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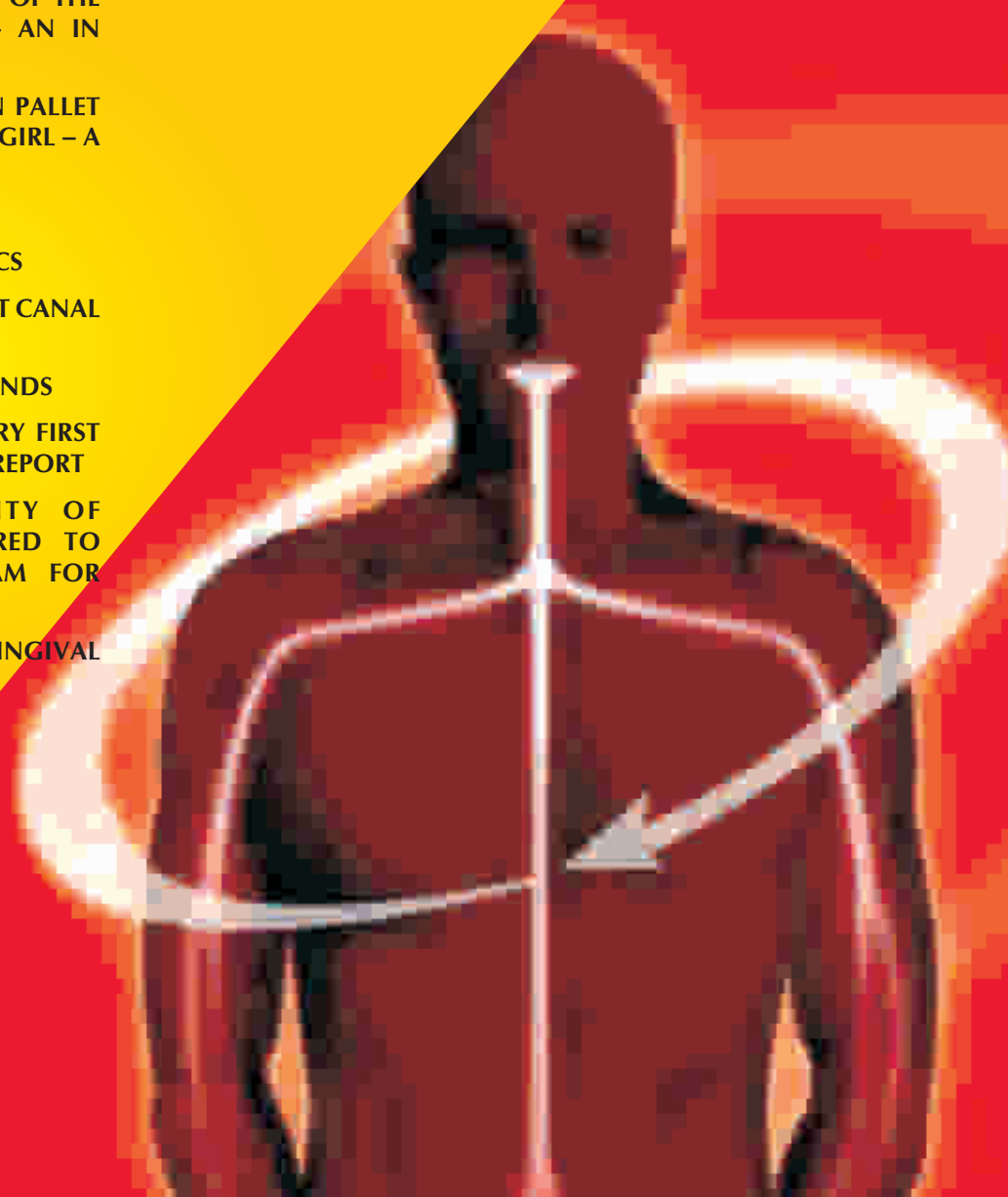

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FROM THE EDITOR

SWINE FLU AND DENTISTRY

The 2009 H1N1 flu continues to cause havoc across the country. As of January 1, 2010, samples from 112766 persons have been tested for influenza A H1N1 swine flu in government laboratories and a few private laboratories across India of which 26039 or 23.09% of them have been found positive, according to release from Ministry of Health and Family Welfare, Government of India.

A total of 967 lab confirmed cases of deaths from H1N1 swine flu influenza virus infection have been registered in India. In view of this grave nature of this pandemic it becomes the duty of a dental professional to curtail the spread of infection in every possible way. A dental professional can minimize the spread of infection by following these simple measures.

Staff should offer a disposable surgical mask to persons who are coughing, or provide tissues and no-touch receptacles. The ill person should wear a surgical mask when outside the patient room.

Dental healthcare personnel assessing a patient with influenza-like illness should wear disposable surgical facemask, non-sterile gloves, gown, and eye protection (e.g., goggles) to prevent direct skin and conjunctival exposure.

Patient and dental healthcare workers should perform hand hygiene (e.g., hand washing with non-antimicrobial soap and water, alcohol-based hand rub, or antiseptic hand wash) after having contact with respiratory secretions and contaminated objects/materials.

Routine cleaning and disinfection strategies used during influenza seasons can be applied to the environmental management of swine influenza.

Staff experiencing influenza-like-illness (ILI) (fever with either cough or sore throat, muscle aches) should seek medical care.

Staffs who were not using appropriate personal protective equipment during close contact with a confirmed, probable, or suspect case of swine influenza A (H1N1) virus infection during the case's infectious period should receive chemoprophylaxis.

Dentists and staff should attempt to make appointments as pleasant and expedient as possible without spreading the virus. Through proper safety measures, it should be completely safe to continue to pursue proper oral care.

Lets us all make a sincere effort to make 2010 a swine flu free year.

Dr Rajan Gupta

A CASE WITH BILATERAL SUPPLEMENTAL MAXILLARY LATERAL INCISORS

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ABSTRACT

Most Supernumerary teeth are located in the anterior maxillary region. They are classified according to their form and location. A case with bilateral supplemental maxillary Lateral incisors is presented. The etiology, types and treatment alternatives are discussed

Key words: Supernumerary teeth, Supplemental lateral incisors

INTRODUCTION

Supernumerary teeth are those that are additional to the normal compliment. Supernumerary teeth, also called hyperdontia, may occur unilaterally or bilaterally, single or multiple and in one or both jaws. They may occur in any region of the dental arch with predilection for premaxilla[1,2] . According to Bodin et.al [3] the commonest site for hyperdontia is premaxilla with prevalence of 1.57%. The etiology of hyperdontia is unclear. Several theories have been suggested regarding their etiology, hyperactivity of dental lamina is being most supported by literature [1,4,5] .Among other theories are:

- Atavism , a reversion to a more primitive type of dentition [6].
- Dichotomy theory by Taylor[7], which states that tooth bud splits in to two equal or differently size parts, resulting in two teeth of equal size or one normal and one abnormal tooth.
- Heredity: Many authors have suggested inheritance as a key factor in the development of supernumerary teeth, as these are more common in the family of the affected children than in general population [8,9]. While there may be a genetic influence, this does not appear to follow a simple Mendelian pattern [10].

Prevalence: Supernumerary teeth have been reported in both the primary and the permanent dentitions. The reported prevalence of supernumerary teeth in the general Caucasian population for the permanent dentition ranges from 0·1 to 3·8% [1,11] . The prevalence of supernumerary teeth is lower in the primary dentition and is said to be 0·3–0·8%[2,7,]. Hyperdontia in the primary dentition is often overlooked because supernumerary teeth are often of normal shape, erupt normally and appear to be in proper alignment; and can be mistaken for gemination or fusion anomalies [12].

Although cases of multiple supernumerary teeth have been reported [13–14], they are rare, as are multiple supernumerary teeth in individuals with no other associated diseases or syndromes [15-16]. The conditions commonly associated with an increased prevalence of supernumerary teeth include Cleft lip and palate, Cleidocranial dysostosis, Gardner's syndrome, Fabry Anderson's syndrome, Chondroectodermal dysplasia and Ehlers– Danlos syndrome.

Classification: Supernumerary teeth may be classified according to morphology and location [17,18] . In the primary dentition, the morphology is usually normal or conical. The morphology of supernumerary teeth presenting in the permanent dentition is more variable, with the following four morphological types being described:

- Conical: This small peg-shaped conical tooth is the most common supernumerary found in the permanent dentition. It develops with root formation ahead of, or at an equivalent stage to, that of permanent incisors and usually presents as a mesiodens between the maxillary central incisors, but rarely erupts labially.
- Tuberculate: This type of supernumerary, that is

larger in size than the conical tooth, possesses more than one cusp or tubercle.

- Supplemental: The supplemental supernumerary refers to duplication of teeth in the normal series and is found at the end of a tooth series.
- Odontoma: Despite not being universally accepted, most authors agree that odontoma represent a hamartomatous malformation.

Bilateral supplemental maxillary lateral incisors have previously been described in the literature [19,20] , but are regarded as an unusual finding. A case of non syndromic, bilateral supplemental type of supernumerary lateral incisors is presented.

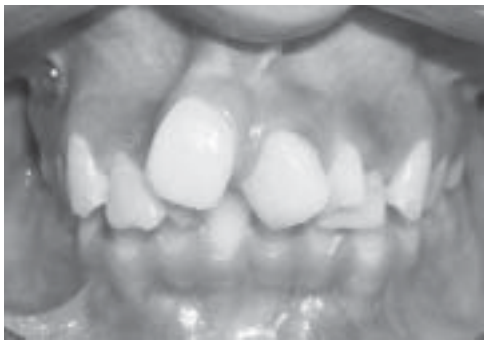
CASE REPORT

A seventeen year old girl reported to the department of orthodontics with the chief complaint of irregularly placed upper front teeth. On intraoral examination she presented with complete set of permanent dentition in both maxillary and mandibular arches except third molars with presence of supernumerary supplemental bilateral lateral incisors having morphology similar to that of permanent maxillary lateral incisors (Fig 1,2&3).

The lateral incisors were similar in size with marked anterior crowding. There was no significant past medical history nor were there clinical signs of any recognized syndrome associated with multiple supernumeraries. She had mild class II div2 malocclusion with marked upper arch crowding. The teeth present in the mouth were 11, 12, 12S, 13, 14, 25, 26, 27, 21, 22, 22S, 23, 24, 25, 26, 27, 31, 32, 33, 33, 34, 35, 36, 37, 41, 42, 43, 44, 45, 46, 47.)

An OPG radiograph was taken which revealed complete root configuration with sound periodontium in relation to all four lateral incisors (bilateral maxillary lateral incisors and their supplemental twin Fig 3). The crown and root morphology of both right and left lateral incisors and supplemental teeth were identical.

Management : Treatment depends on the type and position of supernumerary tooth and on its effect on adjacent teeth. Management of supernumerary tooth should be part of comprehensive treatment plan and should not be



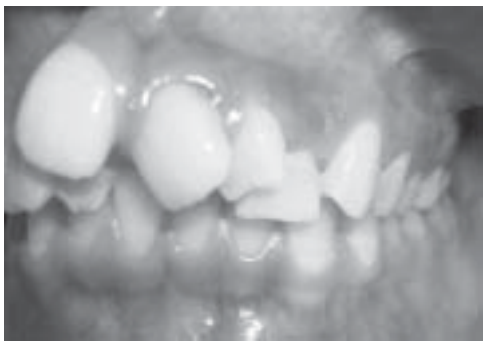


Fig 1&2: Intraoral photographs showing supplemental lateral incisors

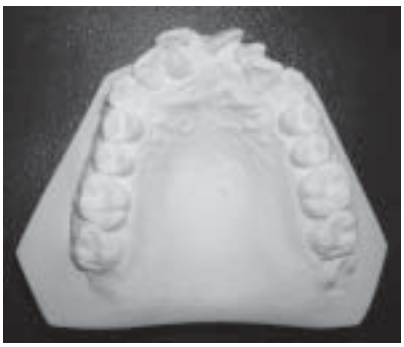


Fig3: Maxillary Cast showing Bilateral supplemental lateral incisors

considered in isolation. Usually it is difficult to distinguish the normal tooth from its supplemental twin. Supplemental supernumerary teeth should be observed till the child is old enough, if it is not interfering with the development and eruption of adjacent teeth. Removal of supernumerary teeth is recommended in cases where they are causing any pathological changes or crowding along with esthetical problem and difficulty in oral hygiene maintenance.

In the present case two supplemental lateral incisors were causing difficulty in oral hygiene maintenance, so decision was taken to extract the supplemental teeth and align the incisors. In the present case as both the teeth were equally formed the teeth which are more displaced were extracted as reported by Hattab et al [21]. After this patient was advised orthodontic treatment for the correction of crowding.

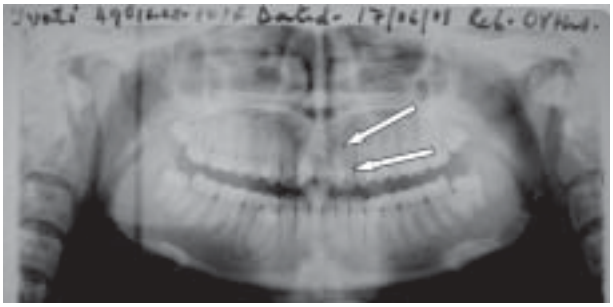


Fig 4: OPG showing supplemental lateral incisors

DISCUSSION

Present case is unusual as it demonstrates multiple supernumerary teeth in the anterior maxilla in patient without any syndrome. Supplemental lateral incisors are rare, bilateral cases even rarer, only few cases having been reported in the literature to date. **Yusof**, in a literature review of multiple supernumerary teeth occurring in the absence of a syndrome, found the anterior maxilla to be an unusual site for this occurrence [22].

Extraction is not always treatment of choice for supernumerary teeth. Unerupted supernumerary teeth that are symptomless are sometimes best to left in place and kept under observation. Since the patient had full set of dentition along with supplemental lateral incisors extraction of supplemental teeth followed by orthodontic correction to establish good occlusion was treatment of choice.

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INFECTION CONTROL IN PROSTHODONTICS

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ABSTRACT

The dentists and allied health workers are exposed to wide variety of potentially dangerous micro-organisms. This occupational potential for disease transmission becomes evident as most human microbial pathogens have been isolated from oral secretions. Because of repeated exposure to the microorganisms present in blood and saliva, the incidence of certain infectious diseases has been significantly higher among dental professionals.HIV, Hepatitis B, Tuberculosis and Herpes simplex virus infections are well recognized and indicate the need for increased understanding of modes of disease transmission and infection control procedures. Dental prostheses, impressions, models and items used in their fabrication are potential sources for cross infection and should be handled in a manner that prevents exposure of dental health care professionals and patients to infectious agents. This article highlights various methods of infection control particularly in the field of Prosthodontics to prevent the transmission of diseases between patients, dentists and lab personnel.

Routinely dental care professionals are at an increased risk of cross infection while treating patients. This occupational potential for disease transmission becomes evident initially when one realizes that most human microbial pathogens have been isolated from oral secretions. Because of repeated exposure to the microorganisms present in blood and saliva, the incidence of certain infectious diseases has been significantly higher among dental professionals than observed for the general population. Hepatitis B, HIV, Tuberculosis and Herpes Simplex Virus infections are well recognized and indicate the need for increased understanding of modes of disease transmission and infection control procedures by dental care providers. [(1)]

The general routes for transmission of microbial agents in dental clinics are as follows [(2)]:

- Direct contact with infectious lesions or infected saliva or blood.
- Indirect transmission via transfer of microorganisms from a contaminated intermediate object.
- Splatter of blood, saliva / nasopharyngeal secretions directly into broken or intact skin or mucosa.
- Aerosolization, the airborne transfer of microorganisms.

Part of the problem lies in the fact that many practitioners and auxiliaries previously failed to comprehend or appreciate the infection potential presented by saliva and blood during treatment. The risk of potential infection was dismissed because of the splatter coming from the patients mouth is not noticed readily. Organic debris may be transparent or translucent and dries as a clear film on skin, clothing and other surfaces. This article highlights various methods of infection control particularly in the field of Prosthodontics to prevent the transmission of diseases between patients, dentists and lab personnel.

GENERAL CONSIDERATIONS [(3&4)]:

When the dental operatory is being prepared for treatment at the beginning of the day, the waterlines should be flushed for several minutes to remove bacterial growth that may have accumulated overnight. The equipments should be disinfected. A hospital level tuberculocidal disinfectant that is registered with the environmental protection agency should be used on hard surfaces in the dental office.

Surgical Gown

Protocol for universal precautions in dental clinic

- **Staff protection measures:** The wearing of gloves reduces contamination of hands with blood. They may be disposable or sterilizable gloves. If re-sterilization is planned, the glowed hands should be washed

with soap and rinsed again. The gloves should be checked for holes and discarded if defective. The gloves that pass the test can be dried, powdered and packed for sterilization.

- Hands should be washed between patient contacts, after removing gloves and before wearing them again. Use of disinfectant scrub like chlorehexidine after washing will have a prolonged antibacterial effect against microbial ingression through the gloves. Hands must also be washed after touching intimate objects likely to be contaminated by blood or saliva from patients and before leaving the dental treatment area.
- Clinic attire should be worn only in the dental environment and should be changed at the end of the treatment schedule.
- Use of mask is usually indicated especially during procedures that cause splashing or spattering of blood or saliva. It is recommended that facemasks should be changed once every hour or between each patient contact, whichever occurs first.
- **Protective eye wear :** It may be in the form of glasses and / or a face shield. It should prevent trauma to the eye tissue from flying droplets or aerosols. Protective glasses should be washed with soap first, rinsed with water and wiped with an appropriate surface disinfectant. Plastic safety lenses can also be immersed in alkaline glutaraldehyde solution and should be thoroughly rinsed to avoid possible irritation to skin and eyes.

Personal Protective Barriers

- **Management of instruments** [3 & 4]**:** They should be cleaned and dried, lubricated if necessary and packaged before loading into the autoclave. Cleaning involves an initial presoaking with detergent solution containing disinfectants to soften organic debris and begin microbial kill. After cleaning the instruments should be dried.
- All moving parts of the instruments especially hand pieces should be lubricated prior to steam sterilization. The burs should be autoclaved or maintained in high level disinfection for not less than 3 hours. Thorough rinsing should be followed to remove all traces of disinfectant. [5]
- Touch surfaces like unit handles, light handle, light switch, chair controls, head rest knob, trolley handle, trolley and 3-way syringes cannot be disconnected and sterilized and therefore need to be treated with disinfectants or covered with a protective barrier. However instruments which enter oral cavity and are connected to some of the equipment e.g. air rotor and surgical hand pieces, ultrasonic inserts or tips, air water syringe tips and light cure probes or tips should be disconnected, sterilized and rinsed before use[3].
- Disinfection of surfaces involves the cleaning of surfaces, after every patient and application of a disinfectant chemical. These chemicals include alcohol (spirit), iodophor products, synthetic phenols, glutaraldehyde, chlorines etc.
- The advantages of barriers include ease and speed of insertion, standard sizes and the protection of equipment from damage by chemicals, blood and fluids.
- Spittoons should be flushed with water, scrubbed and disinfected.
- Waste buckets should be used with disposable plastic bags as liners to be changed wherever necessary.
- **Reducing aerosols in the clinic:** Preoperative mouth rinses with chlorhexidinegluconate or other suitable disinfectant mouth wash should help reduce infectious particles in aerosols. Rubber dam isolation is another method to reduce potentially infective aerosols. High volume secretion during procedures using copious irrigation and even the routine use of saliva ejectors can restrict aerosolization. [6]

PROSTHODONTIC CONSIDERATIONS

- **Disinfection of impressions [7]:**

A. Personal protective equipment: Protective eye wear, masks and gloves should be used when handling a contaminated impression until it has been disinfected.

Thorough rinsing of impression with water

B. **Rinse the impression:** Immediately after an impression is taken in the dental operatory, rinse it under running water in order to remove any saliva or blood. This step is essential for allowing optimum disinfection of the impression.

C. Disinfection techniques: Once the impression is rinsed and shaken to remove excess water, it must be disinfected. This may be accomplished by immersing the impression in, or spraying it with, an acceptable disinfectant.

***a*. Disinfection of an impression by immersion:** It is preferred over spraying. Spraying may not be effective because constant contact of the disinfectant with all surfaces of the impression cannot be assured.

i. Rinse the impression with running water and shake off excess water.

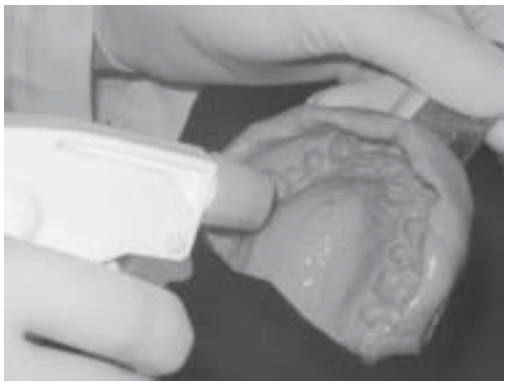
ii. Place rinsed impression into a zippered plastic bag containing appropriate disinfectant.

iii. Leave it immersed in disinfectant for 15 minutes. Polyethers and hydrocolloids may be adversely affected by disinfectants; therefore their immersion time is limited to 10 minutes.

iv. Remove impression from disinfectant.

v. Rinse with running water and shake off excess water.

b. **Disinfection of an impression by spraying:** Spray the cleaned impression and impression tray with an acceptable disinfectant. Seal the sprayed impression in a zippered plastic bag for 15 minutes. Remove the impression from the sealed bag.



Disinfection of Impression by spraying

- **Hydrocolloid impressions [7&8]:** A number of investigators have evaluated disinfection of irreversible hydrocolloid (alginate) sometimes with contradictory results. Based on these findings, the ADA recommended disinfecting alginates by immersion in diluted hypochlorite, iodophor or glutaraldehyde with phenolic buffer. Investigators reported significant adverse effects of specific materials with disinfectants that are non-reactive with other alginates suggesting that caution should be exercised. Given the hydrophilic nature of the material, a minimal disinfection time should be used.

  Limited data are available on disinfection of reversible hydrocolloid, however research data suggest that there is no effect on dimensional accuracy of impressions immersed in an iodophor diluted 1:213, 5.25% sodium hypochlorite with a dilution 1:10, 2% acid glutaraldehyde with dilution of 1:4, and glutaraldehyde with phenolic buffer diluted 1:16. Immersion in 2% alkaline glutaraldehyde has significant adverse effects on the impressions and resultant dies.

- **Rubber base impression materials [7&8]:** They can be disinfected by immersion in iodophor, diluted chlorine solution, glutaraldehyde or complex phenols for the time required for tuberculocidal activity. It is important to

review the method of disinfection with the manufacturers to prevent distortion of the impression or loosening of the adhesive bond between the impression tray and impression material. These impressions also should be rinsed with water before pouring. It is important to inform the dental laboratory that the impression has been disinfected to prevent the laboratory personal from performing more disinfection procedures that might distort the impression.

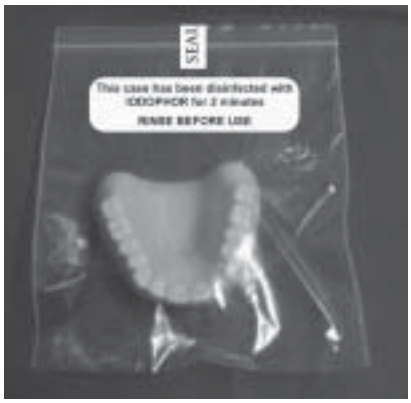
Studies by a number of investigators have shown that polysulphides and silicones are relatively stable and can be disinfected without adverse effects by immersion in most disinfectants approved for use in dentistry. Although hydrophilic, polyether impressions also can be disinfected by immersion, but exposure times should be kept to minimum (10 minutes). Disinfectants requiring exposure times greater than 10 minutes for tuberculocidal disinfection probably should be avoided with polyether. Immersion in acid glutaraldehyde actually improves the surface detail reproduction of elastomeric impressions.

- **Zinc Oxide Eugenol (ZOE) and compound impressions [7&8]:** Limited data are available on disinfection of ZOE and compound impressions. Adverse effect have been reported on ZOE immersed for 16 hours in diluted hypochlorite and on compound by all of the disinfectants tested (hypochlorite, formaldehyde and 2% alkaline glutaraldehyde).
- Once the impression has been disinfected it may be poured in the desired stone.

A. Disinfection of Dental prosthesis and appliances [1,3&4]:

a. The ADA recommends disinfection by immersion in iodophor or chlorine compounds. Although both of these disinfectants are somewhat corrosive, studies have shown little effect on chrome cobalt alloy with short-term exposure (10 minutes) to iodophor or 1:10 hypochlorite. Damage of heat cured denture base resin has been shown to occur after only 10 minutes of immersion in a glutaraldehyde with phenol buffer, although immersion in 2% alkaline glutaraldehyde did not damage the acrylic surfaces. Given the tissue toxicity of glutaraldehyde and phenolic compounds, however iodophor or chlorine compounds are preferred for disinfection of acrylic appliances. Prostheses never should be stored in a disinfectant before insertion. After disinfection and thorough rinsing, acrylic items can be stored in diluted mouthwash until inserted.

b. Fixed metal/porcelain prosthesis may be disinfected by immersion in glutaraldehyde for the time recommended for tuberculocidal inactivation by the disinfectant manufacturer. [5] In addition several clinical studies have confirmed that fixed prosthesis can be disinfected by short immersion in diluted hypochlorite without apparent harm to the device. The higher the content of noble metal, the less the likelihood of adverse effects on the metal. Care should be taken to minimize the exposure times of metals to potentially corrosive chemicals. Iodophor probably could be used as well, but no data are available to substantiate this. Unglazed porcelain should not be exposed to any disinfectant and (porcelain firing/ glazing will suffice), fixed metal prostheses can be sterilized with ethylene oxide or even by autoclaving if desired. Any device that has been immersed in a disinfectant



Prosthesis should be disinfected and sealed before use

should be rinsed thoroughly before delivery to the patient.

- Prosthesis or appliances that have been worn by patients should be cleaned thoroughly before disinfection by scrubbing with a brush and an antiseptic hand wash or by cleaning in an ultrasonic unit.
- Dentures or other acrylic appliances that have been worn by patients and require repair should be disinfected, after cleaning and before handling should be handled (i.e. with gloves) as contaminated even after disinfection. The porous nature of acrylic makes such devices difficult to disinfect adequately.

DISINFECTION OF WAX BITES, OCCULUSION RIMS, STONE MODELS, CUSTOM IMPRESSION TRAYS & BITE REGISTRATIONS [1,3 & 4]

A. Wax rims and wax bites should be disinfected by the spray wipe spray method using an iodophor as recommended by the ADA. Rinse spray may be more appropriate for wax bites. For adequate disinfection these should remain in disinfectant for the time recommended for tuberculocidal disinfection. After the second spray, they can be enclosed in a sealed plastic bag for the recommended time. These items should be rinsed again after disinfection to remove any residual disinfectant.

B. Bite registrations made of various materials such as ZOE or compound can be handled in the same manner as impressions of the same materials. These registrations also can be disinfected, using the rinse spray rinse technique, with most EPA registered hospital level tuberculocidal disinfectants used as sprays. After disinfection, the registration should be rinsed again to remove residual disinfectant.

C. ADA recommends that stone casts be disinfected by the spraying until wet or immersing in a 1:10 dilution of sodium hypochlorite or an iodophor. Casts to be disinfected should be fully set (i.e. stored for at least 24 hours). Investigators submerged die stone models in a variety of disinfectants and found that with 1:10 sodium hypochlorite and 1:213 iodophor, undesirable physical effects on set die stone ranged from none to minimal.

D. A disinfectant stone now is marketed and has been shown to have bactericidal property however this product is not yet EPA registered as a disinfectant. Several investigators have recommended adding disinfectants to gypsum during mixing (ie. As all or part of the liquid, when pouring casts). Although such products have potential for use in infection control, they do not solve the problem of the contaminated impression or tray as a source of infectious microorganisms during transit from the operatory to the laboratory.

E. Custom acrylic resin impression trays should be disinfected by spraying with surface disinfectants or immersing in either 1:213 iodophor or 1:10 sodium hypochlorite. They should be rinsed thoroughly to remove any residual disinfectant and allowed to dry fully before use. After use in the mouth custom trays should be discarded.

Other Prosthodontic items[5&6]**:**

A. Heat stable items such as face bow forks orthodontic pliers and metal impression trays that come in contact with oral tissues should be heat sterilized rather than disinfected.

B. Articulators and face bows should be cleaned and disinfected. After manipulation at chair side wooden handled spatulas should be cleaned and disinfected. Other times such as Hanau torches should be disinfected after use. The area to be touched should be covered with a barrier such as plastic wrap to prevent

Metal trays should be heat sterilized

contamination. Rubber bowls should be cleaned and disinfected after chair side use. (1,3&9)

C. Items such as shade guides should be cleaned and disinfected to avoid cross contamination. If iodophor is used on shade guides, they should be wiped with water or alcohol after the exposure time to remove any residual disinfectant. (9)

D. Ultraviolet light is a part of electromagnetic spectrum. It ranges from 400nm downwards to approximately 150nm. It is well established that greater germicidal effect is in the range of 240-280nm with the optimum being 253-7nm. This is widely accepted as a near maximum for bactericidal and germicidal effect. Most investigators show that the rays are absorbed by the cellular DNA chain which is the initial event in the chain of events leading to cellular death.

Robert J. Boylan et al (1987) (10) under UV light with a wavelength of 254nm as a mode of sterilizing complete dentures, partial dentures and a rubber base impression contaminated with fine known species of microorganisms. The results showed that killing of microorganisms with greater than 98% within 15 seconds and 99% either 30 seconds and 100% in 2 minutes. They also concluded that UV light cannot be used as a sole means of disinfecting the impressions because of shadowing effect that allows the survival of microorganisms unexposed to UV light.

CONCLUSION

Dentists must use effective infection control procedures in their practices. A positive step by step approach should be used. One should determine and practice infection control and build upon them by adding new procedures to the dental routine. The current knowledge in today's society regarding infectious diseases in general and herpes, hepatitis and acquired immune deficiency syndrome (HIV) in particular dictates that all dental practices must incorporate acceptable infection control techniques. Dental prostheses, impressions, models and items used in their fabrication are potential sources for cross infection and should be handled in a manner that prevents exposure of dental health care professionals and patients to infectious agents.

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IMMEDIATE LOADING OF DENTAL IMPLANT "A SUCCESS"- A REVIEW

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INTRODUCTION:

Two stage surgical protocol was given by Branemark, but it has several pre-requisites(1)-

1. Countersinking the implant below crestal bone.
2. Obtaining and maintaining the soft tissue covering over the implant for 3-6 month.
3. Maintaining a non-loaded implant environment for 3-6 months.

The Reason For Countersinking The Implant Below Crestal Bone Are-

i. To reduce and minimize the bacterial infection.

ii. To prevent the apical migration of oral epithelium along the body of implant.

iii. To reduce and minimize the risk of early implant loading during bone remodelling.

DISADVANTAGES OF 2-STAGE PROTOCOL

A second stage surgery is necessary to uncover these implants and place a prosthetic abutment.

ADVANTAGES

A high degree of long term, clinical rigid fixation has been reported after 2-stage surgery.

But during the last 15-years several authors have reported that root form implants may Osseo-integrate even though they reside above the bone and through the soft tissues during early bone remodelling. This surgical approach has been called as one-stage or non-submerged implant procedures and this eliminates the second-stage implant uncovery surgery.

HISTORICAL BACKGROUND OF IMMEDIATE LOADING

- Since long, dentists were experimenting with numerous designs and materials for early implant prototypes.
- In 1963 Lincow introduced root form implants for immediate occlusal load which were named as vent -plants.
- In 1970's Ledermann used titanium plasma sprayed implants and immediately loaded them with mandibular overdenture.
- In 1970's Schroeder(1976,1978,1981) showed that the submerged technique was not a prerequisite for success of implants.
- However, success came for immediate loading in 1980's(Schroeder and Babbush)(2).

THEN CAME THE BIG QUESTION: WHY THE NEED FOR IMMEDIATE LOADING?

The answer to this was associated with lot of studies which were being carried out and was concluded that first and formost reason was Psychological then was Esthetics then Functional and last but not the least was Economics involved.(1,3,14,16)

Indications

- Single tooth replacement.
- Partial edentulism.
- Full edentulism.

Contraindications

- Bruxism
- Smoking.
- Reduced bone quality & quantity.
- Short length implants.

ADVANTAGES:

- This eliminates the second –stage implant uncovery surgery.
- As a result the tissue discomfort and healing associated with second-stage surgery are

eliminated.

- The dentist also eliminates the surgical time for uncovery and suture removal.
- In addition the soft tissue is already mature before fabrication of final Prosthesis.
- Immediate loading of implants loads the implant with a provisional restoration at the same appointment or shortly thereafter.

DISADVANTAGES:

- High chances of failure.
  More bone loss compared to delayed loading.
  Peri-implantitis due to loading.
- Post operative complications.
- Patient cooperation mandatory

Precise and strict following of protocol for implant surgery may take care of above mentioned disadvantages.

PROTOCOL FOR COMPLETELY EDENTULOUS PATIENTS (8,11,13)

2 DIFFERENT APPROACHES ARE THERE

First approach- involves placing several more implants than the usual treatment plan for a conventional healing period and out of them only selected implants in an arch (around 3 or more) are only immediately loaded with a transitional prosthesis. Other implants are left submerged for delayed loading.This approach was given by Schnitman et al in 1990.This approach can be used only in edentulous mandible where abundent bone is present.Tarnow et al (1997)-also followed this approach.He did a study in 10 consecutive completely edentulous cases over 5-years,Out of them 6 were mandibular arches and 4 were maxillary arches, 10-13 implants were used in each arch for final prosthesis, 66 out of 69 implants integrated. Failure rate was 4% and success rate was 96%.

Second approach-This includes immediate occlusal loading of all the implants inserted. The implants are splinted together which decreases the stresses on all the developing interfaces and increases the stability, retention and strength of the transitional prosthesis during the initial healing phase.

GUIDELINES FOR IMMEDIATE LOADING(6,7,8,11)

1. The bone should be of good quality.
2. The implant should engage strong cortical bone with initial stability.
3. The type of implant should be screw type with rough surface.
4. Cantilever should be avoided.
5. An occlusal scheme that promotes axial loading rather than horizontal stress must be designed.
6. Night guards in patient's with parafunctional habits.

FACTORS MODIFYING IMMEDIATE IMPLANT LOADING

- Surgical factors included- primary implant surgery and surgical technique being used.
- Host related factors included-quantity and quality of bone; type of wound healing
- Implant related factors included-implant design, surface coating and length of implant
- Occlusion related factors included-quantity and quality of force;prosthetic design.

Finally the need for re-evaluation of BRANEMARK PROTOCOL was done and concluded that loading per se does not impede the healing process to occur thus Prematurely loaded implants are capable of integration.

APPROACHES TO REDUCE LOADING PERIOD

Careful patient selection, Non-functional loading of the implants, to identify an effective way to reduce micro-motion beneath the critical threshold of deleterious micro-motion.

A NEW PROTOCOL FOR IMMEDIATE FUNCTIONAL LOADING

Fabrication of a provisional restoration prior to surgery, Immediately after the last implant is placed convert a previously constructed provisional prosthesis into an immediate implant supported non-removable prosthesis, Impressions

for the final restoration is made. Opportunity to evaluate the esthetics/phonetics and functional loading during the normal osseointegration healing period. This prosthesis appears to have a splinting effect, locking the implants in place as bone heals around them.

STUDIES ON IMMEDIATE LOADED IMPLANTS WITH FIXED PROSTHESIS(3,17,18)

Author	Patients	Implants	Success Rate
Ericsson	16	88	100%
Chow	27	123	98.3%
Collaert	25	114	98%
Testori	15	103	98.4%

Anterior zone of mandible provided success rates of >90% but lower success rates were observed for short implants placed in unfavourable bone morphology and distal positions. Most studies (Jaffin and Berman,Misch and Degidi) suggested that a high number of implants(8-12) are required in maxilla.

OUTCOMES OF IMMEDIATE LOADING PROTOCOLS

Primary stability of the implant was the underlying requisite for predictable results. The role of implant length on implant success was limited. Short to medium term studies suggest that treatment with fixed prosthesis in the anterior mandible is predictable irrespective of implant type, surface topography and prosthesis design. Atleast 4 implants should be placed in the edentulous anterior mandible to support a fixed prosthesis. To achieve results in extraction sites, implant placement should be restricted to sites without a history of periodontal involvement.

Finally, the marginal bone loss measured, irrespective of prosthesis design, was of the same magnitude as presented for the conventional loading approach.

SUMMARY

Immediate implant loading achieved similar success rates as those reported in the delayed 2-stage approach. Primary implant stability is a key factor to consider before attempting immediate implant loading.

Surgery-, Host-, Implant-, and Occlusion related factors may influence the outcomes of immediate implant loading. Studies are needed to understand the possibility of immediate implant loading in patients who are diabetics, osteoporotics and smokers as well as those who have other systemic compromising diseases.

Long term, prospective studies particularly in Indians are still needed to evaluate other potential determining factors on this technique.

CONCLUSION

The level of predictability and high success of current implant therapy has provided reasons to reassess the guidelines.

With the trend of shortening treatment time and reducing patient discomfort, immediate loading implants has emerged as an alternate approach.

However, meticulous selection is needed to integrate this treatment into daily practice.

Regular maintainence is the key factor to ensure long term success of immediately loaded implants.

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MANAGEMENT OF DEEP BITE WITH MYOFUNCTIONAL TRAINER SYSTEM (A CASE REPORT)

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ABSTRACT

The deep bite is complex orthodontic problem and if not managed early can have serious implications in the form of severe generalized attrition, requiring full mouth rehabilitation at a later stage of life, especially in short facial type cases. The present case report shows how the deep bite can be managed in a adolescent patient by careful diagnosis and with simple, yet comprehensive prefabricated myofunctional appliance such as trainer system (Myofunctional Research Co. Australia) with more predictable long term stability. Different treatment outcome in short and long facial types is also discussed.

Keywords: Deep bite, Long facial type, Prefabricated Myofunctional appliance, Short facial type, Trainer for kids (T4K™) Phase I (Blue), Phase II (Red)

INTRODUCTION

The excessive overbite is a complex orthodontic problem that may involve a group of teeth or the whole dentition, alveolar bone, mandible and maxilla and /or soft tissues of the face. Thus the correction of this problem demands a careful diagnostic analysis, treatment plan and selection of treatment therapy [1] The correction of deep overbite is highly desirable if the overbite affects the facial esthetics and impairs the dental health of an indivijual. Excessive overbite has also been linked to the periodontal disease.

The present case report shows management of deep bite with the very simple, yet comprehensive Trainer system in a young child. The Trainer for Kids (T4K™, Myofunctional Research Co, Australia) is a polyurethane pre-fabricated functional appliance, having various design features[2] that help to control the soft tissue dysfunction detrimental to the development of various malocclusions

CASE REPORT

A young male child (FG) aged 09 years reported to the orthodontic clinic with 7 mm (80%) deep bite in early mixed dentition phase. Patient had a Angle's class I molar relation and developing divison 2 incisor pattern contributed largely by lower lip functioning above the upper incisor edges. (Figure 1 A-D) Patient lower dental midline was shifted to left by 2 mm. Patient had apparently no other problem and wanted to have a preventive orthodontic check-up so that any problem if present can be taken care as early as possible. Patient also presented with a minor crowding of upper and lower anterior teeth.

Fig 1 A Front

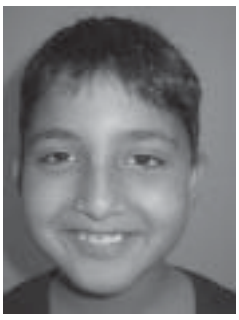

Fig 1B Front Smiling

Fig 1C Profile Right Lateral

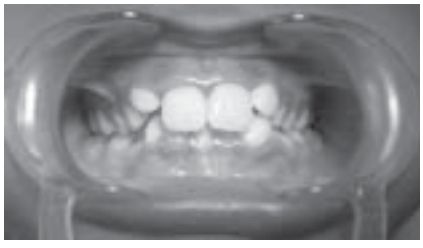

Fig 1D Intraoral Front Occlusal

Figure 1 Pretreatment Photographs

The potentially handicapping deep bite problem was made aware to the parents, and patient was advised to use Trainer for kids (T4K™ Phase I Blue, Myofunctional. Research Co. Australia, Figure 2). This prefabricated functional appliance changes the posture of the mandible into a forward position,[3] and stimulates transverse development.[4] Although this pre-fabricated functional appliance has been demonstrated to produce skeletal and dental improvement in Class II, division 1 malocclusion patients,[3,4] there are no reports using this functional appliance for the exclusive management of deep bite. Thus, the purpose of this paper is to present a clinical case where a patient with Angle's Class I malocclusion, with developing division 2 incisor pattern was successfully treated during the mixed dentition period.

Patient was advised to wear T4K, Blue Phase I (Figure 3) for two hours per day and over night to be effective. Patient showed good compliance and after ten months of appliance wear patient showed marked improvement in upper and lower minor crowding. After the completion of Upper and lower alignment, patient was given T4K Red, Phase II (Figure 4) trainer (which is harder than Blue, Phase I) to hold the bite and to allow complete correction of upper and lower anterior crowding.

The bite was allowed to open by cutting the Trainer (By scissor) on the distal aspect (Figure 5) so as to allow free eruption of lower first molars and it was subsequently cut in pre-molar region as well so as to be present only in anterior area. After 18 months of regular wear patient showed marked improvement in deep bite which was corrected to ideal deep bite of 1-2mm. After complete correction of deep bite, patient was advised to use T4K Red, Phase II only during night time so as to act as a bite holding appliance till the time patient pubertal growth spurt is complete.

DISCUSSSION

Vertical dimension of face gives some indication of the degree of overbite. The vertical dimension is usually measured in terms of facial height and the shorter the anterior facial height the more likely it is that the patient will have a deep overbite. Conversely the longer the facial height the patient is more likely to have an anterior open bite. Deep overbites associated with a short anterior facial height and open bites with long face heights are difficult to correct with orthodontics alone. The greater the skeletal difference the more likely it is that the patient will need a combination of orthodontics and orthognathic surgery to correct the occlusion and the underlying skeletal discrepancy. There are various ways of measuring the vertical dimension, one of the most common is to measure the Frankfort Mandibular Plane Angle which is usually difficult by general dentist. Another way of measuring the vertical dimension of face is to measure the lower facial height and the upper facial height.

The lower anterior facial height is the distance from the base of the chin to the base of the nose. The upper anterior facial height is the distance from the base of the nose to a point roughly between the eyebrows. These dimensions can be measured with a ruler although the index finger and thumb will do almost as well. The lower and

Fig 2 Trainer Label, Myofunctional Research Co, Australia

Fig 3 Trainer For Kids Phase I Blue (soft)

Fig 4 Trainer for Kids Phase II Red (Hard)

Fig 5 Trainer (Phase II Red) cut on the distal aspect on both side to allow bite opening

Fig 6 A Front

Fig 6B Front smiling

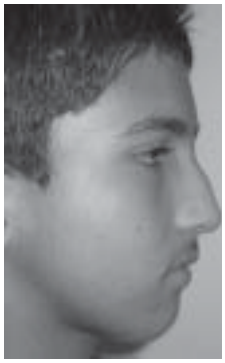

Fig 6C Profile Right Lateral

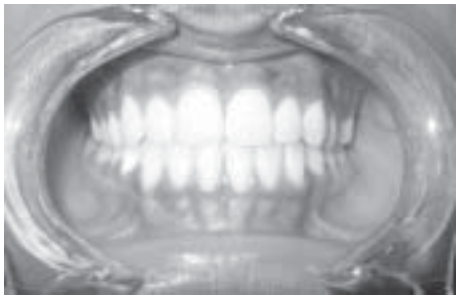

Fig 6D Intraoral Front Occlusal (maxillary and mandible midlines perfectly matched)

Figure 6 Post-treatment Photographs

upper facial heights are usually equal. If the lower anterior facial height is reduced, this can result in a deep overbite that can be difficult to correct. Conversely, if the lower anterior facial height is greater than 50% this can produce an anterior open bite [5]

Long facial types usually exhibit a favourable reaction to overbite correction, whereas short facial types usually present a problems in maintaining permanent overbite correction. The very best and most dependable characteristic for assessing the bite opening potential is the amount of vertical facial growth which has occurred prior to treatment.[6]

The present patient had deep overbite along with a long facial height due to which the deep bite correction was quite dramatic and will be more stable which is evident from the fact that post treatment photographs (Figure 6, A-D) showed almost no relapse inspite of being taken two years after the completion of active treatment. This further emphasis the importance of knowing the skeletal pattern in a particular patient for more predictable treatment outcome. The another important observation was complete correction of midline discrepancy which could be attributed to trainer stimulating the transverse growth of arches.[4]

CONCLUSION

The present case show that how a potentially handicapping malocclusion can be managed with a very simple yet comprehensive prefabricated myofunctional Trainer system without the option of braces at early age and without letting the problem to develop to a stage where its correction and stabilization will be more difficult. The simplicity of treatment further emphasis that how this potentially handicapped malocclusion can be managed even by a general dentist/pedodontist which is more often than not to see this problem, without referring the patient to a specialist and can also have better financial rewards.

The treatment with trainer system is cost effective, natural and more patient friendly, as Trainer wear is part time and not full time, compared to conventional braces. The only draw back with this system is patient compliance, which does not become that much a problem once the patient is made aware of potential benefits of this treatment.

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PLEOMORPHIC ADENOMA OF THE HARD PALATE — A CASE REPORT

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ABSTRACT

Pleomorphic Adenoma is a benign tumor of the salivary glands that has elements of both epithelial and mesenchymal tissues. The tumor most commonly arises in the parotid or submandibular glands. Infrequently, it may arise from the minor salivary glands and present as an intraoral mass over the palate or lip. We reported a case of pleomorphic adenoma of palate in 45 years old female patient, who visited the department of Oral Medicine and Radiology, Sundernagar with chief complaint of painless swelling in palatal area since one year. Incisional biopsy revealed features of pleomorphic adenoma and surgical treatment for tumor was rendered and no recurrence has been reported till date.

Key words; Pleomorphic adenoma, Palate

INTRODUCTION

Salivary gland tumors accounts for less than 3% of head and neck tumors.They are more common in adults than in children.[1] Among all the salivary gland tumors, pleomorphic adenoma is most commonly encountered lesion accounting for approximately 60% of salivary gland tumors. Most salivary gland tumors occur in major salivary glands, especially in parotid gland. As for as intraoral salivary gland tumors are concerned, pleomorphic adenoma also ranks most frequently encountered lesion. Palate is most commonly affected site followed by upper lip and buccal mucosa respectively.[2]

CASE REPORT

A 45-year-old female patient visited the department of oral medicine and radiology with c/o swelling in right maxillary posterior region which had duration of one year. History revealed that patient noticed this swelling one year back and is gradually increasing in size. Swelling was painless and not associated with any ulceration and discharge. There was no preceding history of trauma and her past medical history was unremarkable. The general health of the patient is preserved. On examination a 1.5x2 cm sized, firm, non-tender, circumscribed lesion in the relation to 16, 17, 18 region of hard palate was observed. Fig (1).

It was adherent to the underlying structures and overlying mucosa was intact and pink in color. There was no regional lymphadenopathy and her nasal examination was within normal limits. General physical and systemic examination was

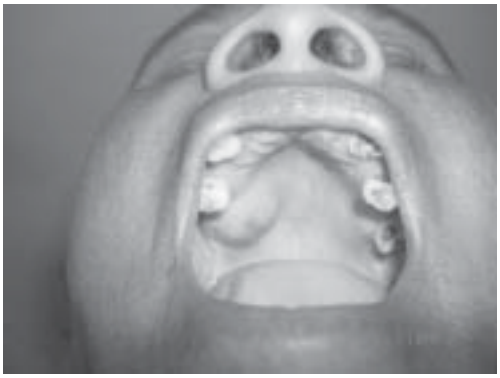

Fig 1 – Pleomorphic Adenoma in right posterior region of hard palate

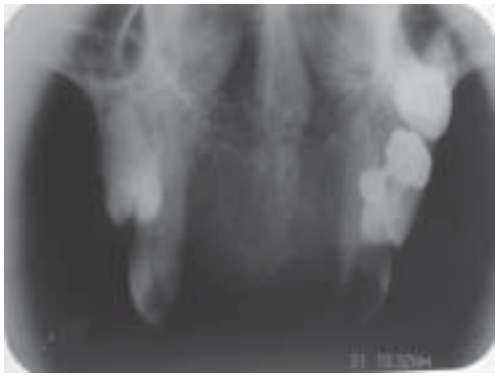

Fig 2 - Radiograph showing no bony invasion

also normal.

A clinical differential diagnosis of odontogenic cyst or minor salivary gland tumor, was considered. An incisional biopsy revealed a benign tumor having characteristic features of pleomorphic adenoma on histopathologic examination. Radiograph of maxilla (occlual view) did not show bony invasion. Figure (2).

The entire tumor was excised with a wide margin and the underlying bone was drilled out. Fig (3) and fig (4). There has been no recurrence for 6 months during follow up.

DISCUSSION

Pleomorphic adenomas are usually painless, slow-growing tumors; however, some cases exhibiting rapid growth have been reported.[3,4,5.] The term pleomorphic describes the embryogenic basis of origin of these tumors, which contains both epithelial and mesenchymal tissues.[6] It has been postulated that these tumors arise from intercalated and myoepithelial cells. Most cases of palatal pleomorphic adenoma cause only a bulge in the palatal mucosa, but some cause an erosion of the palatal bone as well.[3, 7.] These adenomas usually present as asymptomatic submucosal swellings although a few cases have exhibited ulceration and bleeding, usually resulting from trauma. The tumor presents morphologically diverse features, however, both epithelial and mesenchymal elements must be present for diagnosis.[1, 2] Histopathology reveals a tumor composed of islands of stellate and spindle cells that are interspersed in a myxoid background. The pleomorphic nature is determined by an inner layer of epithelial cells and an outer layer of myoephithelial cells arranged in a variety of patterns associated with scant or abundant stroma. Variation may include squamous metaplasia, calcification, cartilage-like tissue, oxyphillic cells and rarely malignant transformation.[7]

Plain x-ray and hematologic investigations play no part in the diagnosis of salivary gland tumor of the palate.[8] The noninvasive diagnostic aids for salivary gland tumors include ultrasound, CT, and magnetic resonance imaging (MRI). These are useful methods in determining the size of the lesion as well as verifying any bony involvement. CT and MRI both provide important information on the location, size, and extension of the tumor into the surrounding superficial and deep tissues. CT is superior to MRI in evaluating bone, especially in diagnosing erosion and perforation of the bony palate and possible involvement of the nasal cavity or maxillary sinus.[8,9] MRI, with its high resolution for soft tissue, provides better definition of the vertical and inferior tumor extension through its multiplanar capacity and the tumor–muscle interface[9] and more clearly indicates the degree of encapsulation.[8]Another advantage of MRI over CT is the absence of exposure to radiation and intravenous contract medium. Treatment of palatal pleomorphic adenoma involves wide local excision of the tumor by careful dissection of the palatal mucosa from the encapsulated mass, including its surrounding capsule, together with clear margins involving the periosteum and associated mucosa, followed by curettage of the underlying bone with a sharp spoon or bur under copious sterile normal saline irrigation, to avoid recurrence.[3, 4] These tumors usually do not recur after adequate surgical excision. Most recurrences can be attributable to inadequate surgical

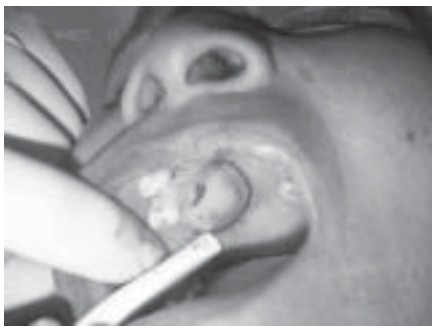

Fig 3 Tumor outline demarcated.

Fig 4 Excised Mass

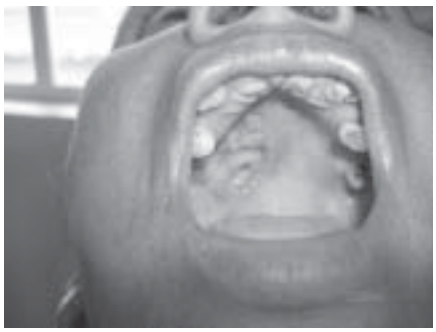

Fig 5 showing post operative healing

techniques such as simple enucleation leaving behind microscopic pseudopod-like extensions.

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THE COMPARATIVE EVALUATION OF THE DIMENSIONAL ACCURACY OF AN ALGINATE AND IMPROVED ALGINATE WITH THAT OF THE ELASTOMER IMPRESSION MATERIAL — AN IN VITRO STUDY

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ABSTRACT

The main aim of the study was to compare the dimensional accuracy of alginate with that of improved alginate, and the dimensional accuracy of improved alginate with that of Elastomer. In this study three different types of materials were taken which includes the alginates, improved alginates and elastomers. The frasaco (Germany) maxillary dentulous model was selected and reference making of one mm in diameter made on the buccal cusps of first premolar and mesio buccal cusps of first molar using round diamond bur. The frasaco model was mounted on the phantom head and using each group 14 impression was made. Expectable impressions were poured with type 4 die stone. Measurements were made between 4 reference points. Readings were taken using Nikon profile projector microscope (Japan) .The reading were obtained and subjected to statical analysis. The result of this vitro study showed that improved alginate better than alginate. But the elastomers are the still more accurate. So the further studies are required to co relate this study clinically.

INTORDUCTION

Partial edentulism is one of the commonest prosthodontic problems we come across. These conditions are frequently treated by Removable and Fixed partial dentures. Since the introduction of Alginate in year 1947 it is one of the commonly used materials for recording the partial edentulous condition. But the studies have shown that the Alginates are not dimensionally stable and accurate enough to be used as impression material for the fixed partial prosthesis. For the last couple of years to overcome the deficiencies of Alginate materials various companies came out with the improved alginates which have better quality, and dimensional accuracy as similar as compared to that of Elastomers.

AIMS AND OBJECTIVES

The main aim of study was to compare the dimensional accuracy of alginate with that of improved alginate, and the dimensional accuracy of improved alginate with that of Elastomer.

MATERIAL AND METHODS

In this study the six different materials were taken. These materials were divided into three different groups.

FIRST GROUP	**Alginates** **A:** Zelgan(Densply India) **B**: Alginoplast (Heraeus and Kulzar)
SECOND GROUP	IMPROVED ALGINATES **A:** Litochrom (Lasod Italy) **B:** Cavex (Cavex Holland)
THIRD GROUP	ELASTOMERS **A:** Putty consistency elastomer (3 m India,Reprosil India) **B:** Light body elastomer (3m India, Reprosil India)

These all specimen impression was poured with Type IV die stone gypsum products.

PREPARATION OF MASTER MODEL:

The frasaco (Germany) maxillary dentulous model was selected and reference making of one mm in diameter made on the buccal cusps of first premolar and mesio- buccal cusps of first molar using round diamond burs as shown in fig 1. These marking were made on 14, 24, 26, 16 teeth and were named as A, B, C and D respectively. As shown in fig 2.

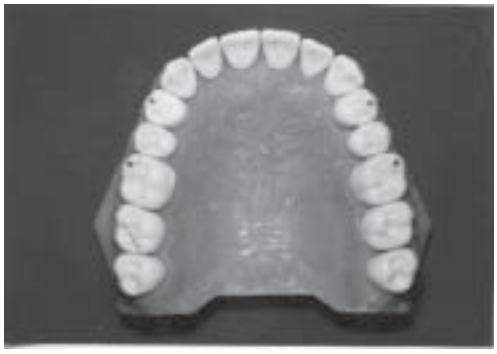

Fig 1. Reference marking on frasaco dentulous model

Fig 2. Reference making on cast

The distance between the above markings were measured with a profile projector microscope and kept as a stranded value. The frasaco model was mounted on the phantom head. using each group of impression materials, 14 impressions was made. Impressions were poured with type IV die stone. Measurements were made between 4 reference points. From A to B, B to C, C to D, and D to A. Using Nikon profile projector microscope (Japan) as shown in Fig 3. The reading was obtained from casts poured from different impression materials and subjected to statical analysis.

DISCUSSION

From the beginning of 18th and 19th centuries many researches are going on to improve the accuracy of the impression material. In 1937 sears first time used the agar hydrocolloid impression material. In 1947 the irreversible hydrocolloid came into the existence. The advantages of the alginates are discussed by the Skinner and Pomes –1)Low cost 2)Low heat is necessary for the preparation 3)No danger of burning of oral mucosa of the patient 4)Sufficient fluidity prior to the time of gelation5)Reduced risk of trapping the air. Caul H.J [1]- Outlined the techniques to avoid the inaccuracies during the use of alginates impression material. 1) Alginate mix should have smooth creamy consistency. 2) Precooling the instruments and use of cool water. 3) Impression should be removed with sudden snap about 2-3 min after the time of set. 4) Impression should pour instantly and removed after the pouring. Andrew etal [2] -conducted study on the accuracy of new alginates and traditional alginates According to them new alginates are 2-3 times costly than the alginate. But their study does not indicate that increased price correspond to that of the similar increased in success of impression. Chi-lin-c [3]- They proved from their study that to overcome the disadvantages of alginates, in the recent past year, several new materials, based upon the alginates have been introduced into the market which can be used for the impression for

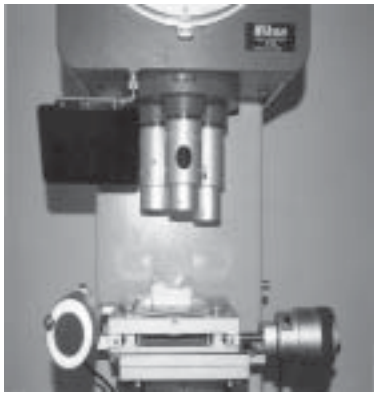

Fig 3 Nikon profile projector microscope

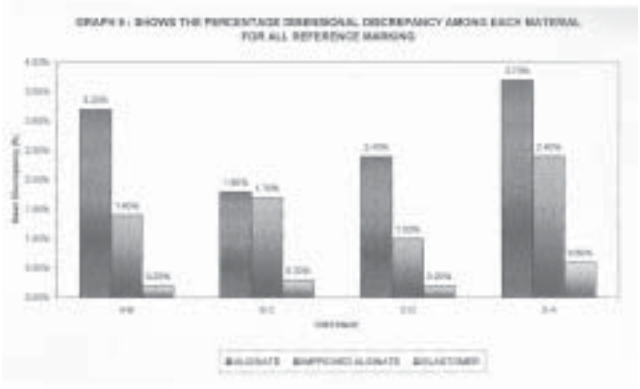

Fig 4 Shows percentage dimensional discrepancy among each material for all reference markings

fixed partial prosthesis. B.A. linke etal[4] - has found in his study stone cast made from Silicon impression materials produced less interbutment distortion than the irreversible hydrocolloid and also state that the statically significant difference exist among the different impression materials. Present study proves that the significant difference exists in interabutment distance of cast made from elastomers, alginates and improved alginates and shows similar results as that of study of B.A .Linke.

RESULTS:

The specimen were analyzed statically by wil coxon's signed rank test, One way ANOVAS test and student Newman kaul's test. The measurements are obtained with the mean value in millimeters and micrometers. The results show that the improved alginates are better than the alginates as shown in graph in figure 4.

CONCULSION:

The result of this vitro study showed that improved alginate better than alginate. These are more dimensionally accurate and shows less interabutment distortion than the alginate. These materials have comparable surface details as compared to that of the elastomers. So these can be used as impression materials for fixed partial dentures in place of elastomers so as to reduce the cost factor. But the elastomers are the still more accurate. So the further studies are required to co relate this study clinically.

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ACCIDENTAL LODGEMENT OF AIR GUN PALLET IN THE BUCCAL SPACE OF 11 YEAR OLD GIRL – A CASE REPORT

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ABSTRACT

Air gun, although considered a toy can cause injuries ranging from trivial to grievous. The severity of injuries depend on the type of air gun used, distance at which it is fired and the anatomic site at which the pallet hits. This article describes a case involving a girl who was accidentally hit by an air gun pallet. The treatment strategy along with review of literature on short and long term complications of air gun injuries is discussed.

Key words: Air gun pellet, buccal space

INTRODUCTION

Air gun is considered to be a toy for children. However incidents of air gun injuries are quite common. In the US alone, every year more than 30,000 injuries caused by air gun are reported.[1] Injuries could appear to be trivial but it may sometimes cause severe morbidity or even death [2]. Air gun injuries, most of time are accidental but could also be result of assaults. The following case report is presented to describe accident that occurred at home & resulted in lodgement of an air gun pallet in the left cheek of 11yr old girl. The management and complication of retained pallet are discussed.

CASE REPORT

An 11yr old girl reported to the department of oral and maxillofacial surgery with air gun injury to the left cheek. At the time of presentation, the child has no symptoms of said injury. History revealed that girl and her sibling were playing at home with air gun four days back. Girl's siblings were aiming at the target with airgun when girl accidentally came into the range of airgun and was hit by the airgun pallet. She was standing approx. 4m distance from her siblings. She experienced severe pain & was taken to a primary health centre from where she was referred to our institute. Examination revealed a small healed scar on the left side of chin (fig 1). The adjoining skin was depigmented. There was no exit mark visible. No sign of fracture or any other abnormality was detected on both extraoral and intraoral examination.

The patient was advised OPG to locate the air gun pellet. OPG revealed about 1cm×1cm irregular round radio opaque shadow at the inferior border of mandible near premolar region (fig 2). No other radio opaque shadow made clear that there wasn't any fragmentation of the pellet. It appeared that pellet had hit the girl with high velocity at an angle

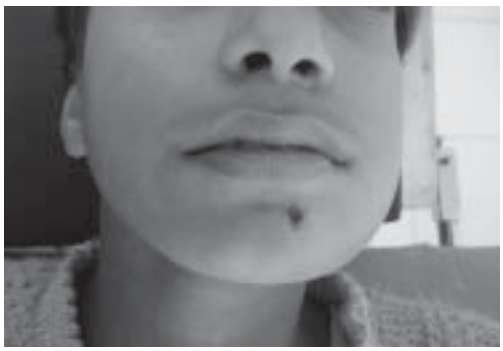

Fig 1

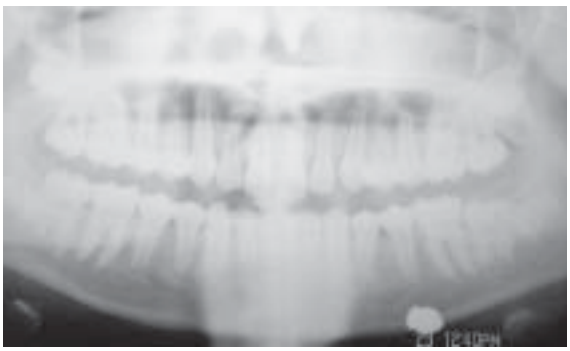

Fig 2

and instead of hitting the bone it penetrated the soft tissue of left cheek and got lodged in the left buccal space.

The patient was advised removal of the pallet. The patients' father was also explained the consequences of leaving the fragment inside such as, foreign body reaction, soft tissue infection and possible lead poisoning. After obtaining the informed consent the pellet was removed from the buccal space by extraoral incision under local anaesthesia.

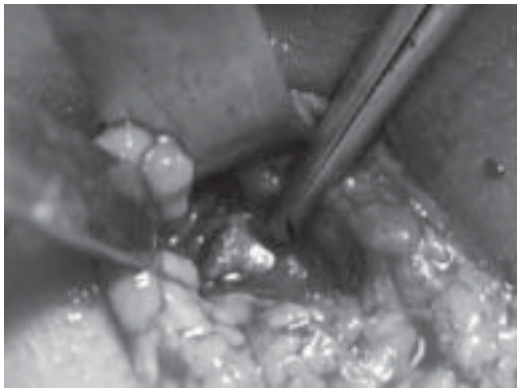

Fig 3

Fig 4

Approximately 3 cm incision was given at 2 cm below the inferior border of mandible. Blunt and sharp dissection was done along with probing to locate the pallet. The pellet was found to be entrapped in the soft tissue bed (Fig. 3) and was carefully removed without causing any injury to the adjacent vital structures (Fig. 4). Wound was irrigated and closed in layers (Fig. 5). The entry wound was also excised and was closed with 4-0 silk. The patient was regularly followed up and sutures were removed after a period of one week. Postoperative period was uneventful and healing was satisfactory.

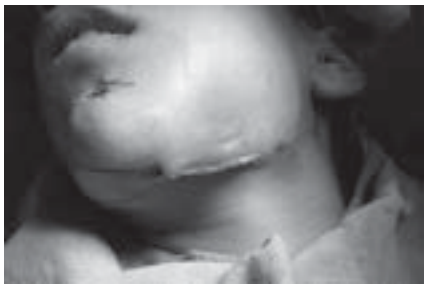

Fig 5

DISCUSSION

Air gun injuries most of the time are accidental and unintentional, but some injuries could also be a result of assault. In rear cases, air gun could be used as a weapon for suicid[3].

Depending on the type of airgun, the velocity of the projectile, distance at which it is fired and anatomic site of penetration are the factors that determine the gravity of injury[4]. Most air gun injuries occur in children. In a retrospective study on 101 children, it was found that 81% victims were male and medium age was 10.9 years[3]. Air gun injuries in children are generally more severe than adults. The adult skeleton can stop pellet projectiles but thin bone of children can easily be transversed by the projectile to enter the deeper structures[5].

The anatomic site of pellet entry determines the type and severity of injury. It may range from minor trauma to serious injuries such as corneal perforation, liver laceration, stomach and intestinal perforation, cardiac perforation, haemopneumothorax and even death[1]. In the head and neck region air gun can cause injury to the eyeball with resultant loss of vision. When the pellet enters the cranium it can cause intracranial bleeding, leakage of CSF, meningitis, brain abscess, formation of traumatic aneurysm and total carotid cavernous sinus fistula[6]. Injuries in the facial region can result in pallets being lodged in the jaw bones, paranasal sinuses[7] or in soft tissue as in the case presented.

When easily accessible surgically such as in the present case the pellets can easily be removed, but when the pellets become embedded in deeper and vital structures, the surgical procedure can be highly invasive resulting in significant morbidity. The projectile from air gun, besides causing immediate and acute trauma can also cause late complications if not removed. In the

paranasal sinuses it may cause chronic inflammation, rhinorrhea and neuralgic type of pain[8]. In a case report, cephalgia of forty years duration was found to be caused by a retained airgun pellet in the maxillary antrum[9]. Besides, the fragments of the pellet can migrate from the site of entry[10].

Retained pellets can also evoke foreign body reaction[11]. If the pellet material is inert, it may be walled off with fibrous capsule around it[12]. Lead from the retained bullet can cause lead poisoning (plumbism), although it is more often reported with gunshot injuries.[13,14] Chronic exposure to low levels of lead may lead to learning deficits, changes in behaviour, short stature, and poor weight gain. The airgun pellets are generally made up of 95% lead, 2.5% tin and 2.5% antimony, [15] therefore the risk of lead poisoning is real. Bowen and Magauran[16] reported raised serum levels of lead in 6 cases of ocular injuries caused by airgun pellet.

In the reported case, the pellet was embedded in the soft tissue of the cheek. The pellet, if left in situ could cause both immediate and late complications as listed above. As the patient was a young girl the risk of future lead toxicity affecting her physical and mental development was high. Above all, the site of pellet lodgement was easily accessible for surgical removal. Hence in the present case patient was advised surgical removal of pellet.

CONCLUSION

Air gun injuries have a wide clinical presentation from minor injuries to more serious life threatening injuries. Modern air gun muzzle velocity can be as high as that of conventional gun. Therefore, air gun must be considered a lethal weapon and not a mere toy. Strict regulation and public education regarding its potential dangers are required so that air gun injuries can be prevented or at least be minimized.

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IONTOPHORESIS AND DENTISTRY

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ABSTRACT

Iontophoresis has had a long history in healthcare for delivery of drugs to the body. The process of introducing ions for therapeutic purpose was first attempted in 1841, for delivery of mercury and iodine into body tissues.

Iontophoresis is a method of electrically transporting ionic particles into the hard and soft tissues to achieve therapeutic benefits. Iontophoresis if properly applied, is a pharmacologists dream i.e. a drug can be placed exactly at the site where it is most needed without affecting other organs of the body, thereby eliminating systemic side effects.

One of the major uses of iontophoresis, is in treatment of hypersensitive dentine. Other applications of iontophoresis include treatment of aphthous ulcers, herpes labialis, lichenplanus, for anaesthetising oral mucosa, and for bleaching of teeth.

The principles of iontophoresis described in this presentation can be used as guidelines for application of drugs, in resolving some difficult dental problems.

I) INTRODUCTION

Many medications available today may be under utilized because they cannot reach the site of action in proper concentrations. Since many medications are ionized, they do not ordinarily penetrate into surface tissue to the extent that their maximum therapeutic effect can be achieved.

This penetration problem of ionic drugs can be largely overcome by providing an energy source which will increase the degree of penetration and thus, the concentration of medication at the desired site of action.

Iontophoresis where in electricity is utilized to assist the drug delivery to the site of action, is specially useful in dental practice where we usually deal almost entirely with the surface tissue. Most of the drugs can be administered more effectively and more safely by Iontophoresis than by topical/systemic administration. The technique has been found to be particularly useful in conditions which are not amenable to usual dental therapy; the most important application being in treatment of hypersensitive teeth. For this reason, iontophoresis can form an important part in periodontal practice.

II) HISTORICAL BACKGROUND

The technique of drug delivery by electric current was first suggested as the physical laws of electricity were being described e.g. medication by ions was recommended by Faraday, Volta & others.

O'Malley & Oester[1] ushered in the scientific era of iontophoresis. They proved that the drug is concentrated only in tissue touching the electrode surface and does not follow the complete pathway of the current. This finding set the limits for iontophoresis, the technique is only useful for treatment of surface tissues.

Gangarosa[2] reported on iontophoretic introduction of local anaesthetics and epinephrine into oral mucosa producing a profound surface anaesthesia, sufficient to extract loose teeth. Gangarosa & Co-workers reported that idoxuridine iontophoresis was effective in treating herpes labialis.

III) EQUIPMENT FOR IONTOPHORESIS :

The **setup** for iontophoresis consists of :

1) **Active electrode / treatment electrode** containing the charged drug to be introduced, which is placed over the tissues which require medication e.g. a lesion on skin.
2) **Indifferent / return electrode :** containing an indifferent electrolyte (such as Sodium citrate or any other salt); is placed at another convenient area of the body.

The two electrodes are connected to a direct current source - either a battery / or a D.C. rectifier

3). **The power supply unit** contains a DC Source; a millimeter and a rheostat, which sets the external voltage bins.

When iontophoresis is performed as in case of fluoride iontophoresis, the medicating solution is placed under the active electrode. The electrical energy causes the drug (fluoride) to enter the surface tissue (the tooth). Once the drug enters the tissue, it does not follow the pathway through the patient to the return electrode, rather the chloride ions (the principle extracellular ions) carry the current to the other electrode by following the pathway of least resistance in the body, completing the circuit (Fig. 1).

Fig. 1 Armamentarium used during Iontophoresis

IV) PRINCIPLES OF IONTOPHORESIS :

1. Condition to be treated is at or accessible from a body surface.
2. Drug to be used is charged.
3. Charged drug is applied at appropriate electrolytic of the same charge.
4. Return electrode of the same or larger area is applied to another site on the body.
5. Indifferent electrolyte is used to saturate the return electrode.
6. Metal / highly conducive electrode material must not contact the body.
7. Adjacent areas which may conduct current, such as gingiva / metallic restorations must be insulated.
8. A safe amount of current (below patients threshold of sensation) is applied for an appropriate length of time and
9. Safety rules (maximum current, current duration etc.) are observed.

V) USES OF IONTOPHORESIS IN DENTISTRY :

Iontophoresis has several documented used in dentistry.

1. Dental Hypersensitivity:

Fluoride iontophoresis, gives the dental profession an effective treatment for dentin hypersensitivity. In order to take maximum advantage of iontophoretic therapy; basic pathophysiological aspects of dentin hypersensitivity need to be understood first :Tooth hypersensitivity which may be described clinically as an exaggerated response to non-noxious sensory stimuli[3] has tormented mankind since ancient times.

Dentin hypersensitivity is associated with dentinal exposure to oral environment; by either loss of enamel or by loss of covering periodontal structures, usually termed gingival recession.

Loss of enamel occurs due to attrition, abrasion, erosion, hypoplastic enamel and improperly formed CEJ. Exposure of root dentin by gingival recession is multifactorial, but acute and chronic periodontal disease, toothbrushing or chronic trauma from other habits and some form of periodontal surgery are important causal factors.

Many theories have been proposed to understand the dental hypersensitivity; of these the hydrodynamic theory is currently believed most responsible for the transmission of dental sensation. Brannstrom and Astrom[4] (1964) suggested that a dentinalgia results from a stimulus (i.e. air blast, thermal stimulus, high osmolarity solutions, like salt or sugar solutions) causing minute changes in the fluid movement within the dentinal tubules. This may subsequently deform the odontoblast or its process and hence cause an elicitation of pain via the intimately associated “mechanoreceptor” like nerve endings.

The incidence of sensitive teeth in the mouth varies, Addy[5] (1987) stated that the canines and premolars were most commonly affected since they were most well cleaned and prominent teeth in the arch.

The understanding of basic pathophysiology of dentin hypersensitivity brings

us to its treatment aspect. Gangarosa and Park[6] (1978) reported dramatic reduction in sensitivity using 2% NaF iontophoresis. The results lasted for at least 3 months and upto 3 years. No apparent adverse effect, of the procedure was observed; the teeth remained healthy and asymptomatic as long as patients were under observation. They also mentioned the three possible mechanisms of NaF iontophoresis. In one mechanism proposed by Lefkowitz and Lefkowitz and associates[7], involves the formation of reparative dentin following application of current to dentin. A second possible explanation is that the electric current produces paraesthesia by altering the sensory mechanism of pain conduction. A third alternative explanation of iontophoretic desensitization is that the concentration of fluoride ions in dentinal tubules may be increased due to the fluoride iontophoresis. This could cause microprecipitation of calcium fluoride that may act to block hydrodynamically mediated pain inducing stimuli .

Instructions for use of NaF iontophoresis (Fig. 2 & 3)

(A) Single tooth Iontophoresis :

1. Apply NaF to cotton in the active electrode tip.
2. Apply $NaNO_3$ to return electrode.
3. The return electrode contacts the skin of the forearm and the active electrode contacts the tooth to deliver fluoride ions.
4. The current switch is turned on and current increased to .5mm and applied for a time of 2 minutes.
5. At the end of the procedure, the electrodes are removed and the tooth tested for treatment of hypersensitivity by air blast.

(B) For multiple teeth hypersensitivities :

Concentrated in quadrants or arch segments, the tray technique is utilized. This is especially useful for post periodontal surgery patients with a great amount of interproximal sensitivity. Here the active electrode is the alginate impression (inside metallic tray). Cotton saturated with 1% NaF is placed on teeth to be treated, the impression inserted and isolated from oral soft tissues by rubber dam and current switched on. A clip electrode is placed on the metal tray handle. The procedure is usually performed at 1.0 mA and time is 1 minute / teeth.

(C) Iontophoresis for crown preparations / extensive cavity preparation :

Since a rubber base impression is usually available, a modification of the tray technique is used. The active electrode is the modified rubber base impression. The impression material around the abutment teeth to be treated is removed. Two holes are made in the plastic on occlusal side of tray, so that a piece of wire can be inserted into the holes over the abutment teeth. Clip electrode is attached to the wire and cotton saturated with 2% NaF is kept on the teeth to be treated. Current is passed through the wire and through cotton into the dentin using 1.0 mA / tooth.

Pulpal safety of fluoride iontophoresis :

Scott[8], on the basis of his histological study recommended 1 mA - min. of direct current. Gangarosa and co-workers also recommended a direct current of 1 mA - min with 2% NaF as safe for pulpal tissue. Also the pain threshold is .5mA and this should not be exceeded to avoid tissue damage from occurring.

As an added precaution they recommended that repeat treatments should be performed at 1 week intervals. This is to assure that any possible changes induced by the current are reversed before a 2^{nd} treatment is started.

2-A) Aphthous ulcers :

Aphthous ulcers and are difficult to treat by conventional methods and since they cause constant discomfort, the dentist needs an effective alterative treatment.

Iontophoresis has been shown to provide dramatic results in treatment of aphthous ulcers[9]. A single treatment with changed steroid, methyl/ prednisolone sodium succinate (0.125%) has been found to be effective in giving immediate relief, elimination of inflammation and rapid healing.

Two methods have been found useful :-

1. **One step method :** here the steroid is applied at the –ve electrode and current of .5mA for normal size lesions and 1.0 mA for large lesions is recommended.
2. **Two step method :** is used for larger lesions

or lesions in highly vascular areas. Here 1st vasoconstriction and local anaesthesia by lidocaine – epinephrine iontophoresis is done under the positive electrode and then application of steroid under the negative electrode is done.

3. At the end of the treatment there is usually a tingling sensation for 2-3 minutes after removing the electrode; patient experiences relief from discomfort after 3-5 minutes and rapid healing occurs during the next 2-4 days. A second treatment is rarely needed.

B. Lichen Planus :

Treatment of Lichen planus is the same as the one step method for aphthous ulcer treatment, except that a larger electrode is usually needed to cover the lesion, a higher current is used and repeat treatments are often required. The lesion is dried and a layer of cotton (soaked with .125% methyl prednisolone Na succinate) is placed covering the lesion. Oral electrode is placed against the cotton and current is applied for 2mA – min / cm^2. This is repeated 3 times over a period of a week. The lesion should then be more comfortable with no evidence of inflammation or erosion process.

3. Herpes Labialis :

There is currently no accepted treatment for Herpes virus (HSV-1) lesions of the orofacial region.

Gangarosa studied herpes labialis treatment by an antiviral compound the idoxuridine.

He concluded that it is extremely effective with reduction of healing time to 3-4 days (normal 9-10 days). There was found to be an immediate loss of discomfort and acceleration of all subsequent stages of the lesion, including coalescence of vesicles, rapid oozing, appearance of a small scab, lack of spread of lesions and rapid healing.

4. Local Anaesthesia for Deciduous Teeth Extraction :

A childs first encounter with a dentist is usually critical, in order to train the child as a co-operative patient. It would be advantageous to extract the loose deciduous teeth without the prospect of an injection at the first appointment. Now the use of

Table I : Uses of Iontophoresis in Dentistry

Condition	Drug	Charge
Dentinal Hypersensitivity	2% NaF	-ve charge
Aphthous Ulcers	Methyl predinisolone - sodium succinate (0.125%)	-ve charge
Herpes Labialis	Idoxuridine	-ve charge
Anaesthesia (pre-injection topical / surface mucosal)	epinephrine(1/10000 - 1/50000)	-ve charge
Bleach	Sodium hypochlorite	-ve charge

Table II : Treatment Specifications

Treatment	Max. Current (mA)	Time (min)	Dosage (mA – min.)
Hypersensitive Dentin			
(a) single tooth	0.5	2.0	1.0
(b) multiple teeth	1.0		1.0/tooth
Aphthous Ulcers	0.5	4.0	2.0
Herpes Labialis	0.5 – 1.0*		2.0
Topical anesthesia	1.0	2.0	2.0
Bleach	0.7-1.0**	2.9-6.0**	2.0-6.0**

* Depends on lesion size. ** Vital - Non-vital
Current should be reduced for patient comfort. Maintain dosage.

iontophoresis eliminates the need for the needle insertion at the child first appointment. The drug used (Lidocaine HCl 2% with 1/50,000 epinephrine) is effective for preinjection topical anaesthesia[10].

Current is applied at 1mA for 3-5 minutes. This procedure is specially recommended before injection into sensitive areas such as palate. Also by using palatal stints / saddle shaped electrode, the palatal injection can be completely eliminated for achieving palatal anaesthesia for extraction / gingival curettage.

The uses of iontophoresis alongwith various treatment specifications are summarized in Table I & II respectively.

VI) CONCLUSION

The subject of iontophoresis must be viewed in terms of methods of drug administration. The major methods of administration are systemic and topical. The advantage of iontophoresis lies in it being a technique which assures penetration of the drug when a surface of the body requires drug therapy and a high concentration in the surface under treatment, while the total dose delivered to the entire body is infinitesimally low.

In dentistry, one deals almost entirely with surface tissue. Thus local therapy is most important in dental practice. The technique of iontophoresis has been found to be useful, for aiding fluoride penetration of enamel during topical therapy, for administration of epinephrine and other drugs directly into the gingiva, for more effective pain control of hypersensitive teeth during endodontics allowing dentin & pulp tissue removal, for local anaesthesia of abscesses before lancing, for antibacterial treatment of infections, for anti-inflammatory steroid treatment of aphthous and herpetic lesions etc. The dentist may also think of other conditions he would like to treat when drugs are available and apply the principles of iontophoresis to the problem and enhance his practice.

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LOCAL DRUG DELIVERY IN PERIODONTICS

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ABSTRACT

In Indian perspective, the periodontal diseases are major cause of tooth loss during adulthood of population irrespective of sex and age. Various treatment modalities have been available to the dental profession. Scaling polishing along with self administered plaque control instructions is the most commonly practised by general dentist for prevention and control of early periodontal diseases. Root planning and soft tissue curettage procedures are added to it for treatment of moderate type periodontal diseases. In some cases, it has limited success and therefore, local applications of some antibacterial drugs by topical application or local drug delivery in the periodontal pockets have been tried. Periodontal pockets provide natural reservoir bathed by gingival crevicular fluid that is easily accessible for the insertion of a delivery device. Controlled release delivery of antimicrobials directly into periodontal pockets has received great interest and appears to hold a sound promise in periodontal therapy. Both topical drug delivery and controlled drug release have been termed as local drug delivery. It does not substitute the local instrumentation but acts as an adjunct to it. The periodic use of local drug delivery in minimizing bleeding, stabilizing attachment levels and thereby reducing probing depth, would allow better control and management of periodontal disease. Various drugs have been under investigation for more than 3 decades promising encouraging results. The rationales of using antibacterial drugs through local delivery into the periodontal pockets have been discussed.

INTRODUCTION

Recent developments in science and technology have revolutionized the basic outlook and approach to the management of periodontal disease. Earlier it had been assumed that periodontal problems were invariably progressive and its morbid effects increased with passage of time assuming that they were age related. Periodontal diseases are infections of the periodontium. Once there is an immune response to a bacterial challenge, then the process is referred to as an infection. Usually the host response contains the bacterial challenge and there are no signs of inflammation. However, if tissue destruction occurs, then the condition is considered a disease. The most common form of periodontal disease is referred to as chronic periodontitis.

Chronic periodontal disease describes a group of related inflammatory reactions resulting in destruction of the tissues that support tooth in its socket. It results usually from extension of the inflammatory process initiated in the gingiva to the supporting periodontal tissues. There are several types of periodontal diseases (periodontitis) and are classified by the American Academy of Periodontology, although they all have the same characteristic features. The clinical findings include increased probing depth (PD), bleeding on gentle probing (BOP), loss of clinical attachment level (CAL) and alteration in the physiologic contour of the gingiva. Unfortunately, periodontitis cannot be cured, but it can be arrested. It can be localized or generalized and depending on the amount of clinical attachment loss, the severity of the disease process can be labelled as mild (< 3 mm), moderate (3 to 4 mm), or severe (e" 5 mm). It has been determined that approximately 30% of the adult population develops chronic periodontitis.

The immediate goal is to prevent, control or eliminate periodontitis and to restore the form, function, aesthetics and comfort of dentition. Periodontal therapy has been directed at altering the periodontal environment to the one, which is less conducive to retention of bacterial plaque in the vicinity of gingival tissue. Active phase of the disease can be reversed dramatically by reducing plaque levels. Classic regimen to achieve this aim includes:

1) Instructions in self administered plaque control measures.
2) Periodontal prophylaxis for removal of calculus, debris and stains.
3) Correction of restorative inadequacies.
4) Root planning and soft tissue curettage.

5) Surgical elimination of periodontal pockets if required.

Scaling and root planing or ultrasonic debridement is effective mechanical therapies for periodontitis. However, in deep or tortuous pockets or sites that do not respond to conventional therapy, it may be beneficial to use adjunctive antimicrobial therapy. For local chemotherapy (drug delivery) to be effective, it must meet 3 requirements: (1) reach the site of disease activity namely the base of the pocket, (2) be delivered at a bacteriostatic or bactericidal concentration, and (3) remain in place long enough to be effective.

LOCAL DRUG DELIVERY

Recently, a new approach using local drug delivery containing antimicrobial agents has been introduced. Such therapeutic intervention provides long-term retention of a highly concentrated drug within the target tissue after local delivery. It produces more constant and prolonged concentration profiles in the local area. Both topical drug delivery and controlled drug release have been termed as local drug delivery. The term local drug delivery and site-specific drug delivery are sometimes used synonymously. The potential therapeutic advantage of local drug delivery approach has been claimed to be several fold. Local drug delivery devices are systems designed to deliver agents locally into periodontal pockets but without any mechanism to retain therapeutic levels for a prolonged period of time. The periodic use of local drug delivery in minimizing bleeding, stabilizing attachment levels and thereby reducing probing depth, would allow better control and management of periodontal disease.

The effectiveness of this form of therapy is that it reaches the base of periodontal pocket and is maintained for an adequate time for the antimicrobial effect to occur. Periodontal pockets provide natural reservoir bathed by gingival crevicular fluid that is easily accessible for the insertion of a delivery device. Controlled release delivery of antimicrobials directly into periodontal pockets has received great interest and appears to hold a sound promise in periodontal therapy.

Controlled release local drug delivery in which the antimicrobial is available at therapeutic level for several days have been evaluated in several forms using different antimicrobials. Controlled drug delivery are designed to release drug slowly for more prolonged availability and sustained action. These delivery systems are also called sustained release, controlled release, prolonged release, timed release, slow release, sustained action, prolonged action or extended action etc.

DRUGS USED FOR LOCAL DELIVERY

Common drugs used for local delivery are:

Tetracyclines including doxycycline and minocycline: Tetracyclines are bacteriostatic for many pathogens at concentrations found in the gingival crevicular fluid after systemic administration (3-6 microgram/ml). However, local delivery of these drugs provides high concentrations that are bacteriocidal. Local application of tetracycline has been associated with minimal side effects.

The tetracycline, tetracycline hydrochloride and doxycycline, are broad- spectrum antibiotics that are effective against anaerobes and facultative organisms. They are bacteriostatic against both Gram-positive and Gram- negative bacteria.

Chlorhexidine: Chlorhexidine is an antiseptic known to reduce gingivitis when used as a mouth rinse and also as a subgingival irrigant It adheres to organic matter and demonstrates low toxicity when delivered locally and is not adsorbed well into the tissue. The chlorhexidine is used in chip form. The chip is easily placed into periodontal pockets greater than 5 mm and requires no retentive system. The body resorbs the chip in 8 to 10 days. The trial studies on the chlorhexidine chip demonstrate that it is a safe and effective adjunctive chemotherapy for the treatment of periodontal disease with minimal adverse efffects.

Metronidazole: Metronidazole is another drug with spectrum of activity relatively specific for obligate anaerobes. It has also been tried with encouraging results.

Collagen membranes for local delivery: Different types of collagen based membranes have been under investigation for local drug delivery system.

AVAILABLE PREPARATIONS FOR LOCAL DRUG DELIVERY

The following are some common preparation available:

- Tetracycline fibers.
- Doxycycline polymer.
- Chlorhexidine chips, and
- Metronidazole and minocycline gels.

The supremacy of local drug delivery system is still inconclusive and controversies such as induction of bacterial resistant strains, the efficacy of systemic versus local drug delivery and whether local drug delivery should function as an alternative or as an adjunct to conventional treatment need more investigations.

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"PERIODONTAL INTERVENTION IN ROOT CANAL FAIURE CASES"-A CASE REPORT

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ABSTRACT

Persistant pain after successful root canal therapy becomes a dilemma for a dentist. This case report deals with one such diagnostic problem, where a maxillary anterior tooth was root canal treated and retreated but pain continued with a draining sinus in relation to that tooth. Interpreted in intraoral periapical radiograph, periapical radioleucency was observed. Surgical intervention revealed a larger cystic lesion around the tooth root which was debrided and bone grafting was done and tissue was approximated. Recall visits revealed complete healing of sinus and symptom free condition was attained. Thus a thorough knowledge about the normal anatomy and its variations and proper diagnostic aids are essential in the diagnosis of periapical pathology leading to correct treatment planning and treatment.

Key Words: Root canal therapy, Periapical cyst, Epicoectomy, Lateral and periapical radioleucency, Lamina dura.

INTRODUCTION:

In day to day dental practice it is observed that patient report only in case of pain and generally seen that tooth has already decayed so much that without proper diagnosis [3, 4, 5] a dentist advises root canal treatment and patient in pain has no other option and hence get going. Now what if pain is persisting even after excellent root canal therapy and why is such a question that keeps the dentist in dilemma that why pain. Now importance of correct diagnosis and diagnostic aids come into play. Radioluecency seen at peri apical region of the root canal treated teeth is seen.

In some cases infection persists or recurs around the root canal treated teeth. In such cases it becomes necessary to surgically intervene and assess the infection directly clean it around the tooth root hence "A Periodontist" [1, 2].

CASE REPORT

A 30 year female reported in the department of periodontology, with persistant complaint of dull pain and pus discharge i.r.t right maxillary central incisor **(Fig.2)**. On clinical and radiographic evaluation after complete history was taken, it was found that she had undergone multiple root canal therapies for the treatment of the same complaint. Last root canal therapy was done 4 weeks ago. Radiographic examination revealed loss of lamina dura, lateral and periapical radioleucency surrounding the tooth root **(Fig.1)**. Clinical examination revealed a probing depth of 7mm distal to right maxillary Central Incisor (C.I) **(Fig.4)**, palatal probing depth was around 4mm. It was decided to surgically operate the area. Treatment plan was properly explained to the patient and a written consent of the patient was taken.

Local anesthesia sensitivity test was done **(Fig.3)** and then proper anesthesia was administered to the patient. Crevicular and vertical releasing incisions were made and full thickness mucoperiosteal flap was raised (Fig.5). After the flap was raised it was visualized there was marked loss of alveolar bone around the root surface. The tooth was not mobile as the mesio and disto palatal bone was still intact **(Fig.6)**. The defect was thouroughly debrided and irrigated **(Fig.7)** and was followed by root conditioning and placement of Osseoconductive bone graft **(Fig.8)**. Soft tissue was approximated with 3-0 mersilk suture properly **(Fig.9)**. Recall of the patient was done after one week for suture removal and then after 2 and 4 weeks respectively clinical and radiographic evaluation was done.

CONCLUSIONS:

Radioleucency was eliminated and trabaculae formation was seen **(Fig 10, 11, 12)**. Apical periodontitis, which may be radiographically [7]

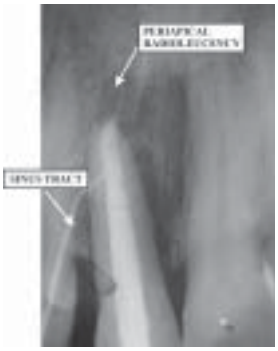

Fig. 1. Pre-OP Radiograph

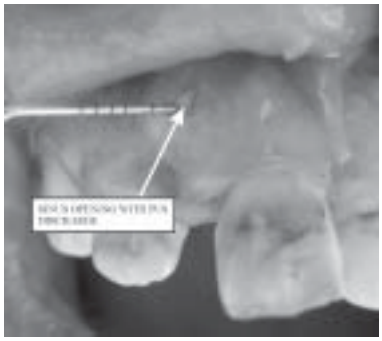

Fig. 2 Pre-OP (Sinus Opening with Pus Discharge)

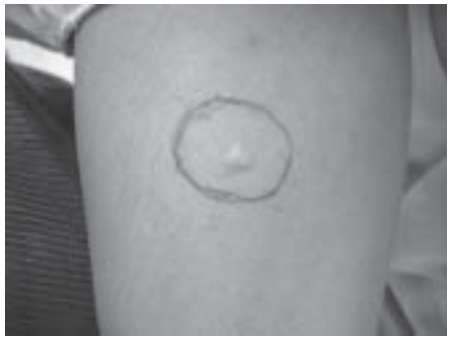

Fig. 3 Sensitivity Test (Local Anesthesia)

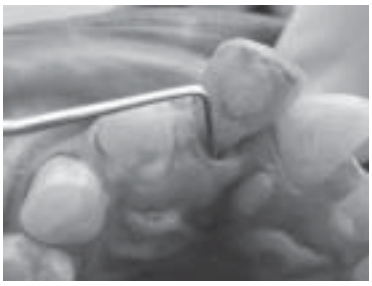

Fig. 4 Probing Depth

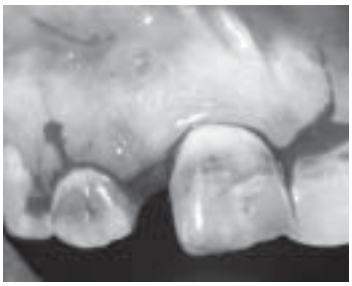

Fig. 5 Incisions.

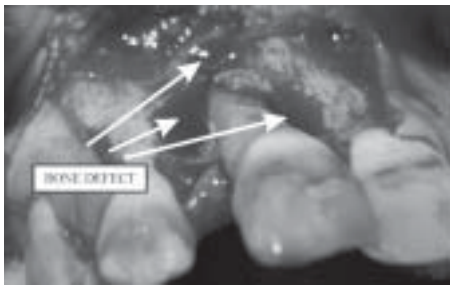

Fig. 6 Lesion Visible Clinically

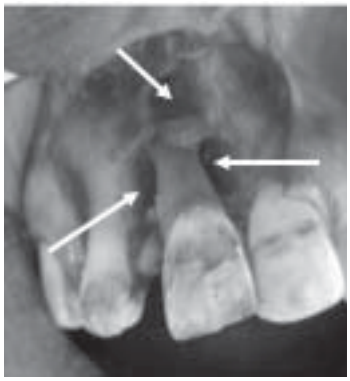

Fig. 7 Debridement of the Lesion

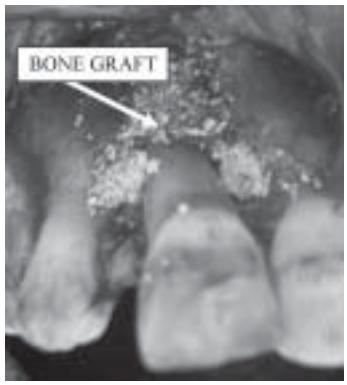

Fig. 8 Bone Graft Placement

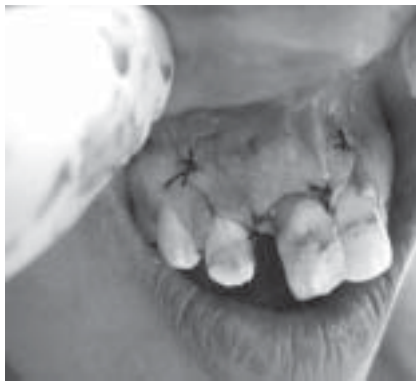

Fig. 9 Suturing after Bone Grafting

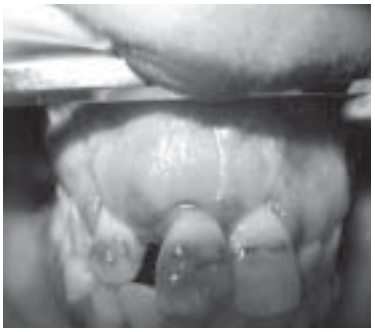

Fig. 10 Post Suture Removal (After One Week).

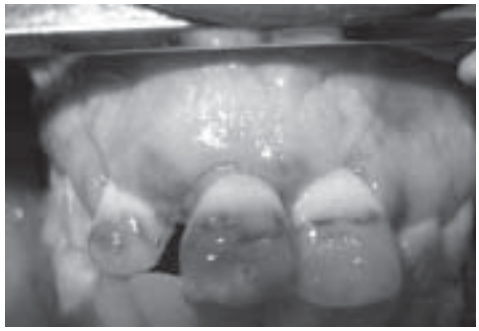

Fig. 11 Lesion Asymptomatic After 15 Days of Suture Removal.

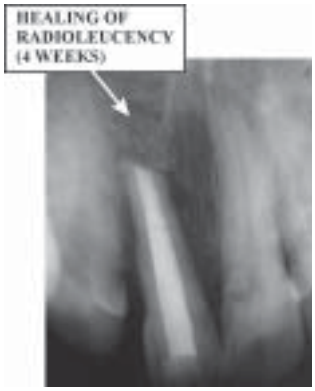

Fig. 12 Post OP Radiograph (Post Suture Removal 4 Weeks)

undetectable or may be larger causing destruction to bone, is likely to persist or emerge in most root filled teeth as a consequence of residual endodontic post-treatment root infection. If the objective of root canal treatment is defined as elimination of apical periodontitis at a histological level, current treatment procedures must be improved. At the same time, it is essential that further knowledge is acquired of the local and systemic biological consequences of residual post treatment root infection and post-treatment apical periodontitis.

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TISSUE ENGINEERING-LETS JOIN OUR HANDS

"A VISION OF A DENTIST-DREAM COME TRUE"

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ABSTRACT

Tissue engineering is an interdisciplinary field which applies the principles of engineering and the life sciences to the design, construction, modification, growth and maintenance of living tissues [1, 2]. One of two approaches can be taken: (1) *in vitro* construction of bioartificial tissues from cells seeded onto a resorbable scaffold or (2) *in vivo* modification of cell growth and function to stimulate tissue regeneration [2, 3]. This concept represents a shift in emphasis from replacement to regeneration of diseased or damaged tissues, in which the development of bioactive materials has played a significant role.

This paper will begin with an overview of the use of biomaterials as implants and their limitations, leading to the reasons for the dramatic shift in focus regarding the approach to repairing damaged tissues. The majority of the paper will discuss the ways in which biomaterials can be developed to implement the concept of tissue engineering. Finally, the implications of these developments for future treatment of damaged or diseased tissues will be considered.

Key Words: Tissue Engineering, Implants, Biomechanics, Regenerative Dentistry.

INTRODUCTION:

The age of tissue engineering is upon us. Mankind is advancing beyond the ability to create inanimate objects, toward the capability of replacing and regenerating our own living body tissues. The amalgamation of bioengineering and dentistry will result in an explosion of knowledge that will enhance our understanding of craniofacial development and culminate in a new era in dentistry, enabling us to restore lost tissue function. Tissue engineering is also referred to as ''regenerative dentistry,'' because the goal of tissue engineering is to restore tissue function through the delivery of stem cells, bioactive molecules, or synthetic tissue constructs engineered in the laboratory. The patient demand for tissue engineering therapies is staggering, both in scope and cost. Each year, $400 billion is spent treating Americans suffering some type of tissue or end-stage organ failure. These data include 20,000 organ transplants, 500,000 joint replacements, and hundreds of millions of dental and oral craniofacial procedures ranging from tooth restorations to major reconstruction of facial soft and mineralized tissues.

The application of regenerative dentistry in dental clinics can produce wonderful treatments to dramatically improve patients' of life. Historically, materials and treatment options have provided the dentist with a limited ability to replace diseased, infected, traumatized, and lost tissues. Looking to the future, advances in bioengineering research are set to unleash the potential of the human genome project and molecular biology into dental practice.

Tissue engineering has become the new frontier in dentistry. A past frontier was the introduction of amalgam restorative materials in the 1830s. By 1845, the American Society of Dental Surgeons, an early professional organization, passed a resolution condemning the use of mercury amalgam as a toxic substance, and expelled members who practiced such use. When used properly, however, the material was long-lasting and relatively easy to manipulate. Eventually, in the late 1890s, largely through work of Dr. G.V. Black, the''Father of Modern Dentistry,''the formulation and proper application of mercury amalgam became better standardized and more successful. The use of dental amalgam has always proven to be controversial and divisive among the general public and dental profession,

as it still is today. If we use dental amalgam as a lesson on the controversy of introducing an entirely new type of dental material and treatment, it is easy to speculate that use of tissue engineering in regenerative dentistry will always prove to be controversial. Controversy surrounding regenerative dentistry is not a bad thing, because it increases scrutiny of its safety, and helps educate the public and profession on its effectiveness and potential disadvantages.

Currently, strategies employed to engineer tissue can be categorized into three major classes: conductive, inductive, and cell transplantation approaches. These approaches all typically utilize a material component, although with different goals.

Conductive approaches (Figure 1) utilize biomaterials in a passive manner to facilitate the growth or regenerative capacity of existing tissue. An example of this that is very familiar to dentists, and particularly periodontists, is the use of barrier membranes in guided tissue regeneration. Nyman et al. were the first to successfully use Osseoconductive mechanisms in providing a means for selective wound healing by supporting the in growth of the periodontal supporting cells, while excluding gingival epithelial and connective tissue cells from reconstruction sites. Techniques and materials are still being optimized in guided tissue regeneration. However, the appropriate use of barrier membranes promotes predictable bone repair and histologically verifiable new attachment with new formation of cementum and periodontal ligament fibers.

Treatment options in restorative and prosthetic dentistry have been revolutionized by another relatively widespread application of a conductive approach, osseointegration of the dental implant. Branemark et al. were the first to successfully achieve this phenomenon, and its application is relatively simple in that the armamentarium does not include living cells or diffusible biological signals.

The second major tissue engineering strategy **"Induction" (Figure 2)** involves activating cells in close proximity to the defect site with specific biological signals. The origins of this mechanism are rooted in the discovery of bone morphogenetic proteins (BMPs). "Urist" first showed that new bone could be formed at nonmineralizing, or ectopic, sites after implantation of powdered bone (bone demineralized and ground into fine

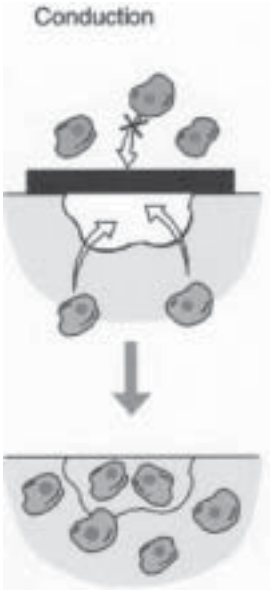

FIGURE 1 - The conductive approach makes the use of a barrier membrane to exclude connective tissue cells that will interfere with the regenerative process, while enabling the desired host cells to populate the regeneration site.

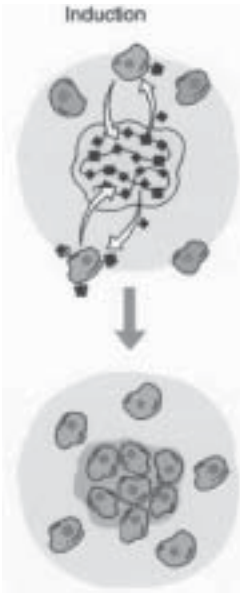

FIGURE 2 - The inductive approach uses a biodegradable polymer scaffold as a vehicle to deliver growth factors and genes to the host site. The growth factors or genes can be released at a controlled rate based on the breakdown of the polymer.

particles). Contained within the powdered bone were proteins (BMPs), which turned out to be the key elements for inducing bone formation. These proteins are now available in recombinant forms and produced on a large scale by biotechnology companies. BMPs have been used in many clinical trials and are very promising as a means of therapy and supplementation in the regeneration and repair of bone in a variety of situations, including non-healing fractures and periodontal disease. One limitation of inductive approaches is that the inductive factors for a particular tissue may not known. In this situation the third tissue engineering approach, cell transplantation, becomes very attractive. This approach involves direct **Transplantation of Cells (Figure3)** grown in the laboratory. The cell transplantation strategy truly reflects the multidisciplinary nature of tissue engineering, as it requires the clinician or surgeon, the bioengineer, and the cell biologist. The clinician is required to biopsy a small sample of tissue containing the cells of interest. Principles of cell biology are required to multiply cells million-folds in the laboratory and maintain their function. Meanwhile, the bioengineer manufactures the tissue, in bioreactors, and the material onto which the cells will be placed for transplantation. Lastly, the clinician is required to transplant the engineered tissue. After transplantation, the polymer scaffold degrades and/or is remodeled by host and transplanted cells, resulting in a completely natural tissue. A common feature to all three of the tissue engineering strategies is that they typically employ the use of polymeric materials. In conductive approaches, the polymer is used primarily as a barrier membrane for the exclusion of specific cells that may disturb the regenerative process. Inductive approaches typically employ a carrier or vehicle for the delivery of proteins (e.g., BMP) or the actual DNA (gene) that encodes the protein. These molecules then directly (proteins) or indirectly (DNA to mRNA to protein) exert their effects on cells at the anatomic site by promoting the formation of the desired tissue type. Biodegradable polymer carriers allow a localized and sustained release of the inductive molecules. The rate and dose of molecule delivery are controlled by features (e.g., degradation rate) of the carrier. Delivery vehicles are also frequently used in cell transplantation approaches. However, in this approach the vehicle serves as a carrier of whole cells and even partial tissues. In addition to serving as simple vehicles for delivery of cells, the vehicles also serve as scaffolds to guide new tissue growth in a predictable manner from both the transplanted cells and interacting host cells. The two major types of polymeric materials used in all three tissue engineering strategies are collagen derived from animal sources and synthetic polymers of lactic and glycolic acid (same polymer used in resorbable sutures). Collagen is degraded by the cells in the tissue as

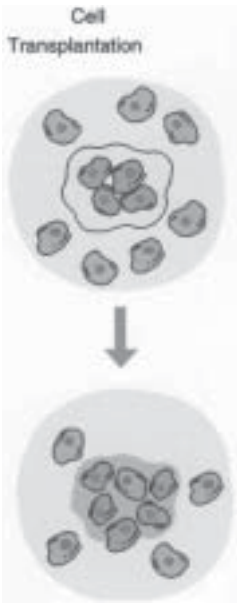

FIGURE 3 - The cell transplantation strategy uses a similar vehicle for delivery in order to transplant cells and partial tissues to the host site.

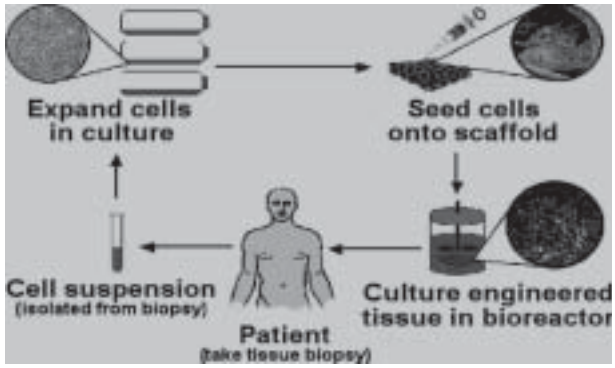

FIGURE 4 - Multidisciplinary nature of tissue engineering

it develops, while the synthetic polymers degrade into the natural metabolites lactic acid and glycolic acid by the action of water at the implant site. A variety of new materials are also being developed for these applications, and injectable materials that allow a minimally invasive delivery of inductive molecules or cells are especially attractive [3].
Practice Implications : Tissue engineering will have a considerable effect on dental practice during the next 25 years. The greatest effects will likely be related to the repair and replacement of mineralized tissues, the promotion of oral wound healing and the use of gene transfer adjunctively.

Recently, there has been a substantial and growing public[1] and scientific awareness of a relatively new field of applied biological research called tissue engineering. This field builds on the interface between materials science and biocompatibility, and integrates cells, natural or synthetic scaffolds, and specific signals to create new tissues. This field is increasingly being viewed as having enormous clinical potential.

Historically, some of the earliest attempts at tissue replacement, dating back thousands of years, involved teeth. In modern times, dentistry has continued to place considerable emphasis on, and be a leader in, the study and use of biocompatible materials. The purpose of this brief review is to provide the practicing dentist with

– A general perspective and background on tissue engineering;
– A sense of what has been accomplished in this field thus far;
– A consideration of the likely impact of tissue engineering on the practice of dentistry during the next 25 years.

For a more in-depth review of this field, we recommend several articles that make up a special report, as well as recent texts on the subject.

TISSUES TO BE ENGINEERED UPON

Two important questions relevant to the dental practitioner are “What kind of impact will tissue engineering have on dentistry?” and “What oral tissues do we have the potential to engineer?” The answer to the first is still being formulated, but tissue engineering will likely have a revolutionary effect on dentistry. The answer to the second question is almost all tissue types. The effect that tissue engineering may have in the field of dentistry stems from its widespread application to many different types of tissues related to the oral cavity, including bone, cartilage, skin and oral mucosa, dentin and dental pulp, and salivary glands.

BONE

Tissue engineering will likely have its most significant impact in dentistry via bone tissue engineering and regeneration. Bony defects secondary to injury, disease, and congenital disorders represent a major health problem. Current strategies aimed at replacing bony defects include the utilization of autografts, allografts, and synthetic biomaterials. Despite the fact that these substitutes restore stability and function to a reasonably sufficient degree, they still contain limitations. This has led to interest in engineering bone, which can be achieved using all three tissue engineering strategies. Both conductive and inductive approaches can be used to regenerate small bony defects. Guided tissue regeneration (GTR) after periodontal surgery represents a conductive approach to regeneration of bone. BMPs, related proteins, and the genes encoding these proteins allow one to engineer bone using inductive approaches in situations where GTR is not sufficient. In contrast, cell transplantation approaches offer the possibility of pre-forming large bone structures (e.g., complete mandible) that may not be achievable using the other two strategies. These structures may even be completely developed in the lab prior to use in large-scale reconstructive procedures.

CARTILAGE

As it relates to craniofacial reconstruction, the design of polymer scaffolds with defined mechanical and degradative properties has opened a new door to cartilage reconstruction. Cartilage destruction is associated with trauma and a number of diseases including degenerative articular cartilage destruction at the temporomandibular joint. The limited capacity of cartilaginous tissue to regenerate and the lack of inductive molecules have focused interest among researchers and manufacturers in developing cell transplantation approaches to engineer cartilage. Transplantation

of cells without a carrier is now used clinically to repair small articular cartilaginous defects. 14 Investigators have also demonstrated in animal models that new cartilaginous tissue with precisely defined sizes and shapes relevant to maxillofacial reconstruction (e.g., nasal septum, temporomandibular joint) can be engineered using appropriate biodegradable scaffolds for transplanting the cells.

SKIN AND ORAL MUCOSA

The most successful application of tissue engineering to date is the development of skin equivalents. Skin tissue is needed in adjunctive esthetic treatment of individuals who are severely disfigured following severe burns, in radical resective surgery to treat invasive cancers, and for major trauma wounds (like shotgun wounds and knife lacerations). Skin with both dermal and epidermal components is grown in the lab using a combination of cells and various polymer carriers, and engineered skin products were the first tissue-engineered products the FDA approved for clinical use. A similar approach has also been developed for the replacement of oral mucosa, although this procedure has not yet been marketed. The engineering and transplantation of oral mucosa and gingiva could be potentially important as a new technique in periodontal graft surgery and in the treatment of gingival recession.

DENTIN AND DENTAL PULP

The production of dentin and dental pulp has also been achieved in animal and laboratory studies using tissue engineering strategies. The greatest potential for these engineered tissues is in the treatment of tooth decay. Dental caries remains one of the most prevalent young adult and childhood diseases, while the phrase "root canal" is probably the most dreaded term in dentistry. There are several ways in which one can potentially engineer lost dentin and dental pulp. There is now evidence suggesting that even if the odontoblasts (cells that produce dentin) are lost due to caries, it may be possible to induce formation of new cells from pulp tissue using certain BMPs. These new odontoblasts can synthesize new dentin. Tissue engineering of dental pulp itself may also be possible using cultured fibroblasts and synthetic polymer matrices. Further development and successful application of these strategies to regenerate dentin and dental pulp could one day revolutionize the treatment of our most common oral health problem, cavities.

SALIVARY GLANDS

The most challenging goal of tissue engineering is replacement of complete organs, and significant progress has been made in efforts to engineer salivary gland function. The loss of salivary gland tissue and/or function, whether it be a sequalae to radiation therapy to treat cancer or part of a disease such Sjogren's syndrome, is a problem that can significantly affect quality of life, particularly for medically compromised individuals. One method in treating salivary gland functional deficiencies makes use of an inductive gene therapy approach. The aim in this approach is to make existing non-secretory ductal epithelial cells (following irradiation therapy) into secretory cells capable of fluid movement. Success in animal models has been demonstrated. Another method to restore salivary gland function employs cell transplantation. Baum et al. have recently initiated the development of an artificial salivary gland substitute composed of polymer tube lined by epithelial cells. This relatively simple device could engraft into the buccal mucosa of patients whose salivary gland tissue has lost function, or been destroyed, and would have the physiological capacity to deliver an aqueous fluid to the mouth via the buccal mucosa. These new approaches could be very effective for treating conditions associated with lost salivary gland function, including dysphagia, dysgeusia, rampant caries, and mucosal infections.

Tissue engineering of teeth requires the coordinated formation of correctly shaped crowns, roots, and periodontal ligament. Previous studies have shown that the dental mesenchyme controls crown morphogenesis and epithelial histogenesis during tooth development *in vivo*, but little is known about the inductive potential of dissociated mesenchymal cells used in ex vivo cultures. A 2-step method is described in which, by using different types of reassociations between epithelial and mesenchymal tissues and/or cells from mouse embryos, reassociations were cultured *in vitro*

before *in vivo* implantation. *In vitro*, the reassociated tissues developed and resulted in tooth-like structures that exhibited normal epithelial histogenesis and allowed the functional differentiation of odontoblasts and ameloblasts. After implantation, the reassociations formed roots and periodontal ligament, the latter connected to developing bone. The shape of the crown, initially suspected to depend on the integrity of the mesenchyme, could be modulated by adjusting the number of dissociated mesenchymal cells reassociated with the epithelial compartment. Based on these results, we propose a refined strategy for tooth tissue engineering that may help to eventually generate morphologically defined teeth [5].

FUTURE DIRECTIONS/ CONSIDERATIONS

The promise of tissue engineering in dentistry is great, but there exist major challenges that must be met in the next fifteen to twenty years for this new field to reach its potential application. Some of the main challenges lie not on the scientific side, but in the application of the technology. Once we fully understand how we can re-create functional, viable new tissues in the laboratory, how will we then be able to translate this knowledge to the patient population at large? A major issue will be the cost of these therapies. Will industry be able to produce tissue products in a cost-efficient manner so the patient can afford this type of treatment? Secondly, in order for the new technology to reach the general masses, there will need to be health care centers and institutes capable of applying these engineered products. Individuals sufficiently trained to utilize these therapies will clearly be required, necessitating new training programs for these scientists, clinicians, and support teams. Another major challenge lies in the ethical concerns regarding engineering tissues. Relevant ethical issues include the source of cells (patient's own vs. donated cells) and type (adult-donor vs. fetal cells). In addition, on what basis will it be decided who receives these new tissue therapies (according to need, ability to pay, etc.)? It is also unclear how third-party groups will react to the new technology and what they will cover. Needless to say, many different perspectives on these questions exist, based on individual, cultural, and scientific principles. This is undoubtedly an exciting time in dentistry and the biomedical community at large. In twenty to twenty-five years, dentistry as we know it today will be remarkably different, as it is now different from the way it was twenty-five years ago. Many dental schools and postgraduate programs are currently evaluating curriculum content in light of the public's oral health care needs and in light of the many advances in genetics, cell and molecular biology, and the materials sciences. At the predoctoral level, tissue engineering provides an ideal opportunity to incorporate a multidisciplinary learning experience into the curriculum which integrates concepts in cell biology, molecular biology, bioengineering, and biomaterials with clinical techniques in oral surgery, periodontics, restorative dentistry, and oral medicine. Students can see first-hand the interplay between the science underlying tissue engineering and the clinical application to oral disease. Such an experience would also allow students to see collaboration among biomedical scientists, dentists, and physicians, which is extremely rare in most dental school programs. At the postgraduate level, there is need to provide the community with a cadre of D.D.S./Ph.D.- trained practitioners, researchers, and educators with expertise in tissue engineering. For the practitioner, continuing education programs can increase awareness of tissue engineering as a therapeutic option for various oral health problems. These programs can also help establish linkages between dentists in the community and tissue engineering specialists at academic health centers. Once the general public is aware of newer and better treatments, they will not accept anything less. The well-informed clinician capable of incorporating this technology into his or her practice will continue to thrive in the future.

WHAT ARE THE SUPPOSIDELY SAFTY MEASURES TAKEN IN TISSUE ENGINEERING/GENE THERAPY-A VERY IMPORTANT QUESTION FOR A RESEARCH

There is unanimity among experts that gene therapy trials should only be carried out under certain safety rules. The nature and scope of these

rules and their legislative basis are, however, matters of controversy. As far as the legal framework is concerned, one side argues that safety is adequately ensured through the network of existing regulations. The other side criticizes the current situation as a tangle of legal regulations and expresses grave doubts that this takes adequate account of the specific hazards of gene therapy techniques.

An overview of the international regulatory mechanisms shows clearly that, despite widely varying legislative approaches, the emphasis in (legislative) efforts everywhere is on patient safety and biological safety. For example:

- There are strict test criteria for pharmaceuticals (which also apply to gene therapy), and this is one way of limiting the risks associated with gene therapy. Thus, licensing of gene therapy projects is subject to demanding requirements.
- There are ethics commissions present in all the countries; these commissions serve to ensure the maximum possible safety for the patient. In all the important countries (except Italy), the opinion (at least 'consultative') of the ethics commissions has to be obtained before approval is granted for conduct of gene therapy trials in humans.
- Another important safeguard is the professional ethical regulations covering the clinical applications of gene therapy. In the overwhelming majority of regulatory systems these are concerned (inter alia) with:
    - Adequate clinical pre-trials
    - Risk-benefit reviews in the use of gene therapy techniques on humans
    - Prior patient education and consent
    - Consultation with an ethical commission
- In addition to the specific statutory regulations there are also the general statutes on civil and criminal liability, which apply on a subsidiary basis.

Biological safety is ensured through various forms of legislation. All countries have a national (official) licensing authority. These are also the basis for establishing a common European licensing authority responsible for biological safety in member states.

Besides the common features indicated above, there are also differences in the ethics commissions of various countries, for example, in terms of the statutory basis of the ethics commissions, the commission's responsibilities, and the binding nature of their votes.

- Under French law, there is a separate act (the 'Loi Huriet') covering the duties and responsibilities of the ethics commissions. In German law, the ethics commission's powers are covered by section 40-I of the Drugs Act and, in Austria, by sections 30 et seq. of the Genetic Engineering Act. In Italy, on the other hand, there is no special regulation covering the responsibilities of the ethics commissions.
- In the USA, the responsibilities of the local ethics commissions are limited to projects promoted by the National Institutes of Health. The licensing procedure in the UK operates at two levels: Besides local ethics commissions, the central ethics commissions must also give its approval for every gene therapy project.

With respect to the binding nature of their votes, some national ethics commissions have a purely advisory status, as for example in France. In other countries (e.g., USA, Austria, UK, and Denmark) the commission's vote is more important and can result in refusal of approval [2].

CONCLUSION

Clearly, the future for regenerative and tissue-engineering applications to dentistry is one with immense potential, capable of bringing quantum advances in treatment for our patients. The need for high-quality research in the basic sciences is paramount to ensuring that the development of novel clinical treatment modalities is underpinned by robust mechanistic data, and that such approaches are effective. This translational model epitomizes how dentistry should evolve and highlights the need for close partnerships between basic and clinical scientists. Advances in tissue engineering provide an increased level of understanding of the mechanical and chemical stimuli that regulate tissue responses. Oral tissue

engineering can be applied to recreate missing osseous or dental structures or correct orofacial deformities, changing the patient's smile, midfacial height, and the soft tissue drape. Biomechanical principles can also be applied to tissue engineering to enhance the bone/tooth or bone/implant functionality and long-term stability. Advancements are also being achieved in the area of biomimetics that will allow the creation of new biologic replacements for missing oral structures. The opportunity for bioengineering to charter the course of tooth regeneration is an exciting prospect and will improve the quality of life for patients for decades to come[1]. The benefits of regenerative endodontics include the ability to continue root development in immature teeth and to revitalize diseased teeth, which may restore their ability to heal in response to disease and trauma. The ideal design of the dental pulp constructs is to be the same shape as gutta-percha cones to accomplish a good fit when inserted into the root canal. The ideal design of the periodontal constructs is to be the same shape as general periodontal barrier membranes, and its benefits include the replacement of diseased and traumatized periodontal tissues. This is an exciting time for biomedical science and its application. Clinical dental practice in 2025 will certainly be different.

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ROOT CANAL THERAPY OF A MAXILLARY FIRST MOLAR WITH FIVE ROOT CANALS: CASE REPORT

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ABSTRACT

This paper reports the case of a maxillary left first molar that presented three root canals in the mesiobuccal root. Root canal therapy and case management are described. Features like wide crown access, adequate illumination and use of exploring files were important for successful completion of the endodontic treatment.

Key Words: internal anatomy, endodontic treatment, maxillary first molar.

INTRODUCTION

Knowledge of the internal dental morphology is a complex and extremely important point for planning and performing of endodontic therapy. The several anatomical variations existing in the root canal system may contribute for failure of root canal therapy, mainly in teeth with pulp necrosis.

Maxillary molars have been reported to have extra canals in as much as 95% of the times [(13)]. It has been suggested that using a No. 1 round bur or ultrasonic instruments to remove secondary dentin from the pulpal floor along the mesiobuccal-palatal aspect of the molar triangle will uncover an additional 31% of these orifices.[(8)] An earlier study found these secondary canals 69% of the time *in vitro* but only 31% *in vivo* [(9)]. Another *in vivo* study found two canals in the mesiobuccal roots of maxillary first molars 77% of the time, and, of these, 62% had two apical foramina [(10)]. A fourth root in maxillary molars is reported to be rare (0.4%). [(11, 12)]

This paper reports the case of a maxillary left first molar that presented three root canals in the mesiobuccal root. Root canal therapy and case management are described.

CASE REPORT

A 15-year old male patient reported to the deptt of pedodontics, Himachal Dental College Sundernagar for treatment of tooth # 26. The patient was complaining of occasional pain in the tooth and was sealed with a zinc oxide and eugenol filling. Thermal sensitivity tests were negative indicating non vital pulp. Neither any fistulae nor any edema was present. The periapical radiograph showed a small area of thickened periodontal ligament around the root apices. (Fig 1)

Local anesthetic (2%Lidocaine with 1:200000 epinephrine) was given and an access opening was made. The operative field was thereafter isolated with a rubber dam. Exploration of root canal entrances was done with an endodontic explorer. The exploration revealed 3 distinct canals in the mesiobuccal root, 1 canal in the distobuccal root and 1 canal in the palatal root, which were later further confirmed by the radiograph for working length determination (Fig 2).

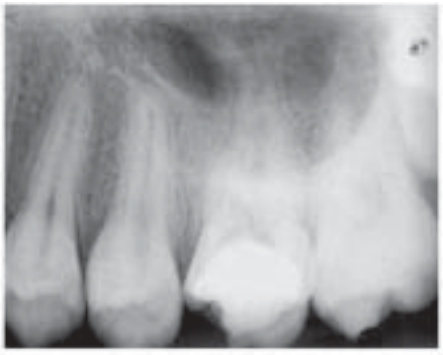

Fig 1: Initial Radiograph

All 5 canals were explored with #10 K-files (Mani Japan). After exploring the canals with #10 K-files, #15 K-files (Dentsply) were introduced in the mesiobuccal-1, mesiobuccal-2 and mesiopalatal canals, while #20 and #25 K-files (Dentsply) were introduced in the distobuccal and

palatal canals, respectively, to determine the working length. The preparation of the canals was done with Protaper files (Dentsply). Preparation of the mesiobuccal canal-1, mesiobuccal canal-2 and mesiopalatal canals was done till file F1 size. Apical preparation of the distobuccal and palatal canals was performed till size F1 and F2 respectively. The canals were repeatedly irrigated with sodium hypochlorite during the preparation.

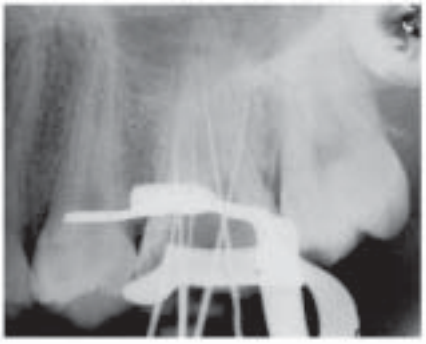

Fig 2: Determination of working length

Chemomechanical preparation was completed in the first session. The canals were flushed with saline in the end, dried and filled with calcium hydroxide paste, which was used as an intracanal medication. Root canal access was sealed with a zinc oxide and eugenol dressing.

After 7 days, the canals were emptied, copiously irrigated with 2% sodium hypochlorite and then with saline and dried with paper points. Main gutta-percha cones were selected for each canal and all canals were filled using the lateral condensation technique. A final radiograph was taken to confirm the completeness and extension of root filings. The tooth was provisionally sealed and the patient was recalled later for restorative treatment.

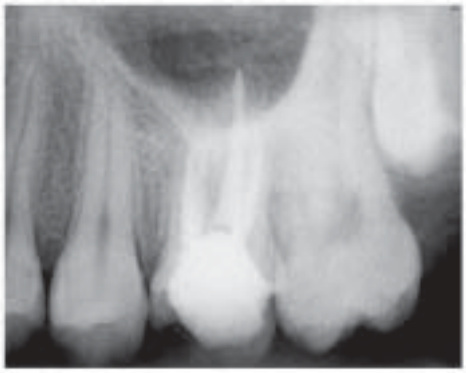

Fig 3: Final radiograph

DISCUSSION

The variations in dental anatomy play an important role in root canal therapy. A great predominance of two very close canals in the mesiobuccal root of maxillary molars has been demonstrated [2]. Despite the current high success rate achieved in endodontic treatments, the mesiobuccal root is still associated to a considerable number of failures due to the difficulty in locating and filling the second and/or third mesiobuccal canals [1,2]. On account of this, root canal therapy of these teeth should be carried out using angulated x-rays [4,5],efficient explorers, wider crown accesses [5], adequate lighting and, whenever possible, image magnification [6,7]. In the case reported in this paper, the mesiobuccal root presented a moderate curvature with three canals. The mesiobuccal canal-1 had one opening and one exit, while the mesiobuccal canal-2 and the mesiopalatal canal presented two openings and one exit.

The instrumentation of these canals was carried out with nickel-titanium files. These instruments are indicated in these cases due to their flexibility and because they pose lesser risks of step formation or perforations. The instrumentation technique (crown down) used in this study recommend a wide access to the middle and cervical thirds, which facilitated the cleaning of the apical third and the filling of the root canals [3].

CONCLUSION

Treating teeth with multiple canals is a fairly common problem. It is a fact that makes imperative a careful search in every tooth for additional canals.

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TO INVESTIGATE THE RELIABILITY OF PANORAMIC RADIOGRAPH COMPARED TO THAT OF A LATERAL CEPHALOGRAM FOR ASSESSING DENTOSKELETAL PATTERN

-In vitro study

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ABSTRACT

This study was conducted to investigate whether panoramic radiographs can be used instead of lateral cephalograms for assessing dento-skeletal pattern. The study conducted in – vitro on 60 diagnostic lateral cephalograms and panoramic radiographs. The result of this study showed that with standard exposure conditions and high image quality, panoramic radiograph can provide information to assess the dento-skeletal pattern of the patient, however for vertical dimension especially in the maxillary/mandibular anterior region, they are not reliable enough to give acceptably accrete additional information as compared to lateral cephalograms.

Keywords: Lateral Cephalograms, Panoramic Radiographs, Dento-Skeletal Pattern

INTRODUCTION

In 1931, Broadbent in the USA and Hofrath in Germany introduced the technique of radiographic cephalometry. Since then, clinicians and researchers have adopted and routinely used this valuable tool to analyze the underlying dentofacial relationships. Although the lateral cephalogram provides us a lot of information regarding the craniofacial structures, it is impossible to accurately visualize the right and left sides of these structures in a single radiograph due to the superimposition of the two sides.

The panoramic radiograph developed by **Paatero. Y.V.** in 1948 however allow the visualization of left and right sides of craniofacial structures by producing an accurate, predictable image of all the teeth and related structures on a radiograph, in the shortest possible time, with the least amount of radiation to the patient and to the operator and with the minimal amount of superimposition of various structures. Facial and mandibular asymmetries are of special interest to the orthodontist. There are some published data about the effect of orthodontic treatment on the temperomandibular joint screened on the panoramic radiographs.

Aiming to enhance the clinical versatility of the panoramic radiograph, the objective of the present study is to investigate whether we can use panoramic radiograph instead of lateral cephalogram to assess dento skeletal pattern. In the present study, measurements will be taken from 60 panoramic radiographs and will be compared with the measurements taken from lateral cephalograms to determine whether the usage of panoramic radiograph could be extended for evaluating dento-skeletal pattern.

Aim:

1. To investigate the reliability of panoramic radiograph compared to that of a lateral cephalogram for assessing dentoskeletal pattern.

Objectives:

1. To investigate whether panoramic radiographs can be used as an alternative to lateral Cephalogram to predict dentoskeletal pattern by measuring angular measurements.
2. To evaluate the variations of Angular measurements on both sides of the panoramic radiographs.
3. To check for the reproducibility of the original

study on Indian population and evaluate whether the measurements are influenced by the sex of an individual.

MATERIALS AND METHODS

This study was conducted on 60 patients who came to the Department of Orthodontia, M.R. Ambedkar Dental College for regular orthodontic treatment. A total 30 male and 30 female patients were selected for the study. This study was divided into two parts. In the first part of the study conventional angular and linear measurements of the lateral cephalogram were compared with the corresponding angular and linear measurements on the Panoramic radiograph.

In the second part of the study a comparison was done to check for any difference between the angular and linear measurements taken on the left and right side of the Panoramic radiograph.

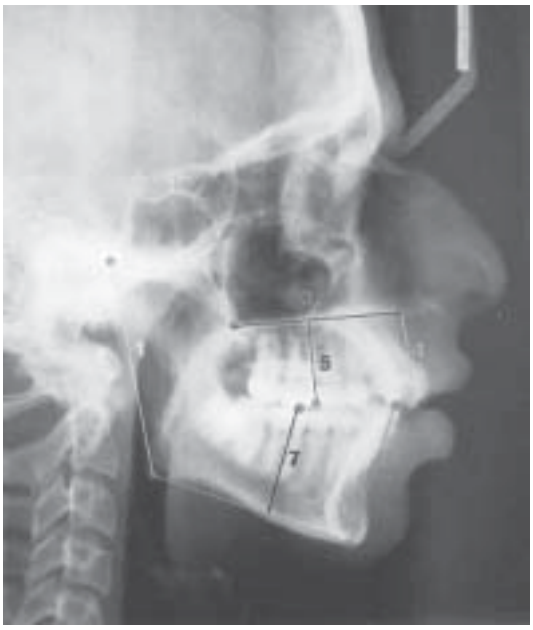
Linear measurements used for the assessment of-	Landmarks used in cephalogram	Landmarks used in panoramic radiograph
Ramal length	Condylion- gonion	Condylion- gonion
Mandibular body length	Gonion-menton	Gonion-menton
Maxillary basal bone length	Anterior nasal spine-posterior nasal spine	Anterior nasal spine-posterior nasal spine
Maxillary dentoalveolar bone height (anterior)	Incisive superiors perpendicular to nasal floot	Incisive superiors perpendicular to nasal floot
Maxillary dentoalveolar bone height (posterior)	Mesiobuccal cusp tip of maxillary first permanent molar perpendicular to nasal floor	Mesiobuccal cusp tip of maxillary first permanent molar perpendicular to nasal floor
Mandibular dentoalveolar bone (anterior)	Incisive inferiors perpendicular to mandibular plane	Incisive inferiors perpendicular to mandibular plane
Mandibular dentoalveolar bone height (posterior)	Mesiobuccal cusp tip of mandibular first permanent molar perpendicular to mandibular plane	Mesiobuccal cusp tip of mandibular first permanent molar perpendicular to mandibular plane

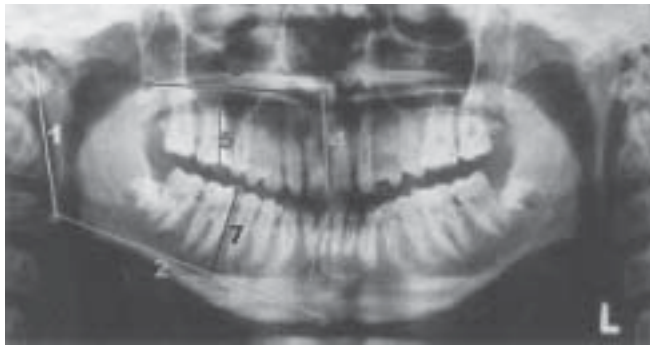
Table-I: the linear measurements measured on the lateral cephalogram and compared on the panoramic radiograph

Angles used for assessment of-	Landmarks used in cephalogram	Landmarks used in panoramic radiograph
Skeletal antero posterior dysplasia of the maxilla	Sella-nasion point A	Opbitale-porion-ans
Morphology of the mandible	Condylion ginion menton	Condylion gonion menton
Inclination of mandibular plane	Interescrion of ans-pns plane and gonion-menton plane	Intersection of ans-pns plane and gonion menton plane
Cant of occlussal plane	Intersection of occlusal plane and porion orbitale plane	Intersection of occlusal plane and porion orbitale plane
Growth pattern	Intersection of porionorbirale plane and gonion-menton plane	Intersection of porionorbirale plane and gonion-menton plane

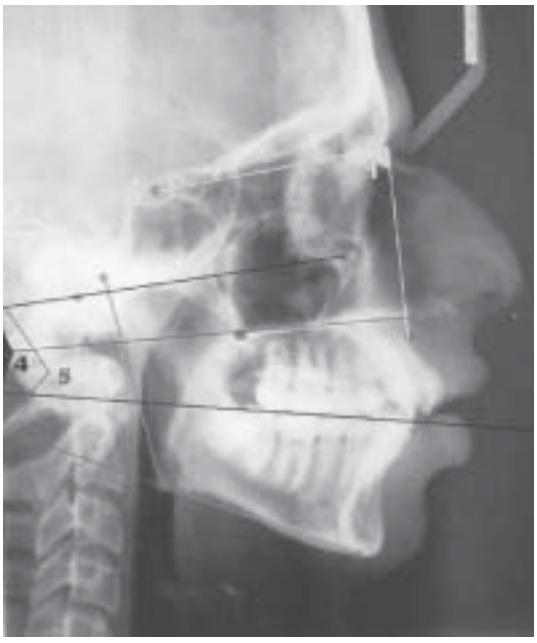
Table –II: the angular measurements measured on the lateral cephalogram and compared on the panoramic radiograph.

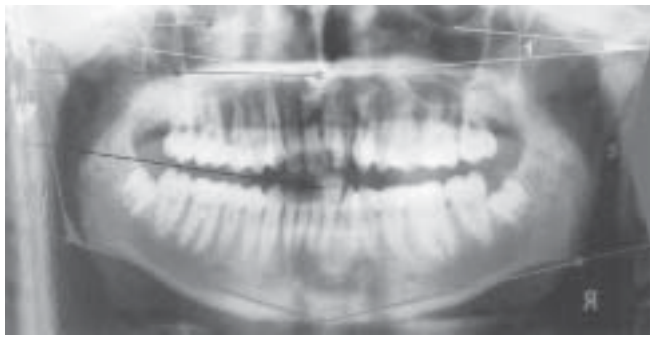
THE LINEAR MEASUREMENTS MEASURED ON THE LATERAL CEPHALOGRAM AND COMPARED ON THE PANORAMIC RADIOGRAPH





THE ANGULAR MEASUREMENTS MEASURED ON THE LATERAL CEPHALOGRAM AND COMPARED ON THE PANORAMIC RADIOGRAPH





R**ESULTS:**

Ramal Length
(CONDYLION-GONION)

Variable	Mean	SD	Paired "t"test	"P" Value
Cephalo-metric	53.5	5.18	5.18	<0.001
Panoramic Right	58.58	8.11	5.84	<0.001
Panoramic Left	59.52	8.26	5.84	<0.001

Table- III (a) shows the cephalometric mean value for ramal length (condylion-gonion).

Mandibular body length
(GONION-MENTON)

Variable	Mean	SD	Paired "t"test	"P" Value
Cephalo metric	68.25	6.92	18.98	< 0.001
Panoram ic-Right	97.9	14.19	19.26	< 0.001
Panoram ic-Left	97.8	14.09	19.26	< 0.001

Table III (b) (shows the cephalometric mean values of mandibular body length (gonion-mention).

Maxillary Basal Bone Length

Variable	Mean	SD	Paired "t"test	"P" Value
Cephalo metric	52.58	5.86	8.42	<0.001
Panoram ic-Right	65.93	15.17	8.35	<0.001
Panoram ic-Left	65.85	15.38	8.35	<0.001

Table III (c): Shows the shows the cephalometric mean values of maxillary basel bone length (anterior nasal spine-posterior nasal spine).

Maxillary Dentoalveolar Bone Height (Anterior)

Variable	Mean	SD	Paired "t"test	"P" Value
Cepohalometric	28.03	3.59	7.28	<0.001
Panoramic Right	34.22	6.31	7.28	<0.001
Panoramic-Left	34.22	6.31	7.28	<0.001

Table III(d): Shows the cephalometric mean values of maxillary dentoalveolar bone height (anterior) (incisive superioris perpendicular to nasal floor) body length.

Maxillary Dentoalveolar Bone Height (Posterior)

Variable	Mean	SD	Paired "t"test	"P" Value
Caphalo metric	22.63	2.94	10.69	<0.001
Panoramic-Right	28.77	5.34	11.72	<0.001
Panoramic-Left	29.45	5.25	11.72	<0.001

Table III (e): Shows the cephalometric mean values of maxillary dentoalveolar bone height (posterior) (mesiobuccal cusp tip of maxillary first permanent molar perpendicular to nasal floor).

Mandibular Dentoalveolar Bone Height (Anterior)

Variable	Mean	SD	Paired "t"test	"P" Value
Cephalometreic	42.93	5	3.77	<0.001
Panoramic-Right	39.48	6.09	3.69	<0.001
Panoramic Left	39.55	6.06	3.69	<0.001

Table III (f): Shows the cephalometric mean values of mandibular dentoalveolar bone height (anterior)(incisive inferioris perpendicular to mandibular plane) of 42.93 mm ± 5 and panoramic mean value of 39.48 mm ± 6.09 and 39.55 mm ± 6.06 for right and left side respectively.

Mandibular Dentoalveolar Bone Height (Posterior)

Variable	Mean	SD	Paired "t"test	"P" Value
Cephalometric	32.67	3.72	8.24	<0.001
Panoramic Right	38.53	5.86	8.95	<0.001
Panoramic Left	38.95	5.74	8.95	<0.001

Table III (g): Shows the cephalometric mean values of mandibular dentoalveolar bone height (Posterior)(mesiobuccal cusp tip of mandibular first permanent molar perpendicular to mandibular plane).

Skeletal Antero Posterior Dysplasia of the Maxilla

Variable	Mean	SD	Paired "t"test	"P" Value
Ceph (SNA	83.2	5.96	59.37	<0.001
Pano(R)(Or-po-ANS)	10.88	14.09	59.32	<0.001
Pano(L)(Or-po-ANS)	11.4	14.96	59.32	<0.001

Table IV(a): Shows the cephalometric mean value for skeletal anterior posterior dysplasis of maxilla (SNA).

Morphology of the mandible (condylion-gonion-menton)

Variable	Mean	SD	Paired "t"test	"P" Value
Cephalo metric	123.18	6.42	10.53	<0.001
Panoramic Right	117.6	5.23	10.38	<0.001
Panoramic Left	117.2	5.17	10.38	<0.001

Table IV(b): Shows the cephalometric mean value for morphology of the mandible (condylion-gonion- menton).

Inclination of Mandibular Plane

Variable	Mean	SD	Paired "t"test	"P" Value
Cephalo metric	25.83	6.86	8.78	<0.001
Panoramic Right	19.42	4.92	9.19	<0.001
Panoramic Left	19.32	4.82	9,19	<0.001

Table IV (c) : Shows the cephalometric mean value for inclination of mandibular plane (intersection of ANS-PNS plane and gonion-menton plane).

Cant of Occlusal Plane

Variable	Mean	SD	Paired "t"test	"P" Value
Cephalo metric	11.35	4.19	3.17	<0.001
Panoramic Right	13.47	4.47	3.96	<0.001
Panoramic Left	13.78	4.72	3.96	<0.001

Table IV (d) : Shows the cephalometric mean value for cant of occlusal plane (intersection of occlusal plane and porion-orbitale plane).

Growth pattern

Variable	Mean	SD	Paired "t"test	"P" Value
Cephalo metric	25.98	5.64	10.24	<0.001
Panoramic Right	19.17	5.02	11.58	<0.001
Panoramic Left	19.12	4.65	11.58	<0.001

Table IV (e): Shows the cephalometric mean value for growth pattern (intersection of porion orbitale plane and gonion-menton plane).

TABLE V
CORRELATION BETWEEN CEPHALOMETRIC AND PANORAMIC LINEAR MEASUREMENTS
The values indicates Pearson's Correlation coefficient = r

	PANO 1	**PANO 2**	**PANO 3**	**PANO 4**	**PANO 5**	**PANO 6**	**PANO 7**
Ceph 1	0.394	0.484	0.41	0.312	0.483	0.32	0.47
"P" value	< 0.003	<0.001	<0.002	<0.002	<0.001	<0.02	<0.001
Ceph2	0.32	0.54	0.41	0.29	0.43	0.33	0.38
"P" value	<0.02	<0.001	<0.001	<0.003	<0.001	<0.02	<0.01
Ceph 3	0.36	0.39	0.65	0.38	0.39	0.35	0.38
"P"Value	<0.01	<0.01	<0.001	<0.02	<0.01	<0.01	<0.01
Ceph 4	0.09	0.07	0.03	0.2	0.14	0.026	0.28
"P"value	NS	NS	NS	NS	NS	NS	<0.05
Ceph 5	0.74	0.4	0.26	0.44	0.54	0.31	0.48
"P"value	<0.001	<0.001	<0.01	<0.001	<.001	<0.02	<0.001
Ceph 6	0.003	0.15	0.08	0.16	0.17	0.19	0.31
"P"value	NS	NS	NS	NS	NS	NS	0 < 0.02
Ceph 7	0.08	0.27	0.14	0.15	0.21	0.17	0.41
"P"value	NS	<0.05	NS	NS	NS	NS	<0.01

TABLE VI
CORRELATION BETWEEN CEPHALOMETRIC AND PANORAMIC ANGULAR MEASUREMENTS

The value indicates Pearson's Correlation coefficient = r

	PANO 8	PANO 9	PANO 10	PANO 11	PANO 12
Ceph 8	0.86	0.029	0.143	0.21	0.276
"P" value	<0.001	NS	NS	NS	<0.05
Ceph 9	0.28	0.754	0.591	0.278	0.46
"P" value	NS	<0.001	<0.001	<0.01	<0.001
Ceph 10	0.031	0.602	0.608	0.35	0.63
"P" value	NS	<0.001	<0.001	<0.01	<0.001
Ceph 11	0.043	0.156	0.299	0.373	0.37
"P" value	NS	NS	<0.1	<0.01	<0.01
Ceph 12	0.043	0.42	0.698	0.388	0.594
"P" value	NS	<0.01	<0.001	<0.01	<0.001

NS= Non Significant

Table shows the Mean values and Standard Deviation for panoramic left and right angular parameters.

Angles Used for Assessment of:	Mean values and Standard deviation for panoramic left side	Mean value Standard deviation for panoramic right side
Skeletal Antero posterior dysplasia of the maxilla	11.4 ± 14.96	10.88 ± 14.09
Morphology of the mandible (Condylion-Gonion-Menton)	117.2 ± 5.17	117.6 ± 5.23
Inclination of Mandibular plane (Intersection of Ans-Pns plane and Gonion0Menton Plane)	19.32 ± 4.82	19.42 ± 4.92
Cant of occlusal plane IIntersection of occlusal plane and porion-orbitale plane)	13.78 ± 4.72	13.47 ± 4.47
Intersection of porion-orbitale plane and Gonion-Me4nton plane	19.12 ± 4.65	19.17 ± 5.02

Table shows the regression equations for linear parameters in which multiple regression equation test was applied with best possible panoramic constant to get highest predictability value.

Predicted Cephalometric parameters	Panoramic Constant	Equation (Predicted parameter = constant(±SD) + coefficient (±SD) OPG parameter	R^2	P
(Cephalometric 1)	(Panoramic 2)	Cephalometric 1=36.07 (±4.18) +0.18 (±0.04) Panoramic 2	0.23	Constant 0.001 Predictor 0.001 Regression 0.001
(Cephalometric 2)	(Panoramic 2)	Cephalometric 2=42.53 (±5.39) +0.26 (±0.06) Panoramic 2	0.27	Constant 0.001 Predictor 0.001 Regression 0.001
(Cephalometric 3)	(Panoramic 3)	Cephalometric 3 = 36.02 (±2.59) + 0.25 (±0.04) Panoramic 3	0.43	Constant 0.001 Predictor 0.001 Regression 0.001
(Cephalometric 4)	(Panoramic 7)	Cephalometric 4=21.21(± 3.12) +0.08)Panoramic 7	0.08	Constant 0.001 Predictor 0.03 Regression 0.03
	(Panoramic 7)	Cephalometric 4=26.62 (±2.95) +0.58 (±0.11) Panoramic 7	0.32	Constant 0.001 Predictor 0.001 Pan 7 & 1 =0.001 Regression 0.001
	(Panoramic 1)	0.36 (± 0.08) Panoramic 1		
(Cephalometric 5)	(Panoramic 5)	Cephalometric 5=13.88(±1.83) +0.30 (±0.06) Panoramic 5	0.29	Constant 0.001 Predictor 0.001 Regression 0.001
	(Panoramic 5)	Cephalometric 5=17.05 (±2.31) +0.44 (± 0.09) Panoramic 5	0.34	Constant 0.001 Predictor Pano 5=0.001 Pano 1 = 0.037 Regression 0.001
	(Panoramic 1)	-0.12 (±0.06) Panoramic 1		
(Cephalometric 6)	(Panoramic 7)	Cephalometric 6 =32.39(±4.31) +0.27 (±0.11) Panoramic 7	0.10	Constant 0.001 Predictor 0.02 Regression 0.02
	(Panoramic 7)	Cephalometric 6=38.35 (± 4.33) + 0.72 (±0.16) Panoramic 7	0.25	Constant 0.001 Predictor Pano 7=0.001 Pano 1 = 0.001 Regression 0.001
	(Panoramic 1)	0.39 (±0.11) Panoramic 1		
(Cephalometric 7)	(Panoramic 7)	Cephalometirc 7=22.15 (±3.07) + 0.27 (±0.08) Panoramic 7	0.17	Constant 0.001 Predictor 0.001 Regression 0.001
	(Panoramic 7)	Cephalometric 7=26.80 (±3.02) + 0.62 (±12) Panoramic 7	0.34	Constant 0.001 Predictor Pano 7=0.001
	(Panoramic 1)	0.31 (±0.08) Panoramic 1		Pano 1=0.001 Regression 0.001

Shows the regression equations for angular parameters in which multiple regression equation test was applied with best possible panoramic constant to get highest predictability value.

Predicted Cephalometric parameters	Panoramic Constant	Equation (Predicted parameter = constant(±SD) + coefficient (±SD) OPG parameter	R^2	P
Sella-nasion-point a (ceph 8)	Orbitaleportion-ans (pano8)	Ceph 8=79.13 (±0.51)+0.37 (±0.03) pano 8	0.74	Constant 0.001 Predictor 0.001 Regression 0.001
	Pano 8 Pano 12	Ceph 8=85.27 (±1.51)+0.36 (±0.03) pano 8 -0.32 (±0.08) Pano 12	0.80	Constant 0.001 Predictor Pano 8=0.001 Pano 12=0.001 Regression 0.001
Condylion-gonion-mentor (ceph 9)	Condylion-gonion-menton (Pano 9)	Ceph 9=12.88 (±12.63)+0.94 (±0.11) Pano 9	0.57	Constant 0.31 (ns) Predictor 0.001 Regression 0.001
	(Pano 10)	Ceph 9=18.17 (±10.05)+0.80 (±0.09) pano 9 +0.57 (±0.09) pano 10	0.73	Constant 0.08 (ns) Predictor 0.03 Regression 0.03
Intersection of ans-pns plane and gonion-menton plane (ceph 10)	(Pano 12) (Pano 12) (Pano 9)	Ceph 10=8.23 (±2.96) + 0.92 (±0.15) pano 12 Ceph10=49.39 (±15.0)+0.65 (±0.15) pano 12 + 0.53 (±0.14) pano 9	0.39 0.52	Constant 0.001 Predictor Pano 9=0.001 Pano 10=0.001 Regression 0.001 Constant 0.002 Predictor Pano 12=0.001 Pano 9=0.001 Regression 0.001
	(Pano 12) (Pano 9) (Pano 10)	Ceph 10= -51.72(±13.35)+0.40 (±0.15) Pano 12 +0.51(±0.12)pano 9 + 0.54 (±0.14) pano 10	0.63	Constant 0.001 Predictor Pano 12=0.01 Pano 9=0.001 Pano 10=0.001 Regression 0.001
Intersection of occlusal plane and porion-orbitale plane (ceph 11)	(Pano 11)	Ceph 11=6.58 (±10.64)+0.35 (±1.12) pano 11	0.14	Constant 0.001 Predictor 0.03 Regression 0.03
Intersection of porion-orbital plane and gonion-menton plane (ceph 12)	(Pano 10) (Pano 10) (Pano 12)	Ceph 12=9.99(± 2.22)+0.83 (± 0.12) pano 11 Ceph12 = 6.01 (±2.36) +0.63 (±0.12) pano 10 0.40(±0.12) pano 12	0.49 0.57	Constant 0.001 Predictor 0.001 Regression 0.001 Constant 0.014 Predictor Pano 10=0.001 Pano 12=0.001 Regression 0.001

DISCUSSION:

Lateral cephalometry is an important tool in orthodontic diagnosis, treatment planning, and evaluation of treatment results and prediction of growth. But the major source of error in cephalometirc analysis includes radiographic film magnification, tracing, measuring, recording and landmark identification. To overcome all these limitations of lateral cephalograms, Paatero in 1961 introduced a technique called panoramic radiography which has gained a rapidly significant role in almost every field of clinical dentistry. The popularity of this technique stemmed from its simplicity of operation, its low radiation dosage when compared to conventional lateral cephalogram and full mouth radiographs, and the wide field of projected structures with reduced super imposition of investing tissue. Some limitations of lateral cephalograms may be overcome by using panoramic radiograph. Therefore it is logical to evaluate the accuracy of measurements gleamed for panoramic radiograph as compared to lateral cephalogram for investigating dentoskeletal patterns.

It is possible to measure any vertical or horizontal distance is only on one side of the mandible, either the left or the right, but that the distance must not transverse the midline of the mandible.

Linear measurements are not reliable because of the magnification factor in the radiographs to eliminate the magnification factor the ratios of the linear measurements were taken and compared between lateral cephalogram and panoramic radiograph and all the radiographs were taken using same machine (PLANMECA PM-2002 EC PROLINE) and by the same operator under standard exposure conditions.

In the present study only one horizontal parameter was compared between lateral cephalogram and panoramic radiograph i.e., the maxillary basal bone length. It was found that significant amount of co-relation exist when the maxillary basal bone length was measured from lateral cephalogram and panoramic radiograph as the multiple regression equation shows 45% predictability of maxillary basal bone length from panoramic radiographs.

The weakness in radiological interpretation of linear measurements in the anterior region of the jaw contributed to investigate the reliability of vertical dimensions from panoramic radiograph.

In the present study also the measurement for anterior maxillary dent alveolar heights compare between panoramic radiograph and lateral cephalogram are not reliable as evidence from the correlation coefficient value which comes out to be 0.2 (highly non significant). For posterior maxillary dent alveolar height the co-relation coefficient between panoramic value and cephalometric value is 0.54, showing that posterior maxillary dent alveolar height can be measured from panoramic radiograph. This result again favours the study done by Xie. Q et al that vertical measurement are more reliable in the maxillary posterior region as compared to the anterior region.

A mandibular anterior region measurement for panoramic radiograph and cephalogram shows the co-relation coefficient of 0.19. This study shows that predicting the cephalometric mandibular anterior dent alveolar height value from panoramic radiograph is not reliable for clinical purpose.

A fourth vertical measurements used in the present study to compare were mandibular dentoalveolar height posterior. The co-relation coefficient value when compared between panoramic radiograph and cephalogram was 0.41 which is highly significant. Thus by using the panoramic mandibular dento alveolar posterior height value and panoramic ramal length value, cephalometric dentoalveolar height posterior can be predictable to significant level.

In the present study, two linear oblique variables were compare i.e., ramal length (Co-Go) and mandibular body length (Go-Me) and both variable lies on one side of the mandible. The result of the present study showed that the correlation coefficient between panoramic ramal length and cephalometric ramal length was 0.394 which is clinical significant.

For mandibular body length (Go-Me), the correlation coefficient between panoramic value and cephalometric value in the present study is 0.54 which is highly significant.

Various studies have been done in the past to investigate the reliability of angular measurements taken from panoramic radiograph. The values for the gonial angle are of particular interest because lateral caphalograms do not permit reliable registration of this angle and the super imposition images create difficulties in recognition and measurement of the individual angle. This disadvantage is not encountered in panoramic radiography, which has proved to be as accurate as cephalography in determining the gonial angle. The co-relation between cephalometric and panoramic radiograph measurements found that gonial angles of panoramic radiograph and basal plane angles of cephalogram showed high correlation of 0.49.

Thus the present study is in favour with all the previous studies that gonial angle can be predicted reliably from the panoramic radiograph. The predictability of cephalometric mandibular plane angles from panoramic radiograph have been studied and concluded that instead of panoramic mandibular plane angles giving highest predictability value for mandibular plane angles, it was panoramic basal plane angle whose correlation coefficient with cephalometric mandibular plane angle was remarkably high i.e., upto 0.76. The present study also favours the study done by Ackam et al. Hence it is recommended that, to predict the cephalometric mandibular plane angle, both panoramic mandibular plane and panoramic basal plane angle should be used.

The present study used panoramic angle (orbitaleporion-ANS) to predict cephalometric SNA angle and found that correlation coefficient was 0.86, slightly less than what Ackam deduced in his study. The regression equation also shows that cephalometric SNA angle can be predicted from panoramic (orbitale-porion-ANS) angle by 74% predictability. Basal plane angle between lateral cephalometric and panoramic radiographs was also compared in this study and the correlation coefficient was 0.608 suggesting that cephalometric basal plane angles can be predicted to significant level from panoramic radiograph. But the regression equation shows that the predictability level using panoramic gonial angle, basal plane angle and mandibular plane angle to predict cephalometric basal plane angle increases upto 63%.

It was found that the correlation coefficient between cephalometric cant of occlusal plane and panoramic cant of occlusal plane was just 0.373, suggesting that predicting cephalometric cant of occlusal plane from panoramic radiograph is nor reliable. The regression equation also shows that the predictability level was just 14%. Thus an orthodontist should be cautious while comparing cephalometric cant of occlusal plane from panoramic radiograph.

No significance difference was found between angular measurements for panoramic left and right side in the present study and all the angular and linear measurements were not influenced by the sex of an individual.

SUMMARY AND CONCLUSION:

The present study was undertaken in an attempt to answer whether panoramic radiograph can be used instead of lateral cephalogram to assess dento-skeletal pattern of the patient.

THE RESULT OF THIS STUDY SHOWED THAT :

1. All angular parameters measured on panoramic radiograph showed high correlation and predictability when compared with similar parameters measured on lateral cephalogram especially for gonial angle measurements except for cant of occlusal plane, which shows least predictability when measured from panoramic radiograph. Thus panoramic radiographs can be used for angular measurements instead of lateral cephalogram.
2. For vertical parameters measured on panoramic radiographs, in posterior region (molar area) the correlation and predictability was acceptable and clinically significant when compared with similar parameters in lateral cephalogram, but the measurements done in the maxillary and mandibular anterior region were not reliable when measured from a panoramic radiograph. Thus a clinician should be careful while measuring vertical measurements in maxillomandibular anterior region from panoramic radiographs.

3. Oblique and horizontal measurements done on panoramic radiograph also shows that these measurements can be recorded from panoramic radiograph with high predictability.
4. No significance difference was found between angular measurements for panoramic left and right side in the present study and all the angular and linear measurements were not influenced by the sex of an individual.

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A RARE CASE OF UNI-LATERAL GINGIVAL ENLARGEMENT

A CASE REPORT

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INTRODUCTION

A common feature of gingival disease is its enlargement or growth. The many types of gingival enlargement can be classified according to etiological factors and resultant pathological changes. The term gingival hypertrophy was used in the past. Hypertrophy is in fact increase in size of tissue or organ because of increase in size of individual cells, as need based response of the body. In case of gingival disease the enlargement is not primarily the result of increase in size of components cells and also does not generally occur in response to an increased functional requirement.

Gingival enlargement or growth can be classified as under:-

1. Inflammatory:-
   - Acute
   - Chronic
2. Drug induced enlargement
   - Dilantic Sodium used as anti convulsant in epilepsy
   - Calcium channel blockers in hypertension
3. Idiopathic gingival enlargement
4. Associated with systemic diseases
5. Neoplastic enlargements.
6. Harmonal enlargements i.e.,
   - Puberty
   - Pregnancy
   - Menu pause
7. Hereditary enlargement

All these types of gingival enlargement affect either the total gingival tissue or along set of teeth or a single tooth in response to presence of dental plague, or some local mechanical irritant in relation to a single tooth, or altered body response in presence of local etiological factors.

In my 30 years of experience as a periodontist, I could come across this particular type of case only once and was not able to logically categorize this type of enlargement in the pattern of classification. Therefore, the wiser comment and critical response of the readers, particularly research oriented will be healthy and positive for my personal knowledge and others, if at all with my confusion regarding the growth category.

CASE REPORT

A seventeen years girl belonging to a village near Jammu attended the clinic along with her parents, with the complaint that she cannot chew her food and the face is deformed on right side and also there is difficulty in clear speech. In fact parents wanted the girl to get married but were worried about her swollen right cheek and visible bulging gingival while talking. The patient was matric passed, intelligent and gave a clear history about the disease as under.

Right from the age of 11-12 years she started noticing gingival inflammation and bleeding on right side. She was using (Datoon) wood stick for teeth cleansing, a common feature in the villages around Jammu and even in Jammu city it self. The commonly used tree is called ‘Flaa’. She was regular user of Datoon and as per her version, she would clean all teeth.

After about 2 years time the enlargement was quite significant and she sought local treatment, which included Alum + Salt in water for gorgling. A dentist cleaned her teeth also but could not properly do it on the right side.

With in 4-5 years, the enlargement was so enormous that the teeth got covered with it completely and were not even visible, both

mandibular as well as maxillary. Lot of traditional local treatment were used. The girl felt tense and depressed.

ON INTRA ORAL EXAMINATION:-

There was a bulky enlargement of gingival on right side both in maxilla and mandible, teeth were invisible. Maxillary 1st and 2nd premolars on right side were tilted distally, First molar was absent. Fig 1, Fig2.

Surprisingly the periodontal health in relation to left side both in maxilla and mandible was significantly normal. Teeth were white and clean (Fig 3).

Enlarged tissue on right side was fibrous, did not bleed or pained on palpation, patient could not approximate her left teeth because premature meeting of bulky gingiva on right side. She did not give history of any other physical ailment. She had normal healthy built, excepting that she looked depressed because of her facial appearance, tense facial expression was very much evident Fig 4.

She was not taking any medicine particularly dilantin Sodium. The enlargement could not be designated as Juvenile, because left side was almost healthy, no involvement of first molars maxillary and mandibular. Puberty (Hormonal) enlargement also recedes with growing age and does not occur unilaterally to this much extent. As I was undecided about categorization regarding classification of growth therefore, I started with investigation.

1. Intra oral radiographs were taken for maxillary premolars and molars, mandibular premolars and molars on right side and maxillary premolars and molars and mandibolars premolar and molars on left side.
2. Blood tests for TLC, DLC, HB, Serum Phosphatase were done.

Radiographs revealed enormous bone loss in molar and premolar regions both in mandible and maxilla on right side. It looked horizontal pattern, ultimately affecting total interdental bone. On examining the radiographs under magnifying lense it was obsorbed that some where palatal or buccal plate radio-opacity was present . the X-rays of left side were almost normal. The Blood tests were also under normal range. The patient was got examined by a medical doctor, who diagnosed her as a healthy person without any organic disease.

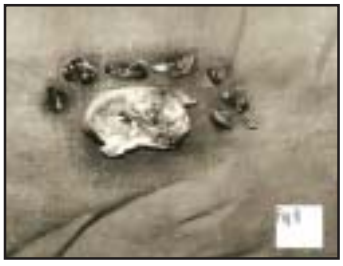
Ultimately the excision of the growth was planned and fate of the teeth to be decided after removal of soft tissue.

All aspects regarding surgery and post surgery were explained to the parents and written consent

to photograph the patient was taken.

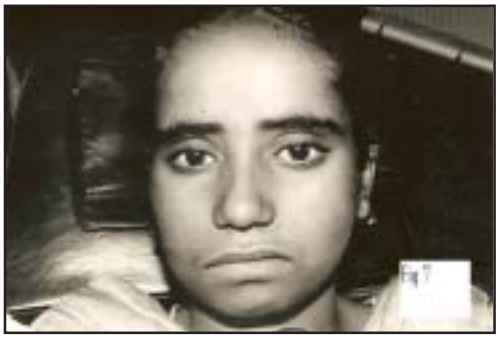
The patient was put on antibiotics one day prior to surgery. The next morning gingivectomy of maxillary area was carried out under local anaesthesia. Thorough curettage of whole area was done after excision of main tissue fold Fig. 5. It was found that despite heavy bone loss, teeth had some stability and could be given a chance of healing, because some strands of alveolar bone seemed present around the teeth, some where of palatal and some where of buccal plate. The wound was packed with Co-pack and patient advised to continue antibiotic and inflammatory tablets for one week. Patient was already motivated for 3 time brushing a day with soft brush, which she was maticulously following on left side. She was also advised chlorhexadine mouth wash twice daily.

After ten days pack was removed, it was observed that teeth gained some stability. The same surgical procedure was repeated for mandibular growth after 2 weeks time with same drugs Fig 6.

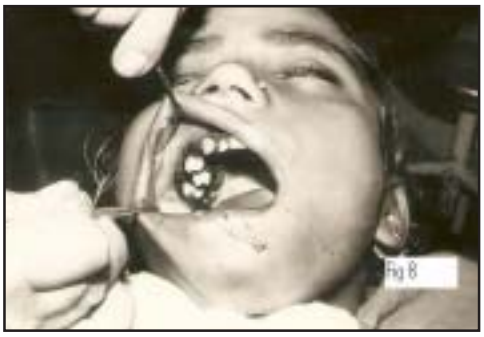


Patient was reexamined after one month duration, surprisingly the teeth were less mobile and reattachment had taken place at various levels of roots of different teeth.

Overall the girl looked normal and was brushing and using tooth picks on right side also. Emotionally she looked happy Fig.7



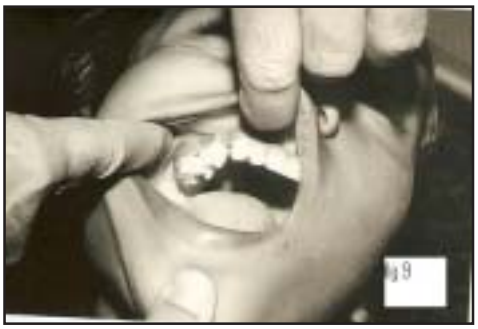
The patient was kept under observation for one year for monthly check ups. The gingival reattachment was observed and the mobility was reduced to 50%. Patient was using right side also for eating Fig. 8.

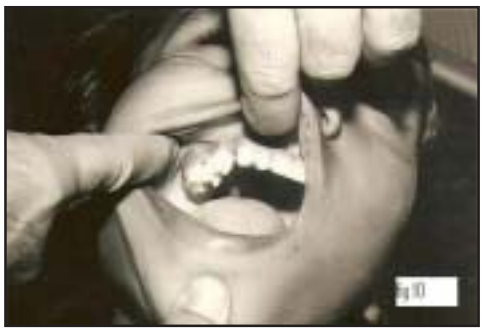


The left side was found improved with optimum periodontal health Fig 9. after 3 months

Fig 10 after 6 months.

Fig 11 after 12 months.





HISTOPATHOLOGY

The excised tissue was sent for histopathological examination. It revealed hyperplasia of connective tissue and epithelium, elongated retepegs and acenthosis of epithelium. Retepegs extended deep into connective tissue.

There were densely arranged collagen fibres bundles. Increase in fibroblasts and new capillaries, inter cellular spaces were widened with cytoplasmic oedema. The presence of granulation tissue with young capillaries and fibroblasts and irregular collagen fibrils with occasional lymphocytes sent indication towards recurrent enlargement.

DISCUSSION

The growth in the patient is of rare type, not fitting in the category of juvenile periodontitis, which is more likely to exist in this age having been persisted from childhood.

It also doest not look like of puberty pattern because such type of periodontitis recede with growing age and also doest not remain unilateral up to the extent present in this particular patient.

Therefore the case is submitted for publishing for the sake of obtaining more experienced and expert comment especially from readers involved in Research and exhaustive clinical-work

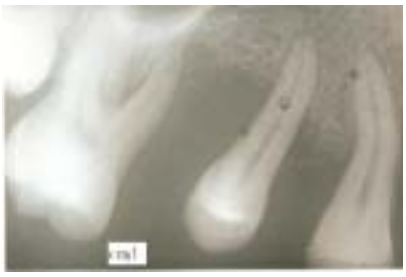
RADIOGRAPHIC DISCRIPTION OF X RAYS

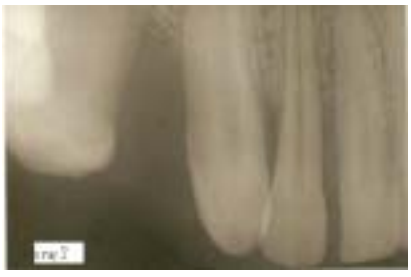
Figure 1 shows heavy bone loss in relation to right upper premolars and 2nd molar. 1st molar is absent 2nd premolar tilted distally. Horizontal pattern of bone loss is observed. Close observation under magnifying lense reveals some stands of cortical plate- strands.

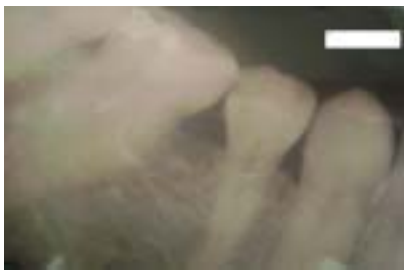
Figure 2 heavy bone loss distal to right upper canine tooth. 50% bone loss between upper central and lateral incisors (Horizontal).

Figure 3 heavy bone loss mesial to mandibular canine and with 1st and 2nd premolar. Vertical bone defect between second premolar and 1st molar on right side.

Figure 4 15 to 20% crestal bone loss in relation to premolars and molars of left side of mandible.
Figure 5 15 to 20 % bone loss in maxillary 1st and 2nd premolar and 1st and 2nd molar on the left side.







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