

PTERYGOID IMPLANT- For Atrophic Posterior Maxilla

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Abstract

The replacement of missing teeth in the posterior maxilla is often a task for the implant surgeon, as the posterior maxilla has many barriers in terms of consistency, quantity, maxillary sinus anatomy, and inaccessibility. There are many surgical procedures to resolve these defects, such as sinus raise, bone augmentation, tilted implants, short implants, and zygomatic implants. As these procedures have their own limits, the pterygomaxillary area provides us with an ideal location for implant placement and posterior maxilla recovery. This series discusses the use of the pterygomaxillary area for implant placement to restore the posterior atrophic maxilla without any additional surgery.

Keywords: Graftless solutions, pterygomaxillary implants, posterior maxilla.

INTRODUCTION

Dental implant/endosseous implant/fixture, a surgical component that interacts with the jaw or skull bone to support a dental prosthesis such as a crown, bridge, denture or facial prosthesis.¹ Implant placement through the maxillary tuberosity and into the pterygoid plate has been defined as pterygoid implant.² It has been used primarily in the rehabilitation of atrophic maxilla patients or for the prevention of maxillary sinus augmentation procedures. It was first offered in 1975 by Linkow and described in 1992 by JF Tulasne. This anatomical advantage was identified in 1989 by Tulasne and the use of pterygoid implants in the pterygomaxillary area was first described. Because of the consistency and volume of available native bone and the presence of the maxillary sinus, implant placement in the posterior maxilla is a great challenge. The drawbacks include higher surgical morbidity, bone grafting criteria, and increased cost and time of care. They still have do not allow immediate loading/function in patients with edentulosis.³ The causes of insufficient bone volume deficiency, especially in the posterior maxilla, may be due to bone resorption, sinus pneumatization or a combination of both. In these cases, the insertion of implants remains extremely unpredictable in this area.⁴ For the placement of dental implants, the posterior area of the maxilla has many limitations^{5,6,7} such as low bone volume, the presence of the maxillary sinus, accessibility issues, and the difficult hygiene that they require.^{8,9} Many surgical techniques, including sinus floor augmentation, alveolar distraction, directed bone regeneration, zygomatic implants and the use of pterygoid, pterygo-maxillary or pterygo-tuberosity implants, have been identified for the reconstruction of the posterior maxilla.¹⁰ One of the methods that can be executed to address this issue is the sinus lift procedure with bone grafting. In recent years, this technique has gained popularity, but it has its own disadvantages, such as the need for a double surgical site with a consequent rise in patient morbidity.

However, with this treatment, the risk of sinus membrane perforation as well as the likelihood of graft resorption around the implant remains. Besides this, in patients with chronic maxillary sinusitis, the treatment can be difficult. If

minimal bone height is not present, the vascularity of the graft is also uncertain.¹¹

DISCUSSION

The key finding of this systematic analysis is that pterygoid implants have a high survival rate for posterior atrophic maxilla dental rehabilitation. All the included studies stated, in general, that pterygoid implants can osseointegrate and remain functionally stable. Six months after implant installation surgery and before implant loading, most implant failures occurred. After the first year, pterygoid implants stayed stable and functional after osseointegration. Pterygoid implants are required for posterior atrophic maxilla rehabilitation. In other regions of the maxilla, the survival rates measured are as high as traditional dental implant survival rates. The procedure of pterygoid implant surgery follows the same fundamental concepts of traditional implant surgery. A simpler surgical approach can be considered to be the pterygoid implant technique, since it does not require a bone grafting procedure. Less overall morbidity, lower care rates, and faster recovery times are correlated with this strategy. From a prosthetic point of view, due to the emergence of pterygoid implants in the second molar region, dental rehabilitation with pterygoid implants has the benefit of eliminating long distal cantilevers. Although the cleaning of prostheses of the pterygoid implants that arise in the posterior region of the maxilla may be a concern for both patients and professionals, this factor has not been reported in any of the posterior region of the maxilla the research involved. A high degree of patient satisfaction related to final prosthesis recovery was also recorded by Curi and Penarrocha. Excellent primary stability of the implant may also provide opportunities for rapid loading of the implant and prosthetic recovery. Rodriguez et al. (Rodriguez et al., 2015) analysed 202 cone beam computed tomographic files of atrophic maxilla patients and found that compared to the tuberosity zone, the bone density of the pterygoid plate area was three times greater. Bone density ranged from 285.8 to 329.1 DV units in the tuberosity zone, and density varied

from 602.9 to 661.2 DV units in the pterygoid plate sector, with a 95 percent DV band.

