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FACULTY OF DENTAL SCIENCE
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Mission

- GLOBAL LEADERSHIP IN HUMAN DEVELOPMENT, EXCELLENCE IN EDUCATION AND HEALTH CARE.
- TO REDUCE MORBIDITY AND MORTALITY FROM ORAL AND CRANIOFACIAL DISEASES AND THERE BY INCREASE THE QUALITY OF LIFE.
- TO PROMOTE SUSTAINABLE, PRIORITY-DRIVEN POLICIES AND PROGRAMMES IN ORAL HEALTH SYSTEMS THAT HAS BEEN DERIVED FROM SYSTEMATIC REVIEWS OF BEST PRACTICES.
- TO REDUCE DISPARITIES IN ORAL HEALTH BETWEEN DIFFERENT SOCIO-ECONOMIC GROUPS WITHIN COUNTRY AND INEQUALITIES IN ORAL HEALTH ACROSS COUNTRIES.

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- TO SPREAD EDUCATION GLOBALLY IN THE FIELD OF DENTAL SCIENCES USING EXISTING RESOURCES AND TECHNOLOGY.
- DEVELOPING EXEMPLARY CLINICIANS EDUCATORS AND SCIENTIST.
- TO PROVIDE NEED-BASED INFRASTRUCTURE AND FACILITIES TO THE STUDENTS AND STAFF.
- TO MINIMIZE THE IMPACT OF DISEASES OF ORAL AND CRANIOFACIAL ORIGIN ON HEALTH AND PSYCHOSOCIAL DEVELOPMENT, GIVING EMPHASIS TO PROMOTING ORAL HEALTH AND REDUCING ORAL DISEASE AMONGST POPULATION WITH THE GREATEST BURDEN OF SUCH CONDITION AND DISEASE.

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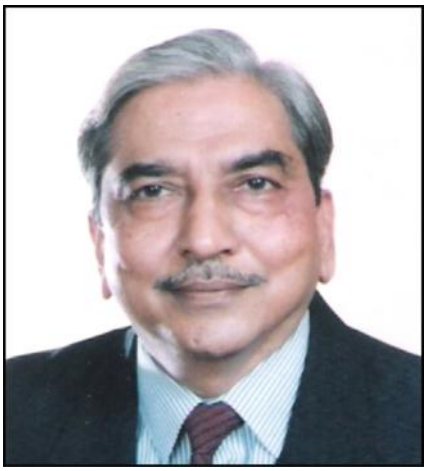

Faculty of Dental Science is a shining feather in the hat of Dharmsinh Desai University since last 13 years. I feel nothing less than immense pride at the functioning and stature that the Faculty of Dental Science has achieved. Be it staff or student satisfaction, infrastructure or resources the university has always supported development and will continue to do so in the future.

I congratulate the editorial committee for coming up with the new issue of the Journal of the Faculty of Dental Science. Wishing glorious new heights in the field of research and publication. My best wishes and blessings remain with the entire team of Faculty of Dental Science for continued progress.

Dr. H.M Desai,

Vice Chancellor,

Dharmsinh Desai University,

Nadiad

Trustee's Message

I have seen the development of the Faculty of Dental Science since over a decade, and I applaud their stellar performance. They have grown as an institute to reckon with and they have grown as a family. The levels of education and values have always seen an upward graph, and the university looks upon them as an exemplary faculty. I am overjoyed to be a part of this team and pledge my support to the Faculty Dental Science at all times.

Mr. Ankur Desai

Trustee

Dharmsinh Desai University

Nadiad.

Coordinator's Message

Times change, and with it, so do the face of education, the need of education and the modicum of conveying scientific matter. It is a matter of immense pride and pleasure for me, as the journal of dental sciences has stayed thus, with constant up-gradations and contributions from staff and students alike. The upkeep of the culture that encourages scientific writing and documentation is what keeps the wheels of an institute well oiled and running. I congratulate the entire team of JODS on yet another brilliant achievement.

Dr. Bimal.S. Jathal,
University Co-ordinator,
Dharmsinh Desai University,
Nadiad

Dean's Message

We're moving forward....join the momentum!

I am extremely happy while penning down this message for our very own Journal of Dental Science, which is an integral part of our institution. We live in a world of information and technology and obtaining information has never been easy. In science the books and journals have been the original source of information and research. Through this journal issue we aim at educating the readers by highlighting current concepts and treatment aspects in dentistry. Keeping in pace with the current scenario, this year we are going for the online publication of the journal.

I congratulate the entire editorial committee for its painstaking efforts in bringing out the current issue of the Journal of Dental Science. I am sure it will serve its purpose of dissemination of knowledge for students and the faculty.

Dr. Hiren Patel
Dean
Faculty of Dental Science
Dharmsinh Desai University
Nadiad.

From the Editor's Desk

"Never let it rest until better turns to best!"

Journal of Faculty of Dental Science, DDU, and Nadiad is a facet to which all of us are associated with. It is a huge responsibility entrusted on me to be the editor of this prestigious journal. With the blessings of God, my parents and great help and support from my associate editors Dr.Jigar Purani Dr.Heena Pandya and all the members of the editorial board, we are today able to present this issue of our journal.

A great deal of appreciation goes to the former editor Dr.Somil Mathur. During his tenure he and his team have worked with complete dedication bringing to the journal a strong vision and wealth of knowledge.

We at the editorial office filter the manuscripts not only for accuracy but also for balance.This takes patience and time to give true dimension and meaning to the content.Hence I request you all to bear with us.I have noticed that manuscripts get rejected due to plagiarism. We as authors need to check our manuscripts for plagiarism before submission so as to not face disappointment on this aspect.

Second thing I would request all the authors to strictly follow the journal guidelines.This will take less time for acceptance and publication.

Third aspect to be taken into consideration is the name of authors to be included in the article. I suggest you all to follow authorship criteria given by ICMJE (www.icmje.org).

We at the journal office are committed to excellence to bring out the best from our authors.I am interested in your view point and would like to keep an open line of communication with our readers. Please email your suggestions, criticisms and comments to fdsjournal@gmail.com.

"Together we can...."

Dr.Shalini Gupta

Editor

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APEXIFICATION : CREATING OBSTRUCTION FOR CONSTRUCTION

*Dr. Amee Patel **Dr. Dipti Choksi ***Dr. Barkha Idnani

ABSTRACT :
Open apices with necrotic pulp and periapical lesion present a special challenge in this regard as they are arduous to treat via conventional endodontic therapy. Apexification using an apical plug of novel biomaterial like Mineral Trioxide Aggregate (MTA) has emerged as an alternative to long-term intracanal use of calcium hydroxide. This case report attempts to discuss the treatment protocol and successful management for such a challenge- traumatized immature tooth with open apex and radicular cyst.

***Keywords*: Open apex, immature necrotic permanent tooth, MTA, calcium hydroxide, apexification, radicular cyst**

Introduction

The immature root with a necrotic pulp and large periapical lesion presents multiple challenges to successful treatment.

i. The infected root canal space cannot be disinfected with the standard root canal protocol with the aggressive use of endodontic files.
ii. Once the microbial phase of the treatment is complete, filling the root canal is difficult because the open apex provides no barrier for stopping the root filling material before impinging on the periodontal tissues.
iii. Even when the challenges described earlier are overcome, the roots of these teeth are thin with a higher susceptibility to fracture.[1]

These problems are overcome by using a disinfection protocol that does not include root canal instrumentation, stimulating the formation of a hard tissue barrier or providing an artificial apical barrier to allow for optimal filling of the canal, and reinforcing the weakened root against fracture during and after an apical stop is provided.

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Until recently, the traditional approach to the treatment of non-vital teeth with incompletely developed roots has been apexification by inducing the formation of mineralized tissue in the apical portion of incompletely formed apex.The barrier facilitates the placement of an appropriate root-filling whilst reducing the possibility of the sealant or root-filling extruding into apical tissues.[2, 3]

Morse et al reported in their literature review three techniques to obturate an immature tooth, which involved the use of a root-filling material without the induction of the apical closure[4]:

i. placement of a large gutta-percha filling or customized gutta-percha cone with sealer at the apex;
ii. placement of gutta-percha with sealer or zinc-oxide/ eugenol short of the apex;
iii. periapical surgery.

These techniques did not gain popularity since there was no physical apical barrier to facilitate obturation. However Morse et al.[4]also reported two techniques, which aimed to provide the formation of an apical barrier:

• placement of calcium hydroxide to induce a mineralized apical barrier;

• placement of a biocompatible material such as dentinal chips against which a root-filling could be placed.

This case report evaluates the effect of calcium hydroxide with mineral trioxide aggregate (MTA) apexification in large cystic area with a successful conservative non-surgically management of a ridiculer cyst associated with permanent maxillary right central and lateral incisor in a 24 year old female patient.

Case report :

A 24 year old female patient reported to the Department of Conservative Dentistry and Endodontics, Faculty of Dental Sciences, with a complaint of persistent pain, mobility and swelling in upper front teeth and palatal area which would occur every 8-9 months for past 3 years and regress after pus discharge.

Illustration 1: ***Swelling in palatal area***

Past history revealed trauma to maxillary anterior teeth 10 years back and she didn't take any medical intervention during the same.

Clinical examination revealed that the maxillar right central incisor (#11), right Lateral incisor (#12) teeth were found to be non vital (necrotic) with grade II Mobility.

Illustration2: ***Preoperative photograph***

An occlusal view of the palate revealed well- defined radiolucency of considerable size, involving anterior part of the palate in relation to #11, #12, with a thin radiopaque border. The clinical and radiographic signs were suggestive of chronic periapical cyst in relation to #11, #12.

Illustration 3: ***Preoperative radiograph***

As the patient was very apprehensive and not willing for surgical intervention, and non-surgical treatment was planned for the management of the pathology and the informed consent was taken.

Cystic fluid was first aspirated with 22 gauge needle from dependent part of the swelling on the palate which was slightly pale straw colored and it was sent for microscopic examination in laboratory which confirmed it as periapical cyst.

Illustration 4: ***Aspirated cystic fluid***

Treatment was carried out under local anesthesia. Access cavity was prepared under rubber dam isolation and working length was determined using electronic apex locator and radiographs.

Illustration 5: ***Working length determination***

On the next visit, calcium hydroxide [$Ca(OH)_2$] with iodoform paste (Metapex, Meta-biomed) was delivered up to the cystic lesion through the root canal of teeth (#11 #12). Access cavity was sealed with interim dressing. The patient was kept on follow up.

Illustration 6: ***Ca(OH)$_2$intracanal medicament placed***

Illustration 7: Six ***month follow up***

The intracanal $Ca(OH)_2$ dressing was replenished after every 2 months interval up to 6 months. After 6 months of commencement of treatment, calcium hydroxide had induced a barrier against which MTA could be condensed. Calcium hydroxide was removed using 17 % EDTA (PrevestDenPro) and copious irrigation and this was verified radio graphically.

Illustration*8: Removal of intracanal medicament*

MTA (Angelus) was mixed according to manufacturer's guidelines to a thick creamy consistency. It was then placed 1 mm short of the working length using a carrier and condensed with minimal pressure using the broad end of appropriate sized pluggers. Due to its hydrophilic nature, MTA adapts well to the peri-apical tissues. This was repeated until approximately five mm of the material was deposited in the apical region which was verified with a radiograph.

Illustration *9: Apical plug of MTA*

A moist cotton wool pledget was then placed in the canal (#11) overnight.The following day, the cotton wool pledget was removed and remaining canal space was obturated by injectable medium viscosity thermoplasticized gutta percha(Ultrafil 3D, Coltene)and resin based sealer (AH plus, Dentsply). Access cavities were sealed with nano-hybrid composite resin.(Grandio, VOCO)

Illustration10: ***Obturation with thermoplasticized gutta percha***

Follow up after 1 month revealed a significant reduction in the size of palatal lesion and the palate became normal in appearance. After 3 months, palpable portion of palate become hardened and the radiolucency of the lesion started disappearing but larger amount of medicament was still remaining within the lesion. However, at 6 month follow up the radiograph showed partial radiopacity with some medicament apparent in the lesion. Nine month follow-up revealed asymptomatic and adequately functioning teeth with radiographic signs of healing.

Illustration 11: ***Follow up after 9 months***

Illustration 12: ***Final Prosthesis***

Discussion :

The above case report presents a triad of trauma, open apex and periapical lesion.

A combined of approach of aspiration technique, calcium hydroxide, mineral trioxide aggregate. was used to manage the case.

A periapical lesion increases in size with an increase in the hydrostatic pressure due to fluid accumulation in the bony cavity. This increase in hydrostatic pressure enhances the osteoclastic activity. The aspiration through the root canal technique aids in decreasing the hydrostatic pressure in the periapical lesion.[5]

The response to trauma can be varied. Some pulps remain apparently normal with no adverse effects; whereas others became necrotic. Necrotic pulps provide a good nutritional supply for pathogenic bacteria, which must be present for the development of a periapical lesion. The treatment options available to manage large cysts range from nonsurgical root canal treatment and/or apical surgery to extraction. In some instances, nonsurgical treatment may be ineffective or difficult; those cases may be treated by surgery. In the present study, radiographs revealed that the involved teeth had large periradicular lesion with uniformly dense radiolucency and well-defined margins around the apices.

Calcium hydroxide has also been traditionally used for apexification of nonvital immature teeth. However, this method is time-consuming and the barrier formed is usually incomplete, revealing 'tunnel defects' histologically which can allow microleakage.[6] Furthermore, long-term exposure of root dentin to calcium hydroxide can lead to a decrease in the fracture resistance of teeth. With the MTA apical plug technique, a one-step obturation after short canal disinfection with calcium hydroxide could be performed. MTA has been successfully used for apexification of nonvital immature teeth. It is more advantageous than calcium hydroxide with regard to its sealing ability and reduced treatment time. Reports advocating single session placement of MTA as an apical barrier without inter appointment calcium hydroxide placement are scarce.[7]

MTA, when it comes in direct contact with the tissues forms calcium hydroxide that releases calcium ions for cell attachment and proliferation. . Scaffolding is provided for hard tissue formation by MTA which modulates cytokine production, encourages differentiation and migration of hard tissue producing cells. Hydroxyapatite is formed on the surface of the mineral trioxide aggregate, thus providing a biologic seal.[8]

Clinicians may restore the tooth after setting of MTA. Thus, the fracture resistance of teeth with thin dentinal walls increases. MTA can also be used in teeth with pulp necrosis and inflamed periapical lesions because it may set in moist environments.[9]

Conclusion :

Endodontic therapy with repeated intracanal dressing obviates the need for surgery in most of the clinical scenarios.

Based on this case report results, the following conclusions can be made:

- MTA showed clinical and radiographic success as a material used to create apical closure in necrotic immature permanent teeth.
- MTA is a promising replacement for Ca(OH)2 for the apexification procedure.

Endodontic therapy using a combination of calcium hydroxide dressing and MTA placement was successful in healing large radicular cyst thus highlighting endodontic biologic rationale.

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BROKEN INSTRUMENT RETRIEVAL FROM MAXILLARY 2ND MOLAR- A CASE REPORT

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Abstract :

One of the most common mishaps occurs during routine endodontic treatment is the fracture of instrument inside the root canal. The separated instrument leads to metallic obstruction and prevents thorough cleaning and shaping procedures. Factors should take into the consideration are tooth type and canal curvature, instrument position and type before attempting instrument retrieval. This case report illustrates instrument retrieval from 27 using small artery forceps and re root canal treatment of same tooth.

Keywords: *H file, instrument separation, instrument retrieval, stieglitz pliers, artery forceps*

Introduction

Separation of endodontic instruments within the root canal is an unfortunate occurrence that may hinder root canal procedure and affect the outcome. This instrument is usually some type of file or reamer but can include gates-Glidden or peeso reamers, lentulo spiral paste fillers, thermo mechanical gutta percha compactors, tips of hand instruments such as explorers or gutta percha spreaders. The separated instrument leads to metallic obstruction in the root canal and prevents thorough cleaning and shaping procedures.[1]The retrieval of separated instruments is usually very difficult and often ineffective. Different methods have been proposed for retrieving objects separated into the root canal.In the past, chemicals such as hydrochloric acid, sulfuric acid, and concentrated iodine potassium iodide were used in an attempt to dissolve the metal obstruction, which is now irrelevant because of the metals used today, as well as the obvious safety issues. Recently, specialized devices and techniques have been introduced specifically to remove separated instruments such as ultrasonic devices, Instrument Retrieval System (IRS) and Masserann kit.

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All these devices have shown limitations, such as excessive removal of root canal dentin, ledging, perforation, limited application in narrow and curved roots, and extrusion of the separated portion through the apex.[2]

If broken instrument is located at the root canal orifice level or just below it that can be grasped by various forceps. Use of forceps not only prevents the excessive removal of dentin, it also reduces chances of root fracture and furcal perforation by overzealous use of ultrasonics. This paper reports a case of H file retrieval with small curved artery forceps from 27 and re root canal of the same tooth.

Case report

A 35 year old female patient referred to Department of Conservative Dentistry and Endodontics with the chief complains of continuous pain at upper left side of mouth for 1 week. Pain was intermittent in nature, dull and that was not associated with any kind of swelling or sinus tract.Patient presented with past dental history of previously attempted root canal treatment.Intra oral examination revealed fractured temporary restoration in relation to 27 and tooth was tender to percussion. Radiographic examination revealed a fractured instrument in the distobuccal canal of 27. It was engaged into remaining gutta-percha of the same canal. There was incomplete biomechanical preparation as well as nonobturated other two canals (mesiobuccal and palatal).Detailed radiographic examination revealed about type of the separated instrument. It was tortuous in shape, it was H file. The periodontal space widening with apical radiolucency was present in 27.Based on clinical and radiographical examination diagnosis of asymptomatic apical periodontitis of 27 was made. Re root canal treatment of 27 with broken instrument retrieval from distobuccal canal of 27 was planned.

Illustration 1: ***Pre operative IOPA of 27 showing separated instrument in distobuccal canal***

Illustration 2: ***Clinical photograph showing orifice enlargement with separated instrument in distobuccal canal of 27.***

Treatment plan :

On the first appointment, local anaesthesia (2% Lignocaine with adrenaline, Xicaine, ICPA, India) was administered. Fractured temporary restoration was removed and straight line access was established. As seen in pre operative IOPAR, H file was embedded in dentin as well as in apical 5mm of gutta-percha. (Illustration 1)Following step by step technique was followed to remove it. A groove was prepared along side of the instrument with the hand K files (No.10) (Mani, Japan) to create a working space to facilitate the entry with Gates Glidden drills into distobuccal canal of 27. Orifice enlargement was done with no 2 and 3 Gates Glidden drills. (Dentsply Maillefer, Ballaigues, Switzerland) (Illustrati-on-2) By this enlargement, a space to place small artery forceps was prepared. (Illustration-10) A firm grip was established with small and curved artery forceps and gentle, coronally directed pulling force was applied. Repeated application of pulling as well as counter clock wise motion with firm grip of artery forceps did disengagement of H file from Root dentin as well as from apical gutta percha & successful retrieval of H file from the distobuccal canal was done.(Illustarion-3)

Illustration 3: ***retrieved H file from Distobuccal canal of 27.***

Remaining Gutta percha was removed with the help of Gutta percha solvent (RC Solve, Prime Dental) and H file from distobuccal canal of 27.Negotiation of all 3 canal was done. (Mesiobuccal, Distobuccal, Palatal.) (Illustration-4)Working length was measured of all 3 canal and was confirmed by IOPAR.(Illustation-5) Biomechanical preparation done with copious irrigation with diluted 5% sodium hypochlorite(Vishal Dentocare).Master cone fit was checked and confirmed by IOPAR, obturation done with AH plus sealer (Dentsply, Detrey,Gmbh, Germany). (Illustration 6, 7) Post endodontic restoration was done with hybrid composite (Unicorn Denmart, Prime Dental, USA).

Illustration 4: ***All 3 canal negotiation***

Illustration 5*: working length determination*

Illustration 6*: master cone confirmation*

Discussion :

Decision on management of intracanal separated instrument should consider the following[3-11]:

1. Root canal anatomy accommodating fragment.
2. Stage of root canal preparation at which the instrument separated.

Illustration 7*: Obturation*

3. Expertise of clinician.
4. Armamentarium available.
5. Potential complication of treatment approach adopted.
6. Strategic importance of the tooth involved.
7. Presence or absence of periapical pathosis.
8. Design of separated instrument

Illustration 8*: Post endodontic restoration of 27*

Guidelines for management of broken instrument are:

Referring the patient to a specialist is a first option if the following is true[12]:

1. The clinician is incompetent at techniques.
2. Good armamentarium is not available.

Two approaches are there for management of intracanal separated instrument.

