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....An Insight to the Dentistry

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Himachal's First Dental Magazine

- HABIT BREAKING APPLIANCE FOR TONGUE THRUSTING – A MODIFICATION
- USE OF BIPHASIC CALCIUM PHOSPHATE IN THE TREATMENT OF OSSEOUS DEFECTS.
- MIDDLE MESIAL CANAL IN MANDIBULAR FIRST MOLAR – A CASE REPORT
- EVALUATION OF COMMERCIALY AVAILABLE BIODEGRADABLE TETRACYCLINE FIBERS THERAPY IN CHRONIC PERIODONTITIS
- RESTORATION OF ANTERIOR GUIDANCE: A CASE REPORT
- FIXED FUNCTIONAL APPLIANCE THERAPY FOR CORRECTION OF CLASS II MALOCCLUSION - A REVIEW OF THE AVAILABLE TECHNIQUES
- HALITOSIS - A REVIEW
- MOTIVATION IN COMMUNITY DENTISTRY
- AN OVERVIEW FOR PHYSICIANS
- STRESS FACTORS AS A CAUSE OF FAILURE IN DENTAL IMPLANTS: A REVIEW
- A SIMPLE TECHNIQUE FOR REMOVING CEMENT RETAINED IMPLANT PROSTHESIS IN CASE OF ABUTMENT SCREW LOOSENING- A CASE REPORT
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FROM THE EDITOR

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

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

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

In postgraduate program, dissertation is a requirement for appearing in university examinations. The main purpose of the dissertation is to expose the postgraduate students

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

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

Dr. Rajan Gupta

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HABIT BREAKING APPLIANCE FOR TONGUE THRUSTING – A MODIFICATION

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ABSTRACT

Tongue thrust, otherwise known as an infantile or reverse swallow pattern, refers to a swallowing movement where the tongue moves forward to approximate the lower lip. Amongst fixed habit breaking appliances for tongue thrust, crib is the most popular appliance. Invariably after few weeks of fixation of this appliance, due to biting forces in the anterior region the whole appliances sinks superiorly and either impinges on mucosa or gets submerged under it. A modification of the tongue crib has been suggested to overcome this problem.

Key words: Anterior Open-bite, Tongue Thrust, Malocclusion, Tongue Crib modification

INTRODUCTION

Tongue thrust, also known as an infantile or reverse swallow pattern, refers to a swallowing movement where the tongue moves forward to approximate the lower lip. It has been taken as one of the possible etiologic factors in malocclusion since early 1960s. Tongue thrusting, simply defined, is the habit of thrusting the tongue forward against the teeth or in between while swallowing. During infantile swallow the infant places the tongue beneath the nipple, in contact with the lower lip and swallow with the jaws apart and lips together. In contrast, during a normal swallow, the middle part of the tongue will press up and out on the roof of the mouth. Where the tip of the tongue is held during the swallow varies from the back side of the lower incisors to the papilla behind the upper incisors. Normal swallow does not include placing the tongue between the teeth even momentarily.

The infantile swallow shifts to an adult swallow gradually. This transition is commonly seen at 3-10 years of age. The full adult swallow can be observed as early as 3-4 years of age and is usually present by age 9 or 10¹²³. In 10-15 % of typical population this is never achieved⁴. Presence of thumb sucking habit in a child may delay this transition. Adult swallow pattern will not get corrected in these individuals unless sucking habit is corrected.

During a tongue thrust, the mid-portion of the tongue is not pressed against the roof of the mouth, but is employed down and forward while the tip of the tongue is spread out between the teeth and touching the lips momentarily. Therefore during the tongue thrust, the mid-portion of the tongue is not on the roof of the mouth and exerts little force against the palate. It's the constriction of the middle of the tongue that protrudes it. The tongue protrudes during swallowing in a tongue thrust. Swallowing occurs about 2000 times per day. During each swallow, the tongue can exert momentary pressures of 1 to 6 pounds on the surrounding structures of the mouth. This pressure will push the teeth and bone forward or apart. Tongue thrusting will move teeth into abnormal positions and cause growth distortions of the face and teeth. It means no simple cause-and-effect relationship between tongue thrust and open-bite. Proffit & Mason measured the data of the force, duration, intensity, and frequency of tongue thrust and concluded that the tongue thrust habit may sustain an open-bite instead of create one⁴. The individuals who place the tongue tip forward have less tongue force against the teeth than those who keep the tongue tip back⁵. It is rare that the anterior open-bite in an adolescent is solely the result of some habit, or the open-bite will correct spontaneously if the habit can be corrected. Pressure by tongue thrust swallowing lasts for approximately 1 second and is too short duration to affect the equilibrium. When there is

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an open-bite, a tongue thrust is a necessary physiologic adaptation to form an anterior seal during swallowing to prevent food or liquids from escaping. Nearly every patient with an open-bite also has a tongue thrust swallow and the reverse is not true. Proffit concluded a child who has an open-bite, tongue posture may be a factor, but the tongue activity during swallowing is not⁶. Chawla et al observed that tongue thrust may develop during fixed appliance therapy⁷. The leveling and aligning phase of fixed mechanotherapy is commonly followed by bite opening as the next phase of tooth movement. Leveling can sometimes lead to a transient increase in overjet when the bite may be over closed pretreatment due to severely retroclined upper anterior teeth. In many situations, as a result of the bite-opening or transient increase in overjet during the early phases of treatment, tongue thrust develops as a secondary feature, though it was not present pretreatment. Thus, even though it may not be a cause of the original presenting malocclusion, a tongue thrust, which develops mid-treatment in this fashion may slow down the treatment and may start to tell on the anchorage. In the majority of cases, it may go unnoticed and anchor loss may continue unchecked. The problem is certainly an added difficulty in managing high mandibular plane angle cases. Additionally, tongue thrust and open bite problems are more common and more difficult to treat in high mandibular plane angle cases⁷.

EFFECTS

There are several different types of tongue thrust and resultant orthodontic problems:

1. **Anterior open bite** - the most common and typical type of tongue thrust. In this case, the front lips do not close and the child often has his mouth open with the tongue protruding beyond the lips. In general, it has been noted that a large tongue usually accompanies this type of tongue thrust.
2. **Anterior thrust** - upper incisors are extremely protruded and the lower incisors are pulled in by the lower lip. This particular type of thrust is most generally accompanied by a strong mentalis (muscle of the chin).
3. **Unilateral thrust** - the bite is characteristically open on the thrust side.
4. **Bilateral thrust** - the anterior bite is closed; however the posterior teeth from the first bicuspid to the back molars may be open on both sides. This is the most difficult thrust to correct.
5. **Bilateral anterior open bite** - the only teeth that touch are the molars with the bite completely open on both sides including the anterior teeth. Once again a large tongue is also noted.
6. **Closed bite thrust** - typically shows a double protrusion meaning that both the upper and lower teeth are flared out and spread apart.

MANAGEMENT

Often other myofunctional variables are associated with the tongue thrust, all of which may lead to dentofacial developmental differences that could have negative dental, speech, and psychosocial consequences. Management of the tongue thrust, therefore, requires a team approach and may include a dentist, orthodontist, physician, and a speech pathologist. Variables that must be addressed by the team sometimes include: (a) anatomical differences (high narrow palatal vaults, malocclusions, restricted frenulums, and lip incompetencies), (b) oral behaviors (thumb/finger/pacifier sucking, licking the lips, teeth grinding, and mouth breathing), (c) medical conditions (obstructions to the airway, and upper respiratory complications), and (d) associated speech problems (lalling and lisping behaviors).

Interceptive attempts to contain tongue thrust have conventionally involved suggestions to the patient, myofunctional exercises and appliances such as cribs, rakes, overlay bite plates, interocclusal elastics, maxillary expanders and loose fitting training appliances. Myofunctional therapy is indicated in severe situations as soon as the child is able to understand the problem and cooperate with the therapist. Often the orthodontist can instruct the child in the proper way of swallowing and this knowledge, coupled with changes in the relationships of teeth during orthodontic treatment, can correct the problem. Increased patient awareness of occlusion also aids

in controlling tongue thrust in swallowing and speaking.

Tongue thrust may contribute to poor occlusal intercuspation both during and after treatment. A tongue thrust may also develop during orthodontic mechanotherapy as a result of the transient creation of intra and interarch spaces and this little recognized phenomenon has been found to occur in many randomly followed cases. In many instances, this seemingly adaptive and secondary response of the tongue posture and function may persist and thereafter impede the resolution of intra and interarch problems. During treatment with fixed appliances, especially so with the preadjusted appliance, anchorage preservation is very important to avoid treatment compromises and even failures. In cases where anchorage preservation is critical, any additional factor that tends to tax the anchorage, howsoever small its individual influence, may cumulatively impact the treatment outcome and thus its role becomes important.

APPLIANCES

There are two types of appliances for correction of tongue thrust habit: removable and fixed. Fixed appliances are always preferred, because the outcome is less dependent on patient's cooperation. Amongst fixed appliances, fixed tongue crib is the most popular appliance (Fig 1). In addition, this appliance can also be used during fixed orthodontic treatment in those cases that have pre-existing tongue thrusting or those cases that develop it during treatment. Fixed tongue crib should be used with lots of caution during fixed orthodontic phase. It is recommended that if this appliance is to be used during fixed orthodontic treatment, any mechanism which is likely to tax anchorage should be withheld till the time the habit gets controlled or corrected. Otherwise, an anterior tongue pressure on crib during its thrust gets transmitted on to the molars. It slows down the treatment and may start to tell on the anchorage. In the majority of cases, it may go unnoticed and anchor loss may continue unchecked.

FIXED TONGUE CRIBS: MECHANISM OF ACTION

The tongue crib quickly redirects the tongue

to a more normal swallowing position for the patients that thrust their tongue in a forward position⁸. The mid portion of the tongue is forced backwards and up because if the patient parts the teeth to swallow, the wires of the appliance are moved downward off the roof of the mouth into a position where the tongue will be engaged if the tongue moves out between the lips. For this reason the patient should be instructed to keep the tip of the tongue under the wires during the swallow and concentrate on pressing the back half of the tongue against the palate.

The appliance is cemented in place and will usually stop the habit in the first couple of months and need to keep the appliance in place until the permanent front teeth overlap each other. After the tongue crib is removed, a retainer will need to be worn (full time for the first 6-8 months followed by part time wear at night only for another 6-8 months). Cayley AS et al. performed a prospective clinical study and assessed the effect of tongue re-education therapy on tongue function and dentofacial form in anterior open-bite patients using electropalatography and lateral head cephalometric radiographs.⁹ She concluded that there was some evidence of a trend for eruption of upper and lower incisors with concomitant reduction of the anterior open-bite and implied that the therapy was partially successful in improving tongue function during swallowing and in reducing anterior open-bite.

THE DESIGN AND THE MODIFICATION

The most common design of fixed anti-tongue thrust appliance has two .036" SS base wires which are adapted, one from upper first molar band on working model on one side to the first molar band on the other side. Anterior extension of this wire

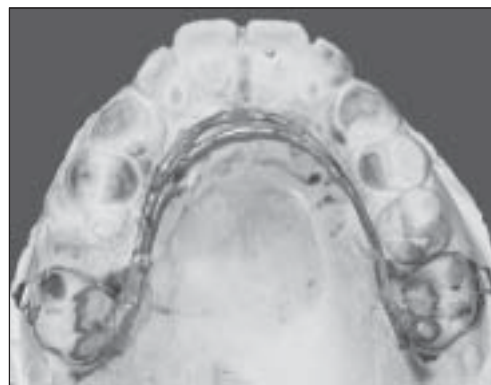


Fig.1 Basic tongue crib Design

is up to the incisive papilla. The second wire is adapted in such a way that it comes in contact with the first base wire posteriorly in 2nd premolar region (Fig 1). Anterior portion of this wire is fabricated in such a way that it lies behind cinguli of lower incisors (Fig 2).

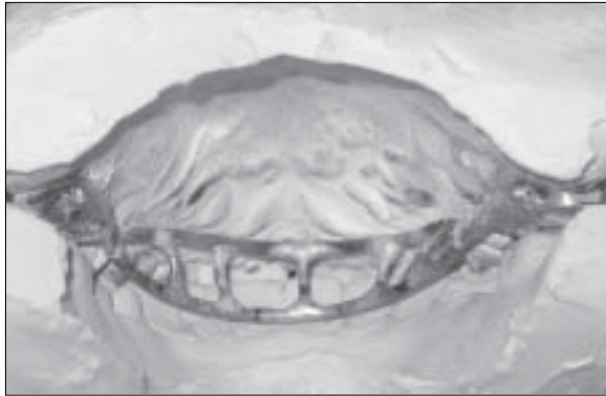


Fig.2 Lingual view of Occluded working models

It is ensured that these wires do not interfere with the lower teeth during occlusion. These two base wires are interconnected with each other by multiple cross wires soldered on both sides. The purpose of this design is to hold the tongue behind incisors during swallowing. Since the fabrication process involves multiple soldered joints, the base wires get softened. However, after few weeks of its cementation of this appliance in the patient's mouth, due to biting forces in the anterior region, the whole appliances sinks superiorly and either impinges on mucosa or gets submerged under it. Patient presents to the dentist's office with pain and inflammation around the anterior part of the palate adjacent to first base wire. At this stage the clinician would remove this appliance from patient's mouth by decementing molar bands. Then the appliance is arbitrarily adjusted occlusally and cemented again in patient's mouth. This may have to be repeated many times during treatment. Moreover, during these adjustments, invariably the appliance gets further disoriented and needs to be modified again. Therefore, the conventional design requires extra visits to the dentist; more chair time in addition to patient discomfort.

To overcome this problem we modified the design of the conventional crib appliance. During its fabrication prior to removal from the working cast, following soldering, cold mould seal is applied under the base wire and then cold cure

acrylic is sprinkled on it so as to increase the surface area of the base wire. Usually 2-3 mm extensions of acrylic on either side are sufficient to prevent it from sinking (Fig. 3).

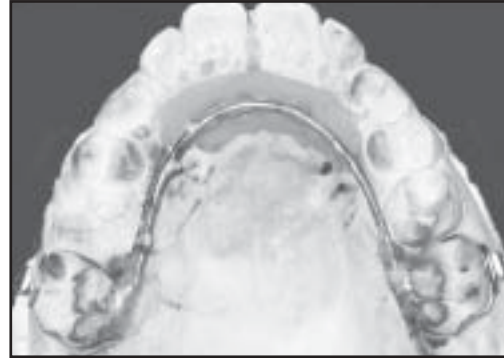


Fig.3 Extension of cold cure acrylic on base wire

Care is taken not to burn the plaster under the base wire during soldering. This is made possible by inserting a metal foil under the base wire prior to soldering. In addition keep a cotton ball soaked in water, on the foil next to the working area to prevent it from overheating. Appliance is removed from the cast; metal and acrylic parts are finished and polished (Fig. 4).

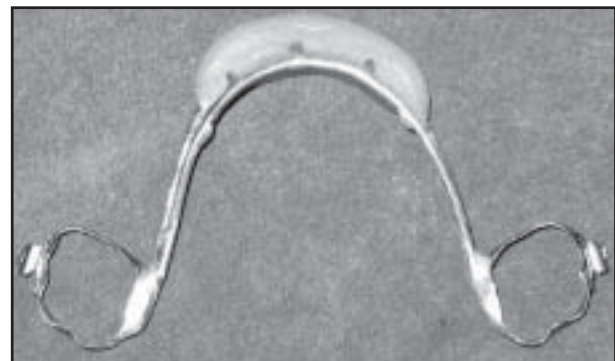


Fig. 4 Finished modified Tongue Crib prior to trial fit

Appliance is positioned in the patient's mouth for trial fit (Fig. 5).



Fig. 5 Modified tongue crib appliance in Patient's mouth

Minor discrepancy if any in the acrylic can be adjusted by trimming it. Since with this design the contact area between mucosa and the appliance increases manifold, it is less likely to get distorted and embedded. Clinically there is better patient comfort and cooperation and lesser number of appliance adjustments.

REFERENCES

1. Pinkham JR et al. Pediatric dentistry: infancy through adolescence, 2nd ed. WBSaunders Co, Philadelphia, 1994; pp205-6,371-2.
2. Graber TM. Orthodontics, principles and practice, 3rd ed. WB Saunders Co, Philadelphia, 1972; pp168
3. Kharbanda et al. Oral habits in school going children of Delhi. Journal of Ind Soc Pedod Prev Dent 2003; 21(3): 120-4.
4. Proffit WR, Mason RM. Myofunctional therapy for tongue thrusting: background and recommendations. J Am Dent Assoc 1975; 90: 403-11.
5. Proffit WR. Lingual pressure patterns in the transition from tongue thrust to adult swallowing. Arch Oral Biol 1972;17:555-63.
6. Proffit WR. Contemporary orthodontics. Lst ed. Mosby-Year Book, Inc., 1986; pp110-2.
7. Chawla HS, Suri S, Utreja A. Is tongue thrust that develops during orthodontic treatment an unrecognized potential road block?. J Indian Soc Pedod Prev Dent 2006;24:80-3
8. McDonald RE, Avery DR. Dentistry for child and adolescent 6th ed., Mosby Co., St.Louis, 1994; pp782-4.
9. Cayley AS et al. Electropalatographic and cephalometric assessment of myofunctional therapy in open-bite subjects. Aust Orthod J 2000; 16(1): 23-33.
10. McDonald RE, Avery DR. Dentistry for child and adolescent 6th ed., Mosby Co., St. Louis, 1994; pp782-4.
11. Graber TM, Vanarsdall RL. Orthodontics, current principles and techniques, 2nd ed. Mosby-Year Book, Inc., St. Louis, 1994; pp17, 43-44.
12. Bell WH et al. Surgical correction of dentofacial deformities. WB Saunders Co, Philadelphia, 1980; pp113.