An anatomical analysis of the pyramidal process of the palatine bone in relation to the implant placement in the posterior maxilla was recorded in some studies with a minimum implant length of 13 mm for pterygoid implants and measured the height and anteroposterior and mediolateral distances of the pyramid process. An anatomical analysis of the pterygomaxillary region with 100 cone beam computed tomography was recorded by Rodriguez et al. (2014); a mean bone corridor height of 22.5 mm was found. In this systematic analysis, if implants had a minimum length of 13 mm, they were called pterygoid only. One research that has not listed the duration of the pterygoid implant. While these authors did not mention the length of the implant, they identified the complete pterygoid implant technique, with the apex of the implant engaged in the pterygoid plate.

ANATOMY OF UPJAW (MAXILLA)

Except for the largest bones of the skull, the maxilla is via their union, the mandible, and form, the entirety of your upper jaw. Each helps to shape the limits. Three cavities, that is to say, the roof of the mouth, the floor of the nose and of the orbital floor; It also includes the formation of two fossas, two fissures, the infratemporal and pterygopalatine, and the orbital and pterygomaxillary of the inferior. Each bone has a body and four procedures. Frontal, alveolar, zygomatic, and palatine. (Fig 1)

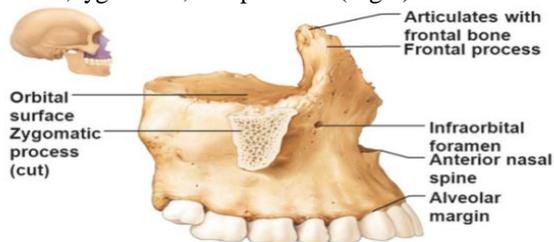


Fig.1 (a): Maxilla (Lateral view)

The Body (corpus maxilla). The body is a little pyramidal in form, The maxillary sinus is a large cavity and contains (antrum of Highmore).

There are four surfaces—

Superior or orbital, lateral, posterior or infratemporal, superior, and a nasal or medial one.

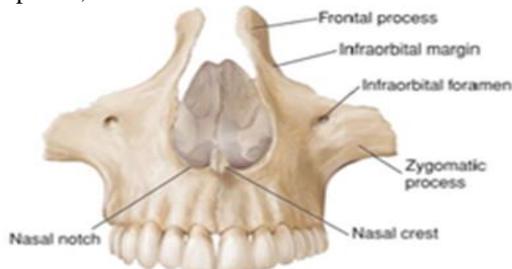


Fig.1 (b): Maxilla (Frontal view)

SURFACES:

SURFACE ANTERIOR:

The surface of the anterior is directed forward and lateral. It presents a series of eminences at its lower portion corresponding to the locations of the teeth roots. A depression, the incisive fossa, is just above that of the incisor teeth, and gives rise to the Depressor alae nasi; the alveolar nasi; A slip of the Orbicularis oris is affixed to the boundary below the fossa; The Nasalis occurs above and slightly lateral

to it. Another depression is lateral to the incisive fossa, the canine fossa; it is broader and deeper than, and is larger than, the incisive fossa. Separated from it by a vertical ridge, the eminence of the canine, referring to the canine tooth's socket. The infraorbital foramen, the end of the infraorbital canal, is above the fossa; it transmits the infraorbital foramen, the infra-orbital vessels and nerves are transmitted.

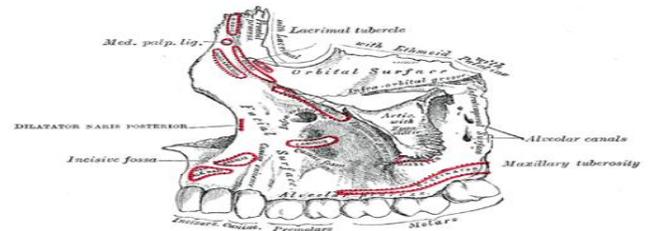


Fig. 2: Anterior surface of maxilla

MAXILLARY SINUS:

- A large pyramidal cavity is the maxillary sinus, Within the maxilla's body: its apex, The zygomatic is formed by a directed lateral direction, Method; its basis, guided towards the media, by the process The nose's lateral wall.