1. *Orthograde approach:* This includes:
a. Removal of instrument.
b. Bypass of instrument.
c. Cleaning and shaping at the level of fractured instrument.
2. *Surgical approach:*

1. Orthograde approach

Attempt of removing the fragment can be established as a first management option when the following is true[13, 14]:

1. The fragment is accessible (located in the coronal third, middle coronal part of the root canal, or before the canal curvature).
2. There is a low risk of further complications.
3. The tooth is strategically important.
4. The instrument separated at an early stage of root canal cleaning and shaping.
5. The clinician is well trained or has sufficient experience.

Attempt at bypassing the fragment can be considered in the following circumstances[15]:

1. As a second approach if removal attempt(s) fail.
2. As a first approach if the fragment separated at an early stage of the cleaning and shaping and is inaccessible (located in the apical canal third, middle apical part of the root canal, or beyond the canal curvature).
3. In a strategically important tooth, and the clinician has sufficient experience.

Leaving the fragment in situ, filling the root canal to the fragment level and reviewing the case can be considered in the following circumstances:

1. As a last conservative approach when attempts at removal and bypassing of the fragment are unsuccessful.
2. As a first approach if the clinician is not confident or competent at other conservative options.
3. As a first approach if the instrument separated at a late stage during root canal cleaning and shaping in inaccessible part of the canal.

2. Surgical approach

It can be considered in the following situations:

1. As a last resort if other conservative approaches fail, post-treatment disease developed, and the tooth is strategically important.
2. As a first approach when periapical pathosis is present at the time of instrument separation, especially if the separation occurred at an early stage of instrumentation

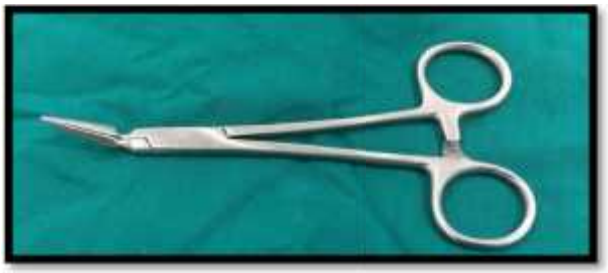

Illustration 9: ***A Stieglitz plier***

As in this case report we have used small artery forceps for retrieval of intracanal separated instrument. Other than that various types of forceps are available like:[7, 15]

Haemostats,
Stieglitz forceps,
Modified Castroviejo needle holder,
Perry plier.

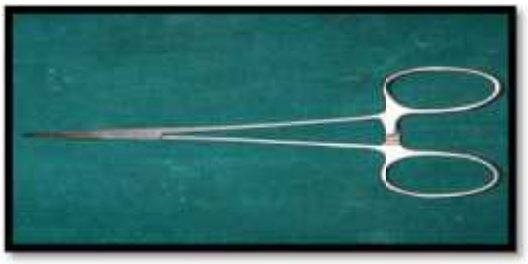

Illustration 10*: small artery forceps*

A Stieglitz plier is specifically designed for retrieval of coronally located broken instrument. Smaller beak size eases its use (Illustration-9). So this various forceps are good substitutes of ultrasonics for retrieval of coronally located broken instrument to prevent overzealous preparation of canal and its risks.

Conclusion :

There is no standardized procedure for successful and guaranteed removal of separated instrument from root canal. Improved visualization combined with a conservative approach leads to favorable prognosis of tooth. Vast majority of separated instruments can be removed if done with care, time and right armamentarium, with proper knowledge of root anatomy and position of the fractured segment. The best antidote for a broken file is prevention.

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A HOLISTIC APPROACH TO AESTHETIC ENHANCEMENT USING DIRECT COMPOSITE RESTORATION- A CASE REPORT

*Dr. Chandni Nayak ** Dr Dipti Choksi ***Dr Dr. Barkha Idnani

Abstract:

Aesthetic dentistry has evolved since the last many years with the advent of composite resin. The use of direct composite restoration to redesign and recontour anterior teeth has evolved and also played a very important role in not only developing the patients functional requirements but also helped majorly to build the overall confidence and well being of the patient.

Keywords: *Aesthetics, composite resin, smile design ,recontouring.*

Introduction

Anterior crown fractures are common form of injury that mainly affects children and adolescents. Uncomplicated crown fracture to the permanent teeth has an intense effect not only on the patient's appearance, but also on function and speech.[1,2]

The predictable esthetic restoration of broken incisal edge of maxillary central incisors is a demanding and technique sensitive procedure. Its success is dependent on operator's skills and knowledge and also on adhering to a systematic and problem solving approach.[1,2]

A logical method is used to build up morphologically correct composite restorations by careful selection of composite shades, tints and opaquers. In accurate combinations, an illusion of varying translucencies and opacities become visible over natural tooth structure.[3]
Fracture during and after an apical stop is provided.

The dental composite has emerged as a top ranked material over other direct restorative counterparts. Their evolution since their introduction in dentistry has resulted in better bonding, optical and handling properties. Their performance has also been supported by many longevity studies.[4]

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For more than 40 years dentists worldwide have been using directly placed resin-bonded composite to restore damaged anterior teeth. While such techniques are invariably more conservative of tooth tissue than indirect procedures, operative techniques using direct composite can be challenging and are considered technique sensitive. Clinicians require both technical and artistic skill to provide composite restorations that restore function and aesthetics to blend seamlessly with the residual dentition. [1,3]

The great popularity of composite resin restorations also results from their acceptable longevity at relatively low financial cost.[4]

This article provides an update on the aesthetic considerations involved in the restoration of anterior teeth with directly placed composite and outlines the contemporary materials, equipment and techniques that are available to optimize every clinical stage.

Case Report 1:

A 24 year old male patient reported to the Department of Conservative Dentistry and Endodontics, Faculty of Dental Science, Nadiad, with the chief complaint of fractured teeth associated with pain in the upper front region of jaw. Patient presented history of trauma due to a road traffic accident 6 days back.
Intraoral examination revealed incisal fracture in relation to the upper left anterior tooth (Illustration no.1).
There was no laceration on the lower and upper lip and the extraoral examination was not significant. The clinical examination noted: Ellis Class II fracture in 22
Pulp vitality test (Electric Pulp test) was performed in 21,11 showed normal response but were kept on follow up.
The temporomandibular Joint showed no abnormalities or fracture.

Illustration no.1 ***Pre-Operative***

Case Report 2:

A 18 year old female patient reported to the Department of Conservative Dentistry and Endodontics, Faculty of Dental Science, Nadiad, with the chief complaint of malformed and fractured teeth associated with pain in the upper front region of jaw. Patient presented history of trauma due to a fall 8 years back.
Intraoral examination revealed incisal fracture in relation to the upper right central and rotated lateral incisor. (Illustration no 2).
Clinical examination noted :Ellis Class II fracture in 21, 22 rotated ,there was no soft tissue lacerations on upper and lower lip Pulp vitality test (Electric Pulp test) was performed in 21,22 showed normal response but were kept on follow up. The temporomandibular Joint showed no abnormalities or fracture.

Illustration no.2 ***Pre-Operative***

Illustration no.3 ***Putty Index***

Radiographic examination with intraoral periapical (IOPA) radiograph revealed:
Horizontal fracture which extended in enamel, dentin but not involving the pulp.
No discontinuity of Lamina dura was seen in apical one-third. Based on the clinical findings a holistic treatment plan was made for both the cases using direct composite restoration.

Treatment Plan: Case 1

Patient was explained about the minimal invasive treatment plan. The shade was selected for composite build up , B2 / I.Putty Guide was used to achieve the palatal guidance (illustration no 3) and reproduce the natural form in relation to 21.A long hollow enamel bevel was given with a diamond point (TR-13 Mani Inc)The Tooth was etched with 37% phosphoric acid (Dtech), then air dried with bonding agent and light cured.
The initial build up was done with a opaque resin shade (Unicorn Denmart Shade OP) on the putty guide.(illustration no 4)
Once the palatal guide was build the the rest was restored with consequent increments of composite(Unicorn Denmart B2 / I)
The restoration was then finished and polished with finishing and Polishing discs and strips (Shofu).(illustration no 5).

Illustration no.4 ***Palatal buildup***

Illustration no.5 ***Post-operative***

Treatment Plan: Case 2

Patient was explained about the treatment plan and the shade was selected .
Putty Guide was used to achieve the palatal guidance and reproduce the natural form in relation to 11.The enamel margin was prepared with diamond points (Mani Inc SO 21) in relation to 12. The Tooth was etched with 37% phosphoric acid (Dtech), then air dried with bonding agent and light cured. The initial build up was done with a opaque resin shade (Unicorn Denmart Shade OP) on the putty guide.
Once the palatal guide was build the the rest was restored with consequent increments of composite(Unicorn Denmart A1/2 / I)
The restoration was then finished and polished with finishing and Polishing discs and strips (Shofu). (illustration no 6)

Illustration no.6 *Post-Operative*

enabled by an intact pulpal circulation.[4,5] Thus, the primary objective in the management of such cases is to limit the pulpal inflammation to a transient level and prevent bacterial ingress. This is best achieved by an efficient dentin seal.[6]

The conventional choice of treatment for these cases is a direct composite resin restoration vs the lithium disilicate emax as it is more cost effective and requires minimal preparation of the tooth surface.[3,5]

The reference guide is created from the teeth (as reconstructed on a model), which makes it possible for the clinician to increase the success rate.[1,2]

The advantage is that the restorative procedure can be carried out in two short clinical sessions, with a drastic reduction in chair time; this factor is important to ensure the child's cooperation. The size, shape and inclination of the teeth are determined in advance, which reduces the need for eventual adjustments.[6]

In addition, the use of a reference guide makes it possible for two or more teeth to be restored simultaneously, in contrast with the conventional technique.[7]

Besides functioning as a matrix for reconstructing the anatomy of the teeth, the reference guide functions as a baffle plate to hold the restorative material, facilitating its insertion into the area to be reconstructed.[8,9]

Study by Sá FC et al on a Nine-year clinical evaluation of composite resins in Class III restorations concluded the efficacy and durability of direct composite restoration [9.]

Conclusion:

The accurate diagnosis combined with an esthetic design and well executed restorative step aim to improve and restore the natural appearance of teeth.[10] Thereby, knowledge of dental morphology is essential, as well as aspects regarding optical and dynamic properties of dental structures. [11,12]
Composites have been widely used in cosmetic procedures, due to diversity of shades and effects that allow detailing the dental structures.[13,14]
The present case supports the plethora of

reports of successful treatment of esthetic enchancement of teeth with the use of direct composite restoration. The technique offers a simple, quick and effective treatment option that is also acceptable for the patients.

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PECTORALIS MAJOR MYOCUTANEOUS FLAP FOR MANDIBULAR RECONSTRUCTION IN ORAL SQUAMOUS CELL CARCINOMA: A CASE REPORT

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Abstract

The pectoralis major myocutaneous (PMMC) flap can be used as either a pedicled or a free flap. The PMMC flap is still considered a workhorse flap for soft tissue reconstruction of the head and neck region. Although the increased use of free tissue transfers to reconstruct complex bony and soft tissue defects has overshadowed the PMMC flap to an extent, it remains a very useful, versatile, and reliable reconstructive option for many head and neck defects of the mucosa or skin, or both.Moreover, the proximity to the head and neck region larger arc of rotation and rich vascular supply are additional advantages of the PMMC flap. This article describes a case of oral squamous cell carcinoma of left lower alveolus reconstructed with PMMC flap afterhemimandibulectomy and modified neck dissection.

Keywords*: pectoralis major mayocutaneous flap, head and neck reconstruction, oral squamous cell carcinoma*

Introduction

Carcinomas of the oral cavity form the second most common cancer in India. Patients usually present with advanced disease which requires extensive ablative surgery.

Modern head and neck surgery is characterized by its emphasis on three important objectives of reconstructive and rehabilitative procedures: esthetic, function and coverage of vital structures. Restoration of normal oral function following such extensive surgery-

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depends on variety of factors which include reconstruction of complex osseous, dental and soft tissue anatomy. To achieve optimal function and aesthetics is therefore a challenge to oral and maxillofacial surgeon.[1,2]

The use of myocutaneous flaps has been a huge step forward in head and neck oncological surgery, as it allows covering extensive resection, which is necessary to comply with the demands of radical removal of malignant tumours and at the same time, achieving acceptable morphological and functional restoration. The concept of pectoralis major island flap was introduced by Brown in 1977. Stephen Ariyan in 1979 used PMMC flap in head and neck reconstruction.[3]

The PMMCflap is a Type V musculocutaneous axial pattern flap which offers enormous advantages by being easily accessible, versatile, bulky, and well vascularised and most importantly does not require micro-vascular expertise for flap transfer.[4] It allows for one stage reconstruction immediately after resection and tends to achieve a harmonious balance within the aims of maxillofacial reconstructive surgery.[5, 6]

Case report :

A 53 years old male patient consulted our department for pain in lower left back tooth region since 2 years and also experienced reduced moth opening since 1 year.

On examination, ulcero-proliferative growth was seen on the left buccal mucosa extending from lower left first premolar to second molar involving the gingivo-buccal sulcus. The lesion was approximately 4 to 5 cm in size. (Illustration 1-2)

Illustration 1: ***Pre-operative facial profile***

Illustration 2: Intraoral photograph

Orthopantomogram (OPG) suggested awell-defined radiolucency with corticated borders involving alveolus on left side of mandible extending anteriorly up to the distal surface of second molar and posteriorly up to the mesial surface of the second molar. (Illustration 3)

Illustration 3: ***Pre-operative OPG***

Punch biopsy was taken and sent for histopathological examination. Diagnosis of squamous cell carcinoma was established. Computed tomography (CT) scan revealed mucosal thickening with enhancement seen along left buccal mucosa and bony erosion in left mandibular region with left side level IB and II lymphnodes involvement.

All pre-operative investigations (blood reports, chest x-ray, Electrocardiogram) were done and patient was operated under general anaesthesia. Apron incision was given with 15 number surgical blade on left side to raise the sub-platysmal flap superiorly till lower border of the mandible, mastoid tip posteriorly and midline of neck anteriorly. (Illustration 4 and 5) Modified neck dissection type II was carried out and lymphnode levels IA, IB, IIA, IIB, III and IV were removed. (Illustration 6) Lip split incision was given for resection of primary tumour on left side of the mandible.Hemimandibulec-tomy of left side was done by using physio-dispenser and oscillating saw. (Illustration 7) Specimens were sent for histological examination and reconstruction was done by using type V axial pattern single paddle PMMC flap.

Illustration 4: ***Apron incision given***

Illustration 5: ***Sub-platysmal flap was Raised***

Illustration 6*: Specimen of modified neck dissection II*

Illustration 8: *Skin paddle design and incision*

Illustration 7: *Specimen of hemimandibulectomy*

Illustration 9: *Exposure of PMMC flap*

The position of the skin paddle on chest wall was adjusted so that it overlies the muscle entirely. Skin incision was taken along the marking and extended laterally up to anterior axillary fold (Illustration 8 and 9).

Illustration 10: Elevation of PMMC flap with peddicle

Illustration 11*: Skin tunnel over clavicle*

Monopolar cautery was used to raise the pectoralis major muscle medially and inferiorly to the skin paddle and dissected from the ribs and intercostal muscles and tunnel was created by subplatysmal plane of dissection over the clavicle for the passage of the flap to the neck (Illustration 10 and 11). Flap was transferred to the recipient side through the tunnel and secured with 3-0 vicryl suture to cover the defect which was approximately 5 to 6 cm in size after resection of the primary tumour (Illustration 12). After chest and neck drains were placed, final closure was done by using 3-0 vicryl suture and skin staples (Illustration 13).

Illustration 12: *PMMC flap placed on recipient site*

Illustration 13: ***Sutures taken***

Follow up of the patient was done at regular time interval and at the end of 1 year the surgical area (recipient site) and chest area (donor site) were healed without any recurrence of the lesion (Illustration 14 and 15). Illustration 16 shows facial profile of the patient at follow up period.

Illustration 14: ***Post-operative photo of recipient site after 1 year***

Illustration 15: ***Post-operative photo of donor site after 1 year***

Illustration 16: ***Post-operative facial Profile***

Discussion :

The PMMC flap, after first being described by Ariyan,has been widely used as a workhorse flap for head and neck reconstruction.[7]Even with the worldwide use of free flaps, these have remained the mainstay reconstructive procedures in many cases for a variety of reasons. The main advantages were the ease of its technical

aspects, the proximity to the head and neck region, and the possibility of obtaining a large amount of well-vascularized tissue for reconstruction of wide defects after resection of malignant tumours of the head and neck in a single-stage procedure. Other advantages include: (1) Muscle pedicle in the neck effectively covers the exposed carotid vessels after radical neck dissection recreating the sternomastoid prominence (2) Elevation of the flap does not require any position changes during surgery and (3) Effective combinations with other flaps can be used for large defects.[8, 9]

The complication rate of the PMMC flap when used for reconstruction varies in different studies.[10,11] Kroll et al have described in their article that the complication rates after PMMC flap reconstruction in female patients are greater because of the interposition of breast tissue between the muscle and the skin paddle. Preoperative planning, operative technique, and postoperative management played important roles in reducing the complication rate and yielding better outcomes.[12]

The reported disadvantages of the PMMC flap concern the thickness of the myocutaneous flap, the functional and cosmetic donor defects, excessive bulk in obese or muscular patients, difficulty using a bipaddled flap in obese patients, and the possibility of hiding the recurrence of the malignant tumor. Another disadvantage of the PMMC flap is its poor vascularity in obese patients and over the random distal end of the rectus abdominis muscle causing partial dehiscence, fistulation, and infection and resulting in a prolonged hospital stay. Troublesome hair growth in the oral cavity in men is another area of concern. [13,14]

In female patients with PMMC flap reconstruction, it has been described that vascularity is compromised because of the intervening mammary fat between the muscle and subcutaneous tissue; however, ultimately, it provided a better contour compared with male patients in the postoperative period because there was about 50% bulk reduction within 3 months of surgery after division of the motor nerves.[15]

Conclusion :

Over the years, the PMMC flap has still retained its significance in reconstruction after head and neck cancer surgery. Despite the use of microvascular flaps, PMMC flap still remains an excellent reconstructive option in head and neck cancers.It can be used as a salvage flap in the event of microvascular flap failure. Because of its simplicity, ease of technique, versatility, and reliability, reconstruction with the PMMC flap appears to be safe and effective.

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DENTAL MANAGEMENT OF PATIENTS ON ANTIPLATELET AND ANTICOAGULANT THERAPY: A REVIEW WITH CURRENT PERSPECTIVES

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Abstract

There are a variety of discordant approaches for the management of patients on anticoagulant therapy undergoing dental or surgical procedures. As with all anticoagulants, bleeding, either spontaneous or provoked, is the most common complication so management protocols for the eventuality of bleeding is of utmost importance. Direct oral anticoagulants offer clinical advantages over warfarin, such as minimal drug interactions and fixed dosing without the need for routine monitoring of coagulation status. A thorough medical and dental history is critical to the identification of patients who may be on some type of hemostasis-altering medication. The dentist must be familiar with the types of diseases and conditions that necessitate the alteration of coagulation mechanisms and the different laboratory tests that are used to assess the coagulation status in these patients.

Key words: *anticoagulants, hemostasis, minor surgery*

Introduction

Hemostasis is a defense mechanism which preserves vascular integrity and avoids blood losses,while ensuring optimum fluidity throughout the circulatory system. Anticoagulant drugs inhibit the enzyme vitamin K reductase, which mediates conversion of vitamin K epoxide to its active form.