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USE OF BIPHASIC CALCIUM PHOSPHATE IN THE TREATMENT OF OSSEOUS DEFECTS

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ABSTRACT

Periodontal bony defects are treated because they complicate the definitive elimination of active pocket defects, compromise the support of the tooth and the tooth's ability to withstand functional stresses, and complicate maintenance of an arrested pocket defect. The ideal result is correction of bony defects by regeneration of lost supporting bone and periodontal ligament. We are presenting a case report of two patients with periodontal osseous defects treated with biphasic calcium phosphosphate(osszfi)[®] a synthetic bone graft material.

INTRODUCTION

Loss of alveolar bone support is one of the characteristic signs of destructive periodontal disease and is generally considered to represent the anatomical sequela of the apical spread of periodontitis. The presence of periodontal osseous lesions is clinically significant in many ways. It relates to the associated loss of tooth support, to the site specificity of periodontal destruction and to the possibility that ecological niches i.e. deep pockets and furcation involvement associated with some osseous lesions may represent site-specific risk factors or indicators for disease progression.¹

Periodontal therapy involves two primary components. First is the elimination of the periodontal infection by eliminating the pathogenic periodontal microflora, which induces substantial favorable clinical changes in the periodontium. However, the anatomic defect resulting from active periodontitis still persists and is represented clinically by loss of clinical attachment, increased probing depths, and radiographic bone loss. The substantial efforts made to alter this defect represent the second component of periodontal therapy. Regenerative treatment has as its goal elimination of periodontal defects by regenerating the lost periodontium including bone, cementum and periodontal ligament.²

At present, bone grafting is the only modality of therapy for which there is histologic evidence, in humans, of regeneration of new attachment composed of new bone, new a cementum and new periodontal ligament coronal to the base of a osseous defect.³

Recently one new bone graft material ossifi (equinox medical technologies, Holland) is introduced. It is a synthesized combination of hydroxyapatite and α - tricalcium phosphate in a 70/30 ratio, creating a new molecule with new characteristics. It has 90% interconnected porosity. When it is placed in bone defect, it occupies 10% of the defect space leaving 90% of the space for regeneration of bone.

It has been developed in such a way that it mirrors the chemical composition and structure of human bone. The biologic similarity to natural bone results in optimal biocompatibility and ensures that this material is well tolerated by the body. The purity and synthetic nature of this material ensure safe grafting without the risk of transmitting viral infections.

CASE REPORT

We are presenting a case report of 2 patients which reported to department of Conservative Dentistry, Himachal Institute of Dental Sciences, Paonta Sahib,.One was 48 years old male with chief complaint of food lodgement and second was 35 years old male with chief complaint of bleeding gums and sensitivity. Medical history was negative for any other coexisting disease.

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E-mail : hids.ps@gmail.com

Clinical examination revealed generalized 6-7 mm pockets with bleeding on probing. Halitosis and pus exudation was also present. Radiographic evaluation consisted of orthopantograph and intraoral periapical radiographs using millimeter grid with vertical bone defect in 36 (case 1) and 46 (case 2).



CASE 1



CASE 2

Laboratory investigations included Hemoglobin level, Total Leukocyte Count, Differential Leukocyte Count, Bleeding Time, Clotting Time and Random Blood Sugar. Based on clinical and radiological examination a diagnosis of chronic generalized periodontitis was made.

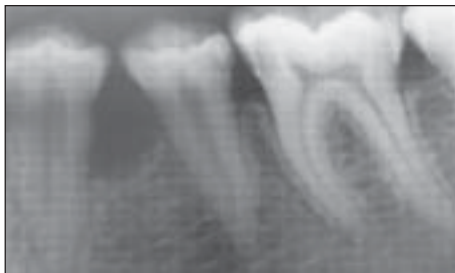


CASE 1



CASE 2

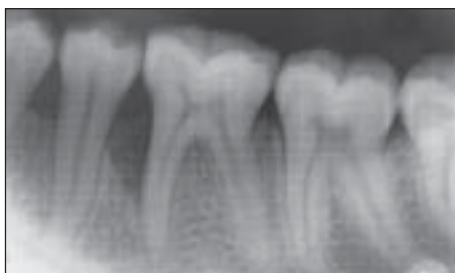
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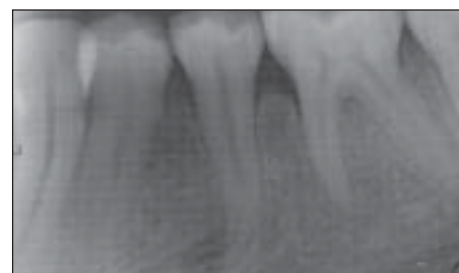
CASE 1



CASE 2



CASE 1



CASE 2

SURGICAL PROCEDURE

The surgical procedure was performed utilizing local anesthesia, 2% xylocaine with epinephrine 1:100,000. Intra sulcular incisions

with reflection of full thickness flaps were utilized to retain as much soft tissue as possible in order to obtain primary closure. Debridement and root planing were accomplished with hand instruments (Gracey Curettes). After cleaning, the surgical area was irrigated with sterile saline. The surgical area was carefully inspected to ensure that the debridement procedure has been completed satisfactorily.

Biphasic calcium phosphate (ossiffil®) was emptied into a sterile dappen dish and prepared by adding 4 to 6 drops of saline until the mixture was paste like in consistency. It instantly gels to a cohesive mass.

In the periodontal osseous defects small increments of graft material were added, starting from the bottom of the defect and adapted well to its configuration. The granules were lightly packed without overfilling of the defect space. Every effort was made to avoid contamination of the debrided root surface with saliva and blood until the graft material had been applied.

The soft tissue flap was then repositioned at the original level and closed with interrupted direct loop sutures using 3-0 Mersilk sutures. Care was taken to achieve a tension free primary closure of flap on suturing. Surgical site was protected by applying a periodontal dressing.

POST-OPERATIVE CARE

1. The patients were advised to rinse with 0.2% chlorhexidine gluconate solution twice daily for 14 days for assistance in plaque control.
2. The patients were advised to avoid chewing in the surgical area for the same period of time.
3. The patients were informed not to brush at the surgical site or manipulate it in any way for 10 days. They were prescribed medications which included a non steroidal anti-inflammatory agent Ibuprofen 400mg thrice a day for post operative discomfort and Doxycycline hydrate 100 mg at a dose of 200

mg the day of surgery and 100 mg per day for the next 6 days to prevent infection.

After 7 to 10 days dressing, sutures and any plaque present in the area was removed. The recall appointments were scheduled at 3 months and 6 months post surgically for soft tissue evaluation, plaque control, and radiographic evaluation.

DISCUSSION

Biphasic calcium phosphate (ossifi)® is a synthetic graft material. Being alloplastic in nature it does not increase the patient morbidity and does not require second surgical site as in case of autografts. It is a synthesized combination of hydroxyapatite and 13-tricalcium phosphate in a 70/30 ratio and has calcium phosphate in its purest form. It has a bioceramic matrix that is extremely biocompatible and highly osteoconductive. It mirrors the chemical composition and structure of human bone and is well tolerated by the body. When it is placed in a bone defect, it only occupies 1 of the defect space leaving 90% of the space for regeneration of new bone. The pore size of this material is highly reproducible and constant. This reproducible interconnected porosity combined with a large granular inner surface area provides the highest degree of osteoconductivity through clot stabilization, vascularisation, cell adhesion and penetration of host bone repair into the inner part of the graft material. Biphasic calcium phosphate (ossifi)® enhances the biological resorption of the granule and ensures optimum bone ingrowth and formation.

The mean percentage of defect resolution at 3 months and 6 months in test sites was 53.65% and 67%.

Biphasic calcium phosphate (ossifi)® improves the healing outcomes regarding probing depth reduction, osseous defect resolution and gain in clinical attachment. Better biocompatibility, excellent handling properties and improved tissue response to the material are the definite benefits of using biphasic calcium phosphate (ossifi)® enhances the biological resorption of the granule and ensures optimum bone in growth and formation.

REFERENCES

1. Papapanou PM, Tonnetti MS. Diagnosis and epidemiology of periodontal osseous lesions. *Periodontol 2000*; 2000; 22:8-22.
2. Garrett S. Periodontal regeneration around natural teeth. *Ann Periodontol 1997*; 7: 621-666.
3. Yukna RA. Synthetic grafts and Regeneration. In: *Periodontal Regeneration Current Status and Directions*. PoIson AM, Quintessence Publishing Co. Inc. 1994:103-112.
4. Addy M. The use of antiseptics in periodontal therapy. In: Lindhe J, Karring T, Lang NP, *Clinical Periodontology and Implant Dentistry*. Blackwell munksgaard, 4th edition. 2003; 464-493.
5. Klokkevoid PR et al. General principles of periodontal surgery. In: Carranza FA, Newman MG. Takel HH. *Clinical Periodontology*. Saunders 9th Edition 2003; 804.
6. Kornman KS, Robertson PB. Fundamental principles affecting the outcomes of therapy for osseous lesions. *Periodontol 2000*; 2000: 22:22-43.
7. Nery EB, Legeros RZ, Lynch KI et al. Tissue response to biphasic calcium phosphate ceramic with different ratios of HA/13TCP in periodontal osseous defects. *J Periodontol 1992*; 63: 729-735.
8. Newman MG et al. Effect of 0.12% chlorhexidine on bacterial recolonization after periodontal surgery. *J Periodontol 1989*; 60: 577-89.
9. Simon RM, Charles MC, John WR et al. In vivo comparison of synthetic osseous graft materials: A preliminary study. *3 Clin Periodontol 1999*; 26(4): 239-245.

MIDDLE MESIAL CANAL IN MANDIBULAR FIRST MOLAR –A CASE REPORT

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ABSTRACT

A mandibular first molar requiring root canal treatment was found to have three mesial canals. This case demonstrates an extraordinary anatomical configuration and supplements previous reports of the existence of such configurations in mandibular first molars.

Keywords: Mandibular first molar, mesial canals

INTRODUCTION

The main rationale of RCT is effective elimination of bacteria from root canals. This is achieved by instrumentation combined with irrigation followed by complete obturation of the root canal system, producing an apical seal which prevents any entry of microorganisms from canal to periradicular tissue or vice versa (1).

Therefore, the success of root canal treatment also depends upon identification of abstract anatomy prior to RCT. While performing a RCT with mandibular 1st molar, one should always keep in mind the unusual anatomy of root canals associated with this tooth.

Sbidmore and B.foundal (2), Pincda and Kuttler (3) have reported cases related to the unusual morphology of mandibular 1st molar. These reports have shown that mandibular 1st molar have 3 or 4 canals. In 1974, Vatucci and William (4) as well as Barke et.al (5) described the presence of independent middle mesial canal in mandibular 1st molar. Since then, there have been multiple case reports of abstract canal morphology of mandibular 1st molar. In addition to above mentioned studies to show the prevalence of middle mesial canal in mandibular 1st molar. In 1981, Pomeranz et.al reported 12 out of 100 cases(6). In 1983, Matiniz and Badanelli reported 26 of 1418 cases(7) and in 1985 and 1989, Fabra-Campos reported 4 of 145 and 20 of 760 cases with similar unusual anatomy, respectively (8,9). Goel et.al in 1991, reported 9 mandibular 1st molars (with 3 mesial canals) out of 60 cases(10).

CASE REPORT

A patient named Suraj Ala, age 26 years came to the clinic with chief complaint of pain since 8-10 days. Clinical examination revealed a large carious lesion and tooth was tender on percussion. No response was observed with thermal and electric pulp testing. Radiographic examination revealed deep carious lesion involving the pulp (Fig 1).

Diagnosis of pulpal necrosis with apical periodontitis was made. Root canal treatment was indicated. Proper access cavity was made and coronal necrotic pulp was removed and the 2 mesial and 1 distal canals were prepared using rotary Protaper (Dentsply). The working length was estimated using an apex locator. After the canals were prepared, the chamber was filled with a cotton pellet and temporary dressing was placed over it. Still, patient reported with pain associated with same tooth on the next day. The canals were checked for any remnant of pulp and irrigated thoroughly with 3% sodium hypochlorite and then with normal saline. Using a sharp explorer between 2 mesial canals, a catch was encountered. A middle mesial canal orifice was found very near to mesiobuccal canal orifice. A number 8 file was inserted slowly and was advanced until working length was achieved. This was confirmed using an apex locator and by radiograph (Fig.2).

Conventional method of radiograph showed overlap of 3 mesial canals. Change in angulation of radiograph helped in differentiating 3 mesial canals. The middle mesial canal originated as a

Fig. 1 showing deep carious lesion involving pulp.

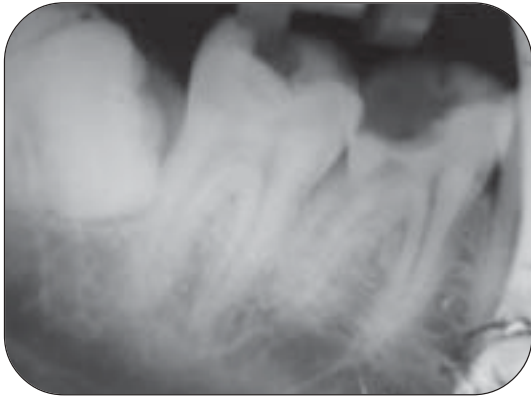
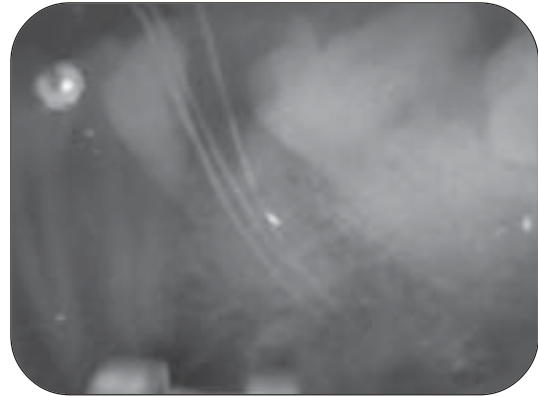


Fig 2 showing 3 mesial canals.



separate orifice but later joined the mesiobuccal canal in apical third .

The middle mesial canal was prepared using Protaper (Densply). The tooth was sealed with cotton pellet and temporary dressing. All the 4 canals were obturated after 2 days using AH26 and F-1 single cone technique. The patient experienced no post obturation pain.

SUMMARY

There are many cases in literature, which indicate the unusual anatomy of mandibular 1st molar. The incidence of middle mesial canal is reported to be 1 to 15% in various reports.

This canal may be independent with the separate foramen or may fuse with mesiobuccal or mesiolingual canals. Awareness of the existence of the 3rd mesial root canal and its identification will definitely improve the success of the endodontic therapy with mandibular 1st molar.

REFERENCES:

1. Grossman LI, Oliet S, Rio CD. Endodontic practice. 11 edition.
2. Skidmore AE, Bjorndal AM. Root canal morphology of the human mandibular first molar. *Oral Surg* 1971;32:778–84.
3. Pineda F, Kuttler Y. Mesiodistal and buccolingual roentgenographic investigation of 7,275 root canals. *Oral Surg* 1972;33:101–10.
4. Vertucci F, Williams R. Root canal anatomy of the mandibular first molar. *JNJ Dent Assoc.* 1974;48:27–8.
5. Barker, BCW, Parsons, KC, Mills, PR, Williams, GL. Anatomy of root canals. III. Permanent Mandibular molars. *Aust Dent J* 1974;19:408–13.
6. Pomeranz H, Eidelman D, Goldberg M. Treatment considerations of the middle mesial canal of mandibular first and second molars. *J Endodon* 1981;7:565–8.
7. Martinez-Berna A, Badanelli P. Investigacion clinica de molars inferiors con cinco conductos. *Boletin de Informacion Dental* 1983;43:27–41.
8. Fabra-Campos H. Unusual root anatomy of mandibular first molars. *J Endodon* 1985;11:568–72.
9. Fabra-Camos H. Three canals in the mesial root of mandibular first permanent molars: a clinical study. *Int J Endo* 1989;22:39–43.
10. Goel NK, Gill KS, Taneja JR. Study of root canals configuration in mandibular first permanent molar. *J Indian Soc Pedod Prev Dent* 1991;8:12–4

EVALUATION OF COMMERCIALY AVAILABLE BIODEGRADABLE TETRACYCLINE FIBERS THERAPY IN CHRONIC PERIODONTITIS

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ABSTRACT

The purpose of the study was to compare the clinical efficacy of tetracycline impregnated fibrillar collagen in conjunction with scaling and root planing to scaling and root planing alone in the treatment of chronic periodontitis. The study was conducted in a split mouth design. Thirty five patients having at least two non adjacent sites in different quadrants with periodontal pockets e" 5mm and with bleeding on probing at initial visit were treated with both scaling and root planing plus tetracycline fibers or with either scaling and root planing alone. Baseline and follow up measurements included plaque index, gingival index, probing pocket depth and clinical attachment level. Both treatment modalities were affective in improving clinical parameters over three months observation period. The combined antimicrobial and mechanical debridement therapy has shown better results as compared to scaling and root planing alone. Application of tetracycline in modified collagen matrix following scaling and root planing might be beneficial in treatment of chronic adult periodontitis and improving periodontal parameters for 3 months duration.

