials and Method:** Three groups were made using 30 extracted, caries free and restoration free molars (n = 10). In the preoperative group, bleaching was performed with 10 % carbamide peroxide, followed by the placement of resin composite and amalgam restorations on class V cavity preparations. In the post operative group, bleaching was performed after the resin composite and amalgam restorations were fabricated. The third group served as a control in which no bleaching was performed. Dye penetration was used for evaluation of marginal leakage.

Results: In post operatively bleached teeth, statistical analysis revealed significant difference between the control and experimental groups for resin composite restorations, but in amalgam restorations there were no significant difference. In preoperatively bleached teeth marginal leakage scores of the resin composite restorations in the experimental group were significantly higher than the control group, but no significant difference was observed between amalgam and resin composite restorations. No significant difference were found between experimental and control groups of amalgam restorations. **Conclusion:** Bleaching with carbamide peroxide may alter the marginal leakage of resin composite restoration, but amalgam restorations are not affected adversely in vitro.

Key words: Amalgam, Carbamide peroxide, Composite resins, Marginal leakage, Tooth bleaching

Dr Malwika Sisodiya, Dr Amit Kumar,
Dr Rohit Mighlani, Dr Mandal, Dr Sudhakar

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Introduction

Bleaching is defined as the process of lightening the colour of a tooth through the application of a chemical agent to oxidize the organic pigmentation on the tooth. There are various techniques and materials used for vital tooth bleaching, of which 10% carbamide peroxide gel has gained the most recent popularity. The techniques were “in-office” or “at-home” bleaching. Carbamide peroxide is used as a vehicle for transporting hydrogen peroxide.¹ “At-home” bleaching using a custom fabricated night guard appliance and 10% carbamide peroxide gel has received the most recent attention; which was initially described by Haywood and Heymann in 1989.²

The chemistry of bleaching with carbamide peroxide is; 10% carbamide peroxide breaks down to give 3.6% of hydrogen peroxide and 7% of urea, the hydrogenperoxide ionizes as per hydroxyl ion and nascent oxygen.^{3,4}

Many questions remain unanswered regarding the effects of the bleaching agent on tooth structure and subsequent restorations. Amalgam is one of the most widely used restoration material for posterior teeth and many patients who under go mouth guard bleaching procedures may have amalgam restored teeth. Some studies have shown an increase in mercury release from amalgam restorations after exposure to 10% carbamide peroxide.^{5,6,7}

It is known that especially resin composite and the enamel organic matrix are affected from these bleaching procedures.

The purpose of this study is to investigate the effect of pre and post-operative application of 10% carbamide peroxide on marginal leakage of amalgam and composite restorations.

Methodology

The present in vitro study was conducted in the Department of Oral pathology. College of Dental Sciences. Davangere.

Method

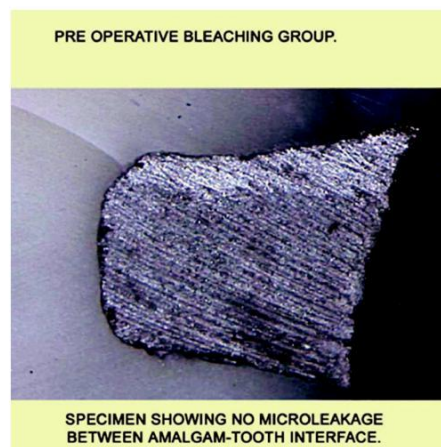
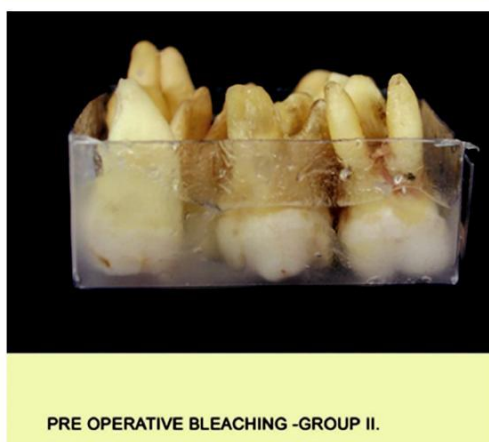
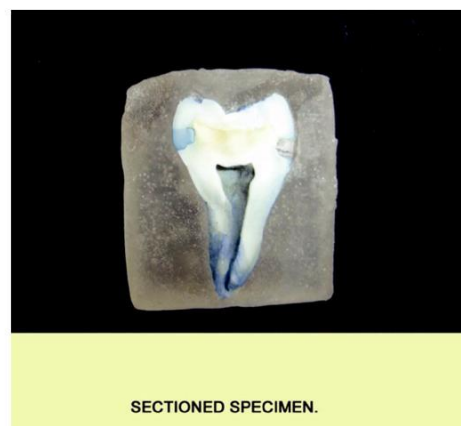
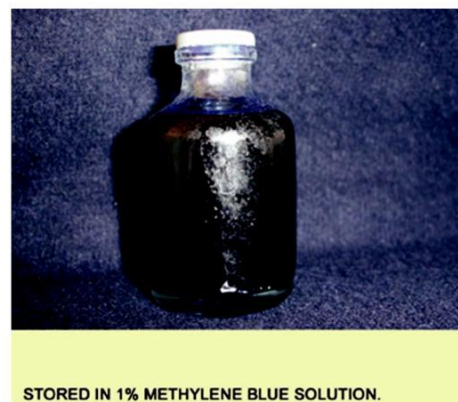
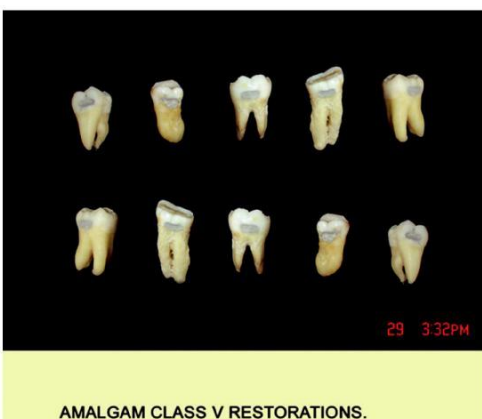
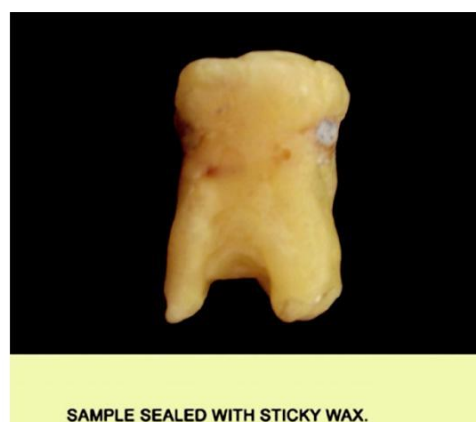
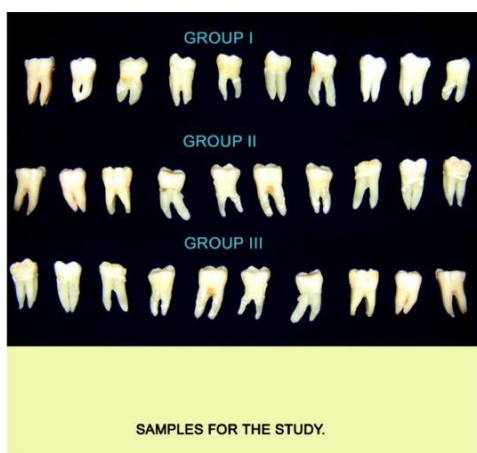
30 extracted molar teeth were taken for the study.

The criteria's for selection were: Free of caries, restoration& fractures The teeth were cleaned of debris and calculus

They were divided into 3 group with 10 teeth in each.

Group 1: 10 teeth were taken and Class V cavities were prepared on each tooth facially and lingually using a new inverted cone diamond bur. The cavities were measuring approximately about 4.0 X 2.0 X 2.0 mm. And were placed 1.0 mm occlusally to the CEJ. The facial cavity preparations were restored with amalgam dispensed from the amalgamator and condensed using hand instruments and burnished using hand instruments.

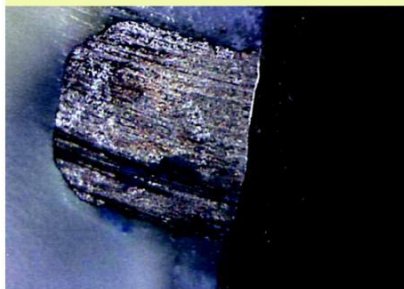
The lingual cavity preparations were etched with 37% phosphoric acid then Single Bond (3M) Bonding agent was applied and cured



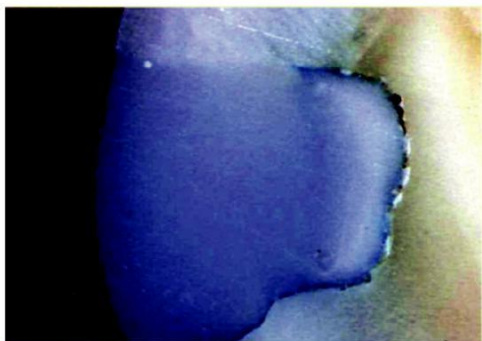


MICROLEAKAGE SEEN IN COMPOSITE-TOOTH INTERFACE.

POST OPERATIVE BLEACHING GROUP.

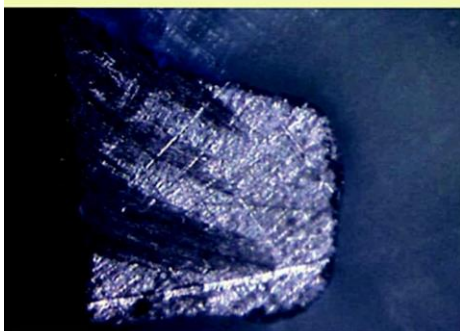


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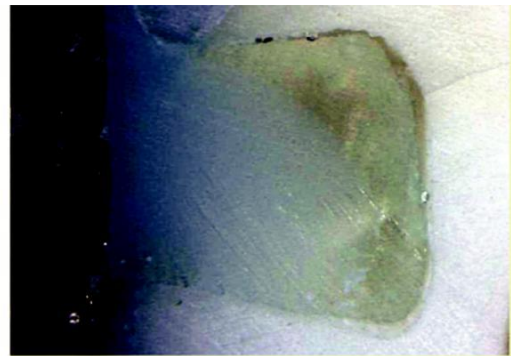


MICROLEAKAGE SEEN IN COMPOSITE-TOOTH INTERFACE.

CONTROL GROUP.

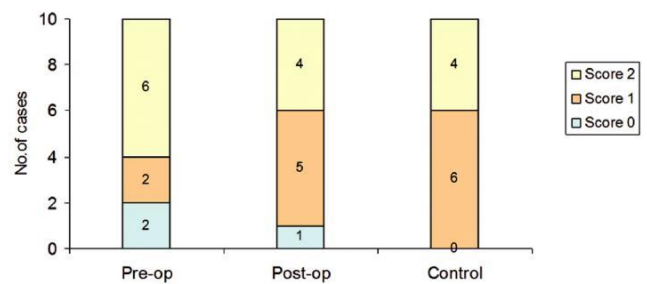


SPECIMEN SHOWING MILD MICROLEAKAGE BETWEEN AMALGAM-TOOTH INTERFACE.

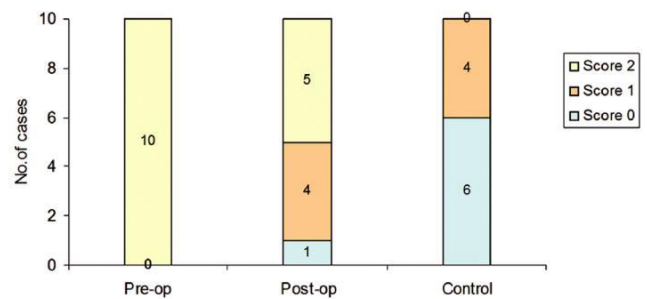


MICROLEAKAGE SEEN IN COMPOSITE-TOOTH INTERFACE.

Microleakage scores : Amalgam



Microleakage : Composite



RESULTS

The present in vitro study was conducted to compare the effect of pre and post operative bleaching on marginal leakage of amalgam and composite restorations.

The chi-square test was used to determine the significant difference in microleakage between the groups.

A p value of 0.5 or less was considered statistical significant.

No bleaching procedures were done – control group

In postoperatively bleached teeth, statistical analysis revealed significant differences between the control and experimental groups for resin composite restoration ($\chi^2 = 8.571$), but in amalgam restorations there were no significant differences.

In preoperatively bleached teeth, marginal leakage scores of the resin composite restorations in the experimental group were significantly higher than the control group, but no difference was observed between amalgam and resin composite restorations. No significant

differences were found between experimental and control groups of amalgam restorations

Formulae Used for Analysis

Chi-square test

Discussion

Three major bleaching methods for vital teeth are described as heat and light technique, micro abrasion technique and gel technique. The gel technique also involves a combination of “home and office bleach techniques”. Hydrogen peroxide and Carbamide peroxide are most commonly used as bleaching agents in the gel technique.²⁰ The result of the present study showed that there was a highly significant increase in microleakage in composite resin restorations in Group II i.e. the Pre operative bleaching group, in which the restorations were done after the teeth underwent bleaching procedures with 10% carbamide peroxide for 14 days, suggesting that bleaching with 10% carbamide peroxide may alter the marginal adaptation of resin composites.

This increase in microleakage in composite restorations after bleaching procedures was in accordance with the previous studies conducted by the following authors. Ulukapi H, (2003)^{8,9} conducted a study to evaluate the effect of pre and post operative bleaching with 10% carbamide peroxide on marginal leakage of Amalgam and resin composite restoration. They concluded that pre and post operative bleaching with 10% carbamide peroxide on composite restorations showed higher microleakage. They most probable reasons given by these authors were attributed to the residual substances formed when carbamide peroxide breaks down, namely urea and hydrogen peroxide which possibly inhibit the polymerization of the resin bonding agent. Thus resulting in loss of marginal seal.

Turkun M, Turkun LS (2004)¹⁸ conducted a study in that the increase in microleakage after immediate restoration with composite after bleaching with 10% carbamide peroxide could be due to the residual peroxide from the bleaching agent, which interferes with resin attachment and inhibits resin polymerization.

Barkhordar, (1997)^{8,9} conducted a study to evaluate the effect of non-vital tooth bleaching on microleakage of resin composite restorations. The results showed that bleaching has a deleterious effect on the tooth- resin composite interface. The probable reasons given by these authors were that, hydrogen peroxide alters the tubular permeability and interprismatic area, leading to high rate of microleakage.

Shinohara SS, Rodrigues JA and Pimenta LAF (2001)¹⁰⁻¹² conducted a study to evaluate the microleakage of Class V adhesive resin restorations in teeth submitted to nonvital bleaching. They concluded that there was a significant increase in microleakage in dentin margin after bleaching treatment. The probable reasons given were attributed to the difference in the composition of enamel and dentin. These materials are strong oxidizing agents that may cause denaturing of proteins in the organic components producing changes that could reduce the performance of resin bond restorations. Another consideration is the presence of dentin tubules.

In the present study, Group I, showed significant increase in microleakage for composite restorations when compared to the control group. This result was in accordance with the following author.

They concluded that pre and post operative bleaching with 10% carbamide peroxide on composite restorations showed higher microleakage. Edward (1997)¹³⁻¹⁶ explored the implications of bleaching procedures on restorative dentistry. According to his review he stated that there was an increased amount of mercury release from amalgam restorations after bleaching with 10% carbamide peroxide.

Campos I, (2003)¹⁷ showed that amalgam, when treated with 10% carbamide peroxide, darkened as a result of the process of corrosion. In his article he states that the amalgam surfaces showed an increase in mercury levels, they affirmed that such changes depended upon time and may be caused by oxidation, corrosion and surface dissolution of the amalgam caused by the decomposition of the lightening products.

Attin T, (2004)¹⁹ amalgam restorations showed an increase in release of amalgam components and also greening of the tooth-amalgam interface during extended treatment with 10% carbamide peroxide. Active oxidation was held responsible for this increased release of mercury and silver. Marginal leakage of amalgam restorations with enamel margins only were not affected by pre operative external bleaching with 10% carbamide peroxide.

However, due to lack of any long-term clinical observations to substantiate these reports, periodic observation of patients is suggested when any type of bleaching is administered and further studies with larger number of samples are recommended.

Conclusion

- Bleaching with 10% carbamide peroxide may alter the marginal leakage of resin composite.
- But amalgam restorations are not affected adversely in vitro.