As a result, the formation of coagulation factors dependent upon this active form is inhibited, and the coagulation process is blocked. So with this hemostatic alteration bleeding becomes difficult to control. As a result, some authors recommend suspending, reducing or replacing. Anticoagulation medication prior to invasive dental treatments, while others advise against such measures, due to the possibility of an increased risk of thromboembolic events.[1]

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There are various anticoagulants in use like warfarin, heparin and low molecular weight heparin. In addition to these there are various direct oral anticoagulants like dabigatran, argatroban, bivalirudin, desirudin and lepirudin. There are various indications of using anticoagulants like in deep vein thrombosis, pulmonary embolism, myocardial infarction and in valvular diseases. In addition the DOACs (direct oral anticoagulants) are becoming more frequently prescribed and their use has significant implications for the management of patients requiring anticoagulant therapy because there is the elimination of the need for monitoring, even if the patient is to undergo surgery. Secondly, these drugs are administered orally at a fixed daily dose, making patient compliance more straightforward.[2,3] The coagulation tests that are commonly used in practice to monitor bleeding risk and anticoagulant therapy are prothrombin time (PT), activated partial thromboplastin time (aPTT), and thrombin time (TT). The INR measures the ratio of the patient's PT to a normal sample that is designed to standardize the differences among laboratories. It is also used to monitor warfarin therapy and the extrinsic coagulation pathway.[4]

Guidelines state that INR of patients should be measured within 72 hour before oral surgery or ideally within 24 hour.[5]

The present article offers an update on the different types of antiplatelet drugs and anticoagulants currently available in the market, with an evaluation of the risks and benefits of suspending such drugs prior to invasive dental treatment. In addition, a review is made of the current management protocols used in these patients.

Overview of antiplatelet drugs

There are various antiplatelet medications that are used to aid anticoagulation for example, aspirin. Aspirin is one of the most commonly encountered medications in a patient's drug history. The active ingredient is acetylsalicylic acid. It is used in the treatment of a myriad of conditions and functions as an analgesic, anti-inflammatory, antipyretic, and antiplatelet medication. It belongs to the group of medications known as nonsteroidal anti-inflammatory drugs. It irreversibly inhibits platelet action, at lower dose it inhibits TXA2 and at higher dose it inhibits TXA2 and PGI2. The PT, aPTT, and platelet count are usually normal in patients on aspirin therapy but the bleeding time may be prolonged. Clopidogrel irreversibly inhibits the adenosine diphosphate receptors on platelets and thus inhibits aggregation and clot formation. It is an alternative drug for persons who require anticoagulation who are unable to tolerate aspirin therapy.[4]

Management of patients on salicylic acid therapy

In general, salicylic acid intake is a challenge that surgeons can readily overcome. For uncomplicated forceps extraction of 1 to 3 teeth, there is usually no need to interfere with aspirin treatment. In patients receiving up to 100 mg salicylic acid daily, bleeding during oral surgical procedures is controllable with suturing and direct packaging with gauze, resorbable gelatin sponge, oxidized cellulose or microfibrillar collagen. If oozing still is seen, tranexamic acid locally will help. In patients receiving higher doses of salicylate, if there is concern, the current value of bleeding time should be established. If it is higher than 20 minutes, surgery should be postponed. However, if emergency surgical treatment is needed, in consultation with the treating physician, desmopressin acetate may be given. If the patient is on SA and on other anticoagulation medications or with

some bleeding tendency, such as hemophilia, or uremia, medical advice should be sought to discontinue the use of aspirin intake 7 days before oral surgery procedures.[6] However currently Zhao et al and Lu S Y et al studied that there is no need of stopping antiplatelet drugs if proper hemostatic protocols are followed.

Overview of anticoagulants

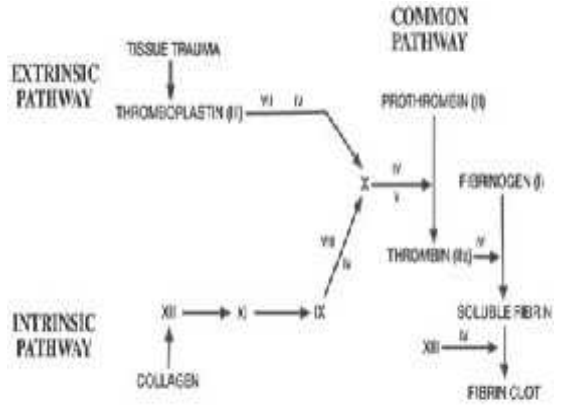

Illustration 1*Coagulation Cascade*

Coagulation of blood comprises the formation of fibrin by a series of interactions among various protein factors and other substances present in plasma.[7]

Medications that interrupt the hemostasis can be grouped into 2 primary categories: anticoagulants that interrupt the coagulation cascade and antiplatelet factors.

Warfarin is an oral anticoagulant that was discovered in Wisconsin more than 80 years ago. It works by inhibiting vitamin K–dependant coagulation factors and its effect is dose dependant. The anticoagulation efficacy is measured by the PT and INR. A target INR range of 2.0 to 4.0 is used for most patients. It is metabolized in the liver and excreted via the kidneys. Various medications can potentiate or decrease the effect of the drug. Drugs that are highly protein bound will displace warfarin and increase its blood concentration, leading to an increase in INR.

Heparin was discovered in 1916 and is usually derived from porcine mucosa. It acts indirectly by activating plasma antithrombin III and it inactivates thrombin. The heparin-AT III complex then binds to clotting factors of intrinsic pathway. It is mainly administered via IV infusion or intermittent SC injection. The anticoagulation effects of this drug are monitored via measuring the aPTT, which should be 1.5 to 2.0 times the normal. Platelets should also be reviewed because of the risk of the rare side effects of heparin-induced thrombocytopenia (HIT) and heparin-induced thrombocytopenia and thrombosis (HITT). These usually occur within the first 10 days of starting heparin therapy but can occur up to many weeks after it has been discontinued. Depolymerization of heparin produces low molecular-weight heparin (LMWH). LMWH requires less monitoring than heparin because it has different anticoagulant profile; selectively inhibit factor Xa with little effect on IIa. As a result it has smaller effect on aPTT and whole blood clotting time. LMWH is also used for in-hospital patient care for therapeutic or prophylactic treatment of conditions such as deep vein thrombosis. LMWH is available for SC or IV use only. Warfarin is known to have its clinical and practical limitations so ultra-low molecular-weight heparins are currently being developed; for example, semuloparin and bemiparin.[4]

Management of patients on warfarin and other oral coumarin anticoagulation therapy

Traditionally, patients on oral anticoagulant therapy were placed into 1 of the following 3 categories, which dictated the appropriate anticoagulation therapy: 1, low-risk procedures required no change in anticoagulation medication; 2, moderate-risk procedures indicated withdrawal of coumarin 2 days before the procedure and verification of INR the day of the procedure and 3, for high-risk dental procedures, a heparin protocol was strongly recommended. The management of patients on anticoagulant therapy should certainly take into consideration the type of the surgical procedure, the INR value.[6] There are some guidelines for using warfarin and heparin therapy they are given in table 1 and table 2.[11]

Dental perspectives

Anticoagulants present management problems in oral surgery mainly because of prolonged intraoperative and postoperative bleeding. They are used according to their recommended doses (Table 3).

The following general points should be considered in patients for oral surgery on anticoagulant therapy:

1. Dental preventive care is especially important to minimize the need for surgical intervention.
2. Systemic conditions that may aggravate the bleeding tendency can be present. These Conditions include a wide range of disorders, including coagulopathies, thrombocytopenias and vascular disorders, such as Ehlers-Danlos syndrome, liver disease, renal disease, malignant disease, and HIV infection.
3. Drugs that cause increased bleeding tendency should be avoided.
4. Any surgical intervention can cause problems; thus, the possibility of alternatives to surgery eg, some local analgesic injections can cause serious problems.
5. Other interventions to avoid, if possible, include regional local analgesic injections should always be considered. The patients should be warned in advance of the procedure of the increased risk of intraoperative and postoperative bleeding and intraoral/extraoral bruising. If the bleeding tendency is great, dental extractions, other surgical procedures spaces of neck and obstruct airway; intraligamentary or intra-papillary injections are far safer.[9,10]

Operative care

Patients on oral anticoagulants are especially at risk from haemorrhage under-some circumstances (Table 4).

Whenever possible, potentially problematic surgical procedures are best carried out in the morning, allowing more time for hemostasis before nightfall. Surgery should be performed with 2% lidocaine with 1:80,000 or 1:100,000 epinephrine unless the patient is an active cocaine abuser or a cardiac patient, in which case epinephrine should be avoided. Surgery should be carried out with minimal trauma to both bone and soft tissues. Local measures are important to protect the soft tissues and operation area and minimize the risk of postoperative bleeding. In the case of difficult extractions, when mucoperiosteal flaps must be raised, the lingual tissues in the lower molar regions should preferably be left undisturbed because trauma may open up planes into which hemorrhage can track and endanger the airway. The buccal approach to lower third molar removal is therefore safer. Minimal bone should be removed and the teeth should be sectioned for removal where possible. Meticulous curettage of the extraction site is essential to avoid excessive bleeding because when postoperative bleeding occurs, the cause is not necessarily the prolonged INR but may be local infection. In the case of multiple extractions, postoperative bleeding does not occur in all

extraction sites; rather, it usually occurs in only 1 site, often alocation associated with severe periodontitis. Bleeding should be assessed intraoperatively, and if there is concern, one should place in the extraction site an absorbable hemostatic agent such as: oxidized regenerated cellulose; resorbable gelatin sponge; collagen; cyanoacrylate; or fibrin glues, which consist mainly of fibrinogen and thrombin and provide rapid hemostasis and tissue sealing and adhesion. Suturing is desirable to stabilize gingival flaps. Resorbable sutures are preferred because they retain less plaque. Nonresorbable sutures should be removed at 4 to 7 days. Gauze pressure containing trenexemic acid should be applied for 10 minutes that can also help to achieve hemostasis.[10, 11]

Postoperative care

Careful mouth cleaning after surgery is essential. Many patients can be managed after surgery with antifibrinolytic agents given topically as a mouthwash during the first 7 to 10 days. If the patient continues to bleed, desmopressin acetate may help. This synthetic analogue of vasopressin induces the release of factor VIIIC, von Willebrand's factor, and tissue plasminogen activator from storage sites in endothelium. It is given as an intranasal spray.1.5-mg desmopression per mL with each 0.1-mL pump spray delivering a 100-to 150-microgram dose.[12,13]

Conclusion

The surgical management of patients on oral anticoagulant therapy remains a challenging area for dentists. Specifically, that patients must first be assessed by their primary physician and dentist to determine their thromboembolic risk. Then their surgical needs should be evaluated and stratified. Patients who are at moderate to high risk of thromboembolism and patients who require moderate to high levels of surgical intervention should be referred to an oral and maxillofacial surgeon. The basis of prudent management for these patients, however, remains rooted on the 5 planks listed earlier: (1) status of their medical condition, (2) proper laboratory assessment of their coagulation profile before surgery, (3) accurate categorization of their thromboembolic profile, (4) appropriate surgical risk stratification and effective local control, and (5) close extended postoperative monitoring. However, patients with a prolonged APTT or PT value have a higher risk of bleeding, therefore, adequate local hemostasis and careful follow up are required.

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Table 1. Guidelines for warfarin therapy after surgery[11]

Day 1: Obtain baseline INR. Start warfarin with 10-mg dose on night of surgery. Use lower doses (2 to 5 mg) if patient is elderly, chronically malnourished, has liver disease, or is on medication that can potentiate warfarin. Alternatively, can use patient's known usual maintenance dose. Day 2: Check INR (reflects first dose only). If INR _ 1.5, give same dose. If INR _ 1.5, give lower dose. Day 3: Check INR (reflects first 2 doses). If INR _ 1.5, it suggests that a higher than average maintenance dose (_5 mg) will be necessary. If INR is 1.5 to 2.0, it suggests that average maintenance dose (approximately 5 mg) will be necessary. If INR _ 2.0, it suggests that lower than average maintenance dose (_5 mg) will be necessary.

Table 2. Guidelines for monitoring Heparin Therapy[11]

1. Check APTT 6 hours after initial bolus and 6 hours after any dose change. Adjust heparin infusion until APTT is therapeutic (46 to 70 seconds).

2. When 2 consecutive APTTs are therapeutic, order APTT every 24 hours only (and adjust drip as needed).

3. Dosages of heparin when calculated by weight are rounded off to nearest 100 U/h.

4. Order complete blood cell and platelet count every 3 days during heparin therapy.

5. Stop heparin 4 hours before surgery. After surgery, restart heparin immediately with same rate used before surgery when APTT was therapeutic.

Table 3. Recommended Doses of Anticoagulant/Antithrombotic Therapies

Drug	Dose form	Recommended dose
Aspirin	Oral	75 to325 mg daily
Clopidogrel	oral	75 mg daily with aspirin when warfarin therapy is unsuitable
Heparin	IV	70 units/kg bolus then 15 units/kg/hour infusion; Adjust dose based on APTT and hospitall'snomogram
Warfarin	IV or oral	Individualize the dose; adjust dose based on INR Target INR = 2.5, 2.0 to 3.0. (with mechanical valve, target INR > 2.5)

Notes: aPTT = activated partial thromboplastin time; INR = International Normalized Ratio; IV = intravenous; SC = subcutaneous [8]

Table 4: Scottish dental clinical effectiveness guidelines[6]

Dental Procedures that are unlikely to cause bleeding	**Low risk of postoperative bleeding complications**	**Higher risk of postoperative bleeding complications**
(1)Local anaesthesia by infiltration, intraligamentary or mental nerve block	(1)Simple extractions (1–3, with restricted wound size)	(1)Complex extractions, adjacent extractions that will cause a large wound, or more than three extractions at once
(2)Local anaesthesia by inferior dental block or other regional nerve blocks	(2)Incision and drainage of intraoral swellings	(2)Flap raising procedures:
(3)Basic periodontal examination (BPE)	(3)Detailed six-point full periodontal examination	a)Elective surgical extractions
(4)Supragingival removal of plaque,calculus, and stain	(4)Root surface instrumentation (RSI)	b)Periodontal surgery
		c)Preprosthetic surgery
(5)Direct or indirect restorations with supragingival margins	(5)Direct or indirect restorations with subgingival margins	d)Peri-radicular surgery
		e)Crown lengthening
(6)Endodontics (orthograde)		f)Dental implant surgery
(7)Impressions and other prosthetic procedures		(3)Gingival recontouring
(8)Fitting and adjustment of orthodontic appliances		(4)Biopsies

DENTAL MANAGEMENT IN PATIENTS WITH RENAL DISORDERS: A REVIEW WITH CURRENT CONCEPTS

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Abstract

Every dental professional is confronted regularly with patients suffering from single or multiple systemic disorders which necessitate modification in routine dental therapy. Renal disease, whether acute or chronic, constitute a large volume of patients who are suffering from underlying, untreated hypertension or diabetes ultimately leading to renal failure. Patients on dialysis or undergoing renal transplant therapy demand utmost care during dental treatment. This article aims at reviewing current perspectives in dental management of these patients.

Keywords: *renal disease, renal transplant, dental treatment*

Introduction

With innovations in field of medicine and technology, the oral health care professionals have to apply a holistic approach for the management of patients with complex medical problems. Among the various systemic disorders, a major cause of morbidity and mortality worldwide is posed by renal diseases, as kidneys are the vital organs for maintaining a stable internal environment.[1] Multiple complex functions like excretion of metabolic waste, regulation of electrolyte concentration and blood volume, regulation of erythrocyte production in bone marrow and calcium homeostasis are performed by kidneys. Kidney diseases can be classified into developmental or inherited diseases and with respect to further course of illness, they can be sub-classified into chronic and acute renal diseases.

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Like any other systemic conditions, renal diseases can cause oral manifestations.[2]The prevalence of oral lesions is affected by the accompanying systemic disease. For example, non-diabetic uremic patients may not show as much of oral manifestations like diabetic uremic patients.[3]Experiments have shown that pyelonephritis can be caused by a bacterial infection which is inoculated in the kidney from any chronic dental infection. Experimental evidence support a connection between renal calculus and oral infection.[4]In pre-transplantation stage (PRTS), impaired renal function can lead to different hematologic and metabolic disorders which involve oral cavity and jaw bones that can interfere with food intake and lead to increased catabolism and deterioration of the condition.[5]Periodontal disease, narrowing of the pulp chamber, enamel abnormalities, premature tooth loss and xerostomia are seen greatly among dialysis patients which may be related to a variety of factors like relative state of immune-suppression, medications, renal osteodystrophy and bone loss, and restriction of oral fluid intake.[6] Malnutrition can be of a significant problem for dialysis patients and this condition can be exacerbated by ill-fitting dental prosthesis, local infections and carious or missing teeth. Maintaining oral hygiene gets increasingly important when a patient is a candidate for renal transplantation, wherein immunosuppressive protocols may further predispose to oral and most likely disseminated infection.[7]Familiarity with the nature of the disease in question and possible complications that may develop in these patients is indispensable prior to any dental treatment, particularly of invasive nature as it is the case in surgical interventions.[8]The description of common renal disorders and their dental management is highlighted subsequently in the article.

Chronic kidney disease

Chronic Kidney Disease (CKD) is defined as structural or functional abnormalities of the kidney, with or without decreased GFR, manifested by pathological abnormalities or markers of kidney damage, including abnormalities in the composition of the blood or urine or abnormalities in imaging tests. (GFR <60ml/min/1.73m^{2}for three months or more, with or without kidney damage).[9] Thus kidney function is impaired followed by high loss of fluids from the body due to increased excretion of urine. The immune system of the patients is grossly weakened and consequently, there is greater tendency to infection. Candidiasis, intra-oral ulcers, xerostomia and paleness of soft tissues is common. With CKD, the following have to be kept in mind

- Absorption of medications administered per os is reduced due to reduced absorption capacity of gastrointestinal tract.
- Anaemia results due to reduced erythropoietin production. Fresh blood transfusion should be avoided because every transplantation is the introduction of new antigens in the body and it can react by producing antibodies against it.[10]
- Bleeding tendency increases due to platelet dysfunction and so APTT and INR have to be monitored carefully.[10]
- In patients with severe renal disease, changes occur in the periodontium like loss of lamina dura and trabecular pattern of jaw bones.[7]
- Acidosis in patients with CKD may reduce the effectiveness of local anaesthetics.[11]
- Secondary hyperparathyroidism is very common which is a result of phosphate retention and it influence on hyper production of parathyroid hormone leading to increased loss of calcium in the bones.[12]
- General Anesthetics is to be avoided in CKD patients whose potassium level is over 5.5 mmol/L or else there is an increased risk of arrhythmia.[9]

Progressive loss of kidney function, ultimately results in clinical syndrome which is denoted as uremia. The systemic signs of renal failure and uremia such as hematologic changes, bone metabolism changes and alterations in immune status can be significant to the dental practitioner (Table 1).[13]Among individuals with chronic kidney disease, the stage is defined by the level of GFR, with higher stages representing lower GFR levels. Based on GFR, classification of CKD can be done as given in table 2.[14]

Renal failure is a debilitating disease carrying high mortality as well as morbidity. It needs long term treatment like continuation of life-long renal replacement therapy in the form dialysis or the renal transplantation.[15]

Acute renal failure

Acute renal failure is caused by three factors i.e. pre-renal, renal and post renal factors.[16] Acute tubular necrosis, hypovolemia, intestinal nephritis and urinary tract obstruction can cause acute renal failure. Tubular dysfunction and depression in the glomerular filtration rate (GFR) occurs which rises the serum creatinine and blood urea nitrogen (BUN) levels. The major metabolic defect is an inability to handle hydrogen ions and secrete potassium ions and thus if left untreated, these patients become acidotic and hyperkalemic which can lead to cardiac irritability and arrhythmias if the patient is challenged by surgery. If the condition is prolonged or permanent, it may be necessary to place a shunt in the patient's arm for repeated hemodialysis.[17]

Patients on dialysis

Dialysis is used if serum creatinine is between 600-800 micromol/L and they are of two types namely: i) Haemodialysis ii) Peritoneal dialysis.[8]

In course of dialysis, patient is given parenteral heparin to prevent coagulation of blood which is retained for 4-6 hours after administration. This is important for the timing of dental intervention i.e. extraction should be done a day after dialysis when the anticoagulant's effect is minimum while the dialysis effect is maximal. Dialysis patients are more susceptible to bleeding and infection. Drugs like streptomycin, kanamycin, vancomycin and tetracycline should be avoided as their excretion is through kidneys.[18]