INTRODUCTION

Periodontal disease belongs to a group of inflammatory disorder whose pathogenesis is not well defined, although it is known that the interaction of host defense mechanisms and etiologic agents is an important determinate of the onset and progression of the disease. There is well documented evidence that bacteria and their products found in dental plaque comprise the primary etiologic agents responsible for periodontal disease^{1,2,3}.

The primary aim of non surgical as well as surgical treatment regimen is the removal of etiologic factor (i.e. plaque and calculus). Non surgical therapy i.e. scaling and root planing may not always result in the complete elimination of etiologic factor because of poor access to the base of deep periodontal pocket and anatomical complexities which may occasionally limit the efficiency of root planing. It has also been suggested that residual bacteria in the dentinal tubules and soft tissues may repopulate the scaled teeth⁴.

Tetracyclines have been used extensively in the treatment of periodontal disease since many years. Tetracyclines are semi-synthetic chemotherapeutic agents which are bacteriostatic in action and hence are effective against rapidly multiplying bacteria. Tetracycline and its derivatives have been used systemically as well as locally in the treatment of periodontal disease. Local drug delivery avoids most of the problems associated with systemic therapy by limiting the drug to its target site with little or no systemic uptake.

Tetracycline have been incorporated into a variety of delivery systems (non resorbable or bio resorbable) for insertion into periodontal pockets. These include hollow fibers (Goodson et al 1979) ethylene vinyl acetate copolymer fibers (Goodson et al 1983), ethyl cellulose fibers (Friedman and Golomb 1982), acrylic strips (Addy et al 1982), collagen preparations (Minabe et al 1989) and hydroxypropylcellulose films (Noguchi et al 1984)⁵.

Recently , new biodegradable local drug delivery system, Periodontal Plus ABTM (Advanced

Biotech Products, Chennai, India) i.e. tetracycline impregnated fibrillar collagen that contains 25 mg pure fibrillar collagen containing approximately 2mg of evenly impregnated tetracycline HCl, has been introduced for the treatment of gingival and periodontal diseases.

The present three months study was designed to clinically compare the efficacy of tetracycline from modified collagen matrix used as combination therapy with scaling and root planing alone in the treatment of chronic periodontitis.

MATERIALS & METHODS

A total of 35 human subjects comprising of both sexes (Male : Female = 16:19), aged between 35 to 60 years were selected from the Out Patient Department of Periodontics at the D.A.V. (C) Dental College and Hospital, Yamunanagar, Haryana (India). All the 35 subjects completed the 3 month follow up study.

STUDY POPULATION:

• INCLUSION CRITERIA

1. Patients who had not undergone any surgical or non-surgical periodontal therapy in the past 6 months.
2. Patients who had not taken antibiotic therapy in the past 6 month.
3. Patients able to follow verbal or written oral hygiene instructions.
4. Patients having 2 nonadjacent teeth separated by atleast 1 tooth with e" 5mm periodontal pocket that bleed on probing at the initial visit.

• EXCLUSION CRITERIA

1. Patients with a history of using anti- microbial mouthrinses within 2 months of the baseline visit or on routine basis.
2. Patients having history of allergy to tetracycline or cyanoacrylate adhesive.
3. Pregnant woman or nursing mothers.
4. Patients with periodontal packets in which the depth of the pockets corresponded to the apex of the tooth as in probable endodontic – periodontic conditions.
5. Medically compromised patients.
6. Teeth with furcation involvements.

35 subjects with a total of 70 sites were

selected. The selected sites were randomly divided into test group and control group.

- **Test Group** included 35 sites treated with local drug delivery and scaling and root planing.
- **Control Group** included 35 sites treated with scaling and root planing alone (without local drug delivery).

CLINICAL PARAMETERS RECORDED

- Plaque Index (**Silness and Loe 1964**)⁶ at baseline, 1month, 2months and 3months post therapy.
- Gingival Index (**Loe and Silness 1963**)⁷ at baseline, 1month, 2months and 3months post therapy.
- Probing Depth measurement from gingival margin to base of pocket using William's graduated probe at baseline, 1month, 2months and 3months post therapy.
- Clinical Attachment Level measurement from cemento-enamel junction as a reference point to the base of pocket with William's graduated probe at baseline, 1month, 2months and 3months post therapy.

STATISTICAL METHODS:

The baseline, 1month, 2months and 3months value were compared for changes that occurred over time i.e. changes in plaque index, gingival index, probing depth reduction and clinical attachment gain. Probabilities less than 0.05 ($p < 0.05$) were considered significant. Probabilities less than 0.001 ($p < 0.05$) were considered highly significant. The paired t- test and student t-test were utilized to evaluate and establish differences between baseline and 1, 2 and 3 months values of test and control sites.

TETRACYCLINE IMPREGNATED FIBRILLAR COLLAGEN:

This product consists of 25mg of pure fibrillar Type-I collagen containing approximately 2mg of evenly impregnated Tetracycline HCl, USP/IP. It is available as a strip containing four individually packed and separable sterile product packs. Just before placement, fibers were soaked with saline in a sterile dappen dish. Soaked fiber

were placed at the prepared site and gently pushed inside the pocket, so that the material fills the depths and curves of the pocket. Hand pressure was applied for just a few minutes to encourage hemostasis and initial setting of the material inside the pocket. The site was sealed with cyanoacrylate adhesive to prevent ingress of oral fluids.

POST TREATMENT INSTRUCTIONS:

1. Avoid chewing hard or sticky food.
2. No flossing on the treated site.
3. Do not disturb the area with tongue, finger or tooth pick.
4. To report immediately if the material is dislodged before the scheduled recall visit or if pain, swelling or any other complication occurs.

RESULTS

The clinical finding at baseline, 1 month, 2 months and 3 months post operative are shown in table 1, 2, 3 and 4. At the start there was no significant difference between both treatment group for the plaque index, gingival index, probing Pocket depth and Clinical attachment level (p d" 0.001).

Table 3 and Graph 1 shows a gradual reduction in probing pocket depth both for test and control group, with more reduction in test group as compared to control group. Similarly more gain in clinical attachment level in the test group as compared to control group is evident from table 4 and Graph 2.

DISCUSSION

One essential goal of current periodontal therapy is successful management of the suspected bacterial pathogens to the extent that destruction of the periodontium is arrested. A number of different non-surgical and surgical therapies have been successful in achieving this goal. Mechanical debridement with or without surgical manipulations, to disrupt the subgingival flora and to provide clean, smooth and biological compatible roots surfaces, had been the therapy to treat periodontal diseases till the early 1970's. Mechanical therapy may however fail to eliminate the pathogenic bacteria because of their location within gingival tissues or in other areas inaccessible to periodontal instruments⁸.

The present study was designated to access the clinical efficiency of tetracycline impregnated collagen fibers by demonstrating then changes in plaque index and gingival index, changes in probing pocket depth and clinical attachment level. A total of 35 patients (Male: Female=16:19) were enrolled in this study. Two interproximal sites with pocket depth e" 5mm were selected in each patient in different quadrants.

Possible side effect of therapy including slight discomfort and gingival redness were evaluated. No treatment related adverse effects were observed in any patient. Garret et al 1999⁹ also reported that treatment emergent adverse events constituted d" 1% of the entire study population with 0.2% of them showing allergic response.

In the present study significant reduction in plaque score from baseline to 3 months for both treatment group (p 0.001) was observed. Similar observation were made by Minabe et al 1991¹⁰, Heijl et al 1991¹¹, Mehta et. Al 2000⁵ and Frisen et al 2002¹² who found low levels of plaque index scores in this study from baseline could be due to a greater attention to oral hygiene practice by all selected participants throughout the study.

Similarly gingival index also showed significant reduction in scores from baseline to 3 months for both treatment groups. Minabe at 1991¹⁰ and Mehta et al 2000⁵ observed low levels of gingival index scores throughout the period of study.

Control of plaque and gingivitis is important in clinical studies because both vary in their association with periodontitis and both affect measured response to therapy, in this study, the reduction in plaque and gingival index may be due to thorough oral prophylaxis and proper home care by patients.

Since increased probing depth and loss of clinical attachment are pathogonomonic for periodontitis, hence pocket probing is a crucial and mandatory procedure in diagnosing periodontitis and evaluating the success of periodontal therapy. In the present study intra group observation showed highly significant (p < 0.001) reduction in probing depth from baseline to 3 months in both group.

On comparison, statistically significant differences was observed from baseline to 3 months between scaling and root planing alone and combination therapy. The results are consistent with the findings of Goodson et al 1991¹³, Minabe et al 1991¹⁰, Newman et al 1994¹⁴, Tonetti et al 1991¹⁵, & Mehta et al 2000⁵. These findings are in contrast with the result of Drisko et al (1995)¹⁶ who observed no significant difference among the different regimens at any point in time. This could be attributed to the fact, that in Drisko et al 1995¹⁶ study tetracycline fibers were placed in non root planed sites and benefit of mechanical debridement was not obtained.

Newman et al 1994¹⁴ quoted that patients tend to have approximately 1 mm reduction of probing depth on average, but in some cases, can have more dramatic effects, such as 2mm or greater. It was similar to the findings of this study.

Goodson et al 1991¹³ also observed that probing depth reduction was higher in combination therapy than scaled sites. Heijl et al 1991¹¹ in their comparative study also observed that there was significant pocket depth reduction in the combination therapy than scaling root planing alone.

A significant gain in clinical attachment level was also obtained from baseline to 3 months in both the treated sites ($p < 0.001$) difference was observed were similar to that of Goodson et al 1991¹³, Heijl et al 1991¹¹, Minabe et al 1991¹⁰, Newman et al 1991¹⁴, Drisko et al 1995¹⁶, Kinane and Radvar 1999¹⁷.

On comparison, highly significant ($p < 0.001$) difference was observed between combination therapy and scaling and root planing alone. This finding is similar to that of Goodson et al 1991¹³, Minabe et al 1991¹⁰, and Newman et al 1994¹⁴.

Minabe et al 1991¹⁰, found gain of clinical attachment level around 2mm, and suggested that the local application of antibiotic using a local drug delivery in combination with root debridement may contribute to clinical attachment gain.

The finding of the study is in contrast with those of Drisko et al 1995¹⁶ who found no significant among the different regimens at any time point. This could be due to reason as mentioned earlier.

The higher efficacy of the modified collagen matrix and tetracycline over scaling and root planing, could be attributed to the availability of a modified collagen matrix to accelerate tissue restructuring, the sustained delivery of a potent drug (tetracycline) that eradicated periodontopathic microorganisms and the ability of tetracycline to inhibit bacterial collagenases.

The reduction of probing depth and gain of clinical attachment were significant in all treatment groups. These improvements might simply reflect a change in tissue composition of periodontal tissues, rather than a true gain of new attachment.

Armitage et al. and Spray et al. have found that inflammation of the gingival tissue has a significant influence on the degree of probe penetration⁵. Improved gingival health may have contributed to the observed reduction of probing depth, presumably by decreasing the edematous swelling of the marginal gingiva and / or by decreasing the penetrability of tissue by the probe as a result of an increase of collagen content.

The crux of the present study clearly shows that mechanical debridement and locally delivered tetracycline work by two different mechanisms. Scaling and root planing removes some amount of bacteria without providing bactericidal activity whereas tetracycline does not remove any calculus deposits. Hence neither is the ideal control for the other. Together, locally delivered tetracycline therapy has a specific purpose of controlling localized infection, and scaling and root planing to remove calculus and other deposits, providing added benefits and the rate of new lesion formation is also decreased by the combination therapy.

CONCLUSION:

1. Application of the tetracycline in modified collagen matrix following scaling and root planing might be beneficial in treatment of chronic adult periodontitis and improving periodontal parameters for 3 months duration.
2. Though the local drug delivery system used in the study is the safe and effective treatment modality, further clinical and microbiological studies are required to determine the effect of this treatment modality over long period.

3. In spite of the proven additive benefits, the availability and cost associated with various controlled delivery devices (EVA fibers) have so far limited the application of tetracycline fibers. As this material is relatively cost effective and biodegradable, its use can be expanded in general population.

REFERENCES

1. **Listgarten MA et al** Role of dental plaque in gingivitis and periodontitis. *J Clin Periodontol* 1988; 485-487.
2. **Haffajee AD, Socransky SS** Microbiological etiological agents of destructive periodontal disease. *Periodontology* 2000, 1994; 5: 78-111.
3. **Socransky SS, Haffajee AD** The bacterial etiology of destructive periodontal disease: Current concepts. *J Periodontol* 1992; 63: 322-331.
4. **Goodson JM et al** Antimicrobial strategies for treatment of periodontal disease. *Periodontology* 2000. 1994; 5: 142-168.
5. **Mehta DS et al** A comparative assessment of the efficacy of tetracycline fibre therapy and phase I therapy in the treatment of chronic adult periodontitis. *JIDA* 2000; 71:207-211.
6. **Silness P, Loe H** Periodontal disease in pregnancy. *Acta Odontol Scand* 1964; 22: 121.
7. **Loe H, Silness J** Periodontal disease in pregnancy. *Acta Odontol Scand* 1963; 21: 533.
8. **Slots J, Rams TE** Antibiotics in periodontal therapy: Advantages and disadvantages. *J Clin Periodontol* 1990; 17: 479-495.
9. **Garrett S, Johnson L, Drisko CH** Two multicenter studies evaluating locally delivered doxycycline hyclate, placebo control, oral hygiene and scaling and root planing in the treatment of periodontitis. *J Periodontol* 1999; 70: 490-503.
10. **Minabe M et al** Therapeutic effects of combined treatment using tetracycline immobilized collagen film and root planing in periodontal furcation pockets. *J Clin Periodontol* 1991; 18: 287-290.
11. **Heijl L, Dahlen G, Sundin Y, Wenander A, Goodson J** A four quadrant comparative study of periodontal treatment using tetracycline containing drug delivery fibres and scaling. *J Clin Periodontol* 1991; 111-116.
12. **Frisen LR et al** Controlled local delivery of tetracycline with polymer strips in the treatment of periodontitis. *J Periodontol* 2002; 73: 13-19.
13. **Goodson JM et al** Multicenter evaluation of tetracycline therapy (ii). Clinical response. *J Periodontol Res* 1991; 26:371-379.
14. **Newman M et al** A 6 month multicenter evaluation of adjunctive tetracycline fiber therapy used in conjunction with scaling and root planing in maintenance patients: clinical results. *J Periodontol* 1994; 65: 685-691.
15. **Tonetti M et al** Principle and clinical applications of periodontal controlled drug delivery with tetracycline fibers. *Int J Periodont Rest Dent* 1994; 14: 421-435.
16. **Drisko C et al** Evaluation of periodontal treatments using controlled release tetracycline fibers: clinical response. *J Periodontol* 1995; 66: 692-699.
17. **Kinane DF et al** A 6 month comparison of the three periodontal local antimicrobial therapies in persistent periodontal pockets. *J Periodontol* 1999; 70: 1-7.

Table 1 : Mean Values Of Plaque Index At Baseline, 1 Month, 2 Months And 3 Months Post Operatively (Test Site & Control Site)

Time interval	Test site		Control site	
	Mean±SD	Difference from baseline	Mean±SD	Difference from baseline
Baseline	2.49±0.32	-	2.46±0.31	
1 month	1.61±0.43	0.88±0.32**	1.88±0.36	0.58±0.21**
2 month	1.06±0.43	1.43±0.37**	1.33±0.40	1.13±0.38**
3 month	0.67±0.41	1.81±0.41**	0.94±0.40	1.51±0.44**

** = Pd” 0.001 – Highly Significant

Table 2 : Mean Values Of Gingival Index At Baseline, 1 Month, 2 Months And 3 Months Post Operatively (Test Site & Control Site)

Time interval	Test site		Control site	
	Mean±SD	Difference from baseline	Mean±SD	Difference from baseline
Baseline	2.42±0.26	-	2.43±0.28	
1 month	1.47±0.42	0.95±0.33**	1.92±0.25	0.51±0.19**
2 month	1.09±0.36	1.34±0.32**	1.53±0.25	0.90±0.26**
3 month	0.63±0.39	1.79±0.35**	1.15±0.27	1.28±0.28**

** = Pd” 0.001 – Highly Significant

Table 3 : Mean Values Of Pocket Depth At Baseline, 1 Month, 2 Months And 3 Months Post Operatively (Test Site & Control Site)

Time interval	Test site		Control site	
	Mean±SD	Difference from baseline	Mean±SD	Difference from baseline
Baseline	6.83±0.85	-	6.71±0.95	-
1 month	5.23±1.00	1.60±0.55**	5.69±0.99	1.03±0.38**
2 month	4.29±1.04	2.54±0.61**	5.29±0.78	1.43±0.50**
3 month	4.14±1.08	2.69±0.71**	5.14±0.73	1.57±0.65**

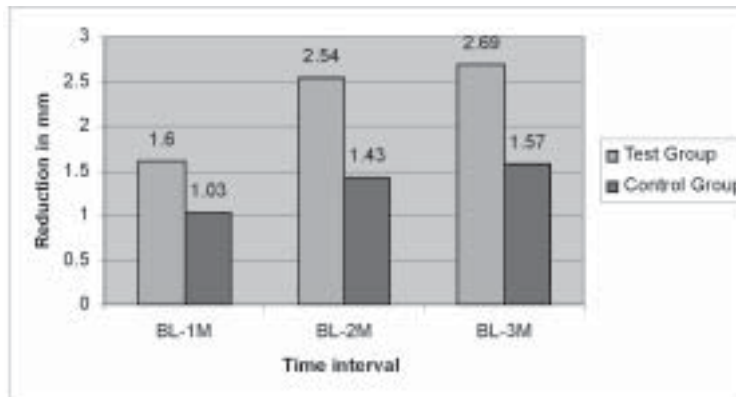
** = Pd” 0.001 – Highly Significant

Table 4 : Mean Values Of Clinical Attachment Level At Baseline, 1 Month, 2 Months And 3 Months Post Operatively (Test Site & Control Site)

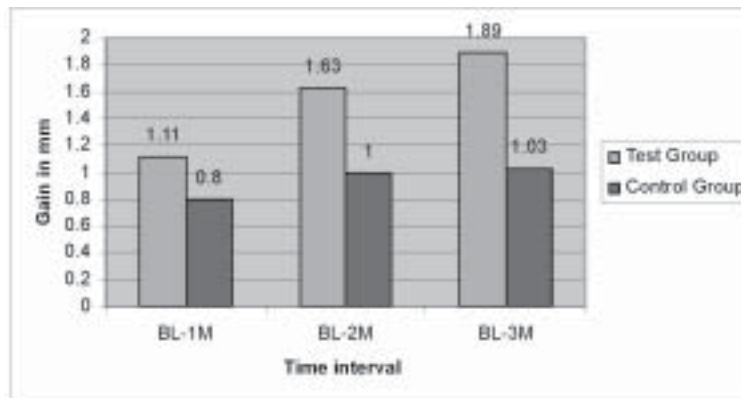
Time interval	Test site		Control site	
	Mean±SD	Difference from baseline	Mean±SD	Difference from baseline
Baseline	7.31±1.10	-	7.29±1.04	-
1 month	6.20±1.23	1.11±0.47**	6.49±0.88	0.80±0.47**
2 month	5.69±1.32	1.63±0.77**	6.29±1.10	1.00±0.42**
3 month	5.43±1.21	1.89±0.63**	6.26±1.06	1.03±0.51**

** = Pd” 0.001 – Highly Significant

GRAPH 2: MEAN CLINICAL ATTACHMENT GAIN AT DIFFERENT TIME INTERVAL



GRAPH 1: MEAN POCKET DEPTH REDUCTION AT DIFFERENT TIME INTERVAL



RESTORATION OF ANTERIOR GUIDANCE: A CASE REPORT

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ABSTRACT

Anterior guidance, also referred to as the incisal guidance is essential for a harmonious functional relationship in the natural dentition. In addition, the success or failure of many occlusal treatments depends on the correctness of the anterior guidance; failure to do so usually results in post-treatment instability. A marked improvement in patient satisfaction can be achieved by precisely harmonizing the anterior guidance to an individual patient's pattern of function. This article presents a case report restoring the anterior guidance in a patient with worn dentition.

Key words: Anterior guidance, Incisal guidance, Disclusion, Occlusal rehabilitation, Canine guidance.

INTRODUCTION

Anterior guidance or incisal guidance is the influence provided by the contacting surfaces of the maxillary and mandibular anterior teeth on the mandibular movements. In the occlusal rehabilitation of a natural dentition, three factors establish the occlusal contours of the posterior teeth¹. These are the two posterior controls i.e. the TMJs, and the anterior control or the incisal guidance. Schuyler² has emphasized the importance of anterior guidance over condylar guidance; as unfavorable incisal guidance may result in abnormal functional movements of the condyles.

Anterior guidance, which is essential for esthetics, phonetics and mastication can be categorized further as group function or canine guidance. While group function appears to be derived from balanced occlusion theory³, the concept of canine guidance or canine rise was suggested by D'Amico⁴ and Scaife and Holt⁵. Canine guidance is the disocclusion of all teeth by the canines in lateral excursions. Stuart and Stallard⁶ also observed this phenomenon and developed anterior guidance as part of their gnathological concept in mutually protected occlusion.

A precise restoration of anterior guidance is necessary for complete harmonious coordination of occlusion. Next to centric relation, the anterior guidance is the most important determination that

must be made when restoring the occlusion⁷. A major function of the anterior guidance is immediate disclusion of the posterior teeth the moment the mandible moves from CR. This is the only occlusal scheme that permits a peaceful coordination of the masticatory musculature. It also prevents excessive wear on the posterior teeth, and actually reduces the forces on the anterior teeth. Thus, the success or failure of occlusal reconstruction hinges on precisely establishing the correct anterior guidance. When the anterior guidance must be changed, current literature appears to favour more proponents of canine guidance than of group function^{4, 5, 8}.

This article presents a case report in which successful reduction of occlusal wear problem was achieved by restoring the anterior guidance in a patient with worn dentition.



Fig.1: Preoperative photograph showing dental attrition.

CASE REPORT

A patient aged 35 years reported to the Department of Prosthodontics, Himachal Institute of Dental Sciences for the treatment of dental attrition which resulted from parafunction. Clinical evaluation revealed loss of tooth structure on both anterior and posterior teeth (Figure 1) and absence of posterior separation on eccentric movements. Occlusal rehabilitation of the dentition was planned and the patient was informed of the treatment necessary to restore the dentition. After analyzing the wear pattern of the teeth, it was decided to alter the anterior guidance to provide for posterior disclusion and eliminate stress on the posterior dentition.

Diagnostic casts were obtained, duplicated and mounted (Figure 2) on a semi adjustable articulator (Hanau Modular Series, Whip-Mix Corp., USA). A diagnostic wax-up was completed on the maxillary and mandibular anterior teeth on the duplicated casts to establish an anterior guidance that provided for disclusion of posterior teeth in all eccentric excursions (Figure 3).



Figure 2: Diagnostic casts mounted on semi adjustable articulator.



Figure 3: Diagnostic wax up for altering the anterior guidance.

The tooth contours from the diagnostic wax-

up were replicated into the provisional restorations (Protemp II, 3M ESPE). The maxillary and mandibular anterior teeth were prepared and the provisional restorations were cemented (Temp Bond, Kerr Mfg Co) to evaluate esthetics, phonetics and function with respect to anterior guidance.

The contours of the provisional restorations were then incorporated into the final restorations (Procera, NobelBiocare, Germany). The completed maxillary and mandibular restorations were permanently luted with resin-based cement (Rely x, 3M, ESPE) (Figure 4). A canine protected occlusion was developed in the final restorations to reduce lateral forces on the posterior teeth. Protrusive guidance was evenly distributed across the maxillary and mandibular incisors (Figure 5).



Figure 4: Postoperative photograph following permanent cementation.



Figure 5: Posterior disclusion evident on protrusion.

DISCUSSION

The construction of a worn dentition is a complex problem representing a real challenge to the dentist. Because successful management of most wear problems requires separation of all

posterior teeth in all jaw positions except CR, the analysis of any severe wear must focus on a careful evaluation of both the condylar and anterior guidance. Many treatment philosophies have indicated that the element of disocclusion should be brought forward to the anterior teeth and thus, establish anterior guidance.

The pattern of tooth wear must be recognized as the wear pattern influences the treatment plan. If only the anterior teeth are worn, it indicates that the disclusion of posterior teeth can be accomplished without changing the incisal guidance. If however, both the anterior and posterior teeth are worn, as was the case in this patient, it indicates that posterior disclusion must be accomplished by readjusting the anterior guidance⁷.

Of the two types of anterior guidance, a canine protected occlusion decreases lateral stresses on posterior teeth and is preferred over group function when restoring or altering the anterior guidance^{3,9}. Electromyographic (EMG) studies of masseter and temporalis muscles reveal that there is less muscle activity generated in a canine protected occlusion versus a group function^{10,11}. This suggests that there will be less wear on the posterior teeth and less stress on the TMJ with a canine protected type of anterior guidance. In this case, a canine protected articulation was developed and evaluated clinically with the help of provisional restorations before the permanent

reconstruction was initiated. A satisfactory clinical result was obtained by readjusting the anterior guidance, with an improvement in esthetics as well as function, thereby justifying the procedures used.

REFERENCES

1. Schuyler CH. The function and importance of incisal guidance in oral rehabilitation. *J Prosthet Dent* 1963; 13: 1011-29.
2. Schuyler CH. Factors of occlusion applicable to restorative dentistry. *J Prosthet Dent* 1953; 3: 781.
3. D'Amico A. Origin and development of the balanced occlusion theory. *J South Calif Dent Assoc* 1960; 28: 317-18.
4. Thornton LJ. Anterior guidance: Group function/canine guidance. A literature review. *J Prosthet Dent* 1990; 64:479-82.
5. Scaife RR, Holt RE. Natural occurrence of cuspid guidance. *J Prosthet Dent* 1969; 22: 225-9.
6. Pokorny PH, Weins PJ, Litvak H. Occlusion for fixed prosthodontics: A historical perspective of the gnathological influence. *J Prosthet Dent* 2008; 99: 299-313.
7. Dawson PE. *Functional occlusion: From TMJ to smile design*. 1st ed. Mosby Elseviers, St. Louis; 2007. pp 160,433.
8. D'Amico A. Functional occlusion of the natural teeth of man. *J Prosthet Dent* 1961; 11: 899-915.
9. Henke DA, Fridrich TA, Aquilino SA. Occlusal rehabilitation of a patient with dentinogenesis imperfect: A clinical report. *J Prosthet Dent* 1999; 81: 503-6.
10. Shupe RJ, Mohamed SE, Christensen LV, Finger IM, Weinberg R. Effects of occlusal guidance on jaw muscle activity. *J Prosthet Dent* 1984; 51: 811-8
11. Williamson EH, Lundquist DO. Anterior guidance: Its effect on electromyography activity of the temporal and masseter muscles. *J Prosthet Dent* 1993; 49: 816-23.

FIXED FUNCTIONAL APPLIANCE THERAPY FOR CORRECTION OF CLASS II MALOCCLUSION - A REVIEW OF THE AVAILABLE TECHNIQUES

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ABSTRACT

The correction of Class II malocclusions by use of headgear, elastics, or removable functional appliances often fail to attract patient cooperation to a very significant extent, which has long been recognized as an important factor in outcome of orthodontic treatment. Failure to adhere to prescribed schedules of appliance wear; result in slow treatment response or no response at all. Fixed functional appliances minimize the need for such co-operation and attempt to maximize the predictability of results. This article reviews and describes the types of appliances used, and their mode of action-based on the current available research.

Keywords: Fixed Functional Appliances, Review.

INTRODUCTION

Successful orthodontic treatment relies heavily on patient co-operation. Unfortunately due to their bulk and inconvenience, the removable functional appliances fail to attract patient cooperation to a very significant extent, which has long been recognized as an important factor in outcome of orthodontic treatment. Failure to adhere to prescribed schedules of appliance wear; result in slow treatment response or no response at all. To overcome these problems with the removable appliances, the fixed functional appliances were developed. Placing the treatment outcome under the control of the orthodontist is likely to produce more predictable results.

HERBST APPLIANCE



At the international dental congress in Berlin in 1909, Herbst presented a fixed bite jumping device called Scharnier, or joint. In 1934, Herbst and Schwartz presented a series of articles on their experiences with the appliance. In 1977, Panchez resurrected the Herbst appliance for use as an experiment tool in clinical research¹. In the October 1979 issue of the American Journal of Orthodontics, Panchez called attention to the possibilities for stimulation of mandibular growth by means of the herbst appliance². The Herbst appliance consists of a bilateral telescopic mechanism that maintains the mandible in a protruded position. The Herbst can be a banded, cast, acrylic splint or cantilever bite jumper. The cast appliance and bite jumper designs are cemented and worn full time negating the need for co-operation.

Effects of the Herbst Appliance

The Herbst appliance can have a restraining effect on maxillary growth and a stimulating effect on mandibular growth. Sagittal growth may be increased whereas the vertical growth is unaffected by treatment. At least 52 percent of class II correction comes from dentoalveolar changes with the rest resulting from mandibular

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growth.² Dento-alveolar changes include lower incisor proclination and maxillary molar distalization and intrusion. The changes are similar to those produced by high pull headgear.³ Vertically, the overbite is reduced. This occurs by intrusion of lower incisors and enhanced eruption of lower molars. The long-term effect on mandibular growth is uncertain and may only have a short term effect on skeletal growth pattern⁴. Hansen et al. found that the appliance did not have any adverse effects on the temporomandibular joint (TMJ)⁵.

The Herbst appliance is indicated in Class II division 1 growing patients with well-aligned arches, post-adolescent patients, mouth-breathers, uncooperative patients, and those that do not respond to removable functional appliances. It can also be used as part of a two-phase treatment, the first being the orthopaedic phase and the second orthodontic phase involving correction of crowding and alignment with fixed appliances. The optimal time for treatment is at or just after the pubertal growth spurt, and when the permanent dentition is established. Because of shedding of primary molars it is not recommended in primary dentition. The appliance is prone to breakage and is limited to use in patients who can tolerate proclination of mandibular incisors.

Indications

1. Dental Class II malocclusion.
2. Skeletal Class II mandibular deficiency.
3. Deep bite with retroclined mandibular incisors.

Contra-Indications

1. Cases predisposed to root resorption.
2. Dental and skeletal open bites.
3. Vertical growth with high maxillomandibular plane angle and excess lower facial height.

JASPER JUMPER



The Jasper Jumper consists of two vinyl coated auxiliary springs fitted to fully banded upper and lower fixed appliances. The flexible springs are attached to the maxillary first molars posteriorly and to the mandibular archwire anteriorly with the springs resting in the buccal sulcus. The springs hold the mandible in a protruded position and produce rapid inter-arch changes similar to those produced by the Herbst appliance. The Jasper Jumper can be used for patients with Class II malocclusions with deep bites. Cope et al. quantified the action of the Jasper Jumper showing that the majority of the action was due to dental, rather than skeletal change, although the maxilla underwent significant posterior displacement and the mandible clockwise rotation.⁶

The Jumper springs, are available in a number of pre made sized, paired left and right. They are attached to the maxillary first molar headgear tube with a soft wire with a ball on one end. The amount of mandibular advancement is adjusted by lengthening or shortening the maxillary connection wire. The jumper mechanism fits over the lower arch wire. A lateral bayonet bend is placed distal to the lower canines and usually the brackets on the lower first premolars are removed. A jig is available which avoids the need for the bayonet bend and removing the bracket on the first premolar. A small acrylic ball is placed adjacent to the bayonet bend and then the archwire is placed through the hole on the anterior portion of the jumper.⁷

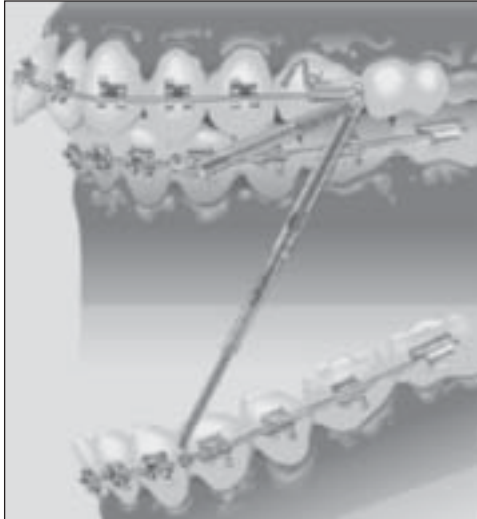
A heavy archwire with lingual root torque is used in the mandibular arch to enhance lower anchorage. The archwire is tied back to prevent lower incisor proclination. When fully extended, the Jasper Jumper produces an anterior positioning of the lower jaw in a manner similar to the Herbst appliance, but with more flexibility. Usually, 6-9 months of appliance wear is necessary in order to correct a mild Class II problem in patients with some remaining growth. Additional treatment time may be required in patients with more severe problems.

The Adjustable Bite Corrector

The Adjustable Bite Corrector appliance functions in a similar way to the Herbst appliance and the Jasper Jumper. The advantages include

universal left and right sides, an adjustable length, stretchable springs, and easy adjustment of the attachment parts. No long-term studies have been carried out on this appliance in the present literature to date.

The Eureka Spring:



Devincenzo (1997) described the Eureka Springs which is a fixed inter-maxillary force delivery system.⁸ It is esthetically acceptable due to small size and lack of protuberances into the buccal vestibule. It avoids tissue irritation and promotes good oral hygiene. The main component of the spring is an open wound coil spring encased in a telescoping plunger assembly. The springs rest in the buccal sulcus and attach posteriorly to headgear tubes on the upper first molars, and anteriorly to the lower archwire distal to the cuspids. A triple telescoping action allows opening of the mouth to 60mm before disengaging. The spring exerts 16g for every millimetre of ram compression. The appliance is designed to be used in conjunction with fully banded upper and lower fixed edgewise appliances with heavy rectangular lower arch in place. Labial root torque to the lower incisors needs to be applied to match the anchorage requirements and buccal root torque should be applied to the upper first molars. The appliance should only be used in conjunction with a transpalatal bar. The mechanics of the appliance has the opposite effect to the of Class II elastics in that it acts to intrude both the lower incisors and the upper molars. The effects of this appliance are entirely dentoalveolar, and no orthopaedic or

bite jumping effects are claimed by the clinicians who have developed the appliance. The dentoalveolar effects achievable with this appliance include maxillary molar distalization or advancement of the lower anterior teeth in Class II cases.

Indications

1. Dental Class II malocclusion.
2. Deep bite with retroclined mandibular incisors.
3. Deep buccal overbites or posterior crossbites.
4. Extremely tight buccal musculature.
5. Minimal buccal vestibular space.

Saif Springs

These are long nickel-titanium closed coil springs that are used to apply Class II inter-maxillary traction when fully banded fixed appliances are in place. The springs are tied in place with steel ligatures and are worn in place of inter-maxillary elastics. The springs are available in to lengths of 7 and 10mm. No longitudinal research studies on this auxillary are available in the literature to date. The prerequisites for successful treatment are as follows:

- Prior correction of deep bites;
- Stabilization of each arch with a large rectangular archwire;
- Direction of force as horizontal as possible;
- Sufficient resistant torque (lower incisor lingual crown torque);
- Proper placement of hooks for spring attachments.

The Mandibular Anterior Repositioning Appliance



The Mandibular Anterior Repositioning Appliance was introduced in 1998 by Ormco/A company after extensive development and testing by Douglas toll of Germany and James Eckhart of the united states. Figure shows cams made from 0.060 square wire attached to tubes (0.060 square)

on upper first molar bands or stainless steel crowns. A lower first molar crown has a 0.059 arm projecting perpendicular to its buccal surface, which engages the cam of the upper molar. The appliance is adjusted so that when the patient closes, the cam on the upper first molars guides the lower first molars and repositions the mandible forwards into a Class I relationship. There have been no studies to date documenting results achieved with this appliance. The developers of the appliance recommend a 12-month treatment time to achieve a bite jumping or orthopaedic effect. Stabilization of the lower molars is assisted by the fitting of a lingual arch and on the upper arch a transpalatal bar to stabilize the upper molars is placed. This appliance does not require the placement of attachments on teeth other than the first molars.

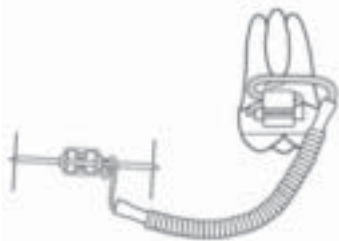
Indications

1. Skeletal Class II with mandibular deficiency.

Contra-indications

1. Dolichofacial growth pattern.
2. Cases predisposed to root resorption.
3. Dental and skeletal open bites.
4. Vertical growth with high mandibular plane angle and excess lower facial height.

The Klapper Super Spring



This appliance is an auxiliary which is fitted to fully banded upper and lower fixed appliance. The appliance consists bilaterally of a length multi-flex nickel-titanium which is bent back on itself attaching to the upper first molar tube and attaching to the lower archwire by means of a helical loop. The springs lie in the buccal vestibule. The effect of the spring is to place a distalizing and intrusive force to the upper first molar. The appliance comes in two sizes, a 27mm primarily designed for extraction cases and 40mm for non-extraction cases. The springs are paired

for left and right sides. The latest design of the spring requires a special oval tube to be fitted to the upper first molars. This facilitates buccolingual adjustment of the springs in the vestibule and aids patient comfort. The springs can be readily removed for adjustment or activation. There have been no studies to date documenting results achieved with this appliance.

CONCLUSION

The awareness, popularity and usage of the fixed functional appliances have ever been on an increase although the controversies regarding their potential and modus operandi still linger around unsettled. They neither are the panacea nor the wholesome solution for all malocclusions; nevertheless they definitely are one of the most powerful weapons in the arsenal of the orthodontist that can accomplish things not possible without such appliances. The appliance selected for treatment should be adapted to the type of growth pattern, direction and amount of growth required. Therefore, the diagnosis and case selection are critical for successful treatment.

REFERENCES

1. Pancherz H. The Herbst appliance: Its biological basis and clinical management. *Am. J. Orthod.* 1985; 87: 1-20
2. Pancherz H. The mechanism of class II correction and Herbst appliance treatment: a cephalometric investigation. *Am. J. Orthod.* 1982a; 87: 1-20
3. Pancherz H, Anehus-Pancherz M. The headgear effect of the herbst appliance. *Am. J. Orthod.* 1993; 103: 510-520.
4. Pancherz H, Frankel U. The Skeletofacial growth pattern pre and post-dentofacial orthopaedics. A long-term study of class II malocclusions treated with the Herbst appliance. *Eur. J. Orthod.* 1990; 12 : 209-218
5. Hansen K, Pancherz H, Petersson A. A long term effect of the Herbst appliance on the craniomandibular system with special reference to the TMJ. . *Eur. J. Orthod.* 1990; 12 : 244 -263
6. Cope, J. B., Buschang, P. H., Cope, D. D., Parker, J. and Blackwood, H. O. (1994) Quantitative evaluation of craniofacial changes with Jasper Jumper therapy, *Angle Orthodontist*, 64, 113-122.
7. Blackwood, H. O. (1991) Clinical management of the Jasper Jumper, *Journal of Clinical Orthodontics*, 25, 755-760.
8. Devincenzo, J. (1997) The Eureka Spring: a new interarch force delivery system, *Journal of Clinical Orthodontics*, 31, 454-467.
9. P. F. Mcsherry, H. Bradley, (2000) Class II Correction-Reducing Patient Compliance: a Review of the Available Techniques *Journal of Orthodontics*, Vol. 27, No. 3, 219-225, September 2000

HALITOSIS - A REVIEW

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ABSTRACT

Bad breath or halitosis, affects between 50-60% of the general population. While some individuals remain unaware of the condition, others suffer from halitophobia i.e. fear of being ignored by other persons due to bad breath. Surprisingly a problem of this magnitude with such high priority to public has traditionally being neglected by the dental profession. Current treatment strategies emphasizes only on masking the malodor and work over short time of period. Chronic halitosis is often difficult to manage and requires a comprehensive knowledge of underlying causes and correct assessment of the malodor.

INTRODUCTION

Halitosis or more simply bad breath is derived from a Latin word Halitus (breath) + Osis (bad). It is an extremely common affliction affecting approximately 50% of adult men. 35% of adult women and 5 % of the children.

Indeed bad breath has been observed for thousands of years. The problem is addressed in Jewish Talmud, as well as Greek and Roman writers. Mohammed has said to have thrown a congregant from mosque for having smell of garlic from his breath. Islamic teachings stress the use of special wooden sticks the Siwak for cleaning the teeth and preventing bad breath. Folk remedies for bad breath abound and many are still in use. The Bible (Genesis) mentions Labdanum

(Mastic) a resin that has been used in Mediterranean countries for bad breath freshening for thousands of years, it may be the original chewing gum. Other folk cure include parsley (Italy), cloves (Iraq), guava peels (Thailand) & eggshells (China). Modern literature in bad breath dates to monograph published in 1874 by Joseph Howe.

AETIOLOGY

90% of patients suffering from halitosis have oral causes such as poor oral hygiene, periodontal diseases, tongue coat, etc. 10 % of the halitosis sufferers have systemic causes that includes renal/hepatic failure, carcinomas, diabetes or trimethylaninuria.

TABLE 1

CAUSES OF HALITOSIS

1	Oral infections	periodontal diseases, Acute primary herpetic gingivostomatitis, ANUG
2	Upper respiratory tract infections	Bronchiastasis Lung abscess
3	Ear, nose and throat causes	Post nasal drip, Sinusitis Tonsillitis, Throat infections
4	Systemic causes	Hepatic Failure Azotemia Diabetic ketoacidosis
5	Medications	Anti depressants Anti hypertensive Anti histamines Oral Contraceptives
6	Certain foods	Food containing lactose e.g. dairy products like milk cheese, yoghurt and ice cream. Food containing Sulphur: onion and garlic
7	Other main Predisposing factors	Smoking, Dry mouth Alcohol, Stress Hormonal changes

ORIGIN OF HALITOSIS

In most cases the malodor is due to bacterial activity. Main anerobic bacteria implicated in halitosis include *F. nucleatum*, *T. denticola intermedia*, *P. gingivalis*, *B. forsyths*. Eubacterium and other subgingival species².

These bacteria interact with methionine and cysteine or serum (protein found in saliva), GCF, blood food retained about the teeth & desquamated epithelial cells and as result large amount of odoriferous Volatile Sulphur Compounds (VSC) are produced.

Various VSC's primarily responsible for halitosis are hydrogen sulphide (H₂S), methyl mercapton (CH₃SH), and dimethyl sulfide and dimethyl disulfide.

In all individuals regardless of the age or oral health status of the oral tissues , the most intense oral malodor is exhibited after prolonged periods of reduced saliva flow and abstinence from food & liquid (e.g. morning mouth) all of which enhance activity of the oral bacterial flora generating VSC's³.

ANALYSIS OF ORAL MALODOUR⁴

For the assessment of oral malodor, reliable methods of measurements are required. The methods may be either subjective/ quantitative.

a) Subjective/Organographic Measurements:

Oraganoleptic scores, or the use of one nose to smell & rank the intensity of odours emanating from the mouth, is the old standard for the measurement of oral malodour. Patients are instructed not to speak for several minute prior to measurement.

TABLE 2

ORGANOLEPTIC SCORING SCALES

1	Absence of odour
2	Questionable to slight malodour
3	Moderate Malodor (Definitely detectable)
4	Strong Malodour (objectionable but tolerable)
5	Severe Malodour (Over whelming, intolerable)

b) Quantitative Methods:

i. Gas chromatography:

Measures volatile Sulphur compounds associated with malodour, directly in mouth

air. It is lab based procedure, which can't be easily implemented at chair side.

ii. Zinc oxide thin film semiconductor sensor:

It's used for measuring traces of VSC's in the mouth Air. It is small in size, simple to handle; enabling its use for routine chair side study & field survey of halitosis.

iii. Portable sulfide monitor (Halimeter):

The availability of halimeter has lead to an unprecedented increase in oral malodour research and treatment due to is superior reproducibility, and sensitivity of sulfide measurements. It is based on detection of sulfides by a sensor in halimeter.

iv. BANA Scores:

Tongue BANA scores correlated with VSC's in the mouth air.

TREATMENT STRATEGIES TO CONTROL HALITOSIS^{2,5}

The treatment of halitosis is based on the underlying causes. Foul odour emanating from mouth due to systemic cause, require medical consultation and combine treatment approach. For oral disease the treatment is:

i. Oral prophylaxis:

In most cases an intensive disinfection of the mouth by scaling and root planning or instruction of a perfect oral hygiene will be sufficient to solve the problem.

ii. Tongue cleaning :

Tongue is the major site for VSC's and hence should be clear properly by either a brush or tongue scrapper.

a. Brushing procedure: Brush is held at right angle to the midline of tongue and drawn from back to front, with tongue extruded.

b. Tongue scrapping: the tongue cleaning arch is placed towards the posterior of the dorsal surface; pressed with a light, firm stroke and pulled forward. This is repeated several times, covering the entire surface of the tongue.

iii. Mouth washers:

Oral rinses are used to supplement the physical debridement methods to reduce the bacterial

load in oral cavity. Commonly used mouth washes found effective against malodor are Chlorhexidine, Listerine, Cetylpyridium chloride, chlorine dioxide and zinc ions. Zinc mouth rinses have been shown to inhibit production of volatile Sulphur compounds and the mechanism is that zinc ions have strong affinity for thiol groups present in VSC's which render H₂S and CH₃SH non malodorous by converting them to non volatile sulfides.

iv Bioadhesives tablets or lozenges:

Small amounts of a fermentable carbohydrate such as glucose when exposed to tongue in form of a lozenge leads to selection of saccharolytic species such as *Streptococci* resulting in lower pH which inhibits malodorous proteolytic flora.

Oral antiseptic bio adhesive tablets containing chlorohexidine and niacin amide remain in place for several hours after initial placement releasing the antibacterials. These significantly reduce dental plaque, quantitative periodontopathogen and total anaerobic bacterial counts, Spirochaetes and halitosis when used daily over 14 days period.

v Antibiotics

Cause related therapy in patients with halitosis is aimed at the reduction of microbial pathogens. Properly selected drugs shows great promise in the treatment of severe periodontitis and halitosis. Traditionally Penicillin, Metronidazoles, Tetracycline have been used. In the recent years Ciprofloxacin and Tinidazoles proved themselves to be highly efficacious and safe.

vi Dietary Recommendations:

Patients should be advised to drink plenty of liquids, avoid coffee, chew sugar free gum specially if the mouth feels dry and rinse their mouth after eating or consuming milk products, fish and meat. Also, fresh, fibrous vegetables such as carrots should be encouraged.

SUMMARY

Halitosis is not a disease but a symptom of various diseases. Though it is very common in the general population few see professional counselling either because they are unaware or feel embarrassed of the condition.

While most oral malodors have a simple cause, no single therapy is always effective. (For best results, a team approach from diagnosing to the pharmacist) is required. This multidisciplinary approach should be arranged before the onset of any complex therapy. When indicated supportive, responsible family members should be additionally involved to assure patient compliances.

REFERENCES

1. Fishman SL. The history of oral hygiene products how far have we come in 6000 years. *Periodontology* 2000; 1997; 15: 7-14.
2. Loesche WJ and Kazor C. *Microbiology & Treatment of halitosis periodontology* 2000; 2002; 28 : 256-279
3. Ratcliff PA. and Johnson PW. The relationship between oral malodor and gingivitis and periodontitis. *J periodontol* 1999; 70: 486-489.
4. Roseenberg M Clinical assessment of bad breath. *Current concepts. J AM Dent assoc* 1996; 127; 475-482.
5. Dayan O Buchhnee A, Begleiter A : Halitosis and Foeter Oris . *Quintessence Int.* 1982; 12: 303.

MOTIVATION IN COMMUNITY DENTISTRY

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ABSTRACT

Motivation in Community Dentistry has great role to play if we want to avoid a toothless generation in near future in India. The existing dental services in the country are unable to prevent edentulousness among the masses. Various regulatory authorities including dental associations and dental professionals have not yet been able to achieve the goal of healthy teeth. They have individually and collectively not succeeded in improving the quality of dental educational standards as well as dental services which have deteriorated at various institutional levels. Dental caries and Periodontal diseases major cause of tooth loss. For this the general dental practitioner is equally or more responsible because he hardly practises preventive dentistry to improve oral hygiene status. However of late, the Indian Dental Association and some oral hygiene product manufacturers have come together to create awareness among people through print as well as electronic media. It is making its impact in educating urban as well as rural population. Keeping this fact in view, other associated dental societies/ speciality associations and social organisation working in health and education sector should join hands and develop some programme for motivating people. Education sector through its network of schools is very important because healthy habits formed early in life last longer. This can go a long way in improving the dental health status of population and ensure that they keep their teeth healthy throughout lifetime.

Health tends to be appreciated only when it is impaired or lost. Early symptoms of the disease frequently go un-noticed or are neglected and regarded as of little significance. This tendency also applies to the most common dental diseases such as Dental caries and Periodontal disease. The development of concept of positive dental health is made difficult by chronic, irreversible, cumulative and prevalent nature of these diseases. Moreover, teeth have different degree of importance to different people.

- Some protect their teeth because of their functional and esthetic value
- Others look after them because of their contribution to social and mental wellbeing
- To many teeth are of such low value that very few attempts are made to protect them.

Other major obstacles to the development of a concept of positive dental health are: undramatic nature of dental diseases and the association of their treatment with pain, discomfort and anxiety. The reluctance of many individuals to accept and carry out on regular basis, oral hygiene and healthy dietary practices related to prevention and control of various diseases also adds to the negativity.

It is a fact that the topic "MOTIVATION IN COMMUNITY DENTISTRY" seems very easy to understand, but it is very hard to practice. This is

due to the fact that in dentistry, we try to inform an individual about existing dental diseases in his mouth which have gradually become part him over a period of many years. Almost everybody over-estimates his oral health as he himself looks after his mouth by whatever means available like toothbrush, chew stick, commercial or domestic tooth powders, salt charcoal mixture or even plain water rinse. It is also a fact that how much inefficiently or insufficiently oral hygiene is practised, no body appreciates it to be pointed out to him frankly. That is why they proudly announce that they had been brushing their teeth very thoroughly since their childhood i.e. 10, 15, 20 or more years. Then, how could it be possible that they lacked the skill to do it? Regular dental check-ups are a very important tool in the hands of a community dentist (Picture 1).



Picture 1. Dental check-up of children in a school setting

It is very challenging task to point out deficiency in one's mouth, as it is the most personal and emotional part of human beings at every age. As new born, peri-oral reflex is the first to develop and the baby recognises everything around him with his lips. As the baby grows, the mouth is used for the pleasures of sucking, tasting, swallowing, eating, speaking and for appearance and beauty. These functions are so dear to everybody individually that he does not want to listen anything about so sensitive part of his body. With all the assurances to improve his present status of mouth, he takes too long to believe that he will not lose even a bit of what he already possesses, in any attempt to improve upon it. This is because his mouth is very dear and important to him. That is why it is the most difficult area to interfere and poses a great challenge to the dentist.

It is true that dental caries is usually disease of younger population but periodontal disease does not usually affect irreversibly very young people. Though dental diseases do not cause serious pain or death, it does make life miserable for many a middle and old aged people. Poor dental health impairs nutrition and adversely affects appearance and communication so that the individual is affected biologically, psychologically and socially. The total effect of dental diseases on general health is un-assessable. The fact is that dental caries is major cause of tooth loss up to 40 years and periodontal disease is major cause after the age of say 40 years. People have accepted this unfavourable state of affairs as inevitable and it acts as a negative attitude towards motivation for seeking dental treatment.

Speciality of dentistry has made major advancements in the diagnosis and treatment of dental disease. Research has provided very effective means of preventing dental diseases as well as curative and rehabilitative procedures. The real challenge today is how to apply these techniques through a systematic approach that may be relevant and responsible for many needy in the Indian perspective. It is therefore, vital to develop a motivational system to identify critical barriers and evolve strategies to avoid or overcome them. Some of the most important barriers that affect motivational system for dental

health can be thought of as economy, educational level, culture, training, administration, pattern of available services etc.

Dental treatment consists of coordinated procedures for the purpose of creating a well functioning dentition in a healthy environment. Prevention and control of dental diseases depends on positive action at personal level, effectiveness of effort to control progression of the diseases at the dentist level and wide range of social factors. People do not act in a desired manner and therefore, dental health cannot be assured unless efficient dental services are provided or made easily accessible. Most of the Government dental health services available in the country are extraction oriented and the facilities for restoration and rehabilitation for healthy and functional dentition are very limited. The services provided under this system vary greatly. The prevention does not receive the attention it deserves. The "forceps" approach is very common in rural areas and this in other words is promoting edentulousness at a very early age. This too acts as a strong barrier for motivating periodontal patients.

The dental profession in general is seriously concerned about the widespread prevalence of Dental caries and Periodontal disease and the premature tooth loss it causes of otherwise sound teeth. Prevention of dental diseases is only possible with the coordinated efforts of the dentists and dental hygienists as they carry most of the responsibilities of prevention and control of early disease. The existing dental services in our country are so inadequate that a total of around 80,000 dentists mostly in ill-equipped and under staffed dental clinics of the Government and private sector are struggling to cater to a population of over 1,200 millions. The dental treatment in well equipped and staffed private clinics is so expensive that only few can afford it. The majority of population in the lower and middle class socio-economic groups have also some expectations from the dental profession.

Of late, the Indian Dental Association and some manufacturers of the oral hygiene products are doing wonderful job for the promotion of oral health through print and electronic media.

Similarly, others associated dental societies should also come forward and contribute their efforts to develop some programme incorporating various social and cultural aspects for benefit of people, so that masses can also retain their teeth longer without sacrificing them prematurely.

Dental Health education and health promotion are indispensable for any programme for individual or community. It should be broad based programme to be shared by the individuals, families, health planners, local educational authorities etc. Health education can help to increase knowledge and re-enforce desired behaviour pattern. But to be successful, it must be integrated with other influences on health namely economic, social and environmental so that people have access to it and they accept it. Thanks to the internet which has made information easier for those who look for it, whether patients or the dentists.

During last more than 4 decades of my dental practice which covered Dental College Hospitals, State Health Institutions at State, district, sub district, block and panchayat level, dental establishments in India including a West African Country, I have practiced motivation successfully everywhere. Motivation has been tried through various dental health education programmes on radio, television, newspapers, pamphlets, dental health talks with and without transparencies/slides, panel discussions but with varying success. I have observed that the most effective method is through personal communication either 1:1 or panel discussion with 30-40 participants. However, motivation of the motivator is the most important aspect of any such health programme (Picture 2).

If properly initiated and conducted, the above interaction will have very strong motivating value. It would initiate in a person, the process of action based on 4 steps. **NEED:** He would feel the need

for his teeth to be cleaned. **ACTION:** He would seek an appointment with his dentist. **INCENTIVE:** He gets teeth cleaned for better smile. **SATISFACTION:** He will have the feeling of freshness in his mouth, which he would always like to possess.



Picture 2. Training of Oral Health Club Volunteers in a High School setting

The following 7 are the key points to be discussed as they concern everybody with or without disease:

- TEETH ARE FOR LIFETIME, YOU CAN KEEP THEM HEALTHY.
- PLAQUE CAUSES MOST DENTAL DISEASES, YOU CAN DISCLOSE IT.
- CLEAN TEETH BRIGHTEN YOUR SMILE, YOU CAN KEEP THEM CLEAN.
- GUM DISEASE CAN BE PREVENTED, YOU CAN KEEP GUMS HEALTHY.
- PREVENTION MUST HAVE PRECEDENCE OVER REPAIR, FOLLOW IT.
- REGULAR CHECK UPS DETECT DISEASE EARLY, VISIT YOUR DENTIST.
- PLAQUE CONTROL ACHIEVES DENTAL HEALTH, SELF ADMINISTER IT.

AN OVERVIEW FOR PHYSICIANS ORAL-SYSTEMIC RELATION

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Throughout the history of mankind, there has been the belief that disease which affects the mouth, such as periodontal disease, can have an effect on the rest of the body.

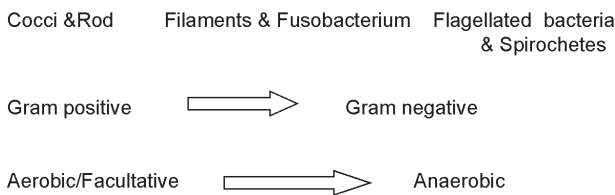
Over the centuries, writings from ancient Egyptians, Hebrews, Assyrians, Greeks & Romans to name a few, have all noted the importance of the mouth in overall health & well-being.

Thus, one could say that the concept linking periodontitis & systemic disease can be traced back to beginning of recorded history & medicine

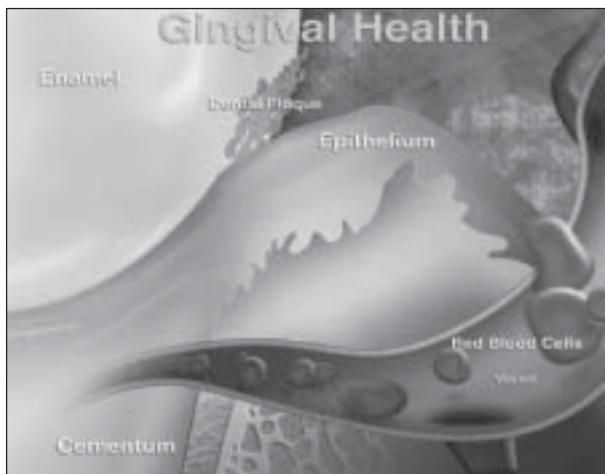
BACTERIAL CULPRITS

In the healthy mouth, more than 350 species of microorganisms have been found. Periodontal infections are linked to fewer than 5% of these species.

BACTERIAL SUCCESSIONS IN THE PERIODONTAL ENVIRONMENT



PERIODONTAL INFLAMMATION : FROM GINGIVITIS TO SYSTEMIC DISEASE



PERIODONTAL THERAPY AND ERADICATION OF GASTRIC HELICOBACTER PYLORI

The oral cavity has been proposed as a reservoir for *H. pylori* that could be responsible for the refractoriness of gastric infection to triple therapy (antibiotics, antimicrobials, and proton pump inhibitors). Evaluation of the efficiency of combined periodontal and triple therapy vs. triple therapy alone, in gastric *H. pylori* eradication in persons with *H. pylori* in the subgingival biofilm indicated that 77.3% of those treated with the combined therapy exhibited successful eradication of gastric *H. pylori*, compared with 47.6% who underwent only triple therapy.

PERIODONTITIS AS A RISK FOR CORONARY HEART DISEASE:

National Health Survey

A survey involving National Health and Nutrition Examination Survey data obtained from nearly 10,000 individuals indicated that those with periodontitis had a **25% increased** risk of CHD compared to those with minimal or no detectable periodontal Inflammation.

There is also evidence that some of the bacteria found in the dental plaque may have a direct effect on atherosclerosis and thromboembolic events. Recent research indicates that periodontitis may be associated with the development of cardiovascular disease. One theory is that the inflammatory proteins and the bacteria in the periodontal tissue enter the blood stream and cause various effects on the cardiovascular system.

A recent study examined the presence of bacteria known to cause periodontitis and the thickening of the blood vessel wall commonly seen in heart disease. After examining samples from more than 650 subjects, the investigators concluded that an increased level of blood vessel thickening was associated with the presence of the same bacteria found in dental plaque known to cause periodontitis.

PERIODONTAL DISEASE AND RESPIRATORY INFECTIONS

From all the evidence reviewed it seems quite plausible. Oral cavity may have a critical role in respiratory infections. e.g. : Oral bacteria from the periodontal pocket can be aspirated into the lung to cause aspiration pneumonia. The teeth may also serve as a reservoir for respiratory pathogens colonization and subsequent nosocomial pneumonia. The cytokines originating from periodontal tissues may alter respiratory epithelium to promote infection by respiratory pathogens.

ASSOCIATION BETWEEN PERIODONTAL DISEASE AND CANCER

Periodontal disease has long been linked to many systemic diseases, and recently a link between periodontal disease and cancer has been established. English-language papers studying the relationship between periodontal disease and tooth loss in humans and increased risk of several types of cancers along with overall cancer risk between 1990 and April 2009 were reviewed.

The most consistent increased risk was noted in studies of oral and esophageal cancers and periodontal disease. Gastric and pancreatic cancers had an association in most but not all studies. Lung, prostate, hematologic and other cancers were less consistently associated. Studies to date indicate a positive correlation between several forms of cancer and periodontal disease.

PERIODONTITIS AS A RISK FOR DIABETIC COMPLICATIONS

Periodontal contribute to the progression of diabetes probably by disturbing the glucose regulation. When bacteria enter the blood stream & enter the immune cells, prompting and inflammatory response, high levels of cytokines damage or destroy cells in the pancreas , altering

the production and utilization and exacerbating the diabetic condition . In diabetic patients with periodontitis , periodontal therapy may have beneficial effects on glycaemic control. Diabetic adults with severe periodontitis at base line had a significantly greater incidence of kidney and macrovascular complications over the subsequent 1 to 11 years.

PERIODONTAL DISEASE AND PREGNANCY OUTCOME

Periodontal disease has been associated with increased risk of preterm low birth weight, low birth weight and preterm birth. Systemic inflammation plays a major role in the pathogenesis of preterm delivery. CRP produced in periodontitis has been associated with adverse pregnancy outcomes, including preeclampsia, intrauterine growth restriction and preterm delivery.

It is seen that more than 60 % of the mortality that occurs among the infants without anatomic or chromosomal congenital defects is attributable to Preterm Low Birth Weight. These infants account for 5 million neonatal intensive care unit hospital days per year at an annual cost of greater than 5 billion \$. The overall cost to society in terms of suffering and long term disabilities far exceeds these monetary estimates. Thus more emphasis should be placed on prevention rather than costly tertiary care ⁽⁴⁾.

PERIODONTAL DISEASE AND STROKE

Overall 25 % of all stroke patients had significant dental infections. This study supports an association between poor oral health & stroke in mean under age 50. Periodontal infection may contribute directly to the pathogenesis of atherosclerosis resulting in narrowing of the vessel lumen & also in elevated production of fibrinogen and C-reactive protein which serve to increase the risk of stroke.

PERIODONTAL DISEASE IN GENETICS

Both genetics and environmental factors play an important role in the patient susceptibility to periodontal disease, researchers believe a number of genes which differs among various ethnic or cultural groups is responsible for the presence and severity of periodontal disease.

There is evidence that genetic factors influence susceptibility to the different forms of early onset periodontitis. However, it is unlikely that a specific gene will be identified as causing enhanced disease susceptibility. It is more likely that the genetic influences are as multifactorial as the diseases themselves, and a complex interplay between genetically determined host responses and environmental challenges may determine whether disease is present.

PERIODONTAL DISEASE AND MORTALITY

Recent study suggests oral health status as a possible risk factor for systemic conditions. Longitudinal Study was done to determine age related changes in the oral cavity and to identify risk factor for those subjects with the most alveolar bone loss averaging more than 21%, the risk of dying during the follow-up period was 70% higher than all other subjects. Thus periodontal status at the base line examination was a significant predictor of mortality independent of other factors.

CONCLUSION

What becomes evident from this review is that the periodontal tissues are often associated with manifestations of a wide range of systemic diseases. Early detection and carefully managed therapeutics with the physician and periodontist working hand-in-hand may prove beneficial to the patient's general health and quality of life.

It is important that physicians recognize and familiarize themselves with these possible oral manifestations, and refer for the treatment of the periodontal disease. However it is too early to provide specific recommendations regarding the treatment of periodontal disease to improve specific health outcomes, but dentists can become advocates for a general health promotion and disease prevention message.

REFERENCES

1. Anil S, Al-Ghamdi HS. The impact of periodontal infections on systemic diseases. An update for medical practitioners. Saudi Med J. 2006 Jun;27(6):767-76.
2. Seymour GJ, Ford PJ, Cullinan MP, Leishman S, Yamazaki K. Relationship between periodontal infections and systemic disease. Clin Microbiol Infect. 2007 Oct;13 Suppl 4:3-10
3. Periodontal therapy improves gastric Helicobacter pylori eradication. Zaric S, Bojic B, Jankovic Lj, Dapcevic B, Popovic B, Cakic S, Milasin J. J Dent Res. 2009 Oct; 88(10):946-50
4. The Association Between Periodontal Disease and Cancer: A Review of the Literature Fitzpatrick SG, Katz J. J Dent. 2009 Nov 3.
5. THORSTENSSON h, Kuylensteirnaj, Hugoson A: Medical status and complications in relation to periodontal disease experience in insulin dependent diabetes. J Clin Periodontol 23:194, 1996
6. Clinical Periodontology and implant dentistry 4th edition Jan Lindhe
7. CARANZA'S CLINICAL PERIODONTOLOGY-10th Edition

STRESS FACTORS AS A CAUSE OF FAILURE IN DENTAL IMPLANTS: A REVIEW

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ABSTRACT

This literature review summarizes research with aim of providing dentist with evidence based guidelines to apply when planning treatment with osseointegrated implants. English-language peer-reviewed articles published between 1969 and 2009 were identified using medline, as well as a hand search, and reviewed. Topics reviewed include the stress factors which are causative factors for the failure of the implants. These factors should be considered while planning an implant treatment. Limitations in the current body of knowledge are identified, and direction for future research is suggested.

INTRODUCTION

In 1969, Branemark et al¹ published landmark research documenting the successful osseointegration of endosseous titanium implants. Since then, these methods for surgical placement of dental implants had a profound influence on the practice of dentistry. For the success and longevity of dental implant osseointegration is very important. To prevent the failure in implants stress should be evaluated at the implant bone interface. Most common complication in an implant reconstruction is related to occlusal overload and stress related factors. Excess stresses to an implant interface may cause early to late implant failures, crestal bone loss, porcelain fractures, unretained restorations, implant component failure and screw loosening.

CAUSES OF OVERLOADING

- a. Overloading Factors related to Patient
- b. Overloading Factors related to the Implants

An implant team should evaluate more than 60 force factors before developing a treatment plan. Some force factors are more important than others. So these forces should be evaluated in the (1) Magnitude, (2) Duration (3) Type (4) Direction (5) Multiplication Factors.²

Several factors may multiply or increase the effect of the other conditions.

Dental conditions primarily include the following:

- 1) Parafunction
 - i) Bruxism

- ii) Clenching
- iii) Tongue Thrust
2. Crown Height
3. Masticatory Dynamics
4. Position of the Abutment in the Arch
5. Direction of Load
6. Nature of the Opposing Arch

1) Parafunctional Forces

Parafunctional forces on teeth or implants are characterized by repeated or sustained occlusion and have long been recognized as harmful to the stomatognathic system. The most common cause of implant failure after successful surgical fixation or early loss of rigid fixation during the first year of implant loading is the result of parafunction. Such complications occur with greater frequency in the maxilla, because of a decrease in bone density and an increase in the moment of force.³ The parafunctional groups presented in this chapter are divided into bruxism, clenching, and tongue thrust or size of the tongue.

- A) **Bruxism** - The forces involved are in significant excess of normal physiologic masticatory loads. Bruxism may generate several hours per day of increased force on the teeth. A 37-year-old patient with a long history of bruxism recorded a maximum bite force more than 990 psi (4 to 7 times normal).⁴
- B) **Tongue Thrust**- is the unnatural force of the tongue against the teeth during swallowing.⁵A force of approximately 41 to 709 g/cm² on

the anterior and lateral areas of the palate has been recorded during swallowing. A tongue thrust habit may lead to tooth movement or mobility, which is especially of consequence when implants are present in the same quadrant.

1) Crown Height

The crown height is the vertical cantilever or the lever. The greater the crown height, greater the movement of force under lateral loads. Because the stresses are concentrated at the crest of rigidly fixated implant, the crown height multiplier increases stress rapidly. For every 1mm crown height increase, force increase may be 20%. Therefore the crown height increased from 10-20% may increase the stress by 200%. As the bone resorbs, the crown height become larger, but the available bone height decreases. An indirect relationship is found between the crown and implant height which magnifies the stresses.



Fig. 1) Bone resorption occurs at the crest, increases the crown height results in more stresses.

These are responsible for the amount of force exerted on implant system. The dentist evaluates the several conditions under this heading: patient size, sex, age and skeletal position.⁶ The size of the patient can influence the amount of bite force. The larger athlete men generate greater forces; than patient of weak physical condition.

2) Position within the Arch

Maximum bite forces in the anterior incisor region range from 35 to 50 psi; those in the canine region range from 47 to 100 psi and those in the molar area range from 127 to 250 psi, Mansour et al⁷ in addition, the force at the second molar was 10% higher than at the first molar, indicative range from 140 to 275 psi.

3) Direction of Load

The direction of the occlusal load results in significant difference in the amount of force exerted on an implant. Forces are tensile, compressive, or shear to the implants. Bone is strongest to compressive forces, 30% weaker to tensile loads, and 65% weaker to shear loads; three dimensional stress analyses has shown that almost all the stresses occur in the coronal half of the implant bone interface. Much less stress occurs with vertical loads compared with the angled load on implant. Lateral forces represent the 50 -200% increase in stress compression as compared with the vertical loading.

4) Opposing Arch

Natural teeth transmit greater impact forces through occlusal contacts than do soft tissue-borne complete dentures. In addition maximum occlusal force with complete dentures is reduced and may range from 5 to 26 psi. Muscle atrophy, thinning of the oral tissues with age or disease, and bone atrophy often occurs in the edentulous patient as a function of time. Complete implant fixed prosthesis does not benefit from proprioception as do natural teeth. And patients bite with a force four times greater than with natural teeth.

STRESS FACTORS RELATED TO IMPLANTS

Available bone describes the amount of bone in the edentulous area considered for implantation. The amount of bone is measured in width, height, length, angulations, and crown height, implant body ratio for proper size of the Implant. Improper selection of implants in relation to available bone increases the stresses at the implant bone interface.

1) Size of the Implant

A) Implant Length-The Implant length corresponds to the height of available bone. Increased implant length is usually not significant at the crestal bone interface, but is beneficial for initial stability and overall amount of bone implant interface. Increased length also provides resistance to torque or

shear forces. An Implant 3 mm longer provides more than 10 % increase in surface area. This increased length does little to decrease the stress at Transosteal region around implant at crest of the ridge.⁸

B) Implant Width-The surface area of each implant is directly related to the width of the implant. Each 0.25 mm of implant diameter, the surface area increases by the 5% -8%. Past theories suggested that the implant height is more important than the width, but it is not true as occlusal load concentrates most at the crest of the bone, so implant width is more important.⁹

2) Implant Design

Threads are designed to maximize the initial contact, enhance surface area and facilitate the dissipation of stresses at the bone implant interface. Functional surface area per unit length of the implant may be modified by varying three thread geometry parameters: Thread Pitch, Thread Shape and Thread Depth.

A) Thread Number- A threaded implant with 10 threads for 10mm has more surface area than one with 5 threads.

B) Thread Depth- A thread depth of 0.2 mm has less surface area than-an implant with 0.4 mm.

C) Thread Shape- The thread shape is an important characteristic of overall thread geometry it include square, v shaped, buttress geometry. The shear force on v thread face is about 10 times greater than the shear force on square thread.



Fig 2) Increased number of Threads provides more surface area for less dense bone

3) Abutment Number

The overall stress on the implant system may be reduced by increasing the number of abutment over which the force is applied. The most effective method to increase the surface area of implant support is by increasing the number of implants used to support prosthesis. The force distributed over three abutments resulted in less stress to crestal bone than two abutments.

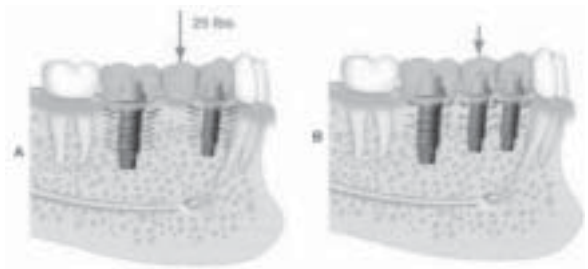


Fig 3) A) Two number abutments results in more forces. B) Three abutment reduces the stress transmission to bone.

4) Abutment Position

Implant positioning also is related to implant number because more than two implants are needed to form a biomechanical tripod, that is, not a straight line. The suggestion is that multiple units be placed in a staggered buccal Abutment offset (tripod effect). Cantilevers are force magnifier and represent a considerable risk factor. Therefore implant number and position should aim at eliminating cantilevers 'whenever possible, especially when other force factors are increased.

SUMMARY

FACTORS MAGNIFIES THE LOAD BY INCREASING THE FORCES ON ABUTMENTS

1	Parafunctional Forcesa) a) Bruxism	4-7 Times More Forces Than The Normal Bite Force
2	Crown Height Increase In 1mm Height	Force Magnifies By 20%
3	Masticatory-muscle Dynamics	Larger Buillt Person Generate More Forces
4	Directio Of Load a) Axial Load b) Lateral Load	Lateral Load Magnifies The Forces By 50-200%
5	Implant Prosthesis	4 Times More Forces Than The Natural Teeth

FACTOR REDUCES THE LOAD BY INCREASING THE SURFACE AREA OF THE IMPLANT

1	Implant Length- 3 Mm Increase In Length	10% Increase in Surface Area
2	Implant Width -0.25 Mm Incaresa In Width	5-10 Increase in Surface Area
3	Thread Depth	More Is The Thread Depth, More is the Surface Area
4	Increased Thread Number	increases the Surface Area
5	V Shape- Thread Design Exerts	10 Times Greater Shear Forces than the Square Thread Design

CONCLUSION

Complications and loss of implants can be costly, both in terms of time and financial resources. Loss of integration can be troublesome, resulting in an edentulous space more difficult to restore than prior to implant placement. The ability to reliably identify patients and conditions with greater potential for success would be valuable

REFERENCES

- Melanie RW and Stanley GV, A review of selected dental literature on evidence based treatment planning for dental implants: Report of the Committee on Research in Fixed Prosthodontics of the Academy of Fixed Prosthodontics, J Prosthet Dent 2004; 92:447-62.
- Bidez MW, Misch CE: Force transfer in implant dentistry: basic concepts and principles, Oral Implantol 18:264-274, 1992.
- Jaffin R, Berman C: The excessive loss of Branemark fixtures in type V bone: a 5 year analysis, J Periodontol62: 2-4, 1991
- Gibbs CH, Mahan PE, Mauderli A, et al: Limits of human bite force, J Prosthet Dent 56:226-229, 1986.
- Kydd WL, Toda JM: Tongue pressures exerted on the hard palate during swallowing, Am Dent Assoc 65:319, 1962
- Howell AH, Bruderold F: Vertical forces used during chewing of food, J Dent Res 29:133, 1950
- Mansour RM, Reynik RJ, and Larson PC: Piezoelectric transducers for biting force measurements! PhD thesis. In Abstracts of the twenty-seventh ACEMB, 1974.
- Weinberg LA, Kruger B: An evaluation of torque on implant/prosthesis with staggered buccal and lingual off- set, Int J OralMaxillofacImplants16:253, 1996.
- Sertgoz A, Guvener S: Finite element analysis of the effect of cantilever and implant length on stress distribution on implant supported prosthesis. J Prosthet Dent 165-169, 1996.

A SIMPLE TECHNIQUE FOR REMOVING CEMENT RETAINED IMPLANT PROSTHESIS IN CASE OF ABUTMENT SCREW LOOSENING- A CASE REPORT

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ABSTRACT

With the increased use of cement-retained implant-supported restorations for the replacement of missing teeth, clinicians may choose to use a definitive cement to lute the implant restoration. A complication that may occur, especially for a single-tooth replacement, is loosening of the abutment screw. In those situations, it may be difficult to remove the cement retained restoration. The purpose of this article is to describe a technique that may facilitate the clinician's ability to easily remove the cement retained prosthesis, by creating an occlusal access hole without causing any damage to the implant. The article also highlights the precautions to be taken to minimize the incidence of abutment screw loosening.

Outline

Several studies have evaluated the advantages and disadvantages of screw-retained and cement-retained implant-supported restorations.^{1,2,3&4} The use of definitive or provisional cements for the cementation of implant-supported restorations is an acceptable alternative to screw-retained implant-supported crowns.⁵

Cement retained implant prosthesis offer several advantages over screw retained implant prosthesis. These include more passive castings, improved direction of loads, easier manipulation in posterior regions especially in patients with limited mouth opening & enhanced esthetics.⁶ The statement that screw retained prosthesis is retrievable and cement retained is not, is far from true. The access hole for prosthetic screw in screw retained prosthesis is often obturated with composite. This requires the clinician to remove the composite obturation before gaining access to prosthetic screw. All this involves considerable chair side time. On the other hand, a cement retained implant prosthesis, even when luted with definitive cement is still retrievable because unlike tooth, the cements do not chemically adhere to the underlying metallic abutments here. Also the metallic abutment is totally free of undercuts which is a possibility in prepared tooth especially if it was previously restored.⁶

But the real challenge is removing a cement retained prosthesis when the underlying abutment screw has loosened. The possibility of using a regular crown remover is ruled out here because rather than cement abutment interface, the stress here would be transmitted to the loosened abutment screw. This can result in a more serious complication of abutment screw fracture. The other standard procedure of removing prosthetic crowns from natural teeth involves sectioning the prosthetic crown mid facially to try breaking the cement seal and then pulling the sectioned crown out with some instrument like scaler. This too has a limited value in case of cement retained implant prosthesis since the metal of the restoration is much thicker in this case. Secondly this involves the risk of damaging the abutment screw head making it practically non retrievable.

Few techniques have been described in literature for retrieving cement retained prosthesis including the one involving, putting a stain on ceramic restoration occlusally to indicate the location of abutment screw.⁷ This article describes a simple, innovative and predictable procedure of removing a cement retained prosthesis in the event of abutment screw loosening.

Clinical case

A male patient aged 38 years reported to Dept.

of Prosthodontics, Himachal Dental College. The patient had undergone implant surgery in 45 region and also received a prosthesis for the same at a private clinic. But subsequent to prosthesis placement, the patient noticed some movement in the prosthesis within 2 days. The patient as well as the clinician perceived this as an implant failure and the patient was referred to the hospital to do the needful.

The X rays of the patient did not reveal any obvious bone loss to call it an implant failure. There was no abscess formation as well. On evaluation it was found that patient had no pain on movement of prosthesis. Also there was limited movement of prosthesis in the vertical direction. All this pointed towards the possibility of abutment screw loosening. Further examination revealed that there were definite occlusal prematurities on implant prosthesis. So it was decided to remove & replace the prosthesis. The technique followed is elaborated below:

Technique:

1. Used sharp carbide to cut through ceramic & metal part of crown on 45 occlusally. As soon as the metal coping is perforated the sealer over abutment screw head was seen. (fig.1, fig.2)
2. On visualizing the sealer, the drilling procedure was stopped to prevent any harm to abutment screw.



Fig. 1



Fig. 2

3. The other thing, clinician has to be worried about is fracture or damage to the abutment screw, because of the movement of abutment during drilling. It has been suggested, in literature, to hold crown tightly with hemostat to minimise movement. But in reality it can be tricky to do the same. We have instead devised a different method to hold the restoration with abutment in place. A putty index (poly vinyl siloxane addition silicone) was created over the faulty implant restoration and the adjoining teeth. Then the index was sectioned over the implant restoration making way for the air rotar carbide bur. This index when held in mouth stabilises the implant restoration in place. Additionally it also aids in tongue and cheek retraction during the procedure.(fig. 1, fig.2)
4. After removing the sealer the abutment screw was removed with hand driver (fig.3) and cemented crown was removed along with the abutment.
5. A fresh abutment was used and a new metal ceramic crown was fabricated with correct occlusion.



Fig. 3

6. Abutment screw was torque tightened with torque wrench (fig.4) to 22.5 N cm. As recommended in literature we waited for 10 min before retightening the screw again to the same value. As expected the screw does loosen a bit after the first tightening.



Fig. 4

7. The new restoration was then cemented in place in 45 region after checking occlusal accuracy.(fig.5, fig.6)



Fig. 5



Fig. 6

Discussion

The patient was told by the clinician that the occlusal discrepancy would settle down within a week or so with the opposing dentition wearing off a bit in natural course. This was probably the point where the clinician went wrong. Scientific literature shows that there are two prime causes of abutment screw loosening:

1. **Occlusal over load:** Screw loosening has been reported to occur with a three-year frequency of from 3 percent to 38 percent in screw-retained posterior restorations. Screw loosening is more likely in single-unit restorations, and can often be related to excessive loading. Screw loosening occurs when compressive occlusal forces are higher than the tension in the screw-implant assembly that holds the components together (the clamping force).
2. **Insufficient torque tightening:** Most standard implant kits have a hand driver to tighten the abutment screw. Or they make use of a non calibrated ratchet to tighten the abutment screw. But almost all standard companies sell a prosthetic implant kit separately which includes a torque wrench. Though expensive, torque wrench is considered indispensable by most dentists who restore implants. Companies recommend that abutment screw be tightened to a particular value which usually ranges between 20 to 40 N cm depending upon the system. Such torque values are not predictably achievable with hand drivers or non calibrated ratchets. Torque tightening the abutment screw creates a pre load in the same, which can predictably hold together the abutment and implant assembly.

Variation to the above technique involves simply retightening the abutment screw after gaining access to the same and filling the access hole with composite. But literature suggests that if a screw is tightened once to the recommended value, it stretches a little thus creating a pre load. The same pre load is not achievable again. Also the screw might have undergone some deformation due to prosthesis movement after screw loosening. Also the possibility of patient accepting a repaired crown is remote since implant patient is usually a highly conscious and demanding patient for right reasons.

To make use of the same abutment, the abutment with the cemented crown can be kept in porcelain furnace at standby temperature (normally 400 C degree or less). Close it without running a baking program for five to ten minutes.

Open the furnace, hold the Crown with a large hemostat (screw facing down), hit the hemostat with an object like another hemostat and the abutment might fall off. Be cautious because they are hot!

But we did not follow the procedure because of reluctance of the company to supply us abutment screw separately (without abutment)

Summary:

As clear from the discussion the clinician has to be very thorough with the occlusal concepts in implant dentistry. Also, the article highlights the need for using accessory prosthetic torque wrench to tighten the abutment screw. A simple procedure for replacing the cement retained prosthesis has been outlined in case the screw loosening complication occurs.

References:

1. Goodacre CJ, Kan JY, Rungcharassaeng K. Clinical complications of osseointegrated implants. *J Prosthet Dent* 1999;81:537-52.
2. Chee W, Felton DA, Johnson PF, Sullivan DY. Cemented versus screw retained implant prostheses: which is better? *Int J Oral Maxillofac Implants* 1999;14:137-41.
3. Hebel KS, Gajjar RC. Cement-retained versus screw-retained implant restorations: achieving optimal occlusion and esthetics in implant dentistry. *J Prosthet Dent* 1997;77:28-35.
4. Michalakis KX, Hirayama H, Garefis PD. Cement-retained versus screwretained implant restorations: a critical review. *Int J Oral Maxillofac Implants* 2003;18:719-28.
5. Breeding LC, Dixon DL, Bogacki MT, Tietge JD. Use of luting agents with an implant system: part I. *J Prosthet Dent* 1992;68:737-41.
6. Misch CE. Principles of cement retained fixed implant prosthesis. In: Misch CE. *Implant Dentistry*. 2nd ed. Mosby: Elsevier; 1999. p. 550-4.
7. Schwedhelm, Ariel J. Raigrodski. A technique for locating implant abutment screws of posterior cement-retained metal-ceramic restorations with ceramic occlusal surfaces *J Prosthet Dent* 2006;95:165-167.

BEWARE ! YOUR PHONE IS 'BUGGED'

**Mobile phones of dental professionals a potential source of bacterial contamination —
A Bacteriological Study**

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INTRODUCTION

Mobile phones are being used in all aspects of health care delivery. They are the much preferred and most used routes of communication. However one aspect that has not been covered is the bacterial contamination of mobile phones. They are particularly susceptible to this as they are in close contact with mouth, nose, ears, hands and various clinical environments. Further keeping the mobile phones in pockets, handbags and snug pouches increases the possibility of bacterial proliferation due to warmth and ideal temperature conditions. Mobile phones are continuously used all day long but never cleaned. Further there are no guidelines for proper disinfection and decontamination of mobile phones thus mobile phones act as reservoirs of infection which may proliferate from patient to patient in a hospital setting.

First it was hand washing, then it was cleaning of floors and walls, now it has come to light that disease producing bacteria colonize on the dentist's mobile phones. Cell phones are being increasingly used for communication as they are inexpensive, small and very handy during emergencies. As early as 1861 Semmelweis demonstrated that bacteria were transmitted to patients by hands of health care workers. Mobile phones of dental professionals harbour harmful pathogens and cause severe nosocomial infections. Thus etiological agents of nosocomial infections have found a unique, significant and perfect way to spread in dental care facilities.

Mobile phones are an important part of dental care and patient management as is the airorater, scaler, etc. While the latter are disinfected, the cell phones are not even cleaned and thus they act as reservoirs and transporters of bacteria from one clinic to another and from one patient to another.



Emergencies in day to day dental practice are excessive and in a hurry the dental professional takes up an emergency call without proper hand hygiene being maintained. This becomes even more significant as even the smallest dental examination involves contact with saliva; and gingival fluid, nasal and mouth breath all potential disease producers as all are in close proximity with the mobile phone. Further the aerosol produced by the airorater and scaler are a mixture of saliva and blood which can transmit bacteria over a considerable distance and these bacteria get harboured in nasal and ear cavities and then get transferred to the mobile phone. Due to this aerosol the mere presence of mobile phone in clinic, can lodge bacteria in them and get transferred with the dental professional moving from one clinic to the other. So this study was to investigate the rate of bacterial contamination of mobile phones of dental professionals working in a tertiary dental care facility where dental teaching and complete dental care and treatment is being provided.

MATERIALS AND METHODS

The study was conducted over for a period of six months from Jan 2009 to May 2009 at Himachal Dental College and Hospital, Sundernager H.P

The control group consisted of 200 attendants of patients in O.P.D's not working in any health care setting and continuously using the mobile phone for atleast fifteen days and who consented for sample collection without prior intimation. .

The test group included 200 dental professionals working in various areas of the hospital. These included 110 dental doctor's (Senior Consultants ,Junior Consultants , Demonstrators ,House Surgeons , Interns) 60 Dental Paramedics (Dental Technicians, Dental Hygienist, Dental Chairside Assistants, Dental X-ray Technicians). 30 other hospital staff (Nurses , Safaikaramchari)

Hospital area wise distribution of test sample included 148 from clinics (Oral Diagnosis , Oral Surgery , Periodontics, Paedodontics , Orthodontics ,Operative Dentistry , Prosthodontics , Oral Radiology) , 5 from Wards (Oral Surgery), 20 from Special Surgeries (Oral Surgery , Periodontics, Paedodontics , ,Operative Dentistry), 3 from central sterilization room, 24 from post graduate clinics , (Periodontics, Peadodontics , Orthodontics ,Prothodontics).

SAMPLE COLLECTION

A sterile cotton swab moistened with demineralized water was rolled over all the exposed outer surfaces of the cell phones which were being used for at least 15 days. Care was taken to make sure that all the buttons of the keypad , mouth piece, earpiece were properly swabbed since these areas are the most frequently in contact with the fingers.

TRANSPORTATION & INOCULATION OF THE SAMPLE

These swabs were transported in sterile tubes containing Cary-Blair transport medium. Later subcultures were made in 5% sheep blood agar, Eosin Methylene –Blue agar and Sabouraud Dextrose Agar.(Hi Media India) Plates were incubated aerobically at 37⁰ C for 24 -48 hours for bacteriological investigation and at room temperature for two weeks for mycological investigation .

Isolated microorganisms were identified using gram stain, colony count, and morphology. Bacteria were identified according to standard

protocol (Mackie and McCartney). Test for identification of gram+ cocci included catalase , Oxidative/Fermentative test, anaerobic mannitol fermentation and coagulase production. A slide coagulase test differentiated staphylococcal isolates into Staphylococcus aureus and coagulase-negative staphylococci (CoNS). Methicillin sensitive staphylococci (MSSA) and Methicillin resistant staphylococci (MRSA) were differentiated by testing with an oxacillin 1 microgram disk on Muellen –Hinton agar with 4% NaCl and incubated at 35⁰ C for 24 hours as oxacillin is an analogue of methicillin .

Streptococci were differentiated in to alfa and beta hemolytic groups based upon production of heamolysis on 5% sheep blood agar.

For identification of gram negative bacteria a battery of biochemical tests were done. Ceftazidime sensitivity of the gram negative isolates were investigated by disk diffusion method. Swabs were cultured for fungi on Sabouraud's dextrose agar and stained with lactophenol cotton blue and further identified by gram staining and KOH wet mounts . Antibiotic sensitivity was done using Kirby –Bauer disc diffusion method on Mueller-Hinton agar.

RESULTS

Bacteriological analysis of 200 test Samples revealed that, 189 (94.5%) of them were infected with micro-organisms. Bacteria isolated from mobile phones mainly included; methicillin Sensitive Staphylococcus, (MSSA), Methicillin Resistant staphylococcus aureus, (MRSA) coagulase negative staphylococci,(CONS) micricoccus sp, streptococcus viridans, enterococci spp., Neisseria spp. candida spp; All of these are known to cause nosocomial infection. The number and type of isolates from use of mobile phone of dental professionals of the test group and control group are compared in Table I

Further it was found that 54% of mobile phones in the test group were vested with at least one type of bacteria ; 35% carried two types of bacteria and more than 11% carried three or more group of microorganisms much more than the control group as shown in table II

Table I : Distribution of isolated bacteria from test samples as compared with control groups.

Microorganismis	Normal habitat on human body	Morphology	Test group N=200	
I Staphylococcus. MRSA MSSA CONS	Anterior Nares, Skin , skin glands, Skin wound & mucous , and conjunctiva	Gram positive cocci	174	120
II Micrococcus	Skin and Mucous membrane	Gram positive	45	25
III Streptococci Streptococci Viridans Alph - hemolytic) Enterococci (y- Hemolytic	Oral cavity, oro pharynx Skin , URT, gastrointestinal Tract Genito Urinary tract .	Gram positive cocci	26	10
IV Neisseria spp.	Upper respiratory tract	Gram negative cocci	22	Nil
V Candida spp (Yeast like)	Skin , nails and mucosa.	Gram positive fungi	15	12
VI Moulds		Gram positive Fungi	16	10

Table II : Number of cell phones that showed multiple organisms

No of microorgisms isolated	Test group N=200	Control group N = 200
None (no growth)	Nil	70
One type	108	105
Two type	70	14
Three or more types	22	1

In the control group more number of samples showed one type of microorganism as compared to test group showing that dental professionals have greater potential of bacteriological transfer.

Methicillin Resistant staphyococcus aureus, (MRSA) was found in 29% of dental professionals

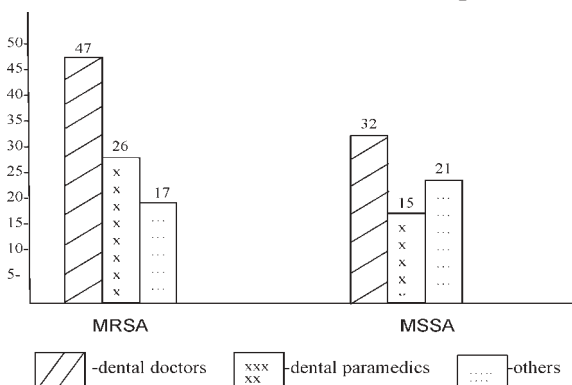


Figure 1 : Methic illin Resistant S taphylococcus aureus (MRSA) and methicillin sensitive staphylococcus aureus (MSSA) Distribution in Dental Professionals

test samples . More worring was that one in every eight handsats showed Methicillin Resistant staphyococcus aureus, (MRSA) a major virulent

strain for nosocomial infections . The control group showed much less presence of MRSA and MSSA thus less chances of bacterial contamination.

Dental professional wise, these deadly pathogens were found on mobiles phones of 58 dental doctors, 26 Dental paramedics and 17 others (Nurses and SafaiKaramcharis)

Hospital area wise distribution of Methicillin Resistant Staphylococcus Aureus showed.

- 37 Dental professionals working in Operative Dentistry
- 32 Dental professionals working in Periodontics
- 27 Dental professionals working in Oral Surgery

and the rest of departments had a nearly equal no. of cases as shown in

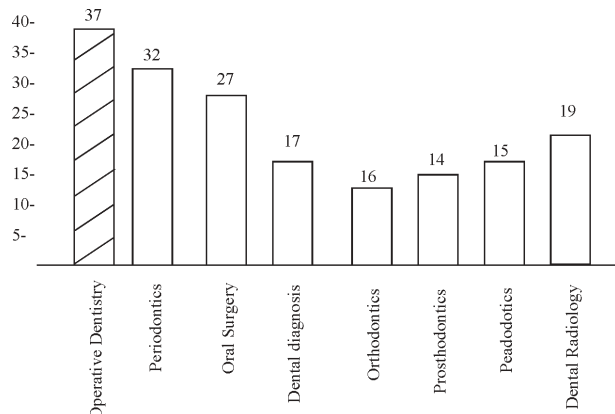


Figure 2 : Department wise distribution of MRSA

DISCUSSION

This study showed that pathogens which could cause deadly infections were loaded on mobile phones of dental professionals thus indicating that mobile phones of dental professionals were significant vectors on propagation of cross infection. Further it was found that mobile phones of dental professionals were infected with more than three types of virulent pathogens. One in every eight mobile phone of dental professionals showed the presence of MRSA. This indicated that mobile phones of dental doctors were more susceptible and bigger transmitter of pathogens, as perhaps they were directly dealing with patients; doing large number of patients; in direct contact with blood, pus, saliva, and gingival fluid; always working in close proximity with patients, contacting with their mouth and nasal breath and perhaps keep more than one mobile phone.

Hospital area wise distribution of MRSA showed that dental professionals working in Operative Dentistry, Periodontics, and Oral Surgery were greater transmitter of microorganisms. The reason for this may be that aerosol mixed with blood, pus, saliva and gingival fluids was produced more in these departments. Pus is known to have larger number of staphylococci. Aerosol of airoters and scalers were potentially hazardous as it could cover greater areas and along with it take harmful pathogens to larger areas of the clinic. Thus the mere presence of mobile phone in the clinic could be potentially significant in the cross infection.

CLINICAL SIGNIFICANCE & PATHOGENICITY OF MICROORGANISMS FOUND IN THE STUDY

Staphylococcus is present in almost 1/3 of adult human population as asymptotically. Man being the principal reservoir of staphylococcus which spreads by direct contact or air borne both of which are significant for bacterial transfer from mobile phones. Staphylococcal infection can never be eradicated because of its carrier state in man. They are normally present in anterior nares, skin, skin gland, mucous membranes and conjunctiva all in close proximity to mobile phone. Health care workers are known to show

higher incidence of carriage of *Staphylococcus Aureus*. It causes diseases like boils, Carbuncles, Furuncles, microabscesses, pneumonia, food poisoning, & septicemia especially in diabetic and immunocompromised patients.

Streptococci Veridance, though a normal commensal of mouth, throat and respiratory tract all again in close proximity to mobile phone can cause diseases like bacterial endocarditis, & sepsis. Dental carries is caused by streptococci mutans, *Streptococci metor* and *streptococci sanguis*, strains of streptococci.

Enterococci *faecalis* & *enterococci faecium* of enterococci spp, from human faeces and wounds are documented to cause deadly infection like UTI, infective endocarditis, Biliary tract infection peritonitis, septicemia, & suppurative abdominal lesions. Poor hand washing after faecal discharge and wound scratch, leads to incorporation of these bacteria on to hands and nails can subsequently spread by mobile phones,

Branhamella a Catarrhalis, a gram negative cocci of **Neisseria spp.** are opportunistic pathogen thriving as normal commensals of upper respiratory tract of man are known to cause diseases like otitis media, sinusitis, pneumonia in children and can get transferred from mobile phones to ears and sinuses of other patients and doctors.

Candidiasis is an opportunistic endogenous infection caused by **Candida spp.**, a gram negative fungi. It is the commonest mycosis involving skin and its appendages and mucosa. Mucocutaneous lesions like oral candidiasis, esophageal candidiasis, conjunctivitis and keratitis can spread through mobile phones as fungi and their spores grow well in deep crevices and holes of mobile phones. Skin and nail infection have huge number of candida spp., which can get transferred to the mobile phones when in contact and subsequently be transferred to other patients.

The warmth of the body, handbags, snuggpouches, further potentiates the growth, colonization and proliferation of these virulent pathogens. Food particles from unclean hands provide excellent media for growth of microorganisms as mobile phones are every minute

part of our daily life. Sweat from hands and other body parts in a tropical country like ours also acts as excellent medium for transportation and growth of microorganisms .

Similar studies conducted by Brady RRW et al, and Karabay O et al , Indicated that the presence of gram negative bacilli from mobile phones was less ie 4.76% and 7.2% respectively ^{14,15}. Khivsara et al reported 40% contamination of mobile phones by staphylococcus in health care works in Manglore hospital ¹⁶. In another study Karabay et al 2007 reported that E coli, Bacillus Spp, Coagulase negative Staphylococcus which are agents of nosocomial Infections have been Isolated from mobile phones of healthcare personnel. ²⁰ In Nigeria, Ekraena and Igeleke (2007) reported that S. Aureus, B. Subtilis, E aerogenes were found in mobile phones of health care staff ¹⁹. Studies have reported that objects like stethoscope, patient files bronchoscope and ball points are vectors for potentially pathogenic microorganisms from health care workers to patients ^{2,3,4,5}. The potential of cell phones as fomites for hospital infection has shown the presence of Methicilin sensitive Staphylococcus aureus (MSSA), coliforms, methicillin resistant Staphylococcus aureus (MSSA), Corynebacterium spp. Enterococcus faecalis, Clostridium perfringens, Klebsiella spp, Enterobacter spp, Pseudomonas spp, Aeromonas spp, Acinetobacter and Stenotrophomonas maltophilia. ^{1,12,14}. Similarly Brady et al said 14% of mobile phones showed growth of pathogenic bacteria³. In other studies bacterial flora on cell phones showed lower rates of contamination, ranging from 7-14.3% which included MSSA, MRSA, coliforms , Enterococcus faecalis, Clostridium perfringens, Acinetobacter spp, Stenotrophomonas maltophilia, Pseudomonas spp. and Aeromonas spp ^{1,8,14}.

Comparing these studies with our study a higher percentage (42%) of mobile phones samples were found to be contaminated and 29% of dental professionals had MRSA growing in their mobile phones which we have compared to MRSA isolates from skin and soft tissue infection of about 18% was significantly higher.

So this study highlights that mobile phones as a potential threat in infection control practices

and could exaggerate the role of dental health care associated infection, suggesting that microbial contamination of mobile phones have an epidemiological risk. Further there are no guidelines for care cleaning and restriction of mobile phones in our dental care settings. It is pointed out that dental professionals should pay special attention to hand hygiene as we believe that repeated hand washing is the simplest and most economical measure to prevent transfer of harmful pathogens although hand hygiene is greatly over looked and under emphasized in dental care facilities .

The present study did not check the efficacy of various chemical disinfectants for cleaning of mobile phones which needs to be done in future. Further investigations are also required to substantiate the role of mobile phones in transmission of pathogens as this would help to reduce the risk of spread of virulent bacteria from cell phones.

CONCLUSIONS

This study resulted in the following conclusion;

1. 94.5 % mobile phones of dental professionals demonstrated evidence of bacterial contamination with at least one type of bacterial with the potential of causing illness ranging from minor skin rash to deadly disease .
2. Mobile phones of dental professionals when compared with mobile phones of people not related to medical services were found to have greater potential of pathogen harbour, colonization , proliferation and transfer from one place to another .
3. Regular and thorough hand washing before and after use of cell phone while doing dental procedures greatly reduces chances of spread of infectious disease .
4. Regular and repeated decontamination of mobile phones with alcohol containing disinfectant wipes, antibiotic sprays with special attention to mouth piece and keeping mobiles phones in U.V. chambers is are simple methods to reduce bacterial spread.

5. Stress on the use of antimicrobial additive materials for mobile phones is another way to reduce bacterial infection e.g Cellophane lamination of mobile phones reduces crevices where bacteria can harbor as well as makes mobiles easy to clean.
6. Finally use of cell phones in hospital setting should be strictly limited to emergency calls only as this would greatly reduce cross infection.
7. Lastly creating awareness among dental personnel regarding the role of mobile phones as fomites in transmission of nosocomial infections would go a long way in nosocomial disease preventoin.

REFERENCES

1. Rafferty KM, Pancoast S. Bacteriological sampling of telephones and other hospital staff hand-contact objects. *J Infect control*. 1984 ;5 (11) :533-5
2. Boyce JM, Opal SM, Chow JW, et al. Outbreak of multidrug-resistant *Enterococcus faecium* with transferable vanB class vancomycin resistance. *J Clin Microbeol*. 1984;32;1148-53.
3. Panhotra BR, Saxena AK, Al-Mulhim AS. Contamination of patients' files in intensive care units: an indication of strict handwashing after entering case notes. *Am J Infect Control*. 2005;33(7):398-401.
4. Sorin M, Segal-Maurer S, Mariano N, et al. Nosocomial transmission of imipenem-resistant *Pseudomonas aeruginosa* following bronchoscopy associated with improper connection to the Steris system 1 processor. *Infect control. Hosp Epidemiol*. 2001;22;409-13.
5. Datz C, Jungwirth A, Dusch H, et al. What's on a doctors' ball point pens? *Lancet*. 1997;350:1824.
6. Wilker PA, Cockerill FR, Craig WA. Performance standards for anti-microbial susceptibility testing: Clinical and laboratory standards institute. 15th informal supplement. 2005. M 100-S15. 25(1).
7. Wayne PA, Khivsara A, Sushma TV, Dhanashree B. Typing of *Staphylococcus aureus* from mobile phones and clinical samples. *Current science*. 2006;90(7):910-12
8. Cathleen M, Braddy MD, Janis E, Blair MD. Colonization of personal digital assistants used in a health care setting. *American J Infect Control*. 2005;33:230-2.
9. Dar JA, Thoker MA, Khan JA et al. Molecular epidemiology of clinical and carrier strains of methicillin resistant *Staphylococcus aureus* (MRSA) in the hospital settings of north India. *Ann Clin Microbiol Antimicrob*. 2006;5:22.
10. Singh D, Kaur H, Gardner WG, Treen LB. Bacterial contamination of hospital pagers. *Infect Control Hosp Epidemiol*. 2002;23(5):274-6.
11. Pittet D, Boyce JM. Hand hygiene and patient care: Pursuing the Semmelweis legacy. *Lancet Infect Dis*. 2001;9:20.
12. Brady R.R, Fraser SF, Dunlop MG, Paterson –Brown, Gibb AP. Bacterial contamination of mobile communication devices in the operative environment. *J Hosp Infect* 2007; 66:397-8.
13. Clinical and Laboratory Standards Institute, Performance standards for antimicrobial disk susceptibility tests; Approved standard, 2005, vol.25, 8edn, Mo2-A8th.
14. Brady RR, Wasson A, Stirling I, Mc Allister C, Damani NN. Is your phone bugged? The incidence of bacteria known to cause nosocomial infection on healthcare worker's mobile phones. *J Hosp Infect* 2006;62:123-5.
15. Karabay O, Kocoglu E, Tahtaci M. The role of mobile phones in the spread of bacteria associated with nosocomial infections. *J Infect Developing countries* 2007;1:72-3 .
16. Khivsara A, Sushma T, Dhanashree B. Typing of *Staphylococcus aureus* from mobile phones and clinical samples. *Curr Sci* 2006;90:910-2 .
17. Gupta V, Datta P, Sngla, Skin and soft tissue infection : Frequency of aerobic bacterial isolates and their antimicrobial susceptibility pattern. *J Assoc Physicians India* 2008;56:389-90.
18. Jaske HC, Tiefenthaler W, Hohlieder Anteking G, Benzer A. Bacterial contamination of anaesthetist's hands by personal mobile phone and fixed phone use in the operating theatre. *Anaesthesia*: 2007; 62; 904-6.
19. Ekkrakene, T. and C.L. Igelake, 2007 .Micro-organisms associated with public mobile phones along bening-sapele express way, Benin Ciry, Edo State of Nigeria. *J. Applied Dci. Res*, 3:2009 -2012.

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