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Dental and Prosthetic Status and Prosthetic Needs of Geriatric Patients in a Hospital Set Up: A Cross Sectional Study

ABSTRACT

Introduction: Oral health status in the elderly reflects the cumulative outcomes of oral health behaviour, diseases and their treatments during a lifespan. Nutrition plays a central role in health, with poor dietary habits and nutritional intake associated with a range of chronic diseases. Dental caries is a common disease among the elderly, which can result in pain and chewing difficulties, thus decreasing their overall health and quality of life. **Aim:** This study aimed to assess oral health conditions in geriatric population aged between 60 and 80 years (N=404) residing in Murad Nagar town of Ghaziabad district in the state of Uttar Pradesh, India. **Materials and Methods:** The study was a cross sectional representative study, representing the oral health status of the rural population aged between 60 to 80 years between the years of 2010 to 2013. World Health Organization criteria and codes for oral health epidemiological surveys were used. Re-examination was carried out in 10% of individuals aiming to evaluate intra-examiner agreement. Chi-square test was used and tests were conducted using IBM SPSS software (ver.20.0; IBM, Chicago, IL, USA). **Results:** Males appeared to have higher DMFT index than the females and it increased with advancing age, explained with higher prevalence of pernicious habits in males than females. Upper and lower dentures each were found in 11.6%, with complete denture as the most commonly used. In those studied, 47% required upper and 46.7% lower dentures. **Conclusion:** The oral health status of the elderly population in Muradnagar is poor, as well as in other Indian towns. The results of this study may help in planning collective health actions, giving an accurate description of the oral problems among the elderly.

Key words: Oral health. Elderly. Dental health surveys. Aging health

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Introduction

In the lifelong ageing process, oral health is one of the most critical areas affected by physical, mental and social conditions. It is closely linked to the general health and quality of life of the individual. Quality of life (QoL) is defined as an individual's perception of his or her position in life, in the context of the culture and value systems in which they live, and in relation to their goals, expectations, and concerns¹. QoL is partly affected by oral health. Perceptions of how oral conditions affect daily function and well-being are referred to as oral health-related quality of life (OHQoL)².

Physiologic decline that occurs with aging affect manual dexterity and this coupled with reduced muscular tone hampers adequate clearing of food particles from oral cavity, making elderly more prone to oral diseases. It is predicted that the elderly population of India shall be the highest in the world by 2025 and their contribution to the demographic profile is increasing everyday³. Geriatric medicine is in its infancy, and geriatric dentistry is almost non-existent⁴.

Oral health, diet, and nutritional status are closely linked. Edentulism is the state of having lost all of one's natural teeth⁵. Monitoring the occurrence of an oral "end state" such as edentulism is important because it is an indicator of both population health

and the functioning and adequacy of a country's oral health care system⁷.

Most of the Indian studies that have been published focused on school children and only a few studies have been done among adults⁸.

There is an increasing demand for geriatric oral healthcare in India. This needs to encompass preventive, restorative, periodontal and prosthodontic services.

Therefore, this paper reports the investigation of the oral health conditions of the elderly population between 60 to 80 years, of Muradnagar town in Ghaziabad district of Uttar Pradesh, India by means of an epidemiological survey about the oral health of these individuals.

Material And Methods

The study was an epidemiological survey (descriptive cross-sectional prevalence study) which used codes and criteria suggested by WHO for epidemiological surveys in oral health. Ethical clearance was taken from the Research Ethics Committee of the ITS Centre for Dental Studies and Research, Ghaziabad, Chaudhary Charan Singh University, Meerut. Target population comprised of subjects visiting Dental Out-Patient Department of Oral Medicine and Radiology,

ITS Dental College, Murad Nagar, Ghaziabad. The subjects come to this institute from all levels of the socioeconomic level of the society. Four hundred and four (404) subjects were examined by the investigator based on estimated population visiting the department.

Inclusion criteria

Individuals aged 60 years to 80 years visiting dental OPD.

Written Informed consent was taken from all the subjects for inclusion in the study. Subjects were informed and clarified about the research objectives. Assurance about maintenance of confidentiality of the information with a right for their participation was given to all the subjects.

Data collection

Study subjects were interviewed and examined for oral health according to standard codes prescribed by the World Health Organization proforma. Record of dentition status and treatment need, prosthetic status, prosthetic need, was done as per World Health Organization, WHO's prescribed criteria.

In order to simplify the operational process of data collection a single investigator interviewed and examined all the subjects under study. However, an estimated 10% of the individuals were re-examined to evaluate the intra-examiner agreement. Examination was performed in a fully reclined dental chair, instruments used were, plane dental mirrors and dental explorers which conformed to world health organization specifications, several pair of tweezers, containers (one for used instruments and another for unused instruments), a wash basin for either water and soap or disinfectant solution, cloth or paper hand towels, gauze, disposable masks, disposable gloves, protective glasses for eyes. Partial or full dentures were removed before examination of the oral mucosa. The number of teeth in all dentulous persons was registered. Carious teeth, teeth indicated for extraction, roots and filled teeth will be recorded. The diagnostic criteria of a carious tooth was a definitive cavity with softened floor or walls on probing. The inspection of the oral cavity was done in a systematic manner.

Results

The average of the DMF-T index was 22.56. Mean number of decayed teeth per person (DT) was 2.44 with confidence interval of 95% among the values 2.13 and 2.74, median of 1, minimum value of 0 and maximum of 20. Mean number of filled teeth per person (FT) was 0.09 with confidence interval of 95% among the values 0.04 and 0.13, median of 0.0, minimum value of 0 and maximum of 6. Mean number of missing teeth per person (MT) was found to be 20.03 with confidence interval of 95% among the values 18.94 and 21.13, median of 22.0, minimum value of 0 and maximum of 32. Men presented a higher DMF-T index when compared to Women, even though women presented a higher incidence of decayed teeth, the difference can be explained by a higher "missing component" among men. (Table 1). The DMF-T index also presented a variation in relation to age group, being lowest in the youngest age group (60 to 64 years) highest in the oldest age group (75 years or more), with statistical significance. (Table 2).

Approximately 47% of geriatric population needed full prosthesis i.e replacement of all missing teeth, in both upper and lower jaws, which was very high. Table 5 and Table 6. Despite the high need for

full prosthesis in both the jaws, approximately 11.6% of the population, were using them, in both the jaws, emphasising low usage as compared to need. Table 3 and Table 4. Full removable dentures were worn by more number of men as compared to women. Table 3 and Table 4. The need for full prosthesis in both the jaws increased as age advanced with regards to both male and female gender. Approximately, merely, 5.5% of geriatric population did not need any prosthesis in both the jaws, suggesting acute need for prosthesis. Table 5 and Table 6. Prosthetic status was dismal in both upper and lower jaws. Table 3 and Table 4. As age advanced need for one unit prosthesis reduced. The need for multi unit prosthesis increased with advancing age more so in elderly women as compared to men. Majority of the patients needing one unit prosthesis were male belonging to youngest age group of 60-64 years. Table 5 and Table 6.

Discussion

The method proposed in the present study allowed the knowledge of the profile of oral health among the elderly residing in rural areas of Ghaziabad district in the state of Uttar Pradesh. Representative sample of the elder population presented an important contribution for the comprehension of the oral health-disease process among the elderly. The M-component i.e the missing component of the dental caries index is surprisingly high in all regions of the world. Oral health care for older people consists of radical treatment in terms of tooth extraction⁹. Dental caries is the curse of mankind, more so with the Indian rural population. The higher rate of missing teeth raises the DMFT index to high levels but these results are comparable to other studies.

Thaweboon S, Thaweboon B, Nakazawa F, Dechkunakorn S, Suddhasthira T and Fujita M (2010) 10], found prevalence of dental caries to be 78% with a mean DMFT-score of 6.53 ± 6.32 among hill tribe villagers. Morales-Suárez-Varela M, Ibáñez-Cabanell P, Gimeno-Clemente N, Manuel Roig-García J, Adoración Nieto-García M and Llopis-González A (2011) 11], found that among non institutionalized elderly of Spain, the mean number of remaining teeth was higher for women. The overall DMFT index showed persistent increase with age from 14% (65–69-year) to 23% (≥ 80 -year), similar to the present study. Patro BK, Ravi KB, Goswami A, Mathur VP, Nongkynrih B (2008) 12], found that the prevalence of dental caries was 91.9% in those ≥ 60 years. The DMF index was 13.8 ± 9.6 in the ≥ 60 years age-group.

Country reports indicate that there is huge unmet need for denture treatment and restorative dental care, particularly among older people⁹.

In the present study edentulousness prevalence was 52.2%. The elderly study subjects in this study mostly belonged to rural areas, lower socio economic strata and were financially dependent on others, which explains higher edentulism prevalence in the present study. Basic dental care is unaffordable to the poor elderly of developing countries and third party payment is extremely rare. This fosters radical care treatment of disease, e.g. tooth extraction. Against this background, older people in these countries hardly ever receive appropriate oral health care.

According to a study conducted by Shah N, Parkash H and Sunderam KR (2004)¹³, on Edentulousness, denture wear and denture needs of Indian elderly – a community-based study, edentulousness was high, more so in rural subjects and with advancing age, with no significant difference between male and female.

Table 1 shows frequency of males and females in different DMFT mean categories

Age	Number	Decayed Mean	Missing Mean	Filled Mean	DMFT Mean
60-64 years	195	2.55	18.75	0.10	21.4
65-69 years	102	2.39	21.09	0.08	23.56
70-74 years	67	2.51	19.87	0.09	22.47
75-80 years	40	1.85	23.87	0.03	25.75
Total	404	2.44	20.03	0.09	22.56

Table 2 shows frequency of different age groups in different DMFT mean categories

CODE	60-64(M) (%)	60-64(F) (%)	65-69(M) (%)	65-69(F) (%)	70-74(M) (%)	70-74(F) (%)	75-80(M) (%)	75-80(F) (%)	TOTAL (%)
0=No prosthesis	93 (23.0)	65 (16.0)	52 (12.8)	37 (9.1)	37 (9.1)	16 (3.9)	28 (6.9)	5 (1.2)	333 (82.4)
1=Bridge	2 (0.4)	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (0.7)
2=More than one bridge	0 (0.0)	0 (0.0)	1 (0.2)	0 (0.0)	2 (0.5)	0 (0.0)	0 (0.0)	0 (0.0)	3 (0.7)
3=Partial denture	4 (0.9)	4 (0.9)	3 (0.7)	0 (0.0)	2 (0.4)	0 (0.0)	0 (0.0)	0 (0.0)	13 (3.2)
4=Both bridge (s) and partial denture (s)	4 (0.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	4 (0.9)
Table 5=Full removable denture	10 (2.4)	11 (2.7)	6 (1.4)	3 (0.7)	6 (1.4)	4 (1.4)	7 (1.7)	0 (0.0)	47 (11.6)

Table 3 shows frequency and percentage of different age groups and gender in different prosthetic status upper jaw code categories

CODE	60-64(M) (%)	60-64(F) (%)	65-69(M) (%)	65-69(F) (%)	70-74(M) (%)	70-74(F) (%)	75-80(M) (%)	75-80(F) (%)	TOTAL (%)
0=No prosthesis	93 (23.0)	67 (16.5)	53 (13.1)	37 (9.1)	36 (8.9)	16 (3.9)	26 (6.4)	4 (1.4)	(82.1)
1=Bridge	1 (0.2)	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (0.4)
2=More than one bridge	1 (0.2)	0 (0.0)	1 (0.2)	0 (0.0)	2 (0.4)	0 (0.0)	0 (0.0)	0 (0.0)	4 (1.4)
3=Partial denture	6 (1.4)	2 (0.4)	2 (0.4)	0 (0.0)	3 (0.7)	0 (0.0)	1 (0.2)	1 (0.2)	15 (3.7)
4=Both bridge (s) and partial denture()	3 (0.7)	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	4 (1.4)
5=Full removable denture	9 (2.2)	11 (2.7)	6 (1.4)	3 (0.7)	6 (1.4)	4 (1.4)	8 (1.9)	0 (0.0)	47 (11.6)

Table 4 shows frequency and percentage of different age groups and gender in different prosthetic status lower jaw code categories

CODE	60-64(M) (%)	60-64(F) (%)	65-69(M) (%)	65-69(F) (%)	70-74(M) (%)	70-74(F) (%)	75-80(M) (%)	75-80(F) (%)	TOTAL (%)
0=No prosthesis needed	9 (2.2)	6 (1.4)	2 (0.4)	3 (0.7)	1 (0.2)	1 (0.2)	0 (0.2)	0 (0.2)	22 (5.4)
1=Need for one-unit prosthesis	7 (1.7)	2 (0.4)	1 (0.2)	1 (0.2)	3 (0.7)	0 (0.0)	0 (0.0)	0 (0.0)	14 (3.4)
2=Need for multi-unit prosthesis	41 (10.4)	41 (10.4)	25 (6.1)	18 (4.4)	16 (3.9)	9 (2.2)	11 (2.7)	3 (0.7)	162 (40.1)
3=Need for a combination of one- and/or multi-unit prostheses	2 (0.4)	4 (1.4)	4 (1.4)	0 (0.0)	3 (0.7)	0 (0.0)	2 (0.4)	1 (0.2)	16 (3.9)
4=Need for full prosthesis (replacement of all teeth)	54 (13.3%)	29 (7.1%)	32 (7.9%)	18 (4.4%)	24 (5.9%)	10 (2.4%)	22 (5.4%)	1 (0.2%)	190 (47.0%)

This is the foundation on which the present study was conducted in order that dental health care reach the underprivileged. Zainab

S, Ismail NM, Norbanee TH and Ismail AR (2008)¹⁴, found that prevalence of edentulism was 56% in Kota Bharu, Kelantan,

Table 5 shows frequency and percentage of different age groups and gender in different prosthetic need upper jaw code categories

CODE	60-64(M) (%)	60-64(F) (%)	65-69(M) (%)	65-69(F) (%)	70-74(M) (%)	70-74(F) (%)	75-80(M) (%)	TOTAL (%)
0=No prosthesis needed	11 (2.7)	5 (1.2)	1 (0.2)	3 (0.7)	1 (0.24)	3 (0.7)	0 (0.0)	24 (5.9)
1=Need for one-unit prosthesis	2 (0.4)	2 (0.4)	1 (0.2)	1 (0.2)	1 (0.2)	0 (0.0)	0 (0.0)	7 (1.7)
2=Need for multi-unit prosthesis	45 (1.1)	38 (9.4)	26 (6.4)	16 (3.9)	22 (5.4)	8 (1.9)	8 (1.9)	166 (41.0)
3=Need for a combination of one- and/or multi-unit prostheses	6 (1.4)	2 (0.4)	4 (1.4)	1 (0.2)	2 (0.4)	0 (0.0)	3 (0.7)	18 (4.4)
4=Need for full prosthesis (replacement of all teeth)	49 (12.1)	35 (8.6)	30 (7.4)	19 (4.7)	21 (5.1)	9 (2.2)	24 (5.9)	189 (46.7)

similar to our study and 62% were women. Moreira RS, Nico LS and Tomita NE (2009)¹⁵, in their study in Brazil, found that the prevalence of edentulism was 63.17% in elderly, higher than the present study. Rabiei M, Kasemnezhad E, Masoudi rad H, Shakiba M and Pourkay H (2010)¹⁶, found that amongst elderly in Iran prevalence of edentulousness was 56% comparable to the present study. Bansal V, Sogi GM and Veerasha KL (2010)¹⁷, found that around half of the elderly subjects in Ambala, India, Dental and prosthetic status and prosthetic needs of geriatric patients had no functional teeth. 10.53% of the subjects had complete dentures. The findings in this study are similar to the present study. 19.1% subjects reported wearing a denture. Ozkan Y, Özcan M, Kulak Y, Kazazoglu E and Arikan A (2011)¹⁸, found that 60% of the examined subjects of an elderly population in Istanbul were edentulous. Talwar M, Malik G and Sharma S (2012)¹⁹, in their study in Chandigarh India, found edentulism prevalence to be 31.1% which was lower than the present study. The low proportion of those who had prostheses may be due to the fact that older people underuse dental facilities due to lack of awareness, financial constraints, and reduced mobility; misconceptions regarding adjustments to dentures and lack of interest in aesthetics may also be contributing factors. Shrivastav A, Bhambal A, Reddy V and Jain M (2011) 20], found that amongst the residents of geriatric homes in Madhya Pradesh, India, majority had no prosthesis and nearly 35% subjects required one-unit prosthesis.

Sex	Number	Decayed Mean	Missing Mean	Filled Mean	DMFT Mean
Male	257	2.28	20.47	0.11	22.86
Female	147	2.70	19.28	0.05	22.03
Total	404	2.44	20.03	0.09	22.56

Conclusion

The oral conditions of the elderly in the present study, mainly expressed by the DMF-T index and edentulism prevalence, are far from the goals of international organizations. The method proposed in the present study allowed the knowledge of the profile of oral health among the elderly residing in rural areas of Ghaziabad district in the state of Uttar Pradesh. Representative sample of the elder population presented an important contribution for the comprehension of the oral health-disease process among the elderly. Basic dental care is unaffordable to the poor elderly of developing countries and third party payment is extremely rare. This fosters radical care treatment of disease, e.g. tooth extraction. Against this background, older people in these countries hardly ever receive appropriate oral health

care. Dental care facilities and services when made available to the masses and the have-nots will reduce edentulousness.

Thus, the present moment asks for initiatives directed to today's elders that can improve their life quality and include them as part of the agenda for oral health, meeting their current needs for restorative and rehabilitation treatment.