Renal transplant patients

Transplantation is recommended for patients with End Stage Renal Disease (ESRD) who are medically suitable since a successful transplant offers enhanced quality and duration of life and is more effective medically and economically that dialysis.[16]However, unlike patients undergoing dialysis, those receiving kidney transplants receive immunosuppressive therapy to prevent T-cell allo-immune rejection response.[19]These patients are extremely sensitive to infection. The immunosuppressant therapy may involve many side effects like hypertension, diabetes and increased bleeding that in turn may largely affect the oral surgical intervention. Because of potential adrenal crisis risk, it is necessary to alter steroid therapy.[20]

Nephrotic syndrome

Nephrotic syndrome is a clinical disease comprising of stages like proteinuria, hypoproteinemia and hyperlipidemia. Diabetes, Systemic Lupus Erythematosus (SLE) and amyloidosis are most common causes of nephrotic syndrome while among the primary kidney diseases, the most important are the diseases involving immune deficiency i.e. glomerulonephritis.[8] It is characterized by alterations of perms-electivity at the glomerular capillary wall, resulting in protein loss through the urine. In nephrotic syndrome, proteinuria exceeds 1000 mg/m^2/d or spot urinary protein to creatinine ratio exceeding 2mg/mg.[21] Treatment aims in reducing proteinuria, control infections and prevent thromboembolism.[16] For patients who are undergoing invasive dental procedures and are on corticosteroids, corticosteroid cover should be administered to minimize the risk of adrenal crisis.[21] Alterations of cellular immunity and malnutrition occur to a protein restricted diet lead to immuno-deficiency in nephrotic syndrome patient. It can also cause Epstein's syndrome which is an idiopathic nephritic syndrome with typical changes in the mucous of new borns in the form of salty, pseudo-diphteric layers stretching over soft palate in the shape of butterfly. Patients with nephrotic syndrome are prone to infection and thus prophylactic antibiotics become important before endodontic therapy, extractions and other invasive procedures. Thus, dental intervention should not be undertaken unless in urgent cases and a nephrologist should be consulted.[8]

Dental considerations

Halitosis and metallic taste are caused by increased concentration of urea in saliva and its transformation into ammonium.[22]Xerostomia is due to restriction of fluid intake, side effect of antihypertensive drugs, salivary gland alteration and oral breathing secondary to lung perfusion problems. Pale mucosa is due to anaemia.[22]Uremic stomatitis is attributed to painful lesions often occurring on the ventral surface of the tongue and on anterior mucosal surfaces. They are resistant to treatment as far as urea levels remain high and heal spontaneously when the renal disorder has resolved.[23]Gingival bleeding resulting from platelet dysfunction and effects of anticoagulants. Gingival hyperplasia secondary to drug treatment (cyclosporine/nifedipine) which is one of the most widely documented oral manifestations in patients. The condition is aggravated by poor oral hygiene.[24]Severe erosions on the lingual surfaces of the teeth are due to frequent regurgitation and vomiting induced by uremia and medication and nausea associated to dialysis.[2]There may be delays and alterations in eruption of teeth.[2]Pulp obliteration can be possible due to alterations in calcium and phosphorous metabolism.[25]Changes in maxillary bone occurs secondary to renal osteodystrophy which causes demineralization of bone with loss of trabecular pattern and cortical bone loss, giant cell radio transparencies or metastatic calcifications of soft tissues. They are at increased risk of fracture during dental treatment like extraction.[2]Diminished prevalence of caries has been observed and attributed to the protective effect on the part of urea, which inhibits bacterial growth and neutralizes bacterial plaque acids.[7]Tartar formation is due to increased levels of urea in saliva and altered calcium and

phosphorous metabolism.[26]Candidiasis is most common both in transplant patients and in patients undergoing dialysis. Cytomegalovirus infection is frequent in the first months after transplantation and prolonged immune suppression can increase patient vulnerability to human herpes virus-8.[24]Mucosal lesions like Oral Hairy Leukoplakia (OHL) can occur due to drug induced immune suppression.[24] Malignization due to increased susceptibility to epithelial dysplasia and carcinoma of the lip attributable to the treatment following renal transplantation has been postulated. Increased risk of malignization in CRF probably reflects the effects of iatrogenic immune suppression, which increases mucosal susceptibility to virus-related tumors like kaposi's sarcoma or non-Hodgkin lymphoma.[24]

Dental management

Consultation with the nephrologist provides information on the state of the disease, the type of treatment, the best timing of dental management, or the medical complications that may arise. Any modification of the usual medication used by the patients or of other aspects of their treatment must first be consulted with the nephrologist.[25]

Prior to any invasive dental treatment, a complete blood count is to be obtained with coagulation tests in view of possible haematological alterations. It is essential to eliminate any infection in the oral cavity as soon as possible, with the consideration of antibiotic prophylaxis when bleeding and/or a risk of septicaemia is expected like in extractions, periodontal treatments, endodontics and periapical surgery, the placement of orthodontic braces, tartrectomy when bleeding is expected, implant surgery, and the re-implantation of avulsed teeth.[27]Blood pressure is to be monitored before and during treatment, with the administration of sedation to lessen anxiety. The metabolism and elimination of certain drugs are altered in situations of renal failure. In such cases dose adjustment or modification of the dosing frequency is needed (Table 3). The prescription of aminoglycoside antibiotics and tetracyclines is to be avoided, because of their nephrotoxicity. Penicillins, clindamycin and cephalosporins can be administered at the usual doses, and are the antibiotics of choice – though the dosing interval should be prolonged. As regards analgesics, paracetamol is the non-narcotic analgesic of choice in application to episodic pain. Aspirin possesses antiplatelet activity, and as such should be avoided in uremic patients. As regards the rest of nonsteroidal anti-inflammatory drugs (indomethacin, ibuprofen, naproxen and sodium diclofenac), dose reduction or even avoidance is indicated in the more advanced stages of renal failure, since they inhibit prostaglandins and generate a hypertensive effect. Benzodiazepines can be prescribed without the need of dose adjustments, though excessive sedation may occur. The narcotic analgesics (codeine, morphine and fentanyl) are metabolized by the liver, and so usually do not require dose adjustment. Close cooperation between medical and dental professionals is desirable in order to improve the oral and general health of the patient, based on the creation of a dental care program in the context of a multidisciplinary approach to the disease.[2]

For dialysis patients :

Patients on peritoneal dialysis require no special measures as regards dental treatment, beyond those already commented above. Due to the already mentioned reasons, dialyzed patients are at an increased risk of bleeding. It is advisable to provide dental treatment on non-dialysis days, to ensure the

absence of circulating heparin, which has a half-life of about four to six hours.[7] In any case, prior to invasive procedures, it is important to request a complete blood count and coagulation tests, and to ensure that local hemostatic measures are available: mechanical compression, sutures, topical thrombin, microfibrilar collagen and oxidized regenerated cellulose.[2]APTT and INR should be checked prior to the surgical intervention. Desmopressin has been proposed for the control of severe bleeding in patients with renal failure, and conjugated estrogens can be used to achieve longer term haemostasis.[28] Tranexamic acid in the form of a rinse or administered via the oral route at a dose of 10-15 mg/kg body weight a day distributed in 2-3 doses, may also prove useful.[29]Short acting barbiturates should be used like pentobarbital as it is metabolized in liver.[18]Although there is some controversy in the literature regarding the need for antibiotic coverage to prevent bacterial-endocarditis in dialyzed patients, endocarditis is effectively a potential complication in such patients. The recommended antibiotic regimen is 2 g of amoxicillin via the oral route one hour before the dental procedure. In the case of patients with allergy to penicillin, clindamycin is the drug of choice (600 mg via the oral route, one hour before the intervention).[2]Dialyzed patients are subjected to numerous transfusions and blood exchanges, and this implies an increased risk of infection in the form of HIV, HBV, HCV and tuberculosis. Periodic monitoring is required, with the adoption of measures to avoid both personal contagion on the part of the dental professional and cross-contamination in the dental clinic.[2]Hemodialysis can affect the serum concentrations of different drugs used by CRF patients, when such substances are administered before the dialysis session. Supplementary dosing after dialysis therefore may be needed.[28]

For transplant patients:

It is important to conduct dental evaluation prior to renal transplantation, in order to eliminate the existing infectious foci. Teeth offering an uncertain prognosis are to be removed.[7]The potential for oral infections after transplantation is very high, since these patients receive immuno-suppressive therapy. Prophylactic antibiotic treatment is therefore indicated before invasive dental procedures are carried out. Prolonged corticosteroid therapy may make it necessary to administer a supplementary dose in situations of stress, such as when visiting the dentist, in order to avoid an adrenal crisis. The most recent guides recommend a dose of 25 mg of hydrocortisone via the intravenous route, before the intervention.[24]Regimen most often include Calcineurin Inhibitor (CNI), corticosteroids, anti-proliferatives and co-stimulation blockers. Azothioprine is the commonly used to prevent organ rejection. Initially high doses of the drug are reduced to 50 to 150 mg/day after two or three months. In the first 6 months after transplantation, patients should avoid any elective dental treatment.

Conclusion :

A thorough check of the oral cavity in patients of renal failure is invaluable to diagnosis at an early stage of multi-system disease. Patients with renal diseases are extremely delicate group of patients. Therefore, these patients should be routinely evaluated for oral lesions and treated accordingly. The dental management of patients with renal disease is complicated by systemic consequences of renal failure particularly anaemia, bleeding tendency,

cardiovascular or endocrine diseases, but with the use of proper treatment protocols, the dental management in these patients can be effective and safe. Dental treatment in such patients implies close cooperation between the dentist and the nephrologist.

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Tables

Table 1. Signs and symptoms of renal failure and uremia

Signs	Symptoms
Peripheral edema	'Restless' legs
Rise in blood pressure	Leg cramps
Pericardial effusion	Ankle edema
Confusion, coma, lethargy	Loss of libido
Renal osteodystrophy	Feeling cold
Pallor due to anemia	Pruritus
Bruising due to platelet dysfunction	Insomnia

Table 2. Classification of CKD based on GFR

CKD stage	Definition
1	Normal or Increased GFR, some evidence of kidney damage reflected by microalbuminuria, proteinuria and hematuria as well as radiologic or histologic changes
2	Mild decrease in GFR (60-89ml/min per $1.73m^2$) with some evidence of kidney damage reflected by microalbuminuria, proteinuria and hematuria as well as radiologic or histologic changes
3 3A 3B	GFR 30-59 ml/min per $1.73m^2$ GFR 45-59 ml/min per $1.73m^2$ GFR 30-44 ml/min per $1.73m^2$
4	GFR 15-29 ml/min per $1.73m^2$
5	GFR <15 ml/min per $1.73m^2$ when renal replacement therapy in the form of dialysis or transplantation has been considered to sustain life

Table 3. Alteration in the dosage of medicines according to creatinine clearance

Pharmaceutical Substance	Adjustment based on Creatinine Clearance (ml/min)		
	>50	10-50	<10
Antimicrobials			
Amoxicillin	Usual dosage every 8 hours	Usual dosage every 8 or 12 hours	Usual dosage every 12-18 hours
Erythromycin	Regular dosage and rate	Regular dosage and rate	Reduced dosage to 50-75%
Clindamycin	Regular dosage and rate	Regular dosage and rate	Regular dosage and rate
Metronidazole	Regular dosage and rate	Regular dosage and rate	Reduced dosage to 50%
Aciclovir	Usual dosage every 8 hours	Usual dosage every 12-24 hours	Usual dosage every 48 hours
Ketoconazole	Regular dosage and rate	Regular dosage and rate	Regular dosage and rate
Analgesics			
Aspirin	Regular dosage and rate	Adjustment of the rate of Administration	Avoid
Paracetamol	Regular dosage and rate	Regular dosage and rate	Adjustment of the rate of Administration
Ibuprofen	Regular dosage and rate	Regular dosage and rate	Avoid
Diclofenac	Regular dosage and rate	Regular dosage and rate	Avoid
Naproxen	Regular dosage and rate	Regular dosage and rate	Avoid
Local anaesthetics			
Lidocaine	Regular dosage and rate	Regular dosage and rate	Regular dosage and rate
Mepivacaine	Regular dosage and rate	Regular dosage and rate	Regular dosage and rate
OTHERS			
Prednisone	Regular dosage and rate	Regular dosage and rate	Regular dosage and rate

AMELOGENESIS IMPERFECTA: A CASE REPORT

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Abstract

Structural defects of teeth are the inherited or acquired conditions which affect the normal structure of teeth like enamel, dentin, pulp, or cementum. Due to such defect, patient's normal function of teeth is hampered. So it is necessary to identify the type of defect by proper investigation techniques and establish the treatment plan to restore the function of teeth. In this case report, clinical and radiographic investigation procedures of a patient with the structural defect is described.

Key words : *structural defect, discoloration of teeth, thinning of enamel, roughened surface, chipping of enamel*

Introduction

Genetic causes have been identified for both isolated teeth malformations and for the dental anomalies seen in patients with craniofacial developmental defects.[1] Mutation in several genes like ENAM, AMELK, DSPP, DMP-1, IBSP, SPP1, etc. have been associated with orofacial and dental defects.[2] Developmental anomalies of tooth is mostly divided on the basis of: (1) Number of teeth (2) shape of teeth (3) size of teeth (4) structure of teeth. Genetic tooth anomalies are many a times associated with syndromes or transferred by hereditary traits.

Sporadic occurrence of genetic anomalies is presumed to be caused by dominant or recessive multifactorial inheritance, by new mutation or by stochastic occurrences. This article refers to laboratory investigations and histological differences in structural defect of tooth.

Case report

A 12 years old male patient reported to Department of Pediatric and Preventive Dentistry, Faculty of Dental Science, DDU, Nadiad with the chief complain of discoloration and wearing of all teeth (Illustration 1 to Illustration 5)

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Illustration 1: ***Initial intraoral view showing the teeth with amelogenesis imperfect***

Illustration 4: ***View of occlusal surface of left maxillary posterior teeth***

Illustration 2: ***View of lingual surface of left mandibular posterior teeth***

Illustration 5: ***View of occlusal surface of right maxillary posterior teeth***

Illustration 3: ***View of lingual surface of right mandibular posterior teeth***

The parents also expressed concern that there was delay in eruption of permanent teeth and change in colour of same during the time of eruption. Patient's past medical history was non-contributory. There was no history of any unusual bone brittleness or unexplained hearing loss in the family or any other systemic illness or drug usage in present or past. Abnormality was not detected on general physical examination. It is necessary to perform the investigations for the diagnosis of the disease so that a proper treatment plan can be implemented. Number of teeth present were

16 55 54 53 12 11	21 22 63 64 65 26
46 85 84 83 42 41	31 32 73 74 75 36

His first paternal cousins have similar condition of teeth. The thickness of enamel was decreasing from posterior teeth to anterior teeth. The teeth were yellowish brown in color and carious lesions were absent. It was seen that enamel was not present on all surface of deciduous teeth. Patient also had poor oral hygiene with moderate to severe dental plaque accumulation along with debris and calculus which caused roughening of teeth surface. Gingival tissues around most of permanent and primary teeth showed mild inflammation. The thickness of enamel was reduced with localized chipping of enamel surface in anterior teeth region. Radiographic features were evaluated by an orthopantomograph (Illustration 6). It shows that following teeth are present in oral cavity.

17 16 15 55 14 54 13 53 12 11	21 22 63 23 64 24 65 25 26 27
47 46 45 85 44 84 43 83 42 41	31 32 73 33 74 34 75 35 36 37

Uneven thickness of enamel is seen in clinical and radiographic finding of following teeth:

16 55 54 53 12 11	21 22 63 64 65 26
46 85 84 83 42 41	31 32 73 74 75 36

Enamel thickness is adequate in erupting permanent teeth:

17	27
47	37

Roots showed normal length and form. Pulp chambers were regular in size.

Illustration 6: ***Orthopantomograph(OPG) of patient***

Pulp obliteration is not seen in any present teeth. Radiodensity of enamel is more than the radiodensity of dentin. Cementum, alveolar bone and periodontal ligament space appear normal. Cervical constriction is not seen in any teeth. Enamel is of variable thickness in the specimen tooth. Enamel is absent on the incisal surface whereas on the proximal surface the thickness is reduced (Illustration 7).

Illustration 7: ***Radiovisiography(RVG) of mandibular anterior teeth***

Discussion:

Amelogenesis Imperfecta is a developmental, often inherited disorder affecting dental enamel. It may be associated with systemic features and comprises of diverse phenotypic entities.[3] On intraoral examination in patient affected with amelogenesis imperfect by Begum N[4] showed generalized yellowish discoloration. The thickness of enamel was reduced with localized chipping of enamel in anterior teeth region. Radiographic examination revealed a generalized loss of enamel thickness. Similar clinical and radiographic features can be seen in our case. Seow[5] studied 32 patients from 17 families with several types of amelogenesis imperfect which showed that 3 families had yellowish teeth. The enamel tended to chip away easily, exposing large areas of dentin. Also patients were disposed to poor gingival health because of enhanced plaque retention and calculus formation which resulted in rough enamel surface. These findings supported the clinical findings seen in our case. Study by Mehta DN[6] showed that enamel was softer in consistency with chipping of enamel on probing. Panoramic radiograph showed presence of thin layer of enamel with radiodensity of enamel more than dentin which supports our study. Yamaguti PM[7] examined 12 family members which revealed that there were alteration in shape and colour of teeth and areas with fractured enamel. These observations were also found in clinical examination of our patient. Due to such structure of enamel, there were failures in composite veneering due to lack of good enamel bonding. Full coverage restorations can be the another treatment option in future when all permanent teeth have erupted fully in the oral cavity.

Conclusion:

The diagnosis we have done are from clinical and radiographic features of amelogenesis imperfecta which differentiates it from other structural defects. So, from clinical and radiographic investigations, we are able to know the extent of disease and number of teeth affected. So we can plan a better treatment from the investigations. Also the progression of disease can be stopped and restoring the patient's normal function and improving the esthetics.

The treatment objectives were to improve the esthetics, prevent further loss of tooth structure and improve his periodontal health. As the part of the treatment plan, the treatment plan was explained to the child and his parents. The initial treatment was scaling and patient was instructed methods to maintain proper oral hygiene which was followed by composite veneering under ideal conditions and extraction of over retained deciduous teeth. The restoration improved the esthetic appearance of his smile.

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A SURVEY OF ATTITUDE ABOUT SMOKING, ASSOCIATED WITH PERIODONTAL DISEASE AND DENTAL IMPLANTS

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Abstract

Objectives

The purpose of the study was to investigate the attitude of patients towards smoking and their knowledge of smoking as a risk factor for periodontal disease and dental implants.

Methods

In this cross sectional study, 158 subjects were provided a questionnaire survey about smoking status for the recognition of smoking as a risk factor for periodontal disease and dental implants using the Kano Test for Social Nicotine Dependence(KTSND).

Results

Smoking was recognized as a risk factor for periodontal disease by 150 patients(95%) and as a risk factor for dental implants by 92 patients (58%). The KTSND scores of the patients with knowledge of smoking as a risk factor and for dental implants was significantly lower than those of the patients without knowledge of smoking as a risk factor for periodontal disease and for dental implants, respectively.

Conclusion

In order to increase the recognition of smoking as a risk factor for periodontal disease and dental implants and patient education must be improved.

Key words: Dental Implant, periodontal disease, smoking, smoking cessation, Kano test For Social Nicotine Dependence (KANO).

Introduction

Smoking is a risk factor for various diseases, including periodontal disease.[1,2]

The oral tissue is most directly affected by smoking; carbon monoxide, a component of smoke, initially impedes blood flow and thereafter impedes immune function.

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Smoking affects dental implants as well as the natural teeth. Strietzel et al. identified smoking as a risk factor for the survival rate of dental implants during healing.[3]

The Kano Test for Social Nicotine Dependence "KTSND", is composed of 10 questions that reflect 3 factors: the smoker's attempt to undervalue the harm caused by smoking, to overvalue the favourable effects of smoking, and to justify smoking as an acceptable cultural and social behavior.[4] Higher KTSND score reflect an increased perception that the act of smoking is acceptable and justifiable, indicating a greater social dependence on nicotine. Smokers as well as non-smokers can answer the questions in the KTSND. It is in the order corresponding to current smokers, former smokers, and nonsmokers.[4-9] The scores change according to various factors, such as smoking experience, occupation, and circumstance.[4-9]

The purpose of the current survey is to investigate the attitude of patients towards smoking and their knowledge of smoking as a risk factor for periodontal disease and dental implants

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Materials and Methods :

Total 158 patients who visited the Department of Periodontics, Faculty of Dental Science, Dharmsinh Desai University, Nadiad from December 2015 to January 2016 were included in the study between age group of 15 to 70 years.