- Its walls are unusually thin everywhere, Nasal orbital, anterior, and correspond to The bone and the subtemporal surfaces of the body.

- The nasal wall, or base, is present in the disarticulated area. Bone, an irregular, broad aperture that interacts with About the nasal cavity. This aperture is in the articulated skull.

The following bones have decreased in size a lot:

The uncinated ethmoid process above, the ethmoid process above, The inferior nasal concha ethmoidal process the vertical part of the palatine above, and the vertical part of the palatine above, and The sinus interacts with the middle meat of the nose, normally through two narrow openings left between the above-mentioned bones; a small section of the lacrimal above and in front.

- Typically only one small opening, near the upper part of the cavity, remains in the fresh state; the other is blocked by the mucous membrane.

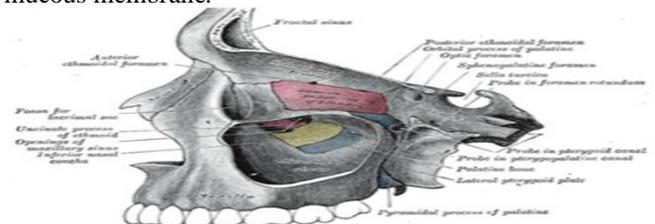


Fig.3: Left maxillary sinus opened from the exterior

PATHOLOGIC ANATOMY

MAXILLARY ATROPHY:

Bedrossian and associates divided the maxilla into three zones of potential atrophy, and their classification aids in understanding the use of zygomatic and other implants in this patient group. (Fig 4.)



Fig. 4: Classification of the three zones of the maxilla

- Edentulous patients with an eggshell-thin posterior maxillary alveolus (zone 3) who retain 4 mm or less of vertical bone height are not candidates for simultaneous posterior implant placement and sinus lift bone grafting.

- Edentulous patients who are fortunate enough to have adequate bone in the incisor-canine region (zone 1), as well as the premolar region (zone 2), may be candidates for the simpler option of tilting the most distal implants to extend the fixture's location distally to the second premolar–first molar area as described in the “all on 4” technique.

- Patients with combined zone 2 and zone 3 atrophy must choose between staged sinus lift bone grafting followed by multiple conventional root-form implants and the graftless, single-stage option of zygoma implants.

- Patients with maxillary atrophy are often elderly and may have medical co-morbid conditions that make them better candidates for a single operation to place all their implants. Such medically fragile patients may be less suitable for a multistep, multiple-surgery treatment plan involving staged sinus lift grafting followed months later by subsequent conventional root-form implant placement.

ANATOMY OF THE POSTERIOR MAXILLA

The precise structures in the posterior maxilla that offers potential assistance for the positioning of implants. Maxillary bone tuberosity, the palatine bone pyramidal process, and the sphenoid bone pterygoid process. (Fig.5)



Fig. 5: Region of a skull demonstrating the inferior relationship of the tuberosity, the palatine bone pyramidal process, and the sphenoid bone pterygoid process.

TUBEROSITIES

The tuberosity the convexity of the maxillary alveolar ridge is the posterior one. The pyramidal approach is its medial and posterior limit. The palatine bone's pyramidal process and the sphenoid bone's anterior surface of the pterygoid process are situated behind and slightly medial to the tuberosity. In order to achieve the best fixture position, the implant needs go through the tuberosity, bone palatine and finally ends in pterygoid process. (Fig 6).

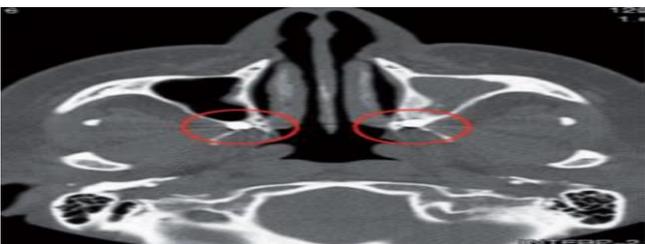


Fig.6: Patient CT with implants correctly anchored into the pterygoid process.