Dental and prosthetic status and prosthetic needs of geriatric patients

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Trigeminal Neuralgia – A review

Abstract

Trigeminal neuralgia (TN) has been a major neurosurgical concern since neurosurgery first emerged as a distinct surgical specialty in the early 20th century. A wide range of treatments has in used. Despite all the advances this disease is still not totally cured and the horrid affliction that the patient develops continues to haunt him for life. This reduces the quality of life. We need to further understand the pathogenesis of the disease and find ways to treat it. The article tries to summarize the disease and its management. This will lead to better understanding of the practicing clinician and give a scope to add further on the disease and its management.

Key words: Trigeminal neuralgia, Fothergill's disease, Tic douloureux

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Introduction

Trigeminal neuralgia (TN) has been a major neurosurgical concern since neurosurgery first emerged as a distinct surgical specialty in the early 20th century. It is also called tic douloureux and Fothergill's Disease. It is the most common of the cranial neuralgias and chiefly affects individuals older than 50 years of age.¹

The earliest descriptions of trigeminal neuralgia as a clinical entity dates back to the 1600s provided by prominent physicians at the time including Dr. Johannes Michael Fehr and Dr. Elias Schmidt, secretaries of the Imperial Leopoldina Academy of the Natural Sciences, and famous philosopher John Locke.¹

The term tic douloureux was coined by Nicholas Andre who believed that the condition stemmed from a nerve in distress and classified it as a convulsive disorder. He conceptualized the disease in terms of convulsions and used the term tic douloureux to imply contortions and grimaces accompanied by violent and unbearable pain.¹

In 1773, an English physician, Dr. John Fothergill presented his experience with 14 patient encounters and deemed the cause to be related to cancer rather than convulsive disorder, thus coining the term, Fothergill's disease. Although the clinical description of this condition had been clarified by the end of the 18th century, it was not until the 1820s that Charles bell localized this pain syndrome to the trigeminal nerve; thus, the condition was ultimately referred to as trigeminal neuralgia.¹

Etiology and pathogenesis

The most widely accepted theory is that a majority of cases of classic TN are caused by an atherosclerotic blood vessel (usually the superior cerebellar artery) pressing on and grooving the root of the trigeminal nerve. This pressure results in focal demyelination and hyperexcitability of nerve fibres, which will

then fire in response to light touch, resulting in brief episode of intense pain.²

Evidence for this theory includes the observation that neurosurgery that removes the pressure of the vessel from the nerve root by use of a microvascular decompression procedure eliminates the pain in a majority of cases. Additional evidence for this theory was obtained from a study using tomographic magnetic resonance imaging, which showed that contact between a blood vessel and the trigeminal nerve was much greater on the affected side.²

Diagnosis

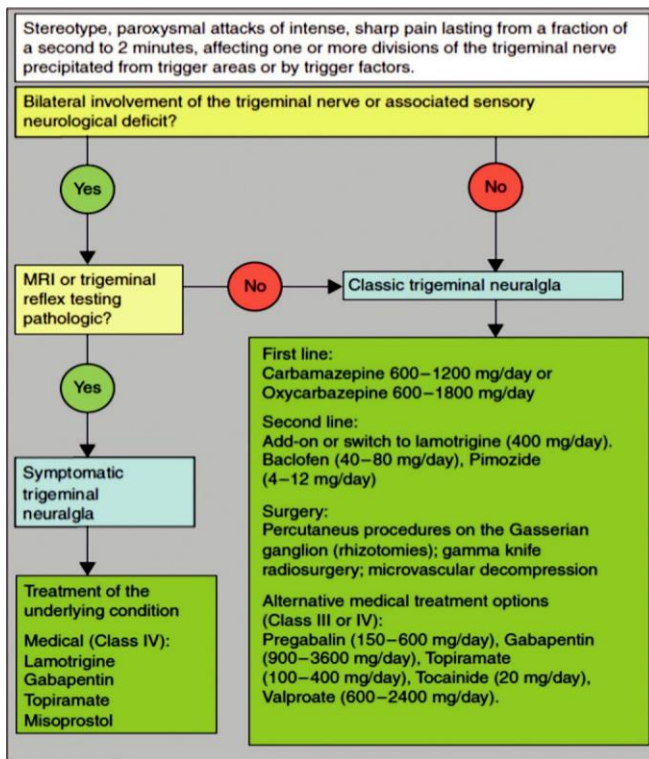
The International headache society (IHS) describes TN as a unilateral disorder characterized by brief electric shock-like pains, abrupt in onset and termination, limited to the distribution of one or more divisions of the trigeminal nerve. The diagnostic criteria for classical TN are as follows:

- A. Paroxysmal attacks of pain lasting from a fraction of a second to 2 minutes, affecting one or more divisions of the trigeminal nerve and fulfilling criteria B and C.
- B. Pain has at least one of the following characteristics:
 - i. Intense, sharp, superficial or stabbing
 - ii. Precipitated from trigger areas or by trigger factors
- C. Attacks are stereotyped in the individual patient.
- D. There is no clinically evident neurological deficit
- E. Not attributed to another disorder.

The IHS description states that between paroxysms the patient is usually asymptomatic, but a dull background pain may persist in some long-standing cases and that many, possibly most, patients with this condition have compression of the trigeminal root by tortuous or aberrant vessels.³

These criteria exclude patients with sensory disturbance in the distribution of the trigeminal nerve. These criteria do not include objective signs such as compression of the trigeminal nerve.

Management



I. Medical –

Initial therapy for TN should consist of trials of drugs that are effective in eliminating the painful attacks. Anticonvulsant drugs are most frequently used and are most effective.

1. First line treatment – First line therapy should be carbamazepine (CBZ 200-1200 mg/day) and oxycarbazepine (OXC 600-1800 mg/day). Although the evidence for the efficacy of CBZ is stronger OXC has a better safety profile. Carbamazepine is the most commonly used drug and is an effective therapy for greater than 85% of newly diagnosed cases of TN. The drug is administered in slowly increasing doses until pain relief has been achieved. Patients who do not respond to carbamazepine alone may obtain relief from baclofen or by combining carbamazepine with baclofen.
2. Second line treatment – Second line treatment is based on very little evidence and included add-on therapy with lamotrigine (400 mg/day) or a switch to lamotrigine, baclofen (40-80 mg/day) or pimozide (4-12 mg/day).
3. Alternative treatment options – Other antiepileptic drugs (AEDs) have been studied in small controlled or open-label studies. Benefit was suggested for phenytoin, clonazepam, gabapentin, pregabalin, topiramide, levetiracetam and valproate as well as tocainide

II. Surgical –

- A. Percutaneous procedures⁵ – These are the procedures done by approaching foramen ovale using Hartel's anatomic landmarks. Once the foramen ovale is reached the afferent nerve fibres are interrupted by causing injury to the trigeminal nerve by using balloon compression, glycerol rhizotomy or radiofrequency thermocoagulation.

B. Surgical procedures⁴ –

- i. Gamma knife surgery – A focused beam of radiation is aimed at the trigeminal root in the posterior fossa. One year after gamma knife surgery, 69% of patients are pain free without additional medication. At 3 years, 52% are still pain free. The development of pain relief can be delayed (mean 1 month). Side effects are sensory complications in 6% that may develop with a delay of up to 6 months, facial numbness in 9-37% which improves over time and paresthesias in 6-13%.^{6,7} Quality of life improves by 88%.⁸ The main disadvantage of gamma knife surgery is the treatment expense that limits widespread usage making it a reserve treatment option for patients that cannot undergo open surgery or have blood coagulation problems (e.g. are receiving warfarin).⁴
- ii. Microvascular decompression – It achieves the most sustained pain relief with 90% of patients reporting initial pain relief and over 80% still pain free after 1 year, with 75% after 3 years and 73% after 5 years remaining pain free. It is, however, a major surgical procedure that entails craniotomy to reach the trigeminal nerve in the posterior fossa. The average mortality rate ranges from 0.2% to 0.5%, and up to 4% of patients suffer from major problems such as cerebrospinal fluid (CSF) leakage, infarcts or haematomas. The most common complications are aseptic meningitis (11%), sensory loss (7%) and hearing loss (10%) as long-term complications.^{4,9}

Conclusion

A wide range of treatments was in use by the beginning of the last century. Pharmacotherapy had little success in this condition. The introduction of carbamazepine had shown its superiority over placebo in TN. Since then, anticonvulsants have remained the mainstay of pharmacological treatment.

Microvascular decompression gained wide-spread acceptance as a treatment method. Neuroablative procedures kept evolving throughout the century, with attempts to balance the adverse effects of neural injury with sufficient pain control. Radiosurgery is the latest innovation in this process.

Despite all the advances this disease is still not totally cured and the horrid affliction that the patient develops continues to haunt him for life. We need to further understand the pathogenesis of the disease and find ways to treat it.

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Additive Manufacturing In Dentistry: A Review

Abstract

The connecting link of technologies and dentistry has often resulted in innovations in manufacture of dental restorations right from Taggart's lost wax technique to the latest CAD CAM restorations. While there are rapid advances made in technologies, its applications in the field of prosthodontics are not far behind. 3 D printing has revolutionized the way things are manufactured and we may not possibly imagine what future holds for us. This paper will give an insight on how 3D printing works, its application in 3D printing of dental restorations and its future directions

Key words: Digital light projection (DLP), Jet, Stereo-lithography apparatus (SLA), Selective laser sintering, direct laser metal sintering (DLMS).

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INTRODUCTION

Additive Manufacturing is finding increasing use in dentistry. More popularly known as three dimensional printing, it is an additive manufacturing process in contrast to conventional CAD/CAM which is a subtractive process.¹

HISTORY:

The first 3D printer was invented by Hideo Kodama of Nagoya, Japan. In 1984 Chuck Hull of 3D systems further redefined the process and named it as Stereolithography.¹

APPLICATIONS:

3D printing can be used to produce:

1. Surgical guides
2. Veneers try in
3. Study Models
4. Orthodontic Appliances
5. Surgical Planning and Mock Surgeries
6. Wax Patterns
7. Maxillofacial Prosthesis

ADVANTAGES OF 3D PRINTING

1. Reduction of fabrication time
2. Reduced fabrication cost
3. Clean safe and efficient process
4. Less waste as only the required amount of material is used.
5. No need to store bulky models as they can be stored digitally and reproduced on demand
6. Possible to print complex shapes and structures
7. Possibility of using multiple materials in a single object
8. Rapid prototyping.

There are basically 5 different 3D printing technologies being used in the dental industry today:¹

1. Digital Light Projection (DLP),
2. Jet,
3. Stereo-Lithography Apparatus (SLA),
4. Selective Laser Sintering and
5. Direct Laser Metal Sintering (DLMS).

Each system varies in the materials available, how those materials are solidified, and how they can be used.

Digital Light Projection (DLP)

The working material for Digital Light Projection is UV- and visible-light sensitive and held in a reservoir. A wiper blade spreads material uniformly across the build platform after each layer is printed. DLP then takes advantage of the same technology used in certain television sets and presentation projectors to illuminate the outline of all of the parts simultaneously. The printed material is cured using a lamp or LED light source depending on printer model.

Typical vertical resolution is 13 μ m to 50 μ m with very good accuracy and excellent surface finish. Post-print processing involves removal of support material by rinsing.²

Jet (PolyJet/ProJet) 3d Printing

Ink being jetted or sprayed onto paper in a single layer, a resin or wax is jetted onto support material, and then onto previously sprayed layers until the part begins to take on depth and shape.

3D Jet printers may have a single print head, or they may have multiple heads to cover the width of the working platform. Either the print head moves across the working platform, or the platform moves back and forth under stationary print head(s).

The 3D Systems and Objet printers use a UV lamp or a light source to harden the resin or wax after each layer is jetted.

The SolidScape printer jets a heated wax that cold-cures in place and does not require exposure to a UV light source.



Figure 1: Jet (PolyJet/ProJet) 3D Printer

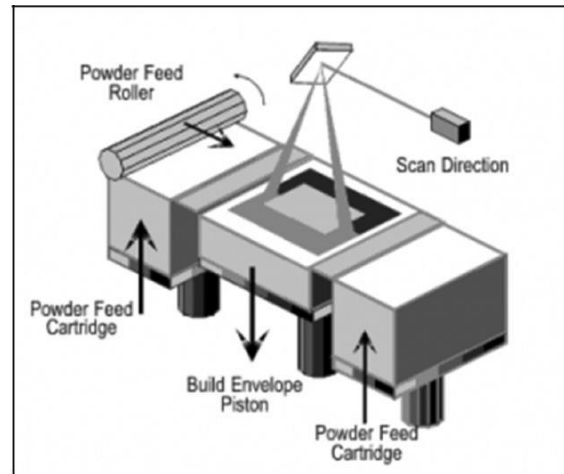


Figure 4: Selective Laser Sintering

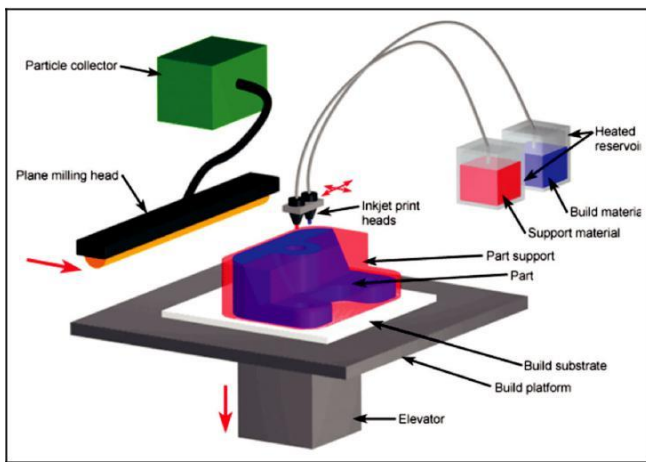


Figure 2: Jet (PolyJet/ProJet) 3D Printing

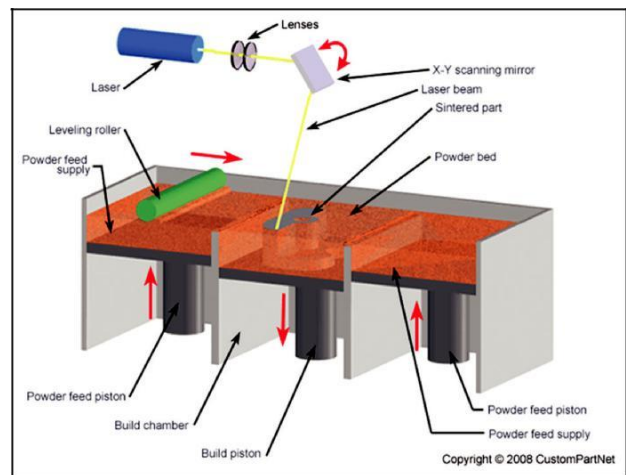


Figure 5: Direct Laser Metal Sintering (DLMS)

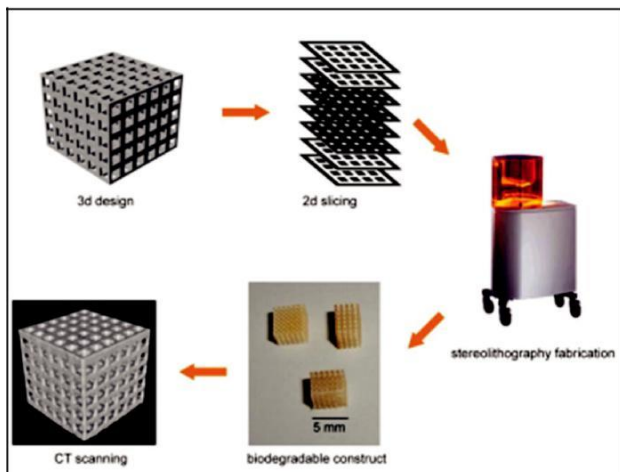


Figure 3: Stereo Lithography Apparatus

Typical layer thickness ranges from 16 μm to 50 μm with excellent accuracy and surface finish.³

Post-printing processing is simply removal of the support material, usually with a water or oil bath and simple rinsing. Most systems have self-cleaning print heads, so no user intervention is required.



Figure 6: 3d printed maxillofacial prosthesis

The curing light source, if necessary, is usually a Xenon lamp with a long service life.

3D printing Stereo Lithography Apparatus (SLA)

Stereo Lithography Apparatus (SLA) 3D printing uses a UV-sensitive liquid resin as the working material. A UV-laser is

projected on and moves across the reservoir of the resin build material, illuminating and hardening the liquid resin only in the areas where the part is being printed. If multiple parts are being printed, each part is traced on the resin by the laser. The platform holding the part or parts lowers after each layer is printed, and a wiper blade spreads more build material uniformly across the working space.³ The UV laser makes another pass, tracing the outline of the next layer for each part in the print job. The process is repeated layer by layer until the job is complete. SLA technology allows for varying the layer thickness throughout the printing process. Some layers can be 100 μm thick where accuracy is not critical and then dialled to 50 μm or less when greater accuracy is required.⁴

Selective Laser Sintering (SLS)

Selective laser sintering (SLS) is an additive manufacturing technique that uses a high power laser (for example, a carbon dioxide laser) to fuse small particles of plastic, metal (direct metal laser sintering), ceramic, or glass powders into a mass that has a desired 3-dimensional shape.²

The laser selectively fuses powdered material by scanning cross-sections generated from a 3-D digital description of the part (for example from a CAD file or scan data) on the surface of a powder bed. After each cross-section is scanned, the powder bed is lowered by one layer thickness, a new layer of material is applied on top, and the process is repeated until the part is completed.

Direct Laser Metal Sintering (DLMS)

DLMS uses a metal powder and SLS typically uses a plastic powder. The powder is spread across the working platform. A laser traces the outline of each part being printed, fusing (DLMS) or melting (SLS) the powder to the layer below it. The platform is lowered, a new layer of material is spread across the platform and the process repeated until the print job is complete.³

DLMS technology has traditionally only been available for printing non-precious metals.

Recently, Argon has developed its own materials and techniques for the EOS machine that allows them to provide both non-precious and noble metal copings. Post-print processing requires cutting off the support material.

RAW MATERIALS FOR 3D PRINTING

A wide range of material are available for 3D printing. These include thermoplastics, granulated alloys (titanium alloys metal alloys) foil, paper, photopolymers, liquid resins, rubber like materials, silicones, glass, ceramics bioink made of cells, and stem cells for tissue generation, etc.⁵

3D PRINTING FOR MAXILLOFACIAL PROSTHESIS

British company FrappDesign and Research* has developed 3D prosthetic eyes that could be produced much faster than existing handmade versions. This enables upto 150 eyes to be made in 1 hr.⁴

3D PRINTING TECHNOLOGY IN SURGICAL PLANNING

Hospitals around the world are increasing turning to 3D technology to plan complex surgeries like orbital hypertelorism.

3D printing means surgeon can go into a operation with a much better idea in mind.⁵

HOW BIO PRINTING WORKS

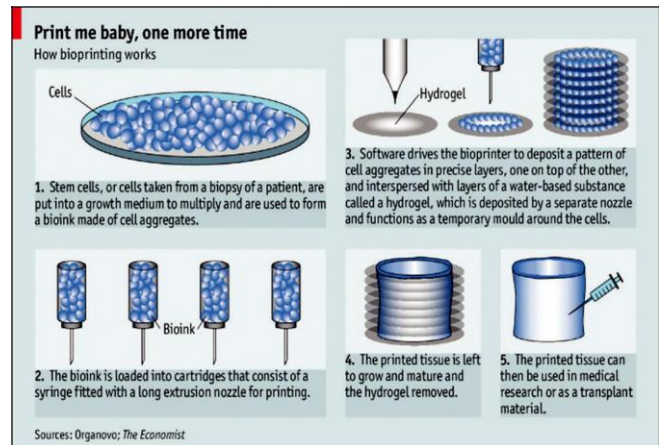


Figure 7: How Bioprinting Works

CONCLUSION

Developments in science and technology might look fictional but it could impedingly disrupt our future. Though the experiments are in a naïve phase, additive manufacturing technology has potential in terms of cost, productivity and time. Additive manufacturing technology in the dental industry is gaining popularity. 3D printing technology has been used for years for rapid prototyping (RP). Equipment manufacturers often want to create a prototype part without investing in expensive tooling. Typical use for RP technology has been same-part, small-volume production, with very good to excellent accuracy. The dental industry requires custom-part, single-unit production, with excellent accuracy. The volume of single-unit production in the dental industry is unlike anything the RP industry has encountered before. Dentistry is quite possibly the ultimate industry for RP technology to move into.⁴

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Obturing Materials in Primary Teeth

Abstract

Pulp therapy has been continued to be a challenge to clinicians. Many research works have been conducted since ages in finding the best suitable obturating materials to suit the specific properties of these teeth. This article seeks to present a review of the commonly used obturating materials and their modifications as well as their advantages and disadvantages.

Key words: Obturating materials, Primary teeth, Endoflas, Calcium hydroxide, Iodoform

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Introduction

Pulpectomy is a non vital pulp therapy which is most commonly recommended, where infection has spread to radicular pulp and the tooth shows the signs of irreversible pulpitis. This procedure aims at complete removal of all necrotic pulpal tissue from both coronal and radicular portion of the primary teeth followed by filling them with an inert resorbable material and it is mainly done in an attempt to prevent premature loss of primary teeth and so as to maintain tooth in the dental arch.¹ The main objective of endodontic treatment is total eradication of microorganisms from the root canal space and prevention of subsequent reinfection which can be achieved by vigilant cleaning and shaping followed by the complete obturation of the canal space.² The ultimate goal of obturation is to create a hermetic seal along the length of the root canal system, from the coronal opening to the apical termination.² Ideal requirement for pulpectomy obturation should be resorbability, antiseptic property, non-inflammatory and non-irritating to the underlying permanent tooth germ, radiopaque for visualization on radiographs, ease of insertion and removal.³ However, none of the presently available obturating materials pose all of these criteria. The present review seeks to evaluate each of the presently available obturating materials and present a few of the emerging concepts related to obturation of primary teeth. Presently, the various commonly used materials for obturation in primary teeth are Zinc oxide Eugenol, Calcium hydroxide, Walkhoffs paste, KRI paste, Maisto paste, Vitapex, Endoflas, Colla cole, Guedes-Pinto paste.^{3,4}

Discussion

Zinc oxide eugenol

Zinc oxide eugenol is one of the most commonly used materials for root canal filling of primary teeth. It was the first root canal filling material to be recommended for primary teeth. It was discovered by Bonastre in 1837 and was subsequently used in dentistry by Chisholm in 1876. Eugenol has anti-inflammatory and analgesic properties that are beneficial after a pulpectomy procedure. However, it also has certain disadvantages like slow resorption rate, irritation to the periapical tissues, necrosis of bone and cementum and alters the path of eruption of succedaneous tooth.⁵ Properties of zinc oxide

eugenol have been tried to be heightened by adding several natural antibacterial substances such as turmeric, neem, aloe vera etc. or by altering it with other materials.⁶ Success rate of zinc oxide was found to be 82.3%, by Barr et al, 82.5% by Gould et al and 86.1% by Coll et al.^{7,8,9} Zinc oxide eugenol has also been used in combination with different components like formocresol, formaldehyde and paraformaldehyde and cresol in order to improve its properties and success rate, but addition of these compounds neither increased the success rate significantly nor made the material more resorbable as compared to zinc oxide eugenol alone.¹⁰ A study conducted by Chawla et al on use of zinc oxide and calcium hydroxide in obturating primary teeth found that the obturated material remained up to the apex of root canals till the commencement of physiologic root resorption.¹¹ Also the material was found to resorb at the same rate as teeth. A combination of calcium hydroxide, zinc oxide, and 10 % sodium fluoride solution has been trialed in a clinical study and was observed that the rate of resorption of this new root canal obturating mixture was quite similar to the rate of physiologic root resorption in primary teeth.¹¹

Traitatvorakul et al when compared the clinical and radiographic success rates of zinc oxide-eugenol cement and calcium hydroxide/iodoform paste (Vitapex) in pulpectomized primary molar after 6 and 12 months they found the success rate of Zinc oxide eugenol to be 48% and 85% respectively.¹²

Calcium hydroxide

Since the introduction of Calcium Hydroxide by Hermann this medicament has been known to promote healing in many compromised clinical situations. Calcium hydroxide has been used either as the solitary root canal filling material for primary teeth or in association with iodoform which are commercially available as Vitapex, Metapex, Diapex. These products resorb easily if involuntarily pushed beyond the apex. However, the rate of resorption of the material from within the canals is faster than the rate of physiologic root resorption.¹³ Pitts studied the absorbable nature of Calcium Hydroxide and found giant cells to be present adjacent to remaining Calcium Hydroxide, but no inflammatory cells were seen.¹⁴ But the major disadvantage was high occurrence of internal resorption which led to poor success rates in long term.

The alkaline property of the material neutralized the inflammatory process as a local buffer and stimulated the alkaline phosphatase activity, which is essential for hard tissue formation. This material was found to be easy to apply and it has no toxic effects on permanent successor and was radioopaque. For all these reasons, calcium hydroxide - iodoform mixture can be considered to be a nearly ideal primary tooth filling material. Trairatvorakul et al after a follow up of 6 and 12 months in pulpectomized primary molar found the clinical and radiographic success rates of calcium hydroxide/iodoform paste (Vitapex) to be 78% and 89%. Within the first 6 months vitapex resolved the furcation pathology at a faster rate as compared to zinc oxide eugenol.¹²

Endoflas

Endoflas is a resorbable paste which contains barium sulphate, calcium hydroxide, iodoform and zinc oxide eugenol. This paste is obtained by mixing a powder containing triiodomethane and iodine dibutylthorocresol (40.6%), zinc oxide (56.5%), calcium hydroxide (1.07%), barium sulphate (1.63%) and with a liquid consisting of eugenol and paramonochlorophenol.² The material is hydrophilic and can be used in mildly moist canals. It provides a good seal. Due to its broad spectrum of antibacterial activity, Endoflas has the ability to disinfect dentinal tubules and difficult to reach accessory canals that cannot be disinfected or cleansed mechanically. The components of endoflas are biocompatible and can be removed by phagocytosis, hence making the material resorbable. Unlike other pastes, Endoflas only resorbs when extruded extra-radicularly, and not intra-radicularly. The disadvantages of this material is that its eugenol content cause periapical irritation. It also causes tooth discoloration. Some studies have indicated that Zinc oxide eugenol has better antimicrobial activity as well as lower cytotoxicity than KRI paste.¹⁵ Antimicrobial efficacy of zinc oxide eugenol, iodoform paste, KRI paste, Maisto paste and Vitapex® were evaluated by Pabla et al. and aerobic and it was found that Maisto paste had the best antibacterial activity. Iodoform paste was the second best followed by zinc oxide and eugenol and Kri paste.

Vitapex® showed the least antibacterial activity.¹⁵ Radhakrishna AM found that when Endoflas powder is mixed with Curcumin gel showed faster resorption of the over extruded material within 1week, also showed a decrease in inter-radicular radiolucency after 1month and maintained until 3month follow-up.¹⁶ Reval N et al compared the clinical and radiographical success rates of zinc oxide eugenol with endoflas for the root canal filling of primary teeth at 3, 6, and 9 months interval and found Endoflas has better results than zinc oxide eugenol thus It can be a material of choice for pulpectomy in primary teeth.¹⁷ Navit S et al compared the antimicrobial efficacy of different obturating materials frequently used in pediatric dentistry like endoflas, zinc oxide eugenol, calcium hydroxide with chlorhexidine, calcium hydroxide with

iodoform and distilled water, metapex and saline. Agar diffusion method was used to determine antimicrobial efficacy against *E. faecalis* and the result showed that among all these obturating materials endoflas had the highest antimicrobial efficacy.¹⁸

Iodoform paste

The original Walkoff paste contained parachlorophenol, camphor and menthol which has been reformed by addition of iodoform in KRI paste and addition of zinc oxide, thymol and lanolin in Maisto paste. These combination products have shown to be bactericidal,

resorbable and harmless to the permanent tooth germs as well as ease of removal. Iodoform containing pastes are readily resorbed from the periradicular region, and do not cause any foreign body reaction. Over filling and resorption of the paste containing Iodoform from the root canals had no effect on the success of the treatment but regarded as having a positive healing effect.

Shah SS when compared zinc oxide eugenol and vitapex as the obturating materials in deciduous non-vital teeth, vitapex showed successful results as a filling material than zinc oxide eugenol.¹⁹

Conclusion

It has been found that the currently employed obturating materials still need to be modified to meet satisfactory clinical results. Due to the shortcomings of Zinc oxide eugenol material several other materials have been investigated and various combinations tried with some degree of success. The current combinations of calcium hydroxide and iodoform seem to provide better results than zinc oxide eugenol cements. However, further controlled studies and researches are required to find the ideal obturating material for primary teeth.

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Nano-dentistry: A New Buzz in Dentistry, Its Role in Cancer Diagnosis and Treatment

Abstract

Curiosity has its own reason for existing. Nanotechnology holds promise for advanced diagnostics, targeted drug delivery, and biosensors. Nanotechnology when integrated into dentistry gives rise to a new stream referred to as nano-dentistry. There is an increase in optimism that nanotechnology applied to dentistry will bring significant advances in the diagnosis, treatment and prevention of diseases. New methods of nano engineered materials that are being developed might be effective in detecting diseases at an early stage thus enhancing the treatment modality of diseases such as cancers. Nanotechnology has increased the hope for better oral health care delivery and improved maintenance through ongoing research in diagnosis, cure and prevention of oral diseases. A day may soon come when nano-dentistry will succeed in maintaining near perfect oral health by the aid of nanorobotics, nanomaterials, and biotechnology.

Key words: Dentistry, Nanotechnology, Nanorobots, Nanodevices

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Introduction

“The next big thing is very small”

Greatness does not come from size. Surprise come in small packages.

Nanotechnology is the engineering of functional systems at the molecular scale. Nano refers to the 10⁻⁹ power, or one billionth. Comparison, a human hair is about 100,000 nanometer thick. The word itself is a combination of nano, from the Greek “nanos” (or Latin “nanus”), meaning “Dwarf”, and the word “Science”¹.

History

The vision of nanotechnology was put forth by the late noble laureate in physics Dr. Richard Feynman by a talk delivered on “THERE IS PLENTY OF ROOM AT THE BOTTOM”, at an American physical society meeting on 1959. The word nanotechnology was coined by Norio Taniguchi and introduced by Prof Eric Drexler. The term NANO-DENTISTRY was first popularized in 2000 by research scientist Robert Freitas².

NANO- STRUCTURE AND MATERIALS

Nano-particles carry special properties such as chemical, optical, magnetic, and electronic properties which segregate them from individual molecules or bulk species which lack these properties³.

Various Nano Structures are:

- Nano-pores
- Nanotubes
- Quantum dots
- Nano-shells
- Dendrimers

Nano particulate drug-delivery systems

There are many interesting nano devices being developed that have a potential to improve cancer detection, diagnosis, and treatment⁴.

Properties of Cancer Cells

Epidermal Growth Factor Receptor (EGFR) over expression and over activity have been associated many different types of Cancer. Cancer cells have a unique properties that can be exploited by nano particles. Nano particles can be used to target bio-markers or antigens that are highly specific to Cancer cells⁵.

Applications of Nano-Technology in Dentistry

Application of Nano-medicine to dentistry has led to the emergence of a branch of science called Nano-dentistry. Emergence of Nano-dentistry will aid in the maintenance of perfect oral health care through the use of nanomaterials, biotechnology, and Nano robotics.

Approaches in Nano-Technology

Top down approaches

The top down approach to create smaller devices by using larger ones to direct their assembly.

Bottom up approaches

The bottom-up approach involves assembling structures atom-by-atom or molecule-by-molecule, and may prove useful in manufacturing devices used in medicine⁶.

Diagnosis of oral cancer

This high mortality rate in cancer is attributed to the difficulties in detecting cancer at an early treatable stage. Detecting oral cancer at it

is earliest is thus vital for improving the survival rate of this disease and imaging plays a critical role in overall cancer management: in diagnostics, staging, radiation planning, and evaluation of treatment efficiency⁷.

Nano devices are small enough to enter the cell

Most animal cells are 10,000 to 20,000 nanometers in diameter. Nano scale devices (less than 100 nanometers) can enter cells and the organelles inside them to interact with DNA and proteins. Tools developed through nanotechnology may be able to detect disease in a very small amount of cells or tissue. They may also be able to enter and monitor cells within a living body⁸.

Nanodevices can improve cancer detection and diagnosis

Detection of cancer at early stages is a critical step in improving cancer treatment. Currently, detection and diagnosis of cancer usually depend on changes in cells and tissues that are detected by a doctor's physical touch or imaging expertise. Instead, scientists would like to make it possible to detect the earliest molecular changes, long before a physical exam or imaging technology is effective. To do this, they need a new set of tools⁸.

Nano devices Can Improve Sensitivity

In order to successfully detect cancer at its earliest stages, scientists must be able to detect molecular changes even when they occur only in a small percentage of cells. This means the necessary tools must be extremely sensitive. The potential for nanostructures to enter and analyze single cells suggests they could meet this need⁹.

Nanodevices can preserve patient sample in active state

This is important because the samples clinicians use to screen for cancer are often in limited supply. It is also important because it can capture and preserve cells in their active state. Scientists would like to perform tests without altering cells, so the cells can be used again if further tests are needed⁹.

Salivary Diagnostics Powered By Nano Technologies

Saliva is a non-invasive and economical diagnostic aid in the diagnosis of oral diseases. The medium can be analysed by the electromechanical biosensors which carry high sensitivity and specificity for the detection of oral diseases.

Oral fluid nanosensor test (ofnaset)

The OFNASET is a portable, automated, user friendly, integrated system that will detect the salivary proteins and nucleic acid targets in the saliva¹⁰.

Oral Diagnosis and Therapeutics:

Photosensitizers and Carriers

Quantum dots can be used as photo sensitizers which can mediate targeted cellular destruction. They can bind to antibody present on surface of target cell and when stimulated by ultraviolet light will release reactive oxygen species and this will be lethal to target cell. This therapy can be used to fight with malignant cell¹⁰.

Using Gold Nano Particle

Gold nanoparticles ('nanogold') occur as clusters of gold atoms up to 100nm in diameter. Gold nano particles are produced in a liquid ("liquid chemical methods") by reduction of chloroauric acid ($\text{H[AuCl}_4\text{]}$), although more advanced and precise methods do exist. It can also be synthesised by laser ablation¹².

TREATMENT

Once the nanoparticle has safely traveled through the blood stream, it binds to the tumor cell. Most work is being done with near-infrared light, which is harmless to humans but can only penetrate human tissue about 1.5 inches. Nano particles can be tuned to be excited only by certain ranges of light. Then by using principle of photo thermal ablation it will convert into heat. Cancer cells die at 42°C (108°F), normal cells die at about 46°C (115°F)¹³.

Nanotubes:

Another nano device that will help identify DNA changes associated with cancer is the nanotube. Nano tubes are carbon rods about half the diameter of a molecule of DNA that not only can detect the presence of altered genes, but they may help researchers pinpoint the exact location of those changes.

Quantum Dots:

These are minuscule molecule that could be used to detect cancer is a quantum dot. Quantum dots are tiny crystals that glow when they are stimulated by ultraviolet light¹¹.

Nano shells as Cancer Therapy

Researchers can already link nanoshells to antibodies that recognize cancer cells.

In laboratory cultures, the heat generated by the light-absorbing nanoshells has successfully killed tumor cells while leaving neighboring cells intact¹³.

Advantage of Nanotechnology Treatment

Nano scale devices have the potential to radically change cancer therapy for the better and to dramatically increase the number of highly effective therapeutic agents. It greatly reduces or eliminate the often unpalatable side effects that accompany many current cancer therapies. It is useful to eradicate cancer cells without harming healthy, neighboring cells¹⁴.

Challenges Faced by Nano Dentistry

Requires proper assembling of the molecules to build a functional unit. Financial constraints for mass production of Nano robots. Difficulty in coordinating the activities of Nano sized Nano robots. Public acceptance is questionable. Ethics and regulations have to be formulated. Human safety, issue requires further research¹⁵.

Future

Human clinical trials within the next 2 -3 years. Safe, consistent and more specific nano particle production. Turning cancer into a chronic, but manageable disease within the next 15-20 years¹⁶.

Conclusion

Over the past 150 years, many innovative and groundbreaking techniques have been developed in order to treat cancer. But these approaches have their own series of undesirable side effects that are both dangerous and damaging to the overall health of the patient. We will make early detection, prevention and treatment with a high degree of accuracy and ease possible that is effective and can be made safe.

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New trends in Computer-Aided Implant Surgery— A Review

Abstract

The objective of this article was to review the different factors and limitations influencing the accuracy of computer-aided implant surgery. In vitro and in vivo accuracy studies of articles were examined. Compared to the conventional technique, this sophisticated technology requires substantially more financial investment and effort but appears superior on account of its potential to eliminate possible manual placement errors and to systematize reproducible treatment success. Future long-term clinical data are necessary to identify clinical indications; detect accuracy; assess risk; and justify additional radiation doses, effort, and costs associated with computer-assisted implant surgery using static guides and dynamic navigation system. **Citation:** Tomar S, Gupta A, Reddy NG, Kumari U, Rana N, Thomas P.(2018) New trends in Computer-Aided Implant Surgery—A Review

Purpose: The main aim of this review is to provide the information on various new trends in computer aided implant surgery.

Key words: Dental implant, Navigation surgery, Surgical guides, Computer planning

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INTRODUCTION

Anatomical structures surrounding site of implant placement has always been subject of interest to dental clinicians. Moreover in order to achieve optimal occlusion and implant loading, correct positioning of implant is of prime importance. Correct implant positioning also enables us to have a optimal design of final prosthesis. Consequently, all of these factors may contribute to the long-term success of dental implants.

CBCT is a three dimensional imaging tool that has led to breakthrough in the field of implant dentistry. CBCT images along with implant planning software allows us to virtually plan the optimal implant position.¹⁻³ The virtual planned information is used to fabricate so called drill guides. These drill guides helps in directing the implant osteotomy and implant placement.

The most recent advancement is the use of dynamic navigation in which a surgeon can visualize the avator of the drill in a 3D relationship to the anatomical structures that were recorded on CBCT images. It also allows the clinician to modify the positioning of implant in real time and can alter the surgical procedure.⁴

Navigation is used for dental implant placement for several reasons (i) to avoid important structures such as the inferior alveolar nerve (ii) to minimize flap mobilization in order to achieve minimally invasive surgery, (iii) to accurately place multiple implants with proper spacing and angulation, (iv) to place single implants in exact locations when access is minimal and when the esthetic needs are high. Navigation allows prosthetic/surgical collaboration with precise planning and accurate orchestration of the plan to achieve ideal patient specific results.

Jung et al (2009)⁵ did a systemic review in which he stated that static system is more accurate than dynamic approach. However, most of

the publications on navigation have been clinical studies, whereas the majority on static protocols has been preclinical (models or cadaver, etc), where more accurate measurements are possible. In a recent clinical study Block M S et al (2018)⁶ stated that Dynamic navigation can achieve accuracy of implant placement similar to static guides and is an improvement over freehand implant placement.

Survival studies

For implants, osseointegration of an implant, with or without peri-implantitis, or loss of bone is considered survival. Implant survival has frequently been documented as an outcome measure (Iqbal and Kim, 2007).⁷ For example, a meta-analysis of implant outcome included studies using either Albrektsson's or Smith and Zarb's criteria "as a useful yardstick", or that "sufficiently described criteria for failure or survival" (Lindh et al., 1998).⁸ A systematic review and qualitative analysis of implant studies spanning 20 years found the majority of studies using survival over success assessment (Bhatavadekar, 2010).⁹

It was found from the systematic review that the implants had been placed using computer- guided surgery have comparable success as compared to implants placed following a non-guided protocol.

Implants placed in upper jaw and lower jaw had shown considerable inconsistency in terms of success. More failures in mandible had been reported by Pomares (2010)¹⁰ whereas Tahmaseb et al (2012)¹¹ reported a higher failure rate in maxilla. The difference in results of various studies could be attributed to different external factors for example sinus augmentation procedures required in maxilla.

Another important factors that could have been affected the survival rate was the use of different restoration approaches in patients. In a study by Tahmaseb et al (2012)¹¹ mini implants were inserted prior to surgery due to which a level of accuracy was being achieved that allowed the fabrication of the final prosthesis.

From various studies it had also been reported that the incidence of prosthetic complication is higher than the surgical complication.

Accuracy studies

Accuracy studies are done to provide an insight of deviation between planned implant position and actual implant placement (fig 1). Several measuring points were used in the studies for the comparison of these positions:

- Error at the entry point, measured at the center of the implant
- Error at the apex, measured at the center of the implant apex
- Angular deviation
- Error in implant height

It is important to have knowledge regarding potential maximal implant deviation and computer guided implant placement procedures. As these procedures are used in surgical site areas where bone quantity is limited or presence of anatomical structure adjacent to surgical site is encountered e.g. mandibular nerve.

*Di Giacomo et al (2005)*¹² proposed that difference in the deviation of implant position planned and the implant placed under computer assist guidance might be due to the movements of surgical guide during implant preparation.

The difference in accuracy for static guides in various studies might be attributed to movement of the surgical guide during implant preparation. It had also been reported that the accuracy of Lab guides (Non CAM) is lower than that of CAM guides.

Furthermore, accuracy is being affected by the support of guides. *Tahmaseb et al (2010)*¹³ stated that guide supported by mini implants provide better accuracy than all the other types of support. This might be due to the reason that the template position is reproducible during acquisition of radiographic data and during implant placement especially in edentulous patients. Bone supported guides had shown statistically significant lower accuracy in reported literature

*Tahmaseb et al (2014)*¹⁴ demonstrated in their study that different factors (teeth- versus mucosa- versus implant-supported; type of guidance, etc) (fig 2,3) can play a crucial role in the overall success of these advanced techniques.

*Ozan et al (2011)*¹⁴ reported significantly better accuracy in the mandible compared to the maxilla within the same study, while *Di Giacomo et al (2012)*¹⁵ reported profoundly higher deviations in the maxilla as well. However, *Pettersson et al (2010)*¹⁶ observed a statistically significant higher deviation in the mandible.

*Block et al (2018)*¹⁶ evaluated dynamic guided system in a clinical study and reported that dynamic navigation is as accurate as static guides. Dynamic navigation (fig 4) has a number of inherent advantages over static navigation. As it allows the clinician to modify the surgical plan while implant placement if required. It provides with the benefit of direct visualization of surgical field at all times. No interference is encountered in visualization of drill site as it is seen in static guides.

Dynamic navigation can be used in patients with limited mouth opening and in the posterior area of the mouth such as second molar sites whereas prolongation of tubes in static guides and drill stack heights are a significant limitation of static guides. Dynamic navigation provides us with guidance in tight single tooth situations eg in the anterior mandibular sites.

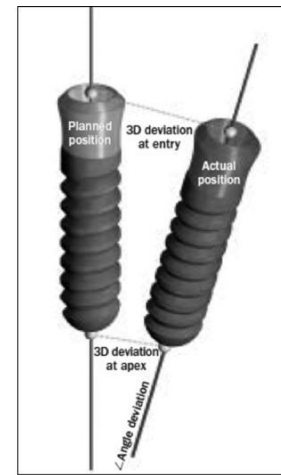


Figure 1: Different variables for describing the deviation per implant



Figure 2: Tooth supported guide



Figure 3: Mucosa supported guide

Special instrumentation is not required in dynamic navigation whereas non-proprietary statically guided implant systems require that very specific drills be used in a predetermined fashion. Static guides allow us to use implants of limited size whereas it is not the same with dynamic navigation.

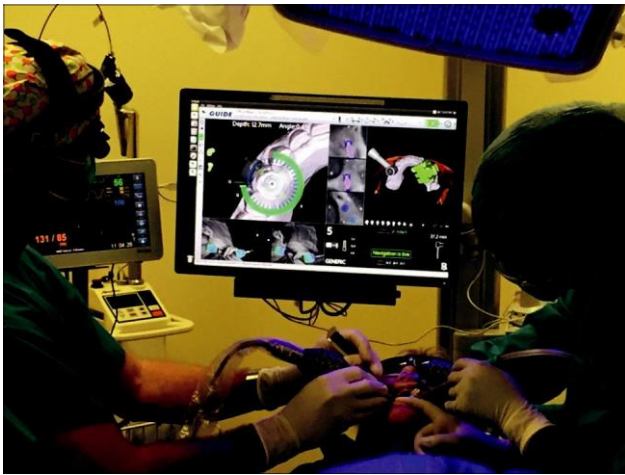


Figure 4: Dynamic navigation system

Dynamic guided implant systems are convenient for the patient and the doctor. CT scan, planning of implant placement and insertion of implant under computer assisted guidance can be performed on the same day. There is no need to fabricate a guide in a laboratory or wait for a guide to be printed on 3D printer. Finally, dynamic guidance allows for improved surgeon ergonomics during surgery as surgeon can visualize the surgical field during the drilling procedure while looking at a computer monitor and does not need to bend over or twist to place the implant.

Thus from various studies it had been seen that the use of either a static CAD/CAM guide or a dynamic guidance system improves the surgeon's ability to place implants in the planned position in all measured dimensions over free hand or conventional lab fabricated guided surgery.

Conclusion

From the reported literature it can be concluded that the accuracy of the evaluated dynamic navigation system was similar to the accuracy reported for static CT-generated guides. With more experience using dynamic navigation system, the surgeon will gain proficiency and will use the plan with less trepidation. The use of either a static CAD/ CAM guide or a dynamic guidance system improves the surgeon's ability to place implants in the planned position in all measured dimensions over freehand or conventional lab fabricated guided surgery.

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Micro-Implant Anchorage for the management of Bimaxillary Protrusion: A Case Report

Abstract

Bimaxillary protrusion is a commonly seen malocclusion in many ethnic races. Patients present themselves with a concern of lip incompetency, impaired facial profile, protrusive and proclined upper and lower incisors, increased teeth display and lack of personal esteem. Reduction of this protuberance to achieve pleasant dentofacial and smile esthetic should be the prime goal of orthodontic treatment of these patients. The successful achievement of these goals depends on the most efficient use of this extraction space. Mini implants are the most suited modality to treat such patients as they provide the absolute anchorage to manage these cases most efficiently.

Key words: Bimaxillary protrusion, Mini Implants, Mini screw, TAD, Smile Esthetics

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Introduction

Bimaxillary protrusion is a type of class I malocclusion having structural deviation in the sagittal relationships of the maxillary and mandibular bony arches. It is often characterized by orthognathic maxilla and mandible with anterior dentoalveolar protrusion. Patients present themselves with a concern of lip incompetency, impaired facial profile, protrusive and proclined upper and lower incisors, increased teeth display and lack of personal esteem.^{1,2,3} Reduction in this procumbency is the prime desire of these patients. Typical method of handling this type of malocclusion includes extraction of all the premolars followed by anterior teeth retraction with a resultant decrease in soft tissue procumbency and convexity.⁴ The successful achievement of these goals depends on the most efficient use of this extraction space. Maximum retraction of the anterior teeth without any loss of anchorage has become possible with the recent introduction of mini implants, also known as the temporary anchorage devices (TAD).^{5, 6}

Use of mini implants, instead of the conventional methods of reinforcing anchorage (extraoral appliances and transpalatal arch), provides absolute anchorage to obtain en masse retraction without anchorage loss.⁷ The need for patient cooperation also gets minimized. The mini implants are usually placed in the safe zones of the interradicular bone on buccal or palatal side of alveolar bone.⁸ This case report presents the successful management of severe bimaxillary protrusion in a female patient using mini implant anchorage for optimal results.

Case Report

Diagnosis And Treatment Planning:

A 16 year old female Patient reported with a chief complaint of forwardly placed front teeth and inability to close her lips. She did not have any significant medical or dental history. Patient had a mesoprosopic facial form, mesomorphic body type with a convex

facial profile, without any gross asymmetry. There was an increased incisor display at rest and during smile. Intra orally she had class I molar and canine relation on either sides. Generalised spacing was present in upper and lower arches. Increased overjet of 5mm and overbite of 1 mm without midline shifts were present (Fig: 1).

Cephalometrically (Fig.2 & Table 1), the patient had a skeletal class I malocclusion (SNA- 80°, SNB-77°, ANB-3°) with a normal maxilla and mandible. Patient had a horizontal growth pattern (FMA-23°). Both, the maxillary incisors and mandibular incisors were proclined and forwardly placed (Tables-1). Panoramic radiographic evaluation showed permanent dentition with all teeth present including the third molars in all quadrants. Total space required to correct the discrepancy was of 18 mm in upper arch and 12 mm in the lower arch. Thus, the management of bimaxillary protrusion in this patient warranted the extraction of all the maxillary and mandibular first premolars with Group A anchorage requirements. Fixed orthodontic mechanotherapy (MBT prescription, 0.022 inches slot) along with the usage of micro-implants for anterior retraction and anchorage control were planned for this patient.

Treatment Progress

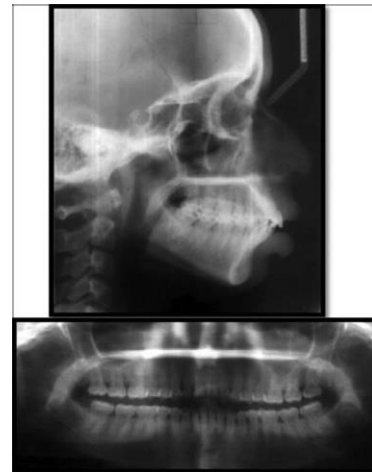
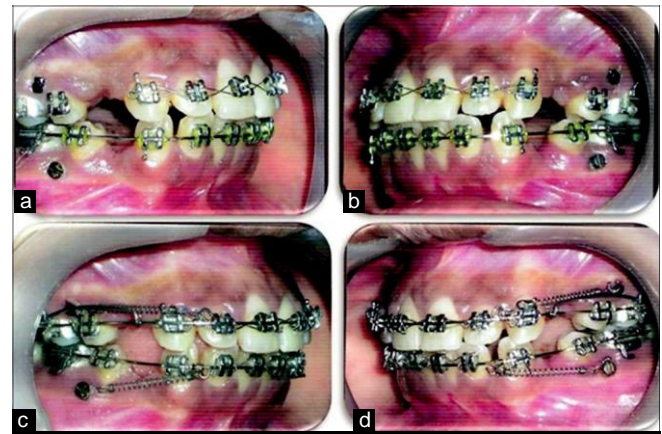
Upper and lower teeth were bonded with fully programmed preadjusted 0.022 MBT prescription brackets after the extraction of upper and lower first premolar teeth. Initial leveling and alignment was started using 0.014" NiTi in both arches, which was followed by 0.016" NiTi, 0.017" x 0.025" NiTi and 0.019" x 0.025" NiTi Wires. Finally, 0.019" x 0.025" Stainless steel wire with retraction hooks between the lateral incisor and canines was placed in both arches. After the Initial leveling and alignment of teeth, micro-implants were inserted in the interdental space between the second premolar and the first molar in both upper and lower arches (Fig 3a). Then, en-masse retraction of six anterior teeth was started in both upper and lower arches. Niti closed coil spring were stretched from the mini implants to the retraction hooks, which delivered constant retraction forces of 150-200 gms (Fig 3b). Tipback springs made with 0.017x0.025 inches

Table 1: Comparison of the pretreatment, post treatment and post retention cephalometric values

Variables	Mean values	Pre treatment	Post treatment
SNA	82°	80°	78°
SNB	80°	77°	76°
ANB	2°	3°	3°
N I PT A	0-2MM	2MM	2MM
N I TO PT PG	0-4 MM	3MM	4MM
SN/GO-GN	32°	30°	31°
U1/NA	22°	47°	24°
U1-NA	4 MM	10 MM	5MM
L1/NB	25°	35°	33°
L1-NB	4 MM	7 MM	4 MM
U1/L1	131°	105°	134°
U1-SN	102	124°	100°
IMPA	90°	106°	94°
FMA	25°	23°	24°
S LINE TO UPPER LIP	-2MM	5MM	3MM
S LINE TO LOWER LIP	0 MM	1MM	3MM
OVERJET	2MM	11MM	2MM
OVERBITE	2MM	6MM	2MM

**Figure1:** Pretreatment extraoral and intra oral photographs.

TMA wire were given to prevent any untoward deeping of the bite during retraction of anterior teeth. A compensating curve was also incorporated in upper archwire to avoid any torque loss in the upper

**Figure 2:**Pre treatment radiographs**Figure 3:** Treatment progress (a) Placement of mini implant in all the four quadrants between second premolar and first molars. b) En masse retraction of the six anterior teeth using mini implants and close coiled NITI springs

incisors. Patient compliance with these micro implants was good. After about seven months of active retraction, closure of the extraction space was achieved (Fig 4). Finishing and detailing were done and the appliance was debonded after total treatment duration of 18 months. Lingual bonded retainers were fixed for retention phase.

Treatment Results (Fig.4, Fig.5 & Table 1)

After 18 months of active treatment, favorable dental and soft tissue relationships were obtained. Drastic improvement in the facial profile and lip competence was achieved. Class I molar and canine relations were maintained. The maxillary and mandibular arches were well aligned, and the dental midlines were coincident. Cephalometric values for the pretreatment and Posttreatment stages are given in Table 1. Maxillary and mandibular incisors showed significant uprighting and significant retraction. Soft tissue profile was improved significantly.

Discussion

Bimaxillary protrusion is a common type of malocclusion prevalent in many ethnic races throughout the world.^{1, 2} Best utilization of the extraction space is the key to successful management of this



Figure 4: Post treatment extraoral and intra oral photographs

type of malocclusion.³ Mini implants or, miniscrews are known to provide an absolute anchorage for orthodontic tooth movement and increases the possibility of maximum utilization of the extraction spaces. The small size of mini implants allows their safe placement in the interradicular alveolar bone on the buccal and palatal aspect of the alveolar process. Benefits, such as ease of insertion and retrieval after treatment and immediate force applications have made mini implants very attractive option. Treatment time can be reduced effectively with minimum patient cooperation while offering maximum treatment efficiency in maximum anchorage cases.⁵⁻⁸ Morphology of the alveolus can be a limiting factor determining the extent of anterior teeth retraction that is possible for correction of protrusion. Some patients may need surgical management for their protruding teeth.⁹ Other limiting factors such as tonicity of the lip musculature, lip redundancy, interlabial gap, tongue thrusting, tongue volume and activity must be evaluated in the patient with bimaxillary protrusion to predict the possible consequences of incisor retraction.^{9,10}

Conclusion

Retraction of anteriors along with significant uprighting of the incisors with usage of mini implants resulted in very satisfying and

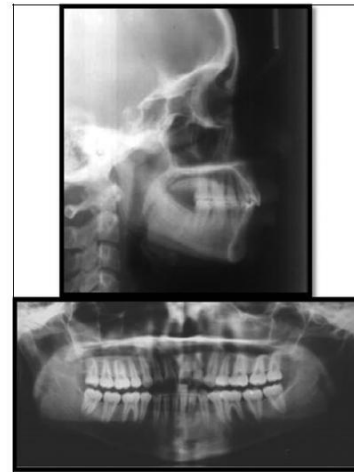


Figure 5: Post treatment radiographs

successful improvement in the dentofacial and smile esthetics of this female patient.

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Coronally Advanced Flap Along with Autologous Platelet Rich Fibrin: Journey to Smile - A Case Report

Abstract

Gingival recession results due to the apical migration of gingival margin. Correction of such gingival recession is necessary to enhance aesthetic as well as functional demand. Variety of periodontal plastic surgical procedures including coronally advanced flap (CAF) are described, each having advantages and disadvantages. To improve the clinical outcome of such surgical procedures, several regenerative materials have been combined with it. Though platelet rich fibrin (PRF) is one of the best regenerative material, it is not frequently used along with the periodontal plastic surgical procedures. In the present case report, PRF is combined with CAF for the treatment of multiple gingival recessions.

Key words: Recession, Platelet rich fibrin (PRF), Coronally advanced flap (CAF), Regeneration, Root coverage

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Introduction

Gingival recession is the displacement of the soft tissue margin apical to cemento-enamel junction with exposure of root in the oral cavity. It is one of the major aesthetic concern seen in the field of periodontology.¹ Root hypersensitivity is a common complaint associated with gingival recession, resulting because of root exposure and subsequent exposure of dentinal tubules in the oral cavity. It also results in attachment loss and root caries.² One or more etiologic factors are responsible for gingival recession includes inflammatory periodontal disease; mechanical trauma from tooth brushing; occlusal trauma; high frenal attachment; tooth malposition or root prominence leading to the thinning of bony plate; orthodontic tooth movement in unusual direction; underlying alveolar dehiscence; thin gingival biotype; and other periodontal treatment-related factors.³ Various periodontal plastic surgical procedures are offered to treat gingival recession. Most commonly used techniques are free graft which includes free gingival graft and subepithelial connective tissue graft; and pedicle flap which includes lateral pedicle flap and coronally advanced flap (CAF). With the use of free gingival grafts, gingival tissue color matching is always a problem which results in an unsatisfactory aesthetic. Though subepithelial connective tissue graft is satisfactory in terms of aesthetic and recession coverage, it requires a second surgical site. CAF technique have also shown more predictable recession coverage with apparently acceptable aesthetic results.² CAF when used alone is unstable on long-term, in spite of having many advantages.⁴ Such procedure does not always result in the regeneration of lost attachment apparatus such as cementum, periodontal ligament, and alveolar bone, which may act as a future risk factor in the recurrence of gingival recession. To avoid such further risk of recurrence, CAF is often combined with various regenerative materials like guided tissue regeneration membranes, enamel matrix proteins derivatives, alloderm, living tissue-engineered human fibroblast derived dermal substitute which helps to regenerate functional attachment apparatus as well

as enhances root coverage. Various new regenerative materials have been tried with CAF. One of such material is autologous platelet concentrates.² Platelet rich fibrin (PRF) is an autologous platelet concentrate system which require simplified process of preparation, and also does not need addition of any anticoagulant during its preparation.⁵ The prepared PRF has a three dimensional fibrin network incorporated with platelets, leukocytes, different growth factors, and circulating stem cells. Use of PRF is increasing in the periodontal and implant surgical procedures because of it's enhanced capacity for bone regeneration and soft tissue wound healing. Thus by considering various advantages of PRF, the multiple gingival recession shown in the present case report, was treated using autologous PRF membrane combined with CAF.²

Case Report

A 42 year old female reported to the department of periodontology in MMDCH dental collage with chief complaint of unaesthetic appearance and teeth sensitivity in maxillary anterior region since 6 months. During clinical examination, Miller's class II recession noticed wrt 23. Recession of 5mm were recorded wrt 23 (Figure 1).

Gingival biotype was thin, width of attached gingiva was adequate. So, we decided to do coronally advanced flap (CAF) with Platelet rich fibrin (PRF) to achieve good root coverage and adequate gingival biotype thickness.

Whole surgical procedure was explained to the patient and written consent was obtained. Complete blood checkup was done before surgical procedure. Scaling and root planing was carried out. Oral hygiene instructions were given mainly in terms of proper brushing technique. Three weeks following this initial therapy, the periodontal re-evaluation was done for oral hygiene maintenance and to record gingival tissue response to the initial therapy. After re-evaluation surgical procedure was carried out.

Surgical procedure

Before proceeding to surgical procedure, The PRF was prepared following the protocol developed by Choukroun *et al.*⁶ 10 ml of intravenous blood (by a venipuncture of the antecubital vein) was collected into two test tubes (each containing 5 ml of blood) without anticoagulant and immediately centrifuged at 3000 revolutions/min for 10 minutes. At the end of centrifugation, three layers were seen, the top layer containing supernatant serum, the fibrin clot at the middle layer, and the bottom layer containing the red blood corpuscles (RBC). The fibrin clot was easily separated from the RBC base (preserving a small RBC layers) using sterile tweezers and scissors. It was placed in a sterile dappen dish and was left aside. Before use, it was slightly squeezed with the gauze piece to remove its serum content. (Figure 2 & 3).

After giving local anaesthesia (1: 200000 adrenaline), a full thickness trapezoidal flap was elevated on the buccal aspect of the teeth being treated. Two horizontal oblique incisions connected with bilateral vertical incisions were given. After that full thickness flap was reflected till mucogingival junction and then partial thickness flap was reflected beyond mucogingival junction for proper coronally advancement of flap. (Figure 4) Flap was placed coronally, PRF membrane was placed on the root surface (Figure 5) and sling sutures were given and periodontal pack was given. (Figure 6) Post operative instructions were given to the patient and patient was recalled after 12 days for suture removal. Medications were given to the patient. Patient was again recalled after 1 and 3rd month.

Result

90 to 100% root coverage was seen after 1st and 3rd months with increase in thickness of gingival biotype. (Figure 6 & 7 & 8)

Formula followed for complete root coverage:-

Preoperative recession – postoperative recession

$\times 100$ Preoperative recession

Discussion

Treatment of gingival recession is becoming an important issue in clinical periodontology due to the increasing demand for cosmetic treatment. Problems relate particularly to the fact that very often, the patient exposes only the most coronal millimeters of the recession when smiling. Thus, only surgical procedures that provide the clinician with a very high percent of complete root coverage should be included in the mucogingival plastic surgical techniques. The present case report aimed at treating Miller's Class-II gingival recessions, with an initial recession height of 5mm wrt 23. Such type of recession defect could be treated with pedicle soft tissue grafts, free soft tissue grafts or combinations of the two. Among the pedicle grafts, the CAF is one of the valid surgical options to cover exposed root surfaces. It has many advantages over other surgical procedures used to treat gingival recessions: it does not require a separate surgical site to obtain a graft; the tissue of the pedicle provides a perfect color and contour match with the surrounding tissue; the procedure is simple to perform; and does not require an extended surgical or recovery time.⁷

Most of the studies support the hypothesis that therapy with CAF alone can be successfully applied when the residual gingiva is thick and wide.⁸ Accordingly the adjunctive use of a graft could



Figure 1 Preoperative view



Figure 2: Centrifuged PRF

be restricted to sites with thin residual gingiva. Therefore in the presented case report, PRF was used along with CAF. PRF also promotes more rapid attachment to the tooth with stable result. In addition, PRF slows down the blood activation process, which could induce an increased leukocyte degranulation and cytokine release from proinflammatory mediators, such as interleukin (IL)-1 β , IL-6, and tumor necrosis factor- α , to anti-inflammatory cytokines, such as IL-4, different growth factors like transforming growth factor-1 β , platelet derived growth factor- α β , and vascular endothelial growth factor, and glycoproteins (thrombospondin-1) over more than 7 days. Leukocytes seem to have a strong influence on growth factor release, immunoregulation, anti-infectious activities and matrix remodelling during healing. As a healing material, it stimulates the gingival connective tissue on its entire surface with growth factors

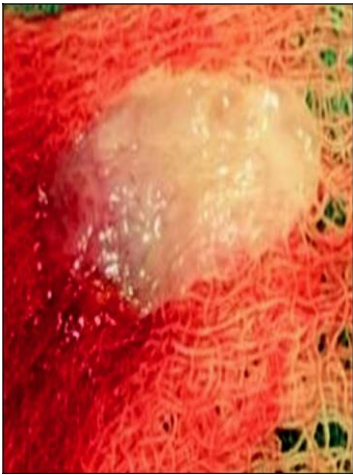


Figure 3: PRF membrane



Figure 6: Sutures placed



Figure 4: Operative view split thickness flap



Figure 7: 1mm recession at 1 month



Figure 5: Membrane PRF



Figure 8: 1mm recession at 3rd month

and impregnates the root surface with key matrix proteins for cell migration (fibronectin, vitronectin, and thrombospondin-1). Moreover, the fibrin matrix itself shows mechanical adhesive properties and biologic functions like fibrin glues: it maintains the flap in a high and stable position; enhances neoangiogenesis;

reduces necrosis and shrinkage of the flap; and guarantees maximal root coverage.⁹

Thamaraiselvan M et al compared CAF with and without PRF in the treatment of isolated Miller's class-I and class-II gingival recession. The CAF group showed a non significant gingival

thickness (GTH) increase of 0.03 ± 0.04 mm which is similar to other studies. Interestingly, the addition of PRF to CAF resulted in a 0.30 ± 0.10 mm GTH increase, which was statistically significant when compared both within and between the groups and concurs well with Aroca et al study. This gain in gingival tissue height (GTH) should be considered clinically significant since abundant empirical evidence suggests that thick tissue, resists occlusal trauma and subsequent recession, enables tissue manipulation, promotes creeping attachment and exhibits less clinical inflammation.² Biju RM et al used PRF along with CAF to treat gingival recession of around 2-3 mm with 22 and 23. Superior results were obtained after the treatment with residual recession of only 1mm remained with 23 after 6 months.⁹

The result from the present case report are in accordance with the studies by Wiltfanget al. and Corsoet al. who have confirmed the successful use of PRF membranes in the management of both single and multiple gingival recession defects. In a similar study Erenand Atilla accepted that the PRF method is practical and simple to perform. Additionally, they found PRF to be superior to subepithelial connective tissue graft since it eliminates the requirement of a donor site. Some of the studies found inferior result of PRF for root coverage. Arocaet al combined PRF to a modified coronally advanced flap and compared with modified coronally advanced flap alone (control group) for the treatment of multiple gingival recession. Similarly, Rajaram V et al evaluated the effect of PRF, when used along with double lateral sliding bridge flap for the coverage of multiple gingival recessions. No added benefits of PRF was seen in both studies.¹⁰

Baseline recession depth is important in determining the treatment outcome. Greater baseline gingival recession depth is always associated with decreased results in terms of root coverage. Gingival recession depth is not only factor which determines the clinical outcome. Other factors like root prominence, tooth position, vestibular depth, high frenal pull, gingival thickness as well as tooth brushing technique of the patient have to be considered and should be corrected before carrying out root coverage procedure.

Conclusion

PRF is used frequently in periodontics as it has several beneficial effects including periodontal regeneration and rapid healing. It gave promising clinical outcome when combined with CAF in the present case report. Though the mechanism involved in improving the treatment outcome is poorly understood, still PRF has a bright scope in different periodontal plastic surgical procedures.

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Implant Retained Mandibular Complete Overdenture with Lingualized Occlusal Scheme for Preservation of Alveolar Ridge Resorption: A Case Report

Abstract

Edentulous elders are one of the target populations in prosthodontic research, as well as in clinical practice. The ultimate goal of treating such cases is to restore the patient to a level of satisfactory esthetics, physiological functions of speech, deglutition and mastication. An excessive loss of the residual alveolar ridge, especially in mandible, makes it difficult to provide a prosthesis that meets the needs of these dental patients. Several methods of treatment for this category of patients have been done for both patients satisfaction and performance. Some of these methods are the implant-supported mandibular overdenture retained by bar-clip attachments, ball attachments as well as mandibular overdenture retained by magnets. This case report describes treatment of completely edentulous patient with resorbed mandibular ridge, with conventional maxillary complete denture and implant supported mandibular complete overdenture with ball attachment, following a lingualized occlusal scheme.

Key words: Overdenture, Lingualized occlusion

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Introduction

Completely edentulous patients have difficulty to wear complete mandibular denture owing to poor support and retention precipitated by advanced bone resorption, xerostomia, loss of attached keratinized tissue and neuromuscular degeneration. For patients' satisfaction and performance several methods of treatment have been proposed such as implant-supported mandibular overdenture retained by bar-clip attachments, ball attachments as well as mandibular overdenture retained by magnets.¹

Dental implants undergo osseointegration, the crestal bone around dental implants may act as a fulcrum point for lever action when a force (bending moment) is applied. Clinical success of dental implants can be achieved by bio-mechanically controlled occlusion.^{2,3}

Controlled occlusal overload is of prime concern as it may lead to bone loss and subsequently failure of implants.⁴

Occlusion is important to ensure minimal and even stress distribution to the osseointegrated abutment fixtures, which cannot move to compensate for possible occlusal and other technical discrepancies for optimal implant load and success.⁵

Different types of occlusal forms and posterior teeth arrangements have been used in implant-supported prostheses. There are many controversial opinions concerning the occlusal design and pattern.⁶

Lingualized implant retained overdenture emphasizes that during the entire lateral movement, posterior teeth on both the working side and the balancing side are in contact. This concept was advocated to be used for patients with maxillary complete denture and mandibular implant overdenture. This simple concept directs

the forces of mastication vertically onto the supporting structures that can be easily arranged and verified.^{7,8}

These case reports evaluated clinically and radiographically implant retained mandibular complete overdenture with lingualized occlusion on ridge resorption.

Clinical Report

Two male patients, aged 58 and 61 years, sought care at Department of Prosthodontics and Implantology, Divya Jyoti College of Dental Sciences and research, Modinagar.

CASE 1

Patient complained of missing teeth and expected to restore his mastication. He also complained of loose mandibular denture. Clinical examination revealed completely edentulous maxillary and mandibular arches (Fig1A), with resorbed mandibular ridge (Fig1B&C).

A treatment plan was formulated involving insertion of conventional maxillary denture and implant supported mandibular denture in lingualized occlusal scheme. Two piece implant (ADIN Implant System) was placed in the mandibular inter-foraminal region ie. B & D position (Fig1D-H)(According to Mish CE: Contemporary implant dentistry), that were left submerged and unloaded for 4 months. At second phase appointment, mucosa was reflected and healing abutments were placed. Indirect impression transfer copings were inserted into the implant bodies. The angulation and position of the implants were evaluated relative to the final restoration. Diagnostic putty impression was made followed by final impression, which was recorded through indirect impression transfer copings and soft tissue

regions with polyvinyl siloxane (Aquasil, Dentsply) (Fig1I). During impression thorough border moulding was performed to avoid overextension of the final restoration. Occlusal rims were evaluated intraorally and mounted on an articulator. The denture teeth were set following a medially positioned lingualized occlusion scheme (Meyers integrated teeth set for lingualized occlusion) (Fig1K) and followed by wax try-in of the denture teeth. At final visit patient was delivered conventional maxillary denture and implant supported mandibular complete overdenture with ball attachments (Fig1L).

CASE 2

Patient complained of unsatisfactory previous mandibular dentures. Clinical examination revealed completely edentulous maxillary and mandibular arches, with resorbed mandibular ridge.

As patient was seeking improvement in his mandibular denture, a treatment plan was formulated, involving insertion of conventional maxillary complete denture and implant retained mandibular complete overdenture. Implants were placed and second phase surgery was carried out followed by fabrication of prosthesis (Fig2), as discussed in the previous case.

Discussion

The ideal artificial tooth arrangement that maximizes denture stability, comfort, esthetics, and function has occupied the dental literature for many years. Of all occlusal schemes that have been presented to the prosthodontist in cases of severe ridge resorption of edentulous patients, that of lingualized occlusion has emerged as one of the more popular.¹⁹ The lingualized occlusion concept is an example of a bilaterally balanced occlusion concept. The premolars and molars are arranged and modified so that only the lingual cusps of the upper posterior teeth make contact with the central fossae of the lower posterior teeth²⁰ (Fig1I). Exceptions are the first premolars which are arranged in a more conventional way. This is due to the first mandibular premolar as it performs more of the scissor function of a cuspid. The mandibular buccal cusps of second premolar and molars do not make contact with their antagonists.²¹

This is achieved by arranging the teeth in such a way that on both the working (active) side and the balancing (passive) side there are simultaneous bilateral balancing contacts. Bite forces are thereby distributed over the largest possible area of the edentulous jaw.²³ In normal class I jaw relationship, this means that with a conventional anatomical occlusion concept, during lateral movement both the buccal and lingual cusps of the upper and lower denture come into contact on the working (active) side, which means a large number of contacts during eccentric jaw movements. In comparison with conventional anatomical concept, the number of occlusal contacts is reduced considerably with the lingualized occlusion concept. In centric relation only the lingual cusps of the posterior teeth in the upper denture make contact in the central fossae of the lower posteriors and buccal cusps are not in contact.²⁴ There is therefore only one "centric stop" between upper and lower antagonistic pair of posterior teeth²⁵⁻²⁷.

An aesthetically pleasing result can be achieved with the help of anatomically formed upper posterior teeth in lingualized occlusion. Although any type of anatomically formed posteriors molars can be made suitable for the lingualized occlusion concept by means of grinding, special teeth have been developed for this occlusion concept over the years.²⁸⁻²⁹

In the nineteen fifties, important modification occurred in the lingualized occlusion concept. In order to obtain better chewing efficiency, the contact relation of the first premolar was changed in the sense that the cusp of the first lower premolar comes in contact with the mesial fossa of the first upper maxillary premolar.³⁰ The result of this is that particularly during functioning, the cuspid and the first premolar guarantee a good scissors effect which improves chewing efficiency and stability of mandibular denture.

Indication and contraindication

In general it can be said that there are no contra-indications for the applications of the lingualized occlusion concept.

It is indicated in cases where patient demands high priority on esthetics but oral conditions does not allow placement of anatomic teeth such as: Severe alveolar resorption, Class II jaw relationship and displaceable supporting tissues. It is indicated also in cases where a complete denture opposes a removable partial denture and in cases patients with parafunctional habits.⁴⁰⁻⁴⁴

Advantages of lingualized occlusion

- Advantages of both the anatomical teeth (i.e. aesthetic and chewing capacity) and the non-anatomical teeth (i.e. less horizontal forces) are maintained, particularly in patients with severe alveolar bone resorption. Vertical forces are directed more centrally on the mandibular alveolar ridge, which gives more stability to the lower denture.⁴⁵
- The upper posteriors can be positioned more buccal of the ridge because the lingual cusps are active and should be situated at the top of the maxillary ridge. In many cases, this prevents an arrangement in cross bite and improves the aesthetic aspect of the dentures. Balanced occlusion with a freedom of centric is easy to achieve within an area of 2 to 3 mm around the centric stops.⁴⁶

Summary

Two completely edentulous patients were taken for this case report with severely resorbed mandibular ridge. Conventional maxillary complete denture and implant supported mandibular complete overdenture were inserted in both patients with lingualized occlusal scheme. The amount of bone loss is low and stability is high in lingualized occlusal scheme as compared to balanced occlusal scheme and use of proper prosthesis design account for the lack of mobility change as it has been shown that proper design is effective in transmitting the horizontal loads, by reducing the stress placed on individual implants. Hence, according to this report the chosen occlusal scheme considered successful. The implant retained overdenture with median lingualized occlusal schemes may be recognized as being acceptable according to the general implant success rates and criteria.

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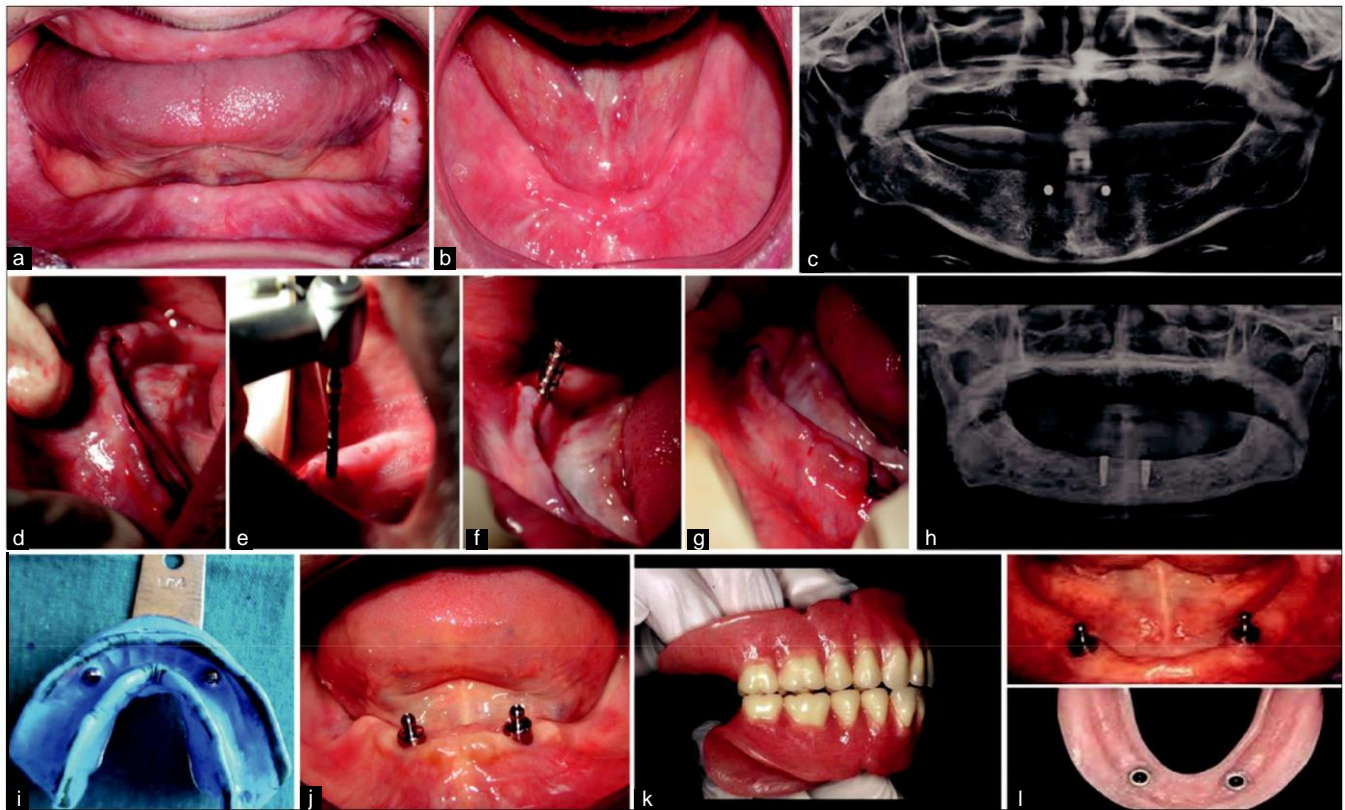


Figure 1: (a) intraoral view of completely edentulous patient, (b) Intraoral view of resorbed mandibular ridge, (c) OPG of patient, (d) Incision for placement of implants, (e) Implant site preparation (At B&D position) (f) Parallelism of both implant site checked, (g) Suture placed after implant placement, (h) OPG of patient after implant placement, (i) Mandibular impression with Indirect impression transfer copings, (j) Ball attachments placed over osseointegrated implants (ODI criteria), (k) Final denture with median lingualized occlusal scheme, (l) O Ring incorporated to mandibular denture.

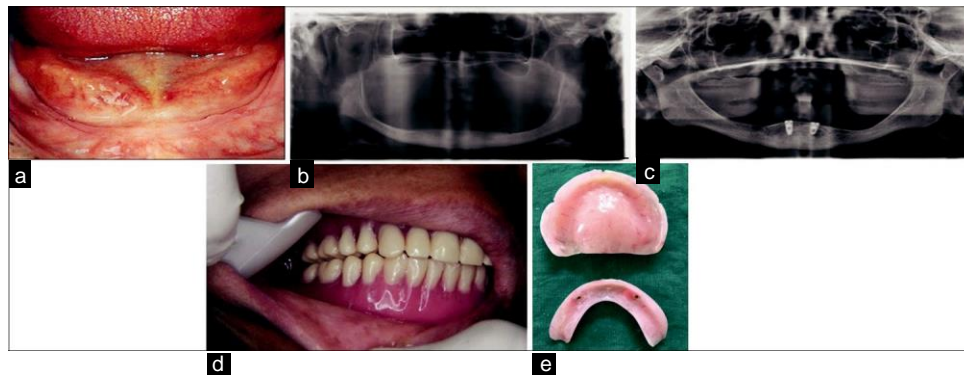


Figure 2: (a) Intraoral view of resorbed mandibular ridge. (b) Pre-operative OPG of patient. (c) Post-operative OPG of patient. (d) Intraoral view of patient with median lingualized occlusal scheme. (e) Intaglio surface of denture.

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The Radix Entomolaris and Paramolaris: A Review and Case Reports with Clinical Implications

Abstract

Normally the permanent mandibular first molar has two roots, mesial and distal. But mandibular molars may have an additional root located either buccally (radix paramolaris) or lingually (radix entomolaris). Understanding of the presence of an additional root and its root canal anatomy is essential for successful treatment outcome. The aim of this paper is to review the prevalence and morphology of radix entomolaris and to present two cases of permanent mandibular first molars with an additional third root (radix entomolaris) in Indian population. In this study we did clinical investigation of two cases; One case of successful endodontic management of permanent mandibular first molar characterized as radix entomolaris. Whereas second one is a presentation of a case of severe bone loss around permanent first molar with an additional third root. Presence of an additional third root in permanent mandibular first molars may affect the prognosis of tooth if it is misdiagnosed. Thus, an accurate diagnosis and thorough understanding of variation in root canal anatomy is essential for treatment success.

Key words: Permanent mandibular first molar; Radix entomolaris; Additional third root; Root canal anatomy

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Introduction

The prevention or healing of endodontic pathology depends on a thorough chemomechanical cleansing and shaping of the root canals before a dense root canal filling with a hermetic seal. An awareness and understanding of the presence of unusual root canal morphology can thus contribute to the successful outcome of root canal treatment [1]. In a mandibular first molar an additional third root, first mentioned in the literature by Carabelli is called the radix entomolaris (RE). This supernumerary root is located distolingually in mandibular molars, mainly first molars. [2] The presence of a separate RE in the first mandibular molar is associated with certain ethnic groups. Mandibular first molar which has three roots has a frequency of less than 5% in white Caucasian (UK, Dutch, Finnish, German), African (Bantu Bushmen), Eurasian and Indian populations. [3] In those with Mongoloid traits, such as the Chinese, Eskimos, and Native American populations, it occurs with a frequency of 5 to more than 30% [4, 5]. Radix entomolaris has an occurrence of less than 5% in the Indian population and such cases are not routinely observed during dental procedures. [8-11]. Knowledge of such anatomic variation of root and root canals is essential during the treatment of the patients presenting with morphological diversities in their root canal anatomy. A Case report on morphology, clinical approach to diagnosis and management of radix entomolaris has been presented here.

Case Report

An 18 years old female came for endodontic treatment of mandibular right first molar. On clinical examination the tooth was deeply carious and was diagnosed with irreversible pulpitis. Radiograph of mandibular right first molar was normal without any periapical

changes. After anaesthetizing the tooth, access preparation was done with endo-access bur and canal orifices were located with DG 16 endodontic explorer. Initial negotiation of the root canals was conformed with K-file 10. The fourth disto-lingual canal orifice was present far from distal root canal orifices. The canal lengths were determined radio graphically with K file ISO 15 size. They were cleaned with 2.5% sodium hypochlorite along with EDTA and shaped and patient was recalled after 3 days. At next appointment obturation done [Figures 1-5 and Table 1].

CASE 2

A 28 year-old female was referred for endodontic treatment of the mandibular right first molar with pain and swelling from last 2 month *clinical presentation*-Patient is gone to Root Canal Treatment 6 months back, on radiographic examination shows incomplete obturation with missed canal in relation to 46 and periapical lesion in distal root & one missed canal. Treatment plan- retrieval of obturating material Access cavity four distinct canal orifices were found and were coronally enlarged with Gates Glidden drills. Initial negotiation of the root canals was performed.

Discussion

The etiology behind the formation of the radix entomolaris (RE) is still unclear. In dysmorphic, supernumerary roots, its formation could be related to external factors during odontogenesis, or to penetrance of an atavistic gene or polygenetic system (atavism is the reappearance of a trait after several generations of absence).

In eumorphic roots, racial genetic factors influence the more profound expression of a particular gene that results in the more pronounced phenotypic manifestation. [8] Curzon suggested that the

'three-rooted molar' trait has a high degree of genetic penetrance as its dominance was reflected in the fact that the prevalence of the trait was similar in both pure Eskimo and Eskimo/Caucasian mixes. [13]

The presence of a separate RE in the first mandibular molar is associated with certain ethnic groups. In African populations a maximum frequency of 3% is found, while in Eurasian and Indian populations the frequency is less than 5%. In populations with Mongoloid traits (such as the Chinese, Eskimo and American Indians) reports have noted that the RE occurs with a frequency.

The RE is located distolingually, with its coronal third completely or partially fixed to the distal root. The dimensions of the RE can vary from a short conical extension to a 'mature' root with normal length and root canal. In most cases the pulpal extension is radiographically visible. In general, the radix entomolaris (RE) is smaller than the distobuccal and mesial roots and can be separate from, or partially fused with, the other roots.¹²

A Classification by Carlsen and Alexandersen Describes four Different Types of RE According to the Location of the Cervical Part of the RE

Type A and B - Distally located cervical part of the RE with two normal and one normal distal root components, respectively.

- Type C - Mesially located cervical part,
- Type AC - Central location, between the distal and mesial root components

This classification allows for the identification of separate and nonseparate radix entomolaris

De Moor et al. (2004) Classified Radix Entomolaris Based on the Curvature of the Root or Root Canal.⁷

1. Type 1: a straight root or root canal. 2.
2. Type 2: a curved coronal third which becomes straighter in the middle and apical third.
- Type 3: an initial curve in the coronal third with a second buccally oriented curve which begins in the middle or apical third.

Song JS et al. (2010) Further Added Two More Newly Defined Variants of RE.⁸

1. Small type: length shorter than half of the length of the distobuccal root.
2. Conical type: smaller than the small type and having no root canal within it.

Radix Paramolaris (additional root located buccally) Prevalence

Bolk reported the occurrence of radix paramolaris [12]. Radix paramolaris is very rare and occurs less frequently than radix entomolaris [12]. Visser

Table 1: Incidence of two canals in distal root of mandibular first molar

Author/Year	Incidence (%)	Population group
Skidmore (1971)	28.9	Caucasians
Gulabivala <i>et al</i> (2002)	33.4	Thai
Sen <i>et al</i> (2004)	46	Turkish
Gulabivala <i>et al</i> (2001)	10.1	Burmese



Figure 1: Clinical images of extracted mandibular molars with a radix entomolaris or paramolaris. (a) first molar with a radix entomolaris [distolingual view(left), lingual view (right)], (b) radix entomolaris on a third molar (lingual view), (c) first molar with a separate radix paramolaris (buccal view), (d) first molar with a fused radix paramolaris (buccal view)]



Figure 2: Preoperative radiographic



Figure 3: Working length determination

reported the prevalence of radix paramolaris to be 0% for mandibular first molars, 0.5% for second molars and 2% for third molars [15].

Classification

Carlsen&Alexandersen (1991) classified radix paramolaris (RP) into two different types

1. Type A: cervical part is located on the mesial root complex.
2. Type B: cervical part is located centrally, between the mesial and distal root complexes.

Morphology

The radix paramolaris (RP) is located mesiobuccally. The dimensions of RP may vary from short conical extension to a mature root which

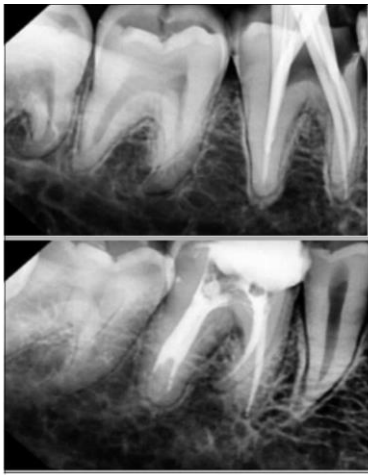


Figure 4: Master cone

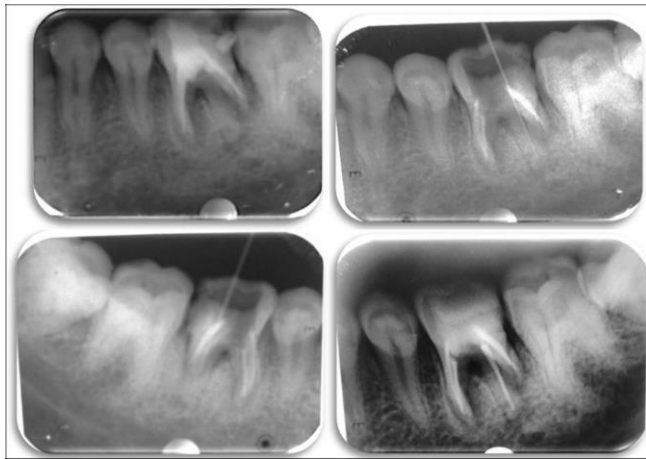


Figure 5: Obturation

can be separate or fuse. Few observations can be made from various studies, i.e. an increased number of cusps is not necessarily related to an increased number of roots; however, an additional root is always associated with an increased number of cusps, and with an increased number of root canals.

Clinical Implications

Endodontic procedures

The presence of radix entomolaris has clinical implications in root canal treatment. Accurate clinical and radiographic diagnosis can avoid failure of root canal treatment because of missed canal in distolingual root. Most important basic principle for successful root canal treatment is the principle of 'straight-line access' [13]. Ultimate objective is to provide access to the apical foramen. As the orifice of radix entomolaris is distolingually located, the shape of access cavity should be modified from classical triangular form to trapezoidal or rectangular form in order to better locate the orifice of distolingual root. The root canal orifices follow the laws of symmetry which help in locating the radix entomolaris. Canal orifices are equidistant from a line drawn in a mesiodistal direction through the pulpal floor and lie perpendicular to this mesiodistal line across the centre [17, 18]. Straight line access is essential as majority of radices entomolaris are curved. Care must be taken to avoid excessive removal of dentin or

gauging during access cavity preparation as this may weaken the tooth structure. A thorough inspection of the preoperative radiograph and interpretation of particular marks or characteristics, such as an unclear view or outline of the distal root contour or the root canal, can indicate the presence of a 'hidden' RE. To reveal the RE, a second radiograph should be taken from a more mesial or distal angle (300).

Clinical inspection of the tooth crown and analysis of the cervical morphology of the roots by means of -- Periodontal probing can facilitate identification of an additional root. - Using various instruments like endodontic explorer, path finder, DG 16 probe and micro-opener - Champagne effect- bubbles produced by remaining pulp tissue in the canal, while using sodium hypochlorite in pulp chamber. - An extra cusp (tuberculumparamolare) or more prominent occlusal distal or distolingual lobe, in combination with a cervical prominence or convexity.

An extension of the triangular opening cavity to the (disto) lingual results in a more rectangular or trapezoidal outline form. Visual aids such as a loupe, intra-oral camera or dental microscope can, in this respect, be useful. A dark line on the pulp chamber floor can indicate the precise location of the RE canal orifice. A severe root inclination or canal curvature, particularly in the apical third of the root (as in a type III RE), can cause shaping aberrations such as straightening of the root canal or a ledge, with root canal transportation and loss of working length resulting. The use of flexible nickel-titanium rotary files allows a more centered preparation shape with restricted enlargement of the coronal canal third and orifice relocation. After relocation and enlargement of the orifice of the RE, initial root canal exploration with small files (size 10 or less) together with radiographical root canal length and curvature determination, and the creation of a glide path before preparation, are step-by-step actions that should be taken to avoid procedural errors

Conclusion

The oral health care professionals should be aware of this variation in anatomy of permanent mandibular first molars. The initial diagnosis is of utmost importance, to facilitate the endodontic procedure and to avoid treatment failures. Proper interpretation of radiographs taken at different horizontal angulations may help to identify number of roots and their morphology. Once diagnosed, the conventional triangular cavity should be modified to a trapezoidal form distolingually to locate the orifice of the additional root.

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Management of Patients with Palatal Cleft: A Case Series

Abstract

Statement of Problem: Patient with cleft palate presented with difficulty in swallowing, altered speech and appearance. **Purpose:** The purpose of the obturator was to close the defect in order to regain esthetics and function. **Materials and Method:** Impression were made and casts were poured, followed by jaw relation and verification of esthetics was done in try in stage. **Conclusion:** The most common prosthetic problem in such patient is getting adequate retention, stability and support which was achieved with obturator.

Key words: Function, Esthetics, Obturator

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Introduction

Cleft can be defined as a congenital abnormal gap in the palate that may occur alone or in conjunction with lip and alveolus cleft. The zones affected by common orofacial clefts are as upper lip, alveolar ridge, hard palate, soft palate, nose and eyes.^{1,2} Clefts of the lip, alveolus and hard and soft palate are the most common congenital abnormalities of the orofacial structures. They frequently occur as isolated deformities but can be associated with other medical conditions. The incidence of cleft lip and palate is 1:600 live births and of isolated cleft palate is 1:1000 live births.³ The incidence varies from Oriental groups to the black population. Although cleft lip and palate is an extremely diverse and variable congenital abnormality, several distinct sub-groups exist, namely cleft lip with/without cleft palate (CL/P), cleft palate (CP) alone and submucous cleft palate (SMCP). The typical distribution of cleft types is: cleft lip alone: 15%; cleft lip and palate: 45%; isolated cleft palate: 40%.³

The etiology of the cleft lip and palate is unknown. Malnutrition and irradiation during pregnancy, psychic stress, teratogenic agents, infectious agents and heredity have been reported as causes of cleft palate. Difficulties associated with cleft palate are eating, breathing, speaking and more importantly psychological well being. Any treatment should aim at improving both physical and psychological performances and also quality of life.⁴

Palatal defects that are treated prosthodontically need to seal congenital or acquired tissue openings of the palate and contiguous structures. A prosthesis used to close a palatal defect in a dentate or edentulous mouth is referred to as an obturator. The obturator prosthesis is used to restore masticatory function and improve speech, deglutition and cosmetics for maxillary defect patients.⁵

This clinical report describes the prosthetic rehabilitation of a cleft palate patient using a heat polymerizing acrylic resin obturator with the objective of providing satisfactory esthetics and function.

Case Report-1

A 14-year-old female patient reported to our department of Prosthodontics, Crown and Bridge and Oral Implantology with a

chief complaint of food and water entering nose when she drinks water and eats food along with difficulty in speaking since birth. She had no other significant related medical history.

Extraoral examination revealed presence of incompetent Lips, Facial asymmetry and suture marks in upper lips suggestive of cleft lip repair.

Intraoral examination showed the presence of Cleft involving soft & hard palate and ridge unilaterally, Missing teeth in anterior region, Malaligned dentition in maxillary arch along with presence of Malocclusion (Case 1 Figure 1-5).

Procedure

- The primary impression of maxillary arch was made with putty based condensation silicone and refined with light body impression material. The mandibular impression was made at the same appointment using the irreversible hydrocolloid impression material.
- Casts were poured using type III gypsum product/dental stone.
- Wax blockout of the defect was done, denture base was fabricated using autopolymerising acrylic resin and occlusal rim was fabricated and bite registration recorded.
- Teeth selection and arrangement was done followed by denture trial which was found satisfactory and the final processing of denture was carried out with help of heat cure acrylic resin (pyrax).
- Finishing and polishing of the denture was done.
- The finished obturator was inserted to an accurate fit into the patient's mouth and necessary adjustment was carried out. Phonetics of the patient was evaluated, the speech showed definite improvement.
- The patient was given training for placement of the prosthesis and post insertion instructions for maintenance.
- The patient was recalled after 24 hr after insertion of the prosthesis, after 1 month, then after 3 months, and later 6 month after insertion. The patient was comfortable and was satisfied with result of prosthesis.



Case 1: Figure 1: Intra oral defect



Case 1: Figure 4: Finished Interim Prosthesis



Case 1: Figure 2: Intra oral with occlusion



Case 1: Figure 5: Interim prosthesis *in-situ*



Case 1: Figure 3: Final impressions

Case Report-2

A 51-Year-old male patient reported outpatient department of Prosthodontics in Mithila Minority Dental College & Hospital with chief complaint of difficulty in chewing. He gave history of difficulty in swallowing food, difficulty in speaking. Medical history was non contributory.

Oral examination reveals patient is edentulous and direct opening present between the nasal and oral cavity since childhood.

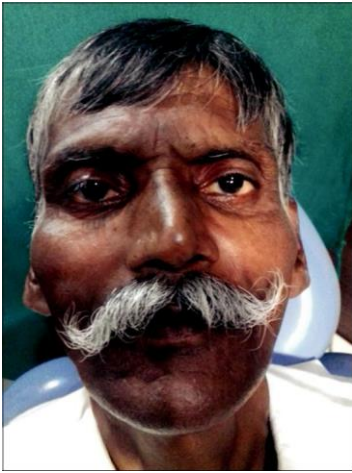
The patient was informed of treatment options. Because of old age patient was not willing for surgical treatment and thus prosthetic treatment was chosen, elaborating a removal acrylic prosthesis best suited for him with palatal obturator to improve the complete denture retention & stability (Case 2 Figure 1-6).

Procedure

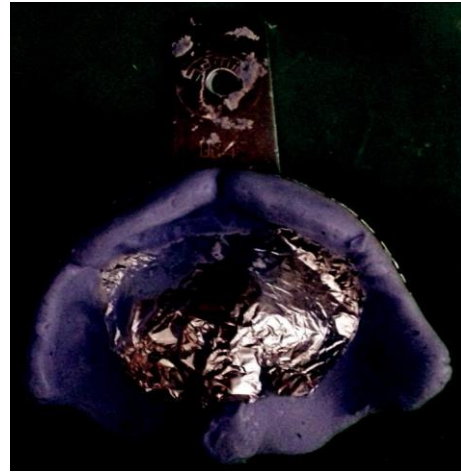
- The primary impression of the upper arch is made with irreversible hydrocolloid, after blocking the defect area using wet cotton. The lower impression is also made at the same appointment using the same material. Primary cast is made for the custom tray fabrication with autopolymerizing resin (pyrax)
- Border molding was done and the final impression was made with zinc oxide eugenol impression paste. The master cast was poured in dental stone(kalabhai).
- Maxillary and mandibular occlusal rim were fabricated and tentative jaw relation recorded. Teeth selection was done and denture tryin was done. which was found satisfactory and the final processing of denture was carried out with help of heat cure resin (pyrax)
- During the final insertion of prosthesis, it was found that the esthetics, mastication, swallowing and speech were improved and the patient was very much satisfied with the result of new prosthesis.
- The patient is recalled after 24 hr after insertion of the prosthesis, after 1 month, than after 3 months, and later 6 month after insertion. The patient was comfortable and was satisfied with result of prosthesis.

Discussion

Obturator prostheses helps in separating the oral and the nasal cavities and restores normal deglutition and speech and further



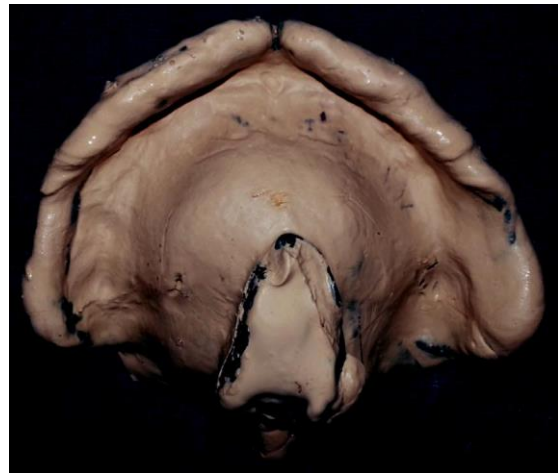
Case 2: Figure 1: Patient profile foto



Case 2: Figure 3: Diagnostic impression



Case 2: Figure 2: Intra oral defect



Case 2: Figure 4: Final impression of maxillary defect

improves the midfacial esthetics by supporting the soft tissues^{6,7}. Prosthodontic management of palatal defects has been employed for many years, Ambroise Pare probably was the first to use artificial means to close a palatal defect - as early as the 1500'ss. The early obturators were used to close congenital rather than acquired defects. The early objectives of treatment were artificial closure of the defect and adequate retention of the artificial closure. The ingenious designs of the early pioneers accomplished these objectives. As time progressed newer and better concepts of obturator evolved. All prosthodontists are aware of the basic objectives of prosthodontic therapy. A comfortable, cosmetically acceptable prosthesis that restores the impaired physiologic activities of speech, deglutition and mastication is a basic objective of prosthodontic care. The most important objective of prosthodontic care, As DeVan's stated, our objective should be "The perpetual preservation of what remains rather than the meticulous restoration of what is missing." This principle is most important in the treatment of the cleft-palate patient.

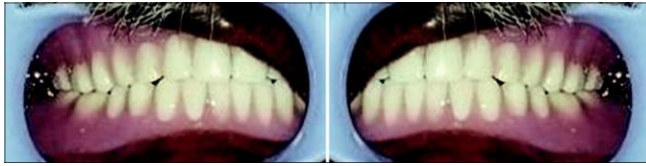
The success of obturator depends upon the volume of the defect, positioning of the remaining hard and soft tissues to be used to retain the prosthesis and also the weight of the prosthesis.



Case 2: Figure 5: Finished interim prosthesis

Conclusion

Prosthetic rehabilitation of patient with palatal insufficiency is a lengthy and time consuming process. A well-planned prosthetic treatment will result in alleviating deformities and provide satisfactory



Case 2: Figure 6: Prosthesis *in-situ*

function and esthetics. Rehabilitation of the patients with obturator helps them resume their daily life normally. However, it is essential that patients take responsibility for maintaining their own oral health.

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