The survey methods included administering questionnaires to patients in English as well as Gujarati (whichever language patient was comfortable with) and collecting and analyzing the data. The survey forms included details like patients' sex, age, smoking experience, knowledge of smoking as a risk factor for periodontal disease and dental implants and the questionnaire of Kano Test for Social Nicotine Dependence. The KTSND consists of 10 questions with a choice of 4 responses with scoring:

Score	Criteria
3	Definitely Yes
2	Probably Yes
1	Probably No
0	Definitely No

Only Question 1 is scored in reverse order, where "Definitely Yes" is scored 0, "Probably Yes" as 1, "Probably No" as 2 and "Definitely No" as 3. The individual scores for each question are added to give a total KTSND score that ranges from 0 to 30, with higher scores indicating a greater social dependence on nicotine. The desired KTSND score is ≤ 9.[10, 11] In this study the smoking rates between men and women, the KTSND scores were compared.

Results :

1. Patient characteristics (Table 1)

The questionnaire was distributed to a total of 158 patients. The mean age was 31.6 years. The highest proportion of subjects was aged 30-39, followed by those aged 20-29, 40-49, 10-19, 50-59 and 60-69.

Overall, 11 (7%) subjects were current smokers and 14 (9%) were former smokers. Among men, 11 (15%) subjects were current smokers and 14 (19%) were former smokers. Among women, all subjects were non-smokers. The highest proportion of current smokers was aged 20-29, then followed by 40-49 and 30-39.

2. KTSND scores (Table 2)

The mean KTSND scores of the current smokers, former smokers, and non-smokers were 14.36±6.29, 4.6±2.16 and 0.02±0.2 respectively. The KTSND score of the current smokers was higher than those of the former smokers and non-smokers. The KTSND score of the former smokers was higher than that of the non-smokers.

Table 1 : ***Patient Characteristics***

	Male	**Female**	**Total**
Subject	75	83	158
Mean age	29.4±9.82	33.6±8.09	31.6±9.13
Smoker	11	0	11
Former smoker	14	0	14
Non smoker	50	83	133
AGE GROUP			
10-19	12	1	13
20-29	30	22	52
30-39	21	42	63
40-49	9	16	25
50-59	1	2	3
60-69	1	1	2
SMOKERS' AGE GROUP			
10-19	0	0	0
20-29	6	0	6
30-39	2	0	2
40-49	3	0	3
50-59	0	0	0
60-69	0	0	0

Regarding the knowledge of smoking as a risk factor for dental implants, out of all of the respondents, 92 patients replied"Definitely Yes". Out of these, 2

patients were current smokers 1 was former smoker
and 89 were non-smokers.

The mean KTSND score of the subjects answering "Definitely Yes" regarding knowledge of smoking as a risk factor for periodontal disease was 11.6 ± 2.87, that of "Probably Yes" was 11.1±7.51, that of "Probably No" and "Definitely No" was 0.

Table 2 : ***The KANO test for social nicotine dependence***

	Smokers (Mean ±SD)	**Former smokers (Mean ±SD)**	**Non smoker (Mean ±SD)**
Q 1: Smoking itself is a disease	0.45± 0.68	0.14± 0.53	0
Q 2: Smoking is a part of culture	0	0	0
Q 3: Tobacco is one of life's pleasures	2.18±1.67	0.92±0.47	0
Q 4: Smokers' lifestyles may be respected	0.90±0.70	0.21±0.42	0
Q 5: Smoking sometimes enriches people's lives	1.45±0.93	0.14±0.36	0
Q 6: Tobacco has positive physical or mental effects	1.45±1.03	0.5±0.51	0
Q 7: Tobacco has effects to relieve stress	2.54±0.93	1.35±0.63	0.01±0.122
Q 8: Tobacco enhances the function of smokers' brains	2.45±0.93	1.07±0.61	0.007±0.08
Q 9: Doctors exaggerate the ill effects of smoking	1.09±0.83	0.07±0.26	0.007±0.08
Q 10: People can smoke at places where ashtrays are available	1.81±1.25	0.21±0.57	0
Total KTSND Score	14.36±6.29	4.6±2.16	0.02±0.2

Moreover, the mean KTSND score of subjects answering "Definitely Yes" regarding knowledge of smoking as a risk factor for dental implants was 1.6±1.04, that of "Probably Yes" was 12.6±4.40, that of "Probably No" was 8.5±8.01, and that of "Definitely No" was 0.

4. Relationship between the KTSND scores and the knowledge of smoking as a risk factor for periodontal disease and dental implants (Table 5)

Smoking was not regarded as a risk factor for either periodontal disease or dental implants by 8 patients because they did not answer "Definitely Yes" to either question; these subjects are hereinafter referred to as the "NN" group. The KTSND score of these subjects was 13.8±7.5. Smoking was regarded as a risk factor for both periodontal disease and dental implants by 92 patients because they answered "Definitely Yes" for both questions; these subjects are hereinafter referred to as the "YY" group. The KTSND score of these subjects was 0.17±1.04. Further, 58 patients thought that smoking is a risk factor for periodontal disease because they answered "Definitely Yes" for questions regarding periodontal disease; these subjects are hereinafter referred to as the "YN" group. The KTSND score for these subjects was 1.72±3.8. Finally, no patient thought that smoking is a risk factor for dental implants only. The KTSND scores of the "NN" group were higher than those of the "YY" and "YN" groups.

Table 3: ***Smoking as a risk factor for periodontal disease***

	Definitely yes	**Probably yes**	**Probably no**	**Definitely no**
Smoker	5	6	0	0
Former smoker	13	1	0	0
Non smoker	132	1	0	0
Total	150	8	0	0
KTSND	11.6 ± 2.87	11.1 ± 7.51	0	0

Table 4: ***Smoking as a risk factor for dental implants***

	Definitely yes	Probably yes	Probably no	Definitely no
Smoker	2	4	5	0
Former smoker	1	13	0	0
Non smoker	89	43	1	0
Total	92	60	6	0
KTSND	1.6 ± 1.04	12.6 ± 4.40	8.5 ± 8.01	0

Table 5: ***Relationship between the KTSND scores and knowledge of smoking as a risk factor for periodontal disease and dental implants***

	Subjects	KTSND Score (Mean ±SD)
Patients who think smoking is not a risk factor for either periodontal disease or dental implants (NN)	8	13.8±7.5
Patients who think smoking is a risk factor for both periodontal disease and dental implants (YY)	92	0.17±1.04
Patients who think smoking is a risk factor for periodontal disease only (YN)	58	1.72±3.8
Patients who think smoking is a risk factor for dental implants only (NY)	0	-

Discussion :

Tobacco smoking is among the largest preventable causes of premature deaths globally.[12] In 2010, an estimated 120 million Indian adults were smoker, making

India is second to China in number of smokers.[13,14] The Indian government implemented the Cigarettes and Other Tobacco Products Act (COTPA) in 2003 and ratified the WHO's Framework Convention on Tobacco Control in 2004, as well as the Cable Television Networks (Amendment) Act 2000 prohibiting tobacco advertising in all state-controlled electronic media and publications, including cable television.[15-17] Further, the Government has also included tobacco control in the priorities of the ongoing National Rural Health Mission.[18] Despite these programmes, the major challenge to success is effective implementation of the provisions of COTPA, especially in enforcement of bans on smoking in public places (which are known to raise cessation rates).[12,16] Most importantly, the trends in smoking reflect the lack of substantial increases in tobacco excise taxes, which have not kept up with the increased affordability of cigarettes and bidis.[19] Substantial increases in the number of male smokers aged 15–69 years, rising over one-third since 1998 to nearly 108 million in 2015.[20] The increase is mostly due to population growth offsetting the modest declines in prevalence over this time period, similar to the pattern observed in other countries.[20]

Smoking is a risk factor for various diseases. Smoking was reported as a risk factor for periodontal disease by Haber et al. and Genco et al., for the loss of periodontal tissue by Haffajee al., and for dental implants by Strietzel et al. and Liddelow et al.[1,2,3,21,22] In order to maintain oral health, all patients must have proper information and the rate of smoking should be 0%. In this study, 94.9% of patients had knowledge of smoking as a risk factor for periodontal disease, whereas 58.2% of patients had knowledge of smoking as a risk factor for dental implants (Table 3). Lung et al. reported that only 6% of their respondents were specifically aware of the link between smoking and periodontal disease.[23] Awareness of smoking as an increased risk for dental implants was very low compared to that of regarding periodontal disease.. In this study, scores of 15.8, 6.5 and 0.4 were obtained in current smokers, ex-smokers, and non-smokers, respectively. Yoshii et al. reported that KTSND scores of 18.0 ± 5.0, 12.2 ± 4.9, and 12.2 ± 5.3 were obtained in current smokers, ex-smokers, and non-smokers, respectively.[8]

The patients' mean age in this study was 31.6, and the patients in this age group would have received sufficient education regarding smoking cessation as youths. Therefore, the KTSND scores in this study were relatively low. In this study, the KTSND scores of the subjects who answered "Definitely Yes" regarding knowledge of the association between smoking and periodontal disease (11.6) and dental implants (1.6) were lower compared to those of the other subjects (Table 3). Further, when viewed individually, the KTSND score of the NN group was higher than those of the other subjects (Table 5). Therefore, patient education regarding dental therapy potentially decreased the KTSND scores of these subjects. In addition, the boundary value between normal and high KTSND scores was set as 10, based on the results of a survey administered to the attendees of a tobacco control meeting who were not socially dependent on nicotine.[10]

The KTSND questionnaire is comprised of 10 questions related to 3 factors: justifying smoking as an acceptable cultural and social behavior, overvaluing the favorable effects of smoking, and undervaluing the harm caused by smoking.[4] Questions 2, 3, 4, and 5 are related to the justification of smoking as an acceptable cultural and social behavior, while questions 6, 7, and 8 are related to overvaluing the

favorable effects of smoking. Questions 1, 9, and 10 are related to undervaluing the harm of smoking. In this study, the KTSND scores of current smokers for Q 3, 5, 6, 7, 8, 9 and 10 were higher than were those of non-smokers. Moreover, the KTSND scores of current smokers for question other than number 2 were higher than those of ex-smokers（Table 2）. Therefore, this study suggests that current smokers tend to both glamorize smoking and underestimate the harm it causes.

The doctor and the patient must remind themselves of the fact that smoking is a risk factor for various diseases. Regarding periodontal disease, current smokers have dark gum color, less blood flow, stained teeth, and bad breath. Although patients can directly evaluate their oral health themselves, they cannot evaluate their lungs. It is important for current smokers to realize the result of smoking cessation every day.

Conclusion :

In this study, 94.9% of patients recognized smoking as a risk factor for periodontal disease, whereas 58.2% recognized smoking as a risk factor for dental implants. The KTSND score of the patients who recognized smoking as a risk factor for both periodontal disease and dental implants was significantly lower compared to those of the other subjects. However, none of the KTSND scores in this study reached the desired KTSND score. In order to increase the recognition of smoking as a risk factor for periodontal disease and dental implants patient education must be improved.

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TOOTH BRUSHING BEHAVIOURS AND DENTAL ABRASION AMONG THE POPULATION IN NADIAD, GUJARAT, INDIA: A CROSS-SECTIONAL STUDY

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Abstract:

Aim: To determine correlation between tooth brushing pattern and dental abrasions among population in Nadiad city,Gujarat. To suggest appropriate remedial measures to prevent self‑inflicted injury.

Material and Method: The study was carried out on 165 patients aged 20 years and above who visited the Department of Periodontology and Oral Implantology, Faculty of Dental Science Dharmsinh Desai Univarsity,Nadiad. Assessment form comprises a questionnaire and information on brushing pattern.

Results: The study revealed a statistically significant relationship between abrasive lesions and age groups as well as technique of tooth brushing. Statistically significant difference was found between abrasions and tooth brushing frequency, while no significant relation was found with the gender and type of toothbrush used.

Conclusion: The prevalence of tooth brushing abrasions increases with age and is more affected by technique of tooth brushing. Increased tooth brushing frequency and changing of toothbrush result in an increase in the number of tooth abrasions. Therefore, dental professionals should make evidence‑based recommendations to their patients and general masses.

Key Words: ***Abrasion, Toothbrushing Pattern, Brushing frequency.***

Introduction

Tooth wear is a common problem, but most often left untreated. The presence of tooth wear might become more noticeable Nowadays and in future. This occurrence could be due to increased dental awareness and people becoming more interested in keeping their dentition healthy for a longer time which could be exposed to wear.[1] Non‑carious cervical lesions (NCCLs) have been attributed to toothbrush abrasion, (commonly termed dental erosion), and abfraction. Dental abrasion is the most prevalent form of NCCL.[2]

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An understanding of the multifactorial nature of tooth wear and its risk factors is important in the patient's diagnostic protocol and management strategy.[3]

Cervical tooth wear or tooth abrasion is defined as the pathological wearing of dental tissues or dental restorations by friction with foreign substances independent of occlusion.[4]Abrasion can be caused due to various foreign objects, most common is due to toothbrush mainly because of faulty tooth brushing technique. Cervical abrasion may vary in its clinical presentation among individuals, and may cause painful sensations linked to dentinal hypersensitivity and impair an individual's oral hygiene performance during tooth brushing.[5,6]

Tooth brushing is the most common means of oral prophylaxis at an individual level and in the light of its potential benefits to oral health, the adverse effects or damage caused by tooth brushing can be rated as rather small.[7]Loss of hard tissue at the cervical area of teeth has been observed.[8]

Abrasion is defined as the pathological wearing away of dental hard tissue by mechanical forces.[9] Although the clinical appearance of these lesions varies, they frequently appear to be wedge-shaped defects having a bright surface, normal hardness and color, and a sharp border.[10,11] Specific cause of these lesions is unknown.[12] It has been suggested that they may be caused by a hard toothbrush, excessive brushing pressure,[13,14]and abrasive toothpaste. Wirdatul RD *et al*.,[15] Bergstrom and Lavstedt[16] have revealed the role of tooth brushing techniques in the development of abrasive lesions. Although it is likely that small scratches on the tooth surface produced by the act of brushing can be repaired by the precipitation of minerals by the process of remineralisation, the mechanical means used to ensure adequate oral hygiene in preventive dentistry has been reported to be a probable main factor in the development of abrasion.[17]

Wear due to abrasion has been reported mainly due to the brushing pressure applied and stiffness of the bristles.[18] As tooth brushing has been more common in modern era, it can be expected that not only will oral hygiene status ameliorate at a population level but also the damage caused by tooth brushing will become more evident in occurrence and severity.[16] Literature does not reveal much data on the studies related to the association between tooth brushing and prevalence of abrasive lesions.[18] Present study has been conducted to determine whether there is a correlation between dental abrasions and the frequency and technique of tooth brushing, as well as to determine the prevalence of abrasion age wise andgender wise.

Materials and methods :

A cross-sectional study was conducted from September 2015 to December 2015 among 165 adults (male 72, female 93) aged 20-65 years who attended the Department of Periodintics and Oral Implantology, Faculty of Dental Science Dharmsinh Desai University, Nadiad Gujarat. Patient included were: those using manual toothbrush for cleaning teeth, excluding those patients who were not having cervical carious lesions. The exclusion criteria were: Teeth that had class-V restoration done on the buccal surface were not included in the study, Patients not willing to participate in the study, those using powered toothbrushes or chewing twigs as means of cleaning teeth, and those having generalized cervical carious lesions. A questionnaire was completed and abrasion on the buccal

surface of teeth was recorded using mirror, probe, and standard dental chair light using type III examination method. Patients were examined intra-orally by a single dentist, who is highly experienced and knowledgeable in the diagnosis of tooth wear. The lesions, which were clearly identifiable at cement– enamel junction of teeth and which were discolored, non-carious, "C" or "V" shaped, and flat-floored were all taken as wedge-shaped defects. They were recorded for each patient. The subjects with abrasive lesions were classified according to age, gender, frequency of tooth brushing, tooth brushing technique, duration of changing worn out toothbrush, and the type of toothbrush used.

Brushing frequency:

The brushing frequency was recorded as per the individual's own statement: No brushing, once a day, twice a day, or thrice a day.

Tooth brushing technique:

Tooth brushing technique was judged on the basis of individual's own demonstration of their brushing habits. The following modes of action concerning tooth brushing technique were recognized: (a)Horizontal technique with strokes parallel to the row of teeth and perpendicular to the long axis of teeth; (b) Vertical technique, parallel to the long axis of teeth; (c)Roll technique, i.e. a coronally directed rolling movement from the gingiva over the tooth surface, and (d)Complex technique, i.e. a combination of horizontal and vertical strokes. Differentiation of the techniques used into more distinct classifications, i.e. Bass, Charters, was not possible.

Changing toothbrush:

Changing toothbrush due to wearing of toothbrush bristles was classified as after 1 month, 2 months, or 3 months, or after 6 months.

Stiffness of the bristle :

Stiffness of the bristles: Most of the subjects were aware what kind of toothbrush they used: Soft, medium, or hard, according to the manufacturer. Those who were in doubt were instructed to estimate the stiffness of their own brushes from reference brushes: One soft, one medium, and one hard.

Statistical methods :

The data was analyzed using the software *"P"* values ≤ 0.05 and ≤ 0.01 were considered as statistically significant and highly significant, respectively.

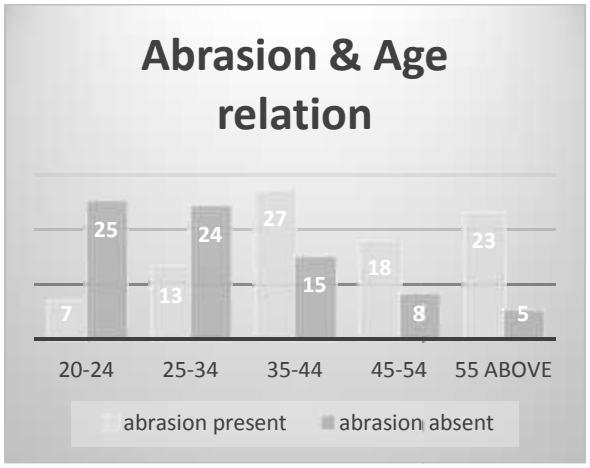
Results :

In order to determine the relationship of abrasive lesions and age, subjects were divided into five groups: 20-24, 25-34, 35-44, 45-54, and 55-65. Gender wise distribution of the abrasive lesion was also noted. The study shows that correlation between the age groups according to the occurrence of abrasive lesions was statistically highly significant. (chart 1)

Table 1: Gender wise distribution

	Abrasion present	Abrasion absent	Total
Male	47	25	72
Female	40	53	93

Chart 1: Distribution of subjects with toothbrush abrasion according to Age groups.



The prevalence of abrasive lesions increased with advancing age. It was lowest in the youngest age group 20‑24 years and highest in the oldest age group, i.e. 55 years and older [Table 2]. It was highest among the subjects who brushed their teeth once a day; 59 (64.8%) has buccal abrasion. Statistically this relationship was highly significant [Table 2].

Table 2 : Toothbrush abrasion according to frequency of tooth brushing

FREQUENCY	ABRASION PRESENT		ABRASION ABSENT		TOTAL NO
	n	%	n	%	
Once daily	59	64.8	32	35.2	91
Twice daily	35	63.6	20	36.4	55
Thrice daily	10	52.6	9	47.4	19

Abrasive lesions were most often seen in those who brushed their teeth horizontally (56.6%), followed by those who brushed vertically (50%) and abrasions were present amongst those subjects who followed a combination of all the methods (45.4%), and then by those who used the roll technique (33.3%). The relationship between frequency of abrasion and tooth brushing technique was statistically significant [Table 3].Presence of abrasions was highest among those who were changing their brushes after 6 months or more (54.5%). This association was statistically highly significant [Table 4].

Table 3: Tooth brushing Technique and abrasion

Technique	Abrasion Present		Abrasion Present		Total
	n	%	n	%	
Horizontal	43	56.6	33	43.4	76
Vertical	8	50	8	50	16
Roll	6	33.3	12	66.7	18
Complex	25	45.4	30	54.6	55

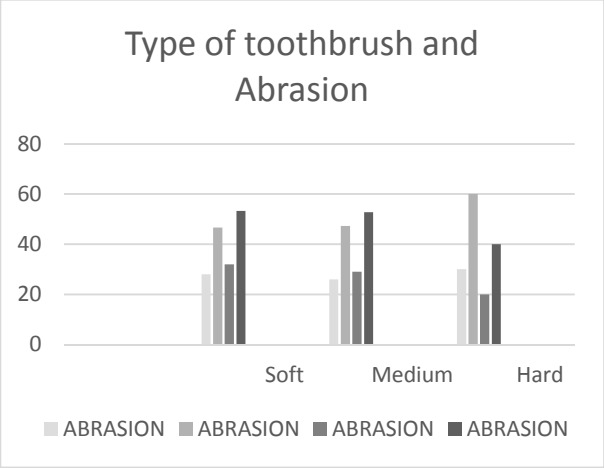
Table 4:Abrasion and duration of changing toothbrush.

Duration of changing	ABRASION PRESENT		ABRASION ABSENT		TOTAL NO
	n	%	n	%	
Every 1 month	3	37.5	5	62.5	8
Every 2 month	18	36	32	64	50
Every 3 month	24	46.2	28	53.8	52
Every 6 month	30	54.5	25	45.5	55

Type of toothbrush used according to the stiffness of the bristles, i.e. soft, medium, hard, also showed an association with the prevalence of abrasive lesions. It was

highest among those who used hard brush (60%) than those subjects who used soft brush (46.7%) [chart 2]. However, association between these two variables was significant.

Chart 2: Abrasion and type of toothbrush used.



Discussion :

The etiology of cervical abrasion is multifactorial and is a combination of several types of wear factors, such as age, diet, gingival recession, periodontal health, dentifrice, speed, and pressure used during brushing, which are interrelated. It is clear that tooth brushing plays an important role. The present results confirm an association between improper tooth brushing, method of tooth brushing, wearing of bristle, clean teeth, and abrasion, in general, clinical wear of tooth.[23] However, many things remain unknown regarding the causes of abrasion. Therefore, the etiology of the wedge‐shaped lesion is highly complicated, as there are wide variations in the clinical characteristics of these lesions. Some lesions are narrowly notched at the cement‐enamel junction and some extend broadly into the root region. The etiology of cervical abrasion is multifactorial and interrelated. It has become clear that tooth brushing plays an important role. The present results confirm at the population level, previous findings from laboratory testing and clinical observation that a relationship exists between tooth brushing and cervical abrasion.[21] As a result of advancement in preventive and restorative dentistry, number of older patients who have managed to preserve their teeth is on the increase, which leads to different problems, the most important of which is the development of cervical lesions in the elderly.[18]

Saerah *et al*.,[19]and Attin *et al*.[8,20] have focused on the examination of the tooth brushing techniques and abrasive qualities of toothpastes as well as types of toothbrushes.

Bergstrom and Lavstedt[16] revealed in their study that in the development of abrasive lesions, frequency and technique of brushing and also the materials used for tooth brushing are affected for the abrasion of teeth. In the present study, all the study subjects who brushed their teeth also used toothpaste. Considering the fact that the abrasive lesions have presumably been formed over a long time, during this time many different toothpastes and toothbrushes must have been used. Present study only deals with the distribution of abrasive lesions according to tooth brushing techniques, tooth brushing frequency, duration of change of toothbrush, and type of toothbrush used according to the stiffness of bristles. Literature review has shown many studies[21-23] which revealed that cervical tooth wear lesions increase with advancing age. Present study also revealed that the frequency of tooth brushing abrasions increased with age and the difference among age groups was statistically highly significant.

Radentz *et al*.,[24] and Ozgoz *et al*.,[25] reported that frequency of cervical abrasions was higher among males than females and this difference was statistically significant. Similar results were obtained in the present study. However, different results were obtained in the studies where the distribution of abrasions among gender was not significant. Despite the contradictory views, more abrasive lesions among males were found in the studies conducted by Ashley[10] and Hawkins *et al*.[26] suggests that men exert higher pressure on teeth while brushing than females and the duration of brushing is longer for men.

Brushing technique has also shown statistically significant results with the formation of wedge-shaped defects. It has been shown that depending on the tooth brushing technique, forces of different severity and shapes would occur in the cervical region of teeth. These differences in the techniques have become influential in the investigation of relations between them and the prevalence of cervical tooth lesions. Present study has reveled higher prevalence of cervical abrasion in those subjects who brushed their teeth horizontally, although the difference was statistically significant. A study conducted by Ullman A *et al*.,[22] has shown similar results, whereas the study conducted by Litonjua *et al*.[6] showed contrasting results.

Duration of changing the toothbrush has also shown to be directly effective on the occurrence of abrasions. Those subjects who admitted of changing their brush due to fraying of bristles after 6 month have significantly more number of lesions than those who change it after 3 months or more. Similar results have been obtained in a study conducted in Turkey.[22]

The stiffness of bristles available as soft, medium, and hard also added to the presence of lesions. Those subjects who used hard toothbrushes showed more cervical lesions than those using soft toothbrushes. But here the force used may have an additive effect. Yadav *et al*.,[28] Borcic *et al*.,[29] and Masato *et al*.,[30] have also reported similar results in their studies.

Conclusion :

Present study gives ample evidence that there exists a relationship between tooth abrasions and brushing frequency, technique, stiffness of bristles, and duration of changing toothbrush. Individual oriented factors, especially brushing technique and daily frequency of brushing, seem to be of prime importance for the occurrence and severity of abrasion and seem to exert a greater influence than more material-oriented tooth brushing factors such as brush materials. It is a prudent suggestion that an emphasis may be given on the correct method, frequency, and choice of the brush, while giving oral hygiene maintenance instructions to the general public. People may be furnished with appropriate prophylactic measures that are effective for oral cleanliness but are still harmless to oral tissues. It is, therefore, critical that dental professionals be knowledgeable about toothbrushes and tooth brushing, so that they can make evidence-based recommendations to their clients and general public.

Clinical significance :

Abrasion, being a self-inflicted destructive process, the damage and mortality caused by this can be prevented by effective oral health instructions and inspiration. In order to prevent this problem from becoming worse as a burden, we

should try to combat the problem from its early stages. Literacy and wakefulness are important steps in achieving good oral health among people.

Limitations and Suggestions :

The literature favors a multifactorial etiology in the development of NCCLs. Incorrect methods and frequency of tooth brushing may be one factor responsible for abrasions. Factors of possible importance to dental abrasion initiation and progression which were omitted in the study are the duration of tooth brushing, pressure applied with the toothbrush, and indirect etiologies like acidic oral environment, easy enamel dissolution, and medication. Some of the biological factors, such as saliva, tooth composition and structure, occlusion and behavioral factors were not considered. Further studies and continuous follow-up should be carried out in future to find the association between these factors and the occurrence of dental abrasion.

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PERIODONTAL HEALTH STATUS OF DIFFERENT SOCIO-ECONOMIC GROUPS : CROSS SECTIONAL STUDY

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ABSTRACT :

Aims & Objective: To assess the oral health awareness and periodontal health status in different socio-economic groups in outpatient department of periodontology and oral Implantology,Faculty of Dental Science, Dharmsinh Desai University, Nadiad, India.

Materials and Methods: This cross-sectional study was conducted on 100 subjects of 30-60 years age group with different socio-economic status classified according to modified Kuppuswamy scale (2012). Subjects were interviewed by the questionnaire and Community Periodontal Index was recorded.

Result: This study showed that the Community Periodontal Index (CPI) code 2 and code 3 is more in lower socio-economic status ($p = 0.115$ and $p = 0.079$ respectively). Significant association was seen in code 0, code 1 & code 4 ($p < 0.01$) which is indicative that upper class have more healthy periodontal status than lower.

Conclusion: Significant association exists between oral health awareness and periodontal health with the socio-economic status of the individual.

Keywords: Oral health, Periodontal status, Socio-economic status

Introduction

In India, periodontal disease is still the leading cause for the tooth loss in adults.[1] It is a chronic inflammatory disease which leads to loss of attachment and deepening of the gingival sulcus that further causes loss of alveolar bone ultimately leading to tooth loss.. Periodontal health status is associated with age, smoking, systemic diseases, gender, genetics and utilization of the dental care.[2,3] It has been seen that the poor oral health is related to the lower economic status.

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In developing countries where illiteracy rates are quite high, education status plays determining role in the health of a particular individual. Health is multifactorial, influenced by factors like genetics, environment, lifestyle, socio-economic status (SES) and many others. Economic status of the individual also determines the utilization of the health services in a particular population.[4,5] Evidences have proven the existence of inadequate oral health in lower SES group as compared with higher SES groups.[5]

Materials and methods

The present cross-sectional study was carried out in the Department of Periodontics and Oral Implantology, DDU, Nadiad. Total 100 subjects of 30-60 years age group with different socio-economic status classified according to modified Kuppuswamy scale were taken for the study, Subjects were interviewed by the questionnaire and Community Periodontal Index was recorded. Patient with history of systemic disease (diabetes, kidney, liver, heart, muscle or joint disease) or using tobacco in any form were excluded from study. A pretested questionnaire was interviewed to each participant asking about their personal information, socio-economic status and oral hygiene habits also asking about use of toothbrush , tooth paste , tooth powder and the frequency of changing their tooth brush. Modified Kuppuswamy SES Scale (2012) was used for categorizing the individuals under different socio-economic groups.[7,8] It is based on education profile, occupation and monthly income.

Modified Kuppuswamy Scale

(A) Education		**Score**
1	Profession or honors	7
2	Graduate or post graduate	6
3	Intermediate or post high school diploma	5
4	High school certificate	4
5	Middle school certificate	3
6	Primary school certificate	2
7	Illiterate	1

(B) Occupation		**Score**
1	Profession	10
2	Semi-profession	6
3	Clerical, farmer, Shop owner	5
4	Skilled worker	4
5	Semi-skilled worker	3
6	Unskilled worker	2
7	Unemployed	1

(C) Monthly Income (In Rs) INR		Score
1	≥32050	12
2	16020 – 32049	10
3	12020 – 16019	06
4	8010 – 12019	04
5	4810 – 8009	03
6	1601 – 4809	02
7	≤ 1600	01

Total score	Socio-economic class
26-29	Upper (I)
16-25	Upper Middle (II)
11-15	Middle/Lower middle (III)
5-10	Lower/Upper lower (IV)
<5	Lower (V)

Clinical Examination CPI Index:

Code 0: No periodontal disease

Code 1: Bleeding observed during or after probing

Code 2: Calculus or other retentive factors either seen or felt during probing

Code 3: Pathological pocket 4 to 5 mm in depth

Code 4: Pathological pocket 6 mm or more in depth

Community Periodontal Index (CPI)[9] was recorded by a single, trained, calibrated examiner with the use of CPITN probe, mouth mirror and under good illumination.

Result :

The results showed that use of toothbrush and toothpaste for cleaning of teeth is more in upper and upper middle class that is 86.6% and 90% respectively as compared to middle, lower/upper lower and lower class with values 30%, 69% and 72 % respectively, as appreciated in **table-1**. Individuals with habit of brushing twice in a day belongs to mainly upper and middle class that is 26% & 25% respectively compared to 1% of lower/upper lower class. On the evaluation of periodontal status it is revealed that code 2 and code 3 of CPI Index is more in Lower socio-economic status that is lower, upper – lower and lower – middle class which is statistically significant. ($p = 0.115$ and $p = 0.079$ respectively). When evaluating the relationship between socio-economic status (SES) and CPI index, significant association was seen in Code 0, code 1 and code 4 ($p<0.01$) which is indicative that upper class have a more healthy periodontal status than lower class.**(table-2)**

Table 1: ***Distribution of the participants according to socio-economic status & oral hygiene aids used***

Socio-economic status	Total	How do do you clean your teeth?		How often you Brush your Teeth?		Ch-sq value	P value
		Toothbrush & toothpaste	Toothbrush & tooth powder	Once	Twice		
Upper (I)	15	13 (86.8%)	2 (13.3%)	11 (73%)	4 (26%)		
Upper Middle (II)	20	18 (90%)	2 (10%)	15 (75%)	5 (25%)		
Middle/Lower middle (III)	25	20 (80%)	5 (20%)	22 (88%)	3 (12%)	42.452	<0.001
Lower/Upper lower (IV)	23	16 (69%)	7 (30.4%)	22 (95.4%)	1 (4.3%)		
Lower (V)	18	13 (72%)	5 (27.7%)	1 (5.55%)	0		

Table 2: ***Relationship between socio-economic status & CPI code***

Socioeconomic status	Relationship between socio-economic status & CPI code					
	Total	Code 0	Code 1	Code 2	Code 3	Code 4
Upper (I)	15	4 (26.6%)	4 (26.6%)	2 (13.3%)	4 (26.6%)	1 (6.6%)
Upper Middle (II)	20	6 (30%)	7 (35%)	3 (15%)	2 (10%)	2 (2%)
Middle/Lower middle (III)	23	5 (21.7%)	5 (21.7%)	8 (34.7%)	3 (13.04%)	2 (8.69%)
Lower/Upper lower (IV)	24	1 (4.1%)	7 (29.1%)	8 (33.3%)	3 (12.5%)	5 (20.8%)
Lower (V)	18	1 (5.55%)	4 (22.2%)	5 (20%)	5 (20%)	3 (33.3%)

Discussion :

Health is multifactorial and multidimensional influenced by factors such as genetics, lifestyle, environment, socio-economic status (SES), and many others. [10] Oral hygiene behavior and seeking oral health care depend on a number of factors. Patients comply better with oral health care regimens when informed and positively reinforced. Lack of information is among the reasons for nonadherence to oral hygiene practices. Further, oral health attitudes and beliefs are significant for oral health behavior. [11] A higher likelihood of seeking preventive dental care is found to be associated with dental health knowledge. [12] India is a country with diverse variations in its social, cultural and economic aspects. [1,2] Most of the lower socio-economic groups have lack of oral health awareness, fear and anxiety towards dentist and also fewer visits to the dentist so, most of the treatment is curative rather than preventive in this group.[2] Various studies have shown an impact of socio-economic status on the oral health of an individual. It has been proven

that a significant association exists between the individual's oral health and awareness about the same.[3,4] Individuals with lower socio-economic group have less awareness and access to the oral health care [1,2] and they are unable to use the oral hygiene aids like mouthwash, interproximal brushes, and various medicated toothpaste because of their high cost. Comparatively Individuals from higher economic status have access to all the above mentioned oral health aids and also the awareness of its role in improving periodontal health.[3] Similar study was done by Chandra Shekar BR et al.[6] where he found that all the subjects in the upper SES were using brushing with toothpaste and oral hygiene aids like, mouthwash, interdental brush, and irrigation device for cleaning their teeth. The upper socio-economic status subjects tend to use the oral health services more frequently. The frequent dental visits facilitate the subjects in the upper class to gain more knowledge on the causes for oral diseases and their prevention, which is not the case among the lower class people. The results of the present study are similar to the study done by Gautam DK et al.[7] that have shown a positive correlation between the periodontal status of an individual and socio-economic status. The study has shown more prevalence of CPI index code 2 and code 3 in lower socio-economic group individuals. Gundala et al [8] has also shown more prevalence of code 2 and code 3 in the lower socio-economic group. The study done by Bertoldi C et al.[2] & Gundala R[8] also shows similar results and significant association between the periodontal health status and socio-economic status of the individual. The results of the study showed that lower socio-economic status have less access to the utilization of the dental services and also have a poor periodontal health status compared to upper class of socio-economic status. Our results were in agreement with the findings of studies by Newman *et al.*[13] and Sanders *et al.*[14] The dental visits were more frequent among the subjects in the upper class. Majority of the subjects in the upper class who visited dentist in the last 1 year did so for a routine dental check-up without any specific complaints, whereas a major bulk of the lower class people visited dentist to get remedy for an acute oral health problem.[15] A look at the reasons for not having a dental visit reflected high cost and lack of attitude and motivation among the subjects in the lower class and lack of time among upper classes.[16] The social pressure to retain the natural teeth and a pleasing appearance drive the upper class people into preventive action, whereas the high cost of sophisticated dental services may discourage

the subjects in the lower class not to have a dental visit on a routine basis.[17]

They reserve the dental visit for an acute problem when all other possible methods to alleviate the existing problem have completely failed. [18] This in the long run may result in the development of a negative attitude toward dentist and dental procedures among the people in lower classes. The direct relationship between SES and oral hygiene practices has been documented in the studies by Davidson *et al.*[19] and Ronis *et al.*[20] The level of dental health knowledge, positive dental health attitude, and dental health behaviors are interlinked and positively associated with the level of education and income as demonstrated by studies in the past. [21,22,23,24] All these studies have found the level of education to play a vital role, as, an educated individual gains the requisite knowledge from multiple sources. This in turn will drive these people to have a positive dental health attitude and behavior.[25] The result of the present study are in contrary with a study done by the Opeodu OI[3] which shows that there is no significant relationship between the periodontal health status and socio-economic group of the individual.

Conclusion :

The study revealed that oral hygiene awareness and periodontal conditions are significantly associated with socio-economic status of an individual.

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NANOROBOT - The next generation of Dentistry

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Abstract:

Nanorobtics is the technology which uses nanorobots that allow precision interaction with nanoscale objects. Treatment possibilities may include permanent hypersensitivity cure, permanent orthodontic realignments during single office visit, local anaesthesia, dentition renaturalisaton, continuous oral health maintenance using mechanical dentifrobots. Dental nanorobots could be constructed to destroy caries-causing bacteria or to repair blemishes of tooth where tooth decay has begun by using computer. These have a strong potential to revolutionise dentistry and might be programmed to crawl through human tissue with navigational precision, to acquire energy to sense and manipulate their surroundings to diagnose and treat diseases. Although the research is still in its preliminary stage, the future of this technology has countless uses.

Introduction:

More than half a century ago, at the annual American Physical Society meeting (1959), the physicist Richard Feynman, Nobel Prize winner in Physics, presented his work "Plenty of Room at the bottom" which dealt with the matter of Manipulating and controlling small scale things, a field which he thought would have "a great deal of technical applications." The infected root canal space cannot be disinfected with the standard root canal protocol with the aggressive use of endodontic files.

The physicist suggested that using regular machine-tools, only smaller, and so on, step by step, till the production of molecular machines.[1] High- tech and effective management at microscopic level, termed nanotechnology, is predicted to be an important part of future dental and periodontal health.

The word nano is derived from the Greek word 'dwarf', a nanometer being a billionth of a meter. Nanomaterials are those with parts less than 100nm in at least one dimension including clusters of atoms, grains less than 100nmin size, fibers less than100nm in thickness.[2]

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In an article published by the Journal of American Dental Association, nanomedicine is defined as the 'science and technology of diagnosing, treating and preventing disease and traumatic injury; of relieving; and of preserving and improving human health through the use of nanotechnology and genetic engineering and eventually complex molecular machine systems and nanorobots. Also, in the same article, the concept of nanodentistry defined as the science and technology that will make possible the maintenance of near perfect oral health through the use of nanomaterials, biotechnology including tissue engineering and nanorobotics.[3]

Materials and Methods :

We've searched electronic databases including "Google Scholar"," JAYPEE journals", "Google Books" and MEDLINE, using the keywords: "nanodentistry", "dental nanorobots"," nanotechnology", "dental nanomedicine". Adding to that, the articles quoted in the first research have been added to the review. From the collected materials, we have conceived a summary of the data regarding their application in dental and medicine.

Results :

The field of dental nanomedicine implies the use of three classes of molecular structures; nanomaterials, non-biological nanoparticles, materials and instruments based on biotechnology and non-biological instruments including nanorobotics, all for therapeutic and diagnostic purposes. The most effective domain of the three classes of the dental nanomedicine technology is considered to be one of the nanorobotics.[4] In the years 2000 the devices necessary for building nanorobots began to be manufactured (micro engines, micro-pumps, micro-impellers, manipulating micro arms and even molecular computers.[5,6] In 2008, C. Edeler, research scientist of the Department of Microrobotic Engineer of Oldenburg University from Germany announced the creation of a mobile platform where nanorobots are already being manufactured.[7]

Applications of nanorobots in dental nanomedicine:

Research scientists appreciate that dental nanorobots could accomplish numerous tasks such as inducing local anesthesia, desensitizing teeth, correct positioning of periodontal tissue and poorly aligned teeth, restorative dental procedures, and curative preventive procedures at the oral cavity level.[3,8,9]

1. **Inducing anesthesia:** As known, local anesthesia used in dental medicine is a painful procedure which causes patient discomfort and can be sometimes accompanied by complications, manufacturing anesthetic dental nanorobots will have a large impact on patients as a result of the numerous advantages. A colloidal suspension containing millions of anesthetic dental nanorobots will be applied to the patient's gingiva which will reach the pulp in approximately 100 seconds and interrupt the traffic of the nervous impulse, under the control of the dentist through the intermediate of the nanocomputer aboard the nanorobots.[9] After the procedure is completed, the dentist

orders the nanorobots to restore all sensation and egress from the tooth.

Nanorobot analgesia offers greater patient comfort, reduces anxiety, no needles, greater selectivity, controllability of analgesic effect, fast and completely reversible action, avoidance of side effects and complications.[3,10,11,12]

2. **Tooth repair:** This will include manufacturing and installation of a biologically analogous whole replacement teeth by using genetic engineering, tissue engineering, that includes both mineral and cellular components, i.e. 'complete dentition replacement therapy' should become feasible within the time and economic constraints of a typical office visit through the use of an affordable desktop manufacturing facility, which would fabricate a new tooth in the dentist's office.

Scientists took advantage of these latest developments in the area of nanotechnology to simulate the natural biomineralization process to create the hardest tissue of the human body i.e dental enamel, by using highly organized microarchitectural units of nanorod like calcium hydroxyapatite crystals which will be arranged roughly parallel to each other.

3. **Treatment of dentine hypersensitivity*:*** A relatively frequently encountered pathology in dental practice is the dentine hypersensitivity characterized by a diffuse symptomatology, slightly painful, caused by pressure, hydrodynamically transmitted to the pulp through the dentinal tubules of the exposed dentin. It seems that in this condition, the hypersensitive teeth have a density of dentinal tubules 8 times bigger, and they have a diameter twice the size of dentinal tubules of non-sensitive teeth.[8,9,13]

Reconstructive dental robots using native biological materials could selectively and precisely occlude specific dentinal tubules within minutes, offering a quick and permanent cure.[14,15]

On reaching the dentin, nanorobots enter the dentinal tubular openings that are 1-4micron in diameter and proceed towards the pulp, guided by a combination of chemical gradients, temperature differentials and even position of navigation, all under the control of onboard nanocomputer as directed by the dentist. Nanorobots can complete the journey into pulp chamber in approximately 100s. The presence of natural cells that are constantly in motion around and inside the teeth, including human gingival, pulpal fibroblasts, cementoblasts, odontoblasts and bacteria inside dentinal tubules, lymphocytes within the pulp or lamina propria suggests that such journey be feasible by cell-sized nanorobots of similar mobility.[16]

4. **Orthodontic treatment*:*** Nowadays, orthodontic treatment has a lot of limitations among which the need to wear the orthodontic appliance for months or years being the most important, to which we can add the unaesthetic aspect of the smile, as

well as the discomfort of the patient in terms of speaking and eating. In the era of the orthodontic nanorobots, they will be able to manipulate directly the periodontal tissues, including gingiva, periodontal ligament, cementum and alveolar bone, allowing a quick and painless uprighting, rotating or vertical positioning within minutes or hours.[8,9]

5. **Aesthetic dental treatment*:*** Nowadays, aesthetic dental medicine uses the tooth implant placed inside the maxillary or the mandibular jaw (on the spot of a former dental root), in order to help replacing one or several missing teeth. This is followed by a period of osteo-integration and abutment (a prosthetic joint) is attached to the implant on top of which the doctor can place the crown, the bridge or the prosthetic, that will replace the missing tooth (teeth). This restoring technique has a lot of advantages, but a lot of disadvantages the most common of which is inducing discomfort to the patient as it is a surgical procedure and requires several sessions stretched along several months, and the implant can be rejected by the individual. The reconstructive nanodental techniques will imply genetic engineering procedures, tissue engineering, nanorobotic manufacturing for the growth of a new tooth in vitro, followed by its installation in the dental alveoli with the help of reconstructive dental nanorobots. The nanotherapy of complete replacement of the dentition with biological teeth, including both mineral and cellular compounds, will have the advantage of being possible in the dental practice in one session.[3,8,9,13] Reconstructive dental nanorobots will maintain the natural tooth and will improve its aesthetic aspect (in terms of color and texture) and durability by means of replacing the upper layers of the enamel with artificial biocompatible materials, such as sapphire and diamond, with a hardness of 20-100 times larger than the natural enamel and thus, a larger fracture resistance.[8,9] The numerous reconstructive dental nanorobots, controlled from a distance and working together will be able to excavate old amalgam restorations and will be used to prepare the cavities and restore the teeth with biological materials, so that the newly formed tooth could not be differentiated from the original one.[8]

6. **Diagnosis of oral cancer:**
   A) *Nanoelectromechanical systems (NEMS):* nanotechnology based NEMS biosensors that exhibit exquisite sensitivity and specificity for analyte detection, down to single molecule level are being developed. They convert (bio) chemical to electrical signal.[17]
   B) *Oral fluid sensor test (OFNASET):* The oral fluid nanosensor test technology is used for multiplex detection of salivary biomarkers for oral cancer. It has been demonstrated that the combination of two salivary proteomic biomarkers (thioredoxin and IL-8 and four

salivary mRNA biomarkers (SAT, ODZ, IL-8 and IL-1b) can detect oral cancer with high specificity ad sensitivity.[18]

C) *Optical nanobiosensor:* The nanobiosensor is a unique fiberoptics- based tool which allows the minimally invasive analysis of intracellular components, such as cytochrome C, which is a very important protein to the process which produces cellular energy and is well-known as the protein involved in apoptosis, or programmed cell death.[19]

7. **Treatment of oral cancer:** nanotechnology in field of cancer therapeutics has offered highly specific tools in the form of multifunctional dendrimers and nanoshells. The unique property dendrimers, such as their high degree of branching, multivalence, globular structure and well-defined molecular weight make them promising in cancer therapeutics.
8. Nanoshells are miniscule beads with metallic outer layers designed to produce intense heat by absorbing specific wavelength of radiations that can be used for selective destruction of cancer cells leaving aside intact and adjacent normal cells.[20,21] Photodynamic therapy: hydrophobic porphyrins are potentially interesting molecules for the photodynamic
9. Oral hygiene and halitosis: Properly configured dentifrobots (dentifrice+nanorobots) could identify and destroy pathogenic bacteria residing in plaque and elsewhere, while allowing the 500 or so species of harmless oral microflora to flourish in a healthy ecosystem. Dentifrobots also would provide a continuous barrier to halitosis, since bacterial putrefaction is the central metabolic process involved in oral malodor. They will be programmed to avoid the occlusal areas and will be deactivated if chewed.[8,12,21]
10. **Surgical nanorobotics:** A surgical nanorobot guided by a dentist, could act as a semi-autonomous onsite surgeon inside the human body. Such a device could perform various functions like searching for pathology and then diagnosing and correcting lesions by nanomanipuation, coordinated by an onboard computer, while maintaining contact with the supervising surgeon via coded ultrasound signals.[23]
11. **Bone replacement materials:** these can be used in maxillofacial injuries requiring bone graft, cleft patient and osseous defect in periodontal surgeries
    A) Hydroxyapatite nanoparticle used to treat bone defects are Ostim^{R}
    B) VITOSSO (beta tricalcium phosphate bone graft material)
    C) NanOSS^{TM}(hydroxyapatite based bone graft)

Benefits vs risks in the use of dental nanorobots:

Rapid development in the field of nanorobotics in the last two decades has generated controversies over the safety of their application as well as the toxic effect of

the medical nanorobots on the human being or the medium[24] and it seems we are witnessing the birth of a new discipline: nanoethics.[25] The benefits of using dental nanorobots could be as numerous as there could be probably as many applications of these minute instruments as there are needs in dental medicine. The possible toxicological risks on the human body are being also discussed,[26] the possible disappearance of *homo sapiens sapiens* if the nanorobots will not be eliminated from the human body, but also the possible disappearance of the biosphere if the nanorobots will evolve towards the capacity of continuous auto-replication, resulting in the appearance of clusters consuming any living creature on Earth, leaving behind a useless gray mass (the so-called gray-goo scenario).[27]

Conclusions:

In the 1950s, nanorobotics was at a fictional stage, now we are at the theoretical stage but the years 2020 will be called the "decade of the medical nanorobots". Nanorobots, considered even now as revolutionary instruments are being expected with a lot of enthusiasm and hopes, but also with some fear as they will radically change the 21st century dental medicine. Nanotechnology is part of a predicted future in which dentistry and periodontal practice may become more high-tech and more effective looking to manage individual dental health on a microscopic level by enabling us to battle decay where it begins. Role of periodontitis will continue to evolve along the lines of currently visible trends. For example, simple self-care neglect will become fewer, while cases involving cosmetic procedures, acute trauma, or rare disease conditions will become relatively more commonplace. Treatment options will become more numerous and exciting. Once widely used, the role of the dentist will change visibly. More than ever, he will have to possess technical capabilities and a quick and correct professional judgment. Besides, patients will ask for more aesthetic dental treatments. As a result, dental nanorobots, today somewhat fictional, will bring significant benefits in oral health, contributing to achieving painless, quick and high precision dental treatments. Technology should be able to target specific cells in a patient suffering from cancer or other life-threatening conditions.

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REVIEW ARTICLE

Caries risk assessment: A new horizon in preventive approach

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Abstract
This review discusses the rationale for Caries Risk Assessment (CRA) and the role various risk indicators play in dental caries occurrence. The purpose of CRA is to find out caries risk level of each patient and encourage them to undertake measures that will move them from high/moderate risk category to low risk category. It also provides an overview of different CRA methods and preventive protocols for risk based clinical management of dental caries. Recognition, reduction and regeneration can lead to early determination of the lesion, minimizing caries risk thus leading to reversal of incipient lesion.
Keywords: *Caries risk, caries risk assessment, management protocol*

Introduction

Dental caries is the most common chronic disease worldwide. Until now, it was a norm to consider only cavitated lesions for the treatment of caries. But caries, as we know it, don't arise de nova, they are preceded by white spot lesion, which are a risk indicator for future caries development.

In Indian dental practice, a variety of patients can be observed. On one end, there are literate patients who come to the dentist being well aware about caries treatment protocols. Unfortunately on the other end, there are many myths regarding dental treatment that lurk amongst mindset of patients. Factors like poor education and low socioeconomic status misguide the patient to have a casual attitude towards carious lesions, which leads to an increased proportion of complications. This lack of awareness is the chief reason behind caries associated morbidity.

Dental caries is an infective and transmissible disease. Carious lesion develops when cariogenic bacteria colonizes on the susceptible tooth surface in presence of dietary fermentable carbohydrates especially sucrose.

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Thus, CRA plays a vital role not only in prediction of disease but also helps in prevention, elimination and reversion of the lesion at an early stage.

Caries risk has been defined by Hausen as the probability that an individual will develop a certain number of carious lesions (cavitated or noncavitated) or reach a given level of disease progression, over a specific period of time, provided his or her exposure status remains the same during this period.[1]Assessing a patient's caries risk status is an essential component in the modern day management of dental caries, where the emphasis on a nonoperative/preventive approach, rather than just the surgical or restorative intervention to the disease process.[2,3]

Several factors play an important role in the development and prevention of caries, therefore it is important to understand how these factors affect the disease process. A risk factor is a behavioral, biological and environmental factor that, if present, increases the probability of a disease occurring, and if absent or removed reduces the probability.[4] Assessing all the risk factors helps to find the etiology of the disease and gives a more accurate analysis of the risk of developing caries in a particular patient. CRA is based more on individual prevention. Thus it is very important for a dentist to make the patient understand to keep the tooth healthy. Most dentists today assess the caries risk in each patient usually, but it is not certain if dentists systematically use this information in their treatment decisions. Anyway, "as dentists we have to look at the patient as a whole. People have caries; teeth have lesions".[4]

After an extensive review of literature on caries risk indicators, Zero, Fontana, and Lennon concluded that no single indicator or combination of risk indicators could consistently be a good predictor of caries risk status when applied across different populations and age groups.[5]Caries etiology is multivariate between pathologic factors like cryogenic bacteria and frequent sugar exposure that play a major role in causing dental caries along with contributing factors like oral self care methods, diet habits, medical history, fluoride exposure and genetics. It is not possible to evaluate the risk from looking at just one risk factor; one has to evaluate all the factors together.

Caries risk assessment methods:

Since caries is a chronic multifactorial infectious disease which is a worldwide problem, many CRA methods have been proposed.

In 1997, The Cariogram model was first presented by Brathall as a graphical illustration of an individual's risk of developing new caries lesions in the future. It also simultaneously expresses the extent to which the different etiological factors of dental caries affect caries risk for that particular individual.[8]Cariogram describes the percentage chance to avoid caries which is easy for a patient to understand.

Caries Questionnaire in combination with Clinical Observations [6]

Based on the concept that caries is an infectious disease, Featherstone *et al*.[6] evolved a consensus statement to assess individual caries risk from a questionnaire that addresses issues such as maternal dental history, family dynamics, socioeconomic factors, oral hygiene measures, fluoride exposure, and frequency of sugar exposures. Along with the questionnaire, clinical observations were made by visual, tactile, and radiographic examination of teeth. Once individual risk status was determined, they suggested using a minimally invasive caries management protocol that included appropriate preventive and therapeutic recommendations.

CAMBRA – Caries Management by Risk Assessment

The CAMBRA model was published in 2003 by a group of experts from the United States. In CAMBRA the focus is on diagnosis, prognosis and risk analysis. In CAMBRA they combine diagnosis and risk/prognosis assessment to get an improved treatment plan. There are four treatment groups and each of them has their own protocol for managing the disease process and recall times. CAMBRA also focuses on minimal operative intervention of cavitated lesions and defective restorations. [14]

AAPD's Caries-risk Assessment Form. [7]

The AAPD modified its original Cariesrisk Assessment Tool (CAT) [10]into a more sensitive and practical tool to assist dental practitioners, physicians, and non dental healthcare providers in assessing the levels of risk for caries development in infants, children, and adolescents. [7]

Caries risk Assessment forms were formulated that can be used by the dentists to assess caries risk status for 0-5 year old and ≥ 6-year-old children. Risk assessment categorization of low, moderate, or high is based on the preponderance of factors for the individual. However, clinical judgment may justify the use of one factor (e.g., frequent exposure to cryogenic snacks, ≥1 interproximal lesions, and low salivary flow) in determining the overall risk. [7]

Amongst the various methods described above, Cariogram is more effective in determining caries risk because of its high specificity and positive predictability. The pie diagram presenting percentage chance to avoid caries makes it easy for the dentist to demonstrate the patients about minimizing caries risk.

Cariogram gives an individual treatment plan. On the other hand, CAMBRA has generalized treatment plan along with periodic follow-ups for each group. But, the individual cost and time constraints imposed by multiple test protocol restricts their use in clinical practice.

Caries Questionnaire in combination with Clinical Observations [6] is a method which can be used by both dental and non dental health care providers, only the clinician must be familiar with clinical presentation of caries and factors related to caries initiation and progression.

AAPD's Caries risk assessment tool is a means of classifying caries risk at a particular time. It should be periodically applied to assess changes in an individual risk status. It assesses all three components of caries risk-clinical conditions, environmental characteristics and general health conditions. It has developed one of the best clinical protocols for the management of caries in different age groups.[14]

Although there is no completely reliable and precise method of CRA to date, the use of a health questionnaire for medical, dental and dietary history remains fundamental to best clinical practice by the majority of dental practitioners. [15]

Caries Prevention:

The treatment plan varies as per the method implemented but the management protocols like diet, oral hygiene maintenance and fluoride application covers the basics of every treatment plan but the outcome varies according to the individual risk. When a caries risk assessment has been done, regardless of the method that has been used, the dentist should make a preliminary therapy plan and a definitive therapy plan, and inform the patient about the prognosis. The preventive treatment plan for the individual should be given in both verbal and written form. It is important to explain to the patient that it is possible for him/her to move to a lower risk group to increase the

percent of avoiding caries by self - administered home care and professional help.

After finding the risk level, the dentist should describe the basic characteristics for caries development and how to prevent it, like avoiding eating things containing ordinary sugar between meals, brush the teeth twice a day with fluoride toothpaste and using dental floss. And then, we should explain individually what the patient should do to reduce his/her own risk, such as extra fluoride supplements, special dietary advice and stimulate the saliva when needed.CRA is equally important for both children and adults. Root caries is commonly found in elderly patients and is an alarming sign in them as it is asymptomatic, has rapid progression and is difficult to restore.

In general the indication for restorative or surgical treatment becomes strong at increasing risk. Even if a patient is "deemed" to be at low risk of future caries at a particular examination, there is a need for maintenance care.[11]Little information is available about the efficacy of caries management and preventive interventions among high risk individuals.[12]The patient's cooperation plays a vital, indispensable role for these management protocols to be effective.

Conclusion:

To conclude, the CRA tools in general dental practice is not yet systematically adopted. The leading caries experts recommend that CRA can become an integral component of minimum intervention dentistry and a new paradigm for caries management. Thus, at such a unique juncture of dental evolution, if the dentist can utilize these methods along with clinical experience, then caries risk assessment protocols not only help the dentists to bridge the information gap but also prevent caries at an early stage.

Thus, CRA makes it easier for the patient to understand why they develop caries and what can be done about it. Every individual should not only strive to get the caries management done, but also aim to keep tooth healthy.

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IMPLANT RETAINED OVERDENTURE WITH BAR ATTACHMENT- A CASE REPORT

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Abstract:
Edentulous arches must be rehabilitated in order to improve mastication, esthetics as well as to fill in the psychological dent created due to missing teeth. Though complete dentures have been used for rehabilitation of edentulous patients, mandibular implant retained overdenture provides mechanically, biologically and psychologically much better option for these patients. This article presents the case report of rehabilitation of completely edentulous patient by means of two implant retained mandibular overdenture with Hader bar attachment.
Keywords: *implant retained overdenture, implant overdenture, bar attachment, hader bar*

Introduction

Edentulism is an unresolved health care issue of sustained significance and prevalence in the aged population. The prosthetic management of the edentulous patient has always been a major challenge. The infected root canal space cannot be disinfected with the standard root canal protocol with the aggressive use of endodontic files.

Complete maxillary and mandibular dentures have been the traditional treatment option. However, most of the patients report problems adapting to the mandibular denture due to lack of comfort, retention and stability.

For decades, natural teeth have been retained in patient's mouth in order to preserve alveolar bone and derive support for overdentures. However, in cases where, extraction of the natural teeth is inevitable, implant-supported overdentures have been a well established treatment for edentulous patients.

According to "The Mc Gill Consensus Statement on Overdentures" the restoration of the edentulous mandible with a conventional denture is no longer the most appropriate choice of prosthetic treatment. Two implant supported overdenture has become the standard of care. [1]

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Different attachment systems have been available for the implant overdentures.[2]

- Ball attachments
- Bar attachment
  - Hader bar
  - Dolder bar
- Locator attachment
- Magnetic attachment

Two implant retained overdentures are very reliable for the patients with an edentulous mandible. It is appropriate to use two implants with an interconnecting bar parallel to the hinge axis. In patients with resorbed mandibular ridge, where there is an availability of sufficient interarch space to accommodate attachments, denture base and denture teeth, those are good candidates for the use of bar attachment for overdenture fabrication.[3,4]

The success rate of implant overdenture varies, depending on a host factors that differ from patient to patient. However, compared with traditional methods of tooth replacement, the implant overdenture offers increased longevity, improved function, bone preservation and better psychological comfort.

CASE REPORT:

A 45 years old, male patient reported to the Department of Prosthodontics, Crown & Bridgework and Oral Implantology, Faculty of Dental Science, Dharmsinh Desai University, Nadiad with the chief complaint of missing upper and lower teeth.

On intraoral examination patient was completely edentulous in relation to maxillary and mandibular arch for past one year (Illustration 1,2).

Two implant retained overdenture was planned for the patient as it improves retention of the denture as well as reduces the residual bone resorption and provides a economical treatment option compared to full arch fixed dental prosthesis.

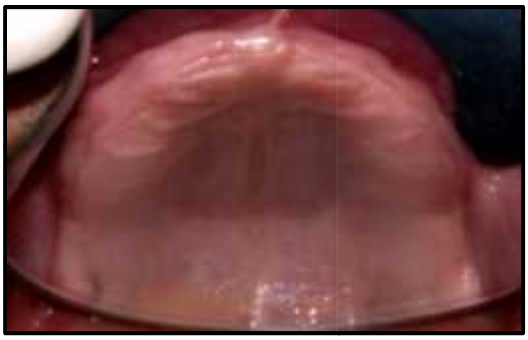

Illustration 1 : ***Preoperative edentulous maxillary arch***

Illustration 2 : ***Preoperative edentulous mandibular arch.***

Illustration 3 : ***Panoramic radiograph taken after implant placement.***

Surgical implant placement was done in the mandibular arch. Site for implant placement was selected by provisional denture fabrication. Two implants (D 3.8 × L 11 Myriad Plus, Equinox Medical Technologies, Netherlands) were placed in the B and D region, by dividing interforaminal region into five segments from A to E and were allowed to osseointegrate for four months (Illustration

3). After osseo-integration of implants, healing abutments were placed and a week later primary impressions were made (Illustration 4,5).

Illustration 4 : ***Edentulous mandible with healing abutments.***

Illustration 5 : ***Primary impressions***

Illustration 6 : ***Fabrication of custom trays***

Custom trays were fabricated for making final impressions (Illustration 6). Open tray impression copings were placed and splinted intraorally with pattern resin (Pattern Resin; GC Corp, Tokyo, Japan) (Illustration 7,8).

Illustration 7 : ***Radiograph showing complete seating of impression copings.***

Illustration 8 : ***Splinting of impression copings with pattern resin***

Maxillary final impression was made with Zinc Oxide-Eugenol impression paste (DPI Impression Paste; Mumbai, India) and poured with dental stone (Class III; Kaldent, Kalabhai Karson Pvt. Ltd, Mumbai, India) (Illustration 9).

Mandibular final impression was made with polyvinylsiloxane impression material (Honigum; DMG, Germany).

Illustration 9 : ***Maxillary final impression*****.**

Impression was poured with die stone (Class IV; Kalrock, Kalabhai Karson Pvt. Ltd, Mumbai, India) (Illustration 10).

Illustration 10 : ***Mandibular final impression with lab analogs.***

Illustration 11 : ***Facebow transfer***

Orientation jaw relation was recorded with face-bow (Hanau Spring-Bow; Whip Mix Corp., Louisville, KY USA) and maxillary cast was secured on a semi-adjustable articulator (Hanau Wide Vue II; Whip Mix Corp., Louisville, KY USA) (Illustration 11).

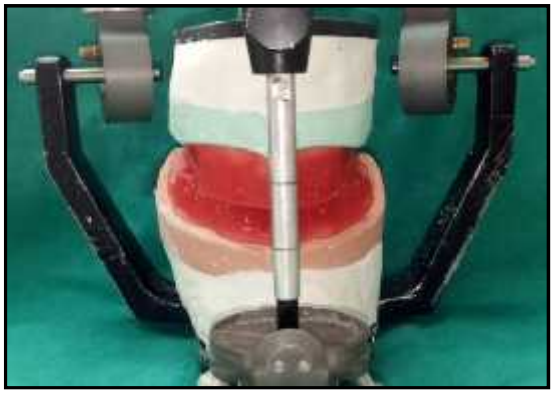

Illustration 12 : ***Jaw relation record.***

Centric relation was recorded using Hight's gothic arch tracers and mandibular cast was articulated. Horizontal condylar guidance was adjusted by means of protrusive record (Illustration 12).

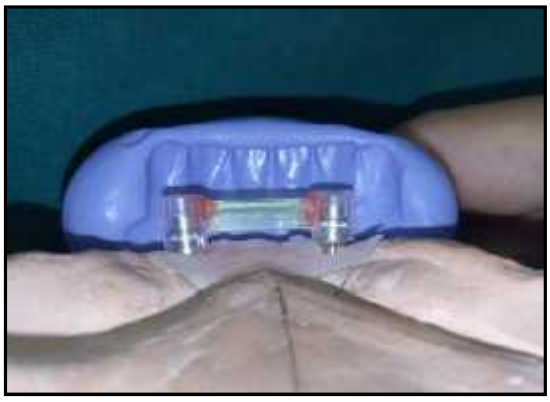

Illustration 13 ***: Pattern for bar attachment lingual view***

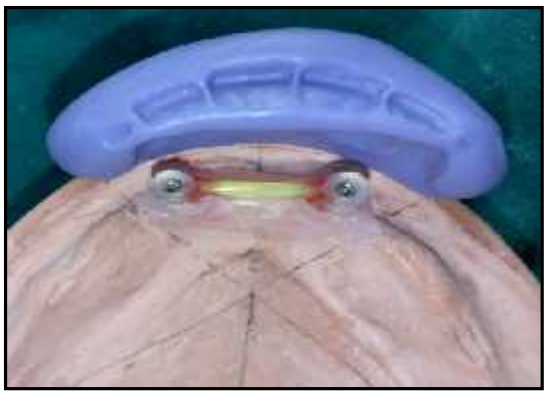

Illustration 14*: Pattern for bar attachment occlusal view*

Anterior teeth arrangement was completed and putty index (Honigum; DMG, Germany) was made. Trial denture was removed from the cast and pattern for Hader bar was attached to the castable abutment by means of pattern resin (Pattern Resin; GC Corp, Tokyo, Japan) (Illustration 13). Assessment of restorative space for accommodation of denture base and teeth was carried out with reference to index, after fabrication of bar attachment pattern (Preci-Horix Plastic Pattern; Ceka, Waregem, Belgium) which was then casted into Co-Cr metal (Illustration 14). Bar attachment trial was done to check for passive fit of the attachment (Illustration 15).

Illustration 15 : *Try-in of bar attachment*

New record base was made and clip (Preci-Horix Rider; Ceka, Waregem, Belgium) is transferred into the record base. Teeth arrangement was completed and intraoral try-in was done to evaluate for the retention of the denture before final processing (Illustration 16).

Illustration 16 : *Try-in*

Blockout was done with dental stone (Class III; Kaldent, Kalabhai Karson Pvt. Ltd, Mumbai) around bar attachment and dentures were acrylized using heat cure acrylic resin (Meliodent Heat Cure; Kulzer GmbH, Germany) (Illustration 17,18).

Illustration 17 : *Block-out of bar attachment*

Illustration 18: ***Acrylized mandibular denture with retentive clip.***

Illustration 19 : ***Bar attachment insertion.***

Bar attachment was fitted intraorally with a torque of 25N and dentures were inserted (Illustration 19,20).

Illustration 20 : ***Insertion of denture.***

Illustration 21 : ***Comparison of pre-operative and post-operative results.***

DISCUSSION:

Completely edentulous patients find more difficulties in adapting to complete dentures, problem arises particularly with the mandibular dentures due to lack of retention, stability and support.[5]

Complete denture is no longer considered the first treatment option for the completely edentulous mandibular arch. Two implant supported overdenture is considered the standard of care for the same.[1]

The ideal treatment plan is based on the patient's needs, desires and the best possible treatment option. Not all patients should be treated with the same type or design of the overdenture. Broad knowledge, proper patient selection, better psychological understanding, proper pre-surgical prosthetic planning and a very good biomechanical background are the main components for achieving proper overdenture design.[6]

Implant overdenture is supported or retained by the implants by means of various attachment systems either splinted or non-splinted.

Two implants can be used individually in non-splinted manner with a ball, Locator, magnetic or telescopic attachments. However, patient satisfaction regarding retention and stability of implant- retained overdentures have been declined significantly with the use of two non-splinted ball

attachments, while patient satisfaction with single-bar and triple-bar (two and four implants) attachments did not change with time.[7] Two implants, when splinted together with a straight bar, will permit denture movement vertically, thus the implants as well as the mucosa will be involved in the dissipation of the occlusal forces.[7,8] When compared to mandibular conventional dentures, two implant retained overdenture with bar attachment significantly improved patient comfort, masticatory efficiency and speech.[9]

There are a wide range of commercially available bar attachments which are either pre-fabricated from type IV gold or other type of bars which comes in castable and pre-milled plastic patterns. The selection of attachments varies from patient to patient, on the basis of number and position of implants, available restorative space, shape of the arch, loading protocols and economics. Most commonly used attachments are ball and bar attachments.[10,11,12] In the present case, bar attachment (Ceka Waregem, Belgium) was selected, as it can be casted into any alloy of choice, soft snap of the clips over bar providing better patient comfort as well as ease of replaceability of the clips.

Though implant overdenture improves retention, stability and support, it has certain limitations as it needs replacement of clip every one year. The shorter the bar segment, the greater the chance of clip loosening. Also the bone density around dental implants should be checked every 1,3,5,7,10,15 and 20 years recall period for satisfactory treatment outcome.[13]

CONCLUSION:

The use of osseointegrated implants as a foundation for the prosthetic replacement of missing teeth has become widespread in the last few decades. Overdentures supported by implants offer better stability, support, retention, improved function and patient acceptance. Complete denture is no longer the best treatment option for mandibular arch, however implant overdenture is a better treatment option. By appropriate selection of attachment systems, based on the patient criteria, successful treatment outcome can be achieved. Hence, two implant retained overdentures were considered standard care for edentulous mandible situations providing satisfactory outcome of the treatment.

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FULL-MOUTH REHABILITATION OF PARTIALLY EDENTULOUS PATIENT WITH SEVERELY WORN DENTITION: A CASE REPORT

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Abstract:

Severe tooth wear is frequently multifactorial and variable. The severe wear of anterior teeth facilitates the loss of anterior guidance and collapse of posterior teeth further results in the loss of normal occlusal plane and the reduction of the vertical dimension. This case report describes 77-year-old male, who had the loss of anterior guidance, severe wear of dentition along with reduction of the vertical dimension. The decision of increasing vertical dimension was made by anatomical landmarks, facial and physiologic measurements. Once the compatibility of the new vertical dimension had been confirmed, interim fixed restoration and the permanent reconstruction was initiated. This case reports that a satisfactory clinical result was achieved by restoring the vertical dimension with an improvement in esthetics and function.

Keywords*: tooth wear, vertical dimension of occlusion, full-mouth rehabilitation*

Introduction

The gradual wear of the occlusal surfaces of teeth is a normal process during the lifetime of a patient. However, excessive occlusal wear can result in pulpal pathology, occlusal disharmony, impaired function, and esthetic disfigurement.[1] Tooth wear can be classified as attrition, abrasion, erosion and abfraction depending on its cause.

A differential diagnosis is not always possible because, in many situations, there exists a combination of the processes.[2] Therefore, it is important to identify the factors that contribute to excessive wear and to evaluate alteration of the vertical dimension at occlusion caused by the worn dentition.[3]

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In many cases, the vertical dimension of occlusion (VDO) is maintained by tooth eruption and alveolar bone growth. As teeth are worn, the alveolar bone undergoes an adaptive process and compensates for the loss of tooth structure to maintain the vertical dimension of occlusion. Therefore, vertical dimension of occlusion should be conservative and should not be changed without careful approach.[4,5]Especially, increasing the vertical dimension of occlusion in bruxers puts a severe overload on the teeth and often results in destruction of the restorations or teeth themselves.[4]
Management of worn dentition using fixed or removable prostheses is complex and among the most difficult cases to restore. Assessment of the vertical dimension is important for the management, and careful comprehensive treatment plan is required for each individual case. Articulated study casts and diagnostic wax-up can provide important information which is helpful for the evaluation of treatment options. Tolerance of changes to vertical dimension ofocclusion is usually confirmed with the clinical evaluation of the patient having a diagnostic splint or provisional prosthesis.[5]
This clinical report describes an approach towards rehabilitation of worn dentition with metal ceramic restorations and cast partial denture.

Case report:

A 77-year-old man was referred for the treatment of severely worn dentition. He came with a chief complaint of inability to chew due to missing posterior teeth and worn out anteriors.
Intraoral examination revealed a generalized loss of dental substance that was greater on the palatal aspect of maxillary anterior teeth and the incisal edges of mandibular anterior teeth. Mandibular molars were missing bilaterally along with missing maxillary left second premolar and maxillary left molars. Maxillary right second premolar had palatal cusp fracture, so was indicated for extraction and maxillary right molars were supraerupted. All anterior teeth showed sharp enamel edges, dentinal craters, and attritional wear due to the loss of posterior support (Illustration 1,2).

Illustration 1: ***Maxillary arch***

Illustration 2: ***Mandibular arch***

The previous mandibular and maxillary removable partial denture had lost its retention and support and the patient was no longer able to chew comfortably using those dentures. There was no temporo-mandibular disorder history or soreness of the mastication muscles, but the discrepancy between centric occlusion (CO) and

maximum intercuspal position (MIP) was found when the patient was guided to centric relation (CR) with bimanual palpation technique.

To determine whether vertical dimension of occlusion had been altered, the following aspects were investigated:[1,5]

1. Loss of posterior support: mandibular posterior teeth were missing, and the patient did not use the mandibular partial denture. Posterior collapse resulted in excessive wear and fracture of teeth.
2. History of wear: Physiologic wear can be compensated by tooth eruption in general, but the accelerated wear may exceed the rate of eruption.
3. Phonetic evaluation: If the distance between the incisal edge of the mandibular incisors and palatal surface of the maxillary incisors is about 1 mm, it makes normal "s" sound. The patient's increased freeway space had altered "s" sound.
4. Interocclusal rest space: The patient's interocclusal rest space, measured between nose tip and chin tip, was 5 - 6 mm which was greater than the normal value, 2 - 4 mm (Illustration 3).

Illustration 3: ***Interocclusal rest space***

The possible causes of patient's worn dentition which might include posterior loss of support, parafunction, eating habit, and dental ignorance were explained to the patient. The treatment options were full mouth rehabilitation with metal ceramic restoration after endodontically treating the teeth followed by crown lengthening procedure and rehabilitating mandibular and maxillary edentulous posterior region with implants or removable partial denture.

However, the orthopantomograph (OPG) showed inadequate bone height in maxillary and mandibular edentulous span. Since, the patient didn't want to undergo extensive procedures like sinus lift and grafting, restoring the edentulous regions with a cast partial denture was preferred.As there was clinical evaluation of reduced vertical dimension of occlusion, full mouth rehabilitation withincreasing vertical dimension of occlusionwas planned. Only mandibular anterior teeth were indicated for crown lengthening procedures to obtain a sufficient clinical crown length and ferrule effect.

The patient's casts were secured on a semi-adjustable articulator (Hanau™ Modular Articulator; Whip Mix Corp., Louisville, USA) using a face-bow record and an interocclusal record that was made with the aid of a Lucia jig and Alu Wax bite registration material (Illustration 4).

Illustration 4: ***Casts secured on a semi-adjustable articulator***

The new vertical dimension of occlusion was set by 3 mm increase in the incisal guidance pin of the articulator. Because the patient's interocclusal rest space was 2 - 3 mm larger on the premolar area than normal distance, the actual increase were determined 3 mm in the anterior teeth and 1 - 2 mm in the posterior teeth. After taking

CR record using Lucia jig and wax-rim, diagnostic wax-up was performed (Illustration 5, 6, 7).

Illustration 5: ***Diagnostic wax up (Frontal view)***

Illustration 6*: Diagnostic wax up (Right lateral view)*

Tooth preparation for all the present teeth was carried out (Illustration 8, 9) and Bis-acryl provisional crowns (Cool Temp; Coltene, Switzerland) were fabricated direct technique using a polyvinyl siloxane putty index that was produced from the diagnostic wax-up (Illustration 10).

Illustration 7: ***Diagnostic wax up (Left lateral view)***

The provisional fixed restorations were cemented with temporary cement (Freegenol Temporary Pack; GC Corp., Tokyo, Japan), and the patient's adaptation was monitored.

Illustration 8: ***Tooth preparation for maxillary teeth***

Illustration 9: ***Tooth preparation for mandibular teeth***

Maxillary and mandibular interim removable partial dentures were fabricated and delivered for posterior edentulous span.

Illustration 10*: Interim restoration in place*

For three months, interim restorations were adjusted, and used as a guide for the definitive oral rehabilitation. During this period, the patient's condition and functions, such as muscle tenderness, discomfort of temporo-madibular joint (TMJ), mastication, range of the mandibular movements, swallowing, and speech, were evaluated. Improvement in mastication, speech, and facial esthetics confirmed the patient's tolerance to the new mandibular position with the restored vertical dimension of occlusion. The anterior guidance and posterior disclusion on excursive movement were established. Adjusted occlusion was transferred to customized anterior guide table, which was made with resin (Pattern Resin; GC Corporation, Tokyo, Japan).

Maxillary cast partial denture with closed horse-shoe major connector design and meshwork shaped minor connector was planned. Embrasure clasps were designed for maxillary right molars and Rest-Proximal plate-I bar (RPI) system was planned for maxillary left first premolar. The auxillary cingulum rest was placed on maxillary canine for additional support. The design for mandibular cast partial denture was planned with lingual bar major connector and a meshwork minor connector. RPI system was planned for second premolars bilaterally along with the auxillary rests on first premolars bilaterally.

Final tooth preparations were performed after three months, and definitive impressions were made with polyvinylsiloxane impression material (Illustration 11, 12). Bite registration was made using provisional crown and occlusal registration material (Honigum; DMG, Germany). Porcelain fused to metal restorations were fabricated using customized anterior guide table and cemented with glass ionomer cement.

Illustration 11: ***Final impression – maxillary arch***

Illustration 12: ***Final impression – mandibular arch***

Because the patient's anterior guidance table was used in the production of definitive restoration, the amount of occlusal adjustment on the lingual surface of maxillary anterior teeth was minimal. The anterior maxillary and mandibular teeth were restored first followed by the posterior mandibular and maxillary teeth (Illustration 13). Surveyed crowns were given for maxillary left first premolar, maxillary right molars and mandibular premolars bilaterally. All the restorations were checked for their respective esthetic and functional requirements.

Thereafter, individual polyvinylsiloxane impresssions (Honigum; DMG, Germany) were made for fabrication of maxillary and mandibular cast partial denture.

Illustration 13: ***Metal-ceramic restoration in all present teeth***

The try in for metal framework of cast maxillary and mandibular cast partial denture was performed (Illustration 14, 15) followed by teeth arrangement and final try in.

Definitive maxillary and mandibular cast partial dentures were fabricated and delivered withminor occlusal adjustments (Illustration 15, 16, 17, 18, 19, 20, 21).

Illustration 14: ***Cast partial denture framework try in – maxillary arch***

Illustration 15: ***Cast partial denture framework try in – mandibular arch***

The prostheses were designed using canine guided occlusion. Oral hygiene instruction and regular check-up were administered.

Illustration 16: ***Final prosthesis (centric occlusion)***

Illustration 17: ***Final prosthesis (Left Lateral)***

Illustration 18***: Final prosthesis (Right lateral)***

Illustration 19: ***Final prosthesis (Lateral excursion)***

Illustration 20***: Final prosthesis (Lateral excursion)***

Illustration 21: ***Final prosthesis (Protrusion)***

Discussion:

In 1984, Turner[1] classified the treatment of a severely worn dentition by the amount of the loss of VDO and available space to restore. The classification and conventional treatment, which includes raising VDO with multiple crown-lengthening procedures, have been widely used up to present. However, the etiology of tooth wear is multifactorial, and clinical controlled trials of restorative and prosthodontic approaches are limited in quantity and quality. In addition, lack of evidence regarding the long-term outcomes of treatment methods and materials cause difficulty in clinical decision-making.[6] Because of these unclear guidelines, adhesive strategy, that is more conservative and reversible, is increasing.[6,7,8] Nonetheless, the composite resin restoration could not be used for the patient in this case. The remaining tooth structures were too small to have sufficient retention of composite resin, and the surveyed crowns to support removable partial denture were necessary. Therefore, the conventional treatment modality that includes provisional restoration, careful monitoring, and definitive prosthesis, was chosen.

The rehabilitation using restoration of anterior crowns and removable partial denture providing posterior support is affordable and common for many patients who require the treatment of teeth wear.[6] However, the restored anterior teeth can be easily exposed to excessive occlusal loads if the patient does not wear the removable partial denture or resorption of residual ridge proceeds. Because the compliance of patients in wearing free-end saddle dentures has been shown to be poor,[9] the education on wearing removable partial denture is necessary. Regular check-up for the occlusal adjustment and removable cast partial denture fitting is essential.

Conclusion:

In this clinical report, raising vertical dimension of occlusion using removable occlusal overlay splint and following fixed provisional based on accurate diagnosis showed successful full mouth rehabilitation for severely worn down dentition.

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