PTERYGOID PROCESS:

Pterygoid processes are two more compact bone columns than superior maxilla. They go down from the sphenoid bone to the lower area. The pterygoid process is compound by three parts: upper base, wing and pterygoid groove. The

distance from the alveolar crest at second molar level to the medium region of pterygoid process is usually 15 mm. Due to this, at least 13 mm of length is necessary to reach the pterygomaxillar process. Only by this way the fixture will be called pterygoid implant¹¹ (Fig 7).

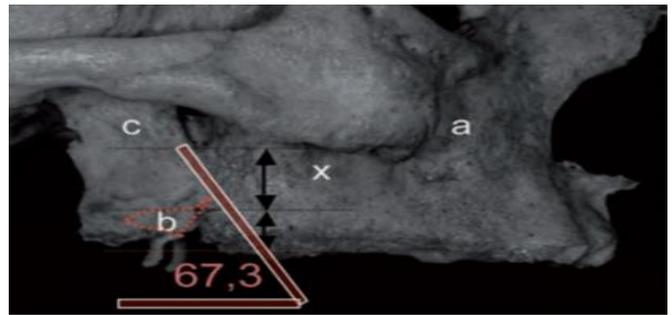


Fig. 7: Pterygo-palatine-maxillar area in a lateral view
 a) Superior maxilla. b) Bone palatine pyramidal process. c) Sphenoid bone pterygoid process. x) Pterygomaxillary suture length (12 mm). y) Tuberosity length (5 mm). Anthropometrically the position of this bone column compound by the tuberosity, the palatine bone and the pterygoid process, has been analyzed and the angulation change according to presence or absence of the dentition. In dentulous maxilla, there is no resorption then, the tubero-pyramid- pterygoid column angulation is $76, 5 \pm SD 3, 0^\circ$ in mesio-distal way respect to the Frankfurt plane and $17, 2^\circ \pm SD 2, 7^\circ$ of bucolingual angulation. In edentulous maxilla, the column angulation is $67, 3^\circ \pm SD 5, 0^\circ$ in mesio-distal way respect to the Frankfurt plane and $14, 1^\circ \pm SD 2, 1^\circ$ of bucolingual angulation¹². The pyramidal process conforms the pterygomaxillar suture width. Pterygomaxillar suture in the half lower part is compound by three bones: tuberosity, pyramidal process and pterygoid process.

If we observe these bones in lateral view, we can find four different shapes: (FIGURE 8). Type to I: equilateral shape of triangle. Type II: rectangle shape of triangle. Type III: narrow rectangle triangle shape. Type IV: there is no shape in lateral vision.

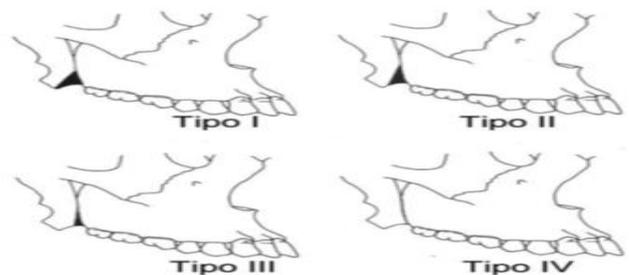


Fig. 8: Palatine bone pyramidal process from buccal view. In caudal vision, we can distinguish three types: Type to I: equilateral shape of triangle. Type II: rectangle shape of triangle. Form III: narrow rectangle shape of triangle. According to Lee, the length of the pterygomaxillary suture or the pyramidal palatine bone process height is 13.1 mm and the antero-posterior width is 6.5 mm. 45 (83%) of the 54 measured skulls by Lee, showed higher height than 10 mm.

PTERYGOID IMPLANTS

Endosseous implant inserted via the maxillary tuberosity and the pterygoid plate; suggested for dental or maxillofacial prosthesis retention in the maxillae.²⁶

Implants of Pterygoid are when located in the pterygoid process, the length of fixtures of 7 mm to 20 mm enables prosthetic regeneration without graft in the posterior maxilla. They need mesial abutment usually located in the premolar area.(Fig: 9)



Fig 9: Pterygoid implants

This technique consists of using the near compact bone (pterygoid process – palatine bone) as a fixture support. When we use this technique it's not necessary to harvest the compact bone from donor site to the sinus. The applied forces go to the pterygomaxillary buttress and they spread to the skull.²⁸

AREA OF PLACEMENT :

2 separate anatomical locations where pterygoid implants are inserted are described in the literature: the pterygoid process (Fig: 10) and the pterygomaxillary area (Fig: 11).

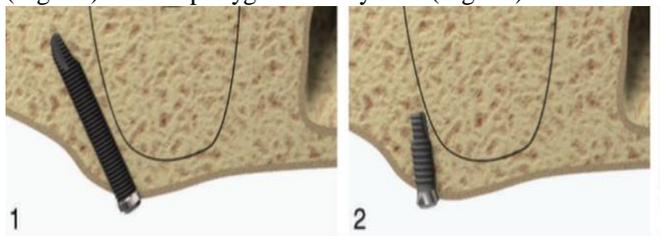


Fig 10. In the pterygoid phase, an implant **Fig 11.** In the pterygomaxillary an implant

DESCRIPTION IN PTERYGOID IMPLANT :

Implant lengths ranged from 7 mm to 20 mm. In the pterygomaxillary area, shorter implants were implanted and longer implants were anchored in the pterygoid phase. Longer implants were used in the pterygoid process to compensate for the poor quality of the posterior maxilla and to achieve sufficient intraosseous fixation. The majority of the implants used were 15 mm long (approx. 97 percent). The use of implants <15 mm in length in this field has been defined in several studies; however, it would be very difficult to include these implants in the pterygoid plate according to the present findings. Pterygoid implants are typically mounted at an angle of 45 ° to 50 ° to the horizontal plane with a diameter between 3.75 and 4 mm.

INDICATIONS:

1. Patients with partial arches of edentula.
2. Absolutely exuberant arches. In maxillary complete arch fixed implant-supported prosthetic rehabilitation, they are particularly helpful when four implants do not sufficiently provide force distribution and prosthetic support.
3. Rehabilitation of maxillectomy defects.

CONTRAINDICATIONS:

Patients with trismus or reduced mouth opening, when there is an absence of maxillary tuberosity. Entry to the pterygomaxillary area is obliterated by the presence of an affected maxillary third molar.

ADVANTAGES:

No bone graft is necessary, integrity of the sinus is preserved, the architecture of the sinus (e.g., septated sinus) is rarely a technical problem, the outcome is predictably successful (of 50 fixtures placed, six have been unsuccessful), the anterior-posterior spread is maximized; there is no need for cantilevering, the fixture is placed at an easy angle to restore, there is little morbidity, tuberosity reduction or other tissue pasty can be done simultaneously, treatment time is shorter than with sinus grafting.

DISADVANTAGES:

The procedure is technique sensitive—it is a semi blind procedure through 15 to 20 mm of bone, adequate bone support is necessary in the tuberosity and pterygoid raphae region.

PREOPERATIVE EVALUATION

A high-quality panoramic radiograph is usually all that is necessary to evaluate the area radiographically. Consideration should be given to the degree of sinus pneumatization, the shape of tuberosity, the relative density of bone of the pterygoid plates. Knife-edged maxillary ridges are rarely a problem in this area, because the maxilla tends to increase in width as it approaches the second and third molars. Computerized tomography provides a clearer picture, but has been used by the author only in patients with severe maxillary atrophy.

The size of the sinus determines both the angle and anteroposterior placement of the implant (Figs 10 to 11).

PATIENT SELECTION:

Until surgical procedure, a systematic preoperative assessment of the patient is needed. Before initiation of surgical procedure, all surgical and prosthetic needs must be considered in order to allow for a consistent outcome. The quantity of residual bone in the pterygomaxillary region is taken into account by the preoperative assessment procedure. Patients had to be in good general health and a minor oral surgical procedure had to be tolerable.

ANATOMICAL AND RADIOLOGICAL APPROACH:

All patients should receive a preoperative orthopantomography. In the panoramic radiograph, the patient should be positioned through the guides lights along three major axes (anterior-posterior, vertically (Frankfort plane), and midsagittal alignment) to standardized the radiologic measures. Thus computed tomography of cone beams (CBCT) and panoramic tests are done to assess the following parameters:

- 1.) Implant angulation of the anteroposterior axis relative to the Frankfort plane on a reconstructed panoramic view (Fig. 12);

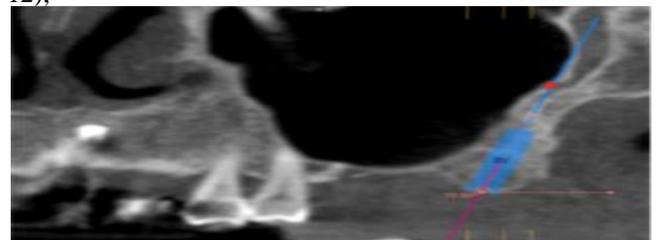


Fig 12: Virtual implant placement following the pterygoid bone corridor; the mesiodistal inclination (panoramic view) is shown

- 2.) Distance from the alveolar ridge of tuberosity to the most apical point of the apophysis of the pterygoid following the long virtual implant axis; Bone mass, measured in the pterygomaxillary area as the density value (DV),

- 1.) Density of bone (DV) in the region of tuberosity.
- 2.) On the buccopalatal axis, the implant angulation relative to the Frankfort plane (Fig. 13);

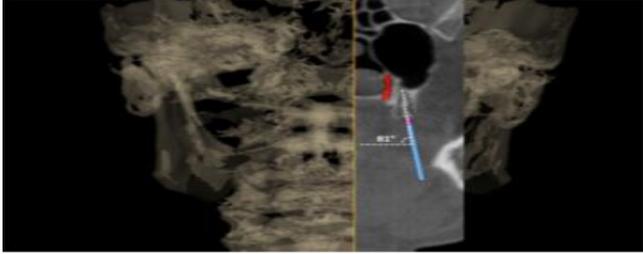


FIG 13: Picture showing the location of the virtual implant in coronal view; showing buccopalatal angulation. A protection gap of more than 2 mm should be noted between the body of the implant and the palatal artery.

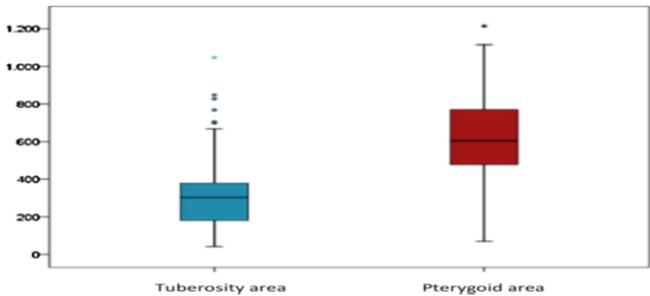


Fig 14: Density in the tuberos and pterygoid regions; importance of density in the tuberos and pterygoid regions; (DV).

OPERATIVE TECHNIQUE:

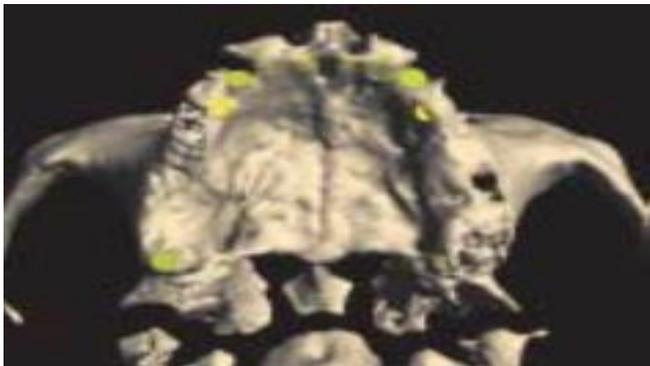


Fig 15: Digital computerized tomogram of the atrophic maxilla with the planned implant site



FIG 16: A depth probe is placed on the hamular process to help in the orientation. The ideal implant placement is 5 mm lateral to this process. This structure is frequently palpated during the drilling phase. A full-thickness incision is made a few millimetres medial to the crest of the tuberosity to the premolar zone, from the pterygomaxillary fissure. A soothing cleavage is placed

anteriorly. A mucoperiosteal flap is elevated buccally, exposing the tuberosity entirely.



Fig 17: The standard incision is made from the posterior tuberosity, slightly medial to the alveolar crest to the premolar area.

A "labial veneer" stent is preferred for the flexibility it affords the surgeon in location and angle of the fixture. Because of the angulation of the fixture, the crew access area will be in the central fossa of the first molar. The implant angle is determined by the floor of the sinus and vertical the height of the tuberos bone. The normal tendency when this procedure is attempted for the first time is to place the fixture too far anteriorly with too little horizontal angulation. A guide hole 3 to 4 mm deep is placed in the second molar area of the tuberosity with a No. 4 or 6 round bur.

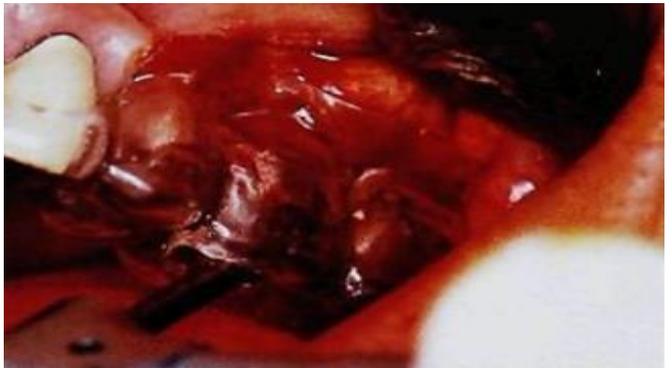


Fig 18: A guide hole is placed with the aid of a labial veneer stent.

To establish the final depth and angle of the fixture placement, a long-shaft 2-mm twist drill on a bur extension is used.



Fig 19: A long-shaft 2-mm twist drill on a bur extension is sunk through the pterygoid buttress. The hamular process is palpated and at approximately 45 degrees to the occlusal plane, the drill is directed 5 mm laterally. The primary guide used to determine the thickest part of the pterygoid bone pillar is this procedure. If the correct direction is taken, the twist drill will meet the

pterygomaxillary thick cortical bone. The stitching area is 10 to 14 mm long. The drill will noticeably slow down, then speed up again after the pterygoid phase passes through it. The drill is removed and a probe is placed in the hole in an attempt to feel the sinus cavity. If the floor of the sinus has been perforated, a new site must be located at least 3 mm posterior to the previous one. The long shaft pilot and twist drills are used similarly. It is important to pass completely through the pterygoid plate buttress of bone. There is no countersinking.



Fig 20: An 18-mm implant is placed without countersinking. After the implant site has been completely prepared, a depth probe with an enlarged tip is used to explore the site and determine the length of the implant to be used. Care is taken to check that the sinus has not been perforated. The implant should pass completely through the pterygoid process to establish bicortical stabilization, a fixture that will extend 3 to 4 mm past the pterygoid process and into the fossa is selected. This is usually a self-tapping 15- to 20-mm threaded implant. It is easily placed with a long fixture mount.

COMPLICATIONS:

There are main surgical hazards that can occur during the procedure:-

- The first is a significant intraoperative bleeding that stopped at the place of the implant. Bleeding is due to the proximity of the inner maxillary artery, 1 cm above the pterygomaxillary suture, an unusual complication of this kind. A minor venous bleeding caused by the insertion of the drill a few millimetres into the retropterygoid region was identified by Valero'n and Valero'n. With local haemostatic procedures, it was resolved.
- The second one is a hypoesthesia of the palatine nerve that was done in 4 weeks.
- The third was a pain that needs to remove the implant. When anchoring the implants into the pterygoid process, Krekmanov reported problems. Due to drilling outside the pterygoid process, an implant was lost during placement. Due to difficulties putting them in the initially drilled implant bed and having to put them in a different location, Vrielinck et al lost 4 out of 6 implants, which resulted in inadequate bone anchorage.
- Some authors related the difficult prosthetic process as a complication.
- Raspall described 2 abscesses in 238 cases of pterygoid implants.

CONCLUSION

With the use of implant help obtained from osseous sites in remote locations such as zygomatic bone, the advancement of Osseo integrated implant principles, as they refer to

rehabilitation of extremely resorbed maxillae or maxillary defects, has been significantly enhanced pterygoid process or pterygomaxillary region. The newer radiographic tools like CBCT have enabled us to place implants in previously inaccessible areas like pterygomaxillary region. We are able to successfully restore the posterior atrophic maxilla without the augmentation of the deficient bone with sinus lift procedures. This procedure, like any other procedure has certain disadvantages like the site of implant placement is anatomically complicated and poorly understood. Further, inadequate mouth opening restricts both the placement as well as prosthetic restoration of implants in this area. Although the outcomes are positive, the selection of cases is important and a detailed understanding of the risks associated with the procedure should be taken into account. The pterygoid plate fixture has been used successfully with fixed prosthesis, partial prosthesis, and framework-supported over dentures. Many of the implants have been in function for more than 4 years. Restoring posterior maxilla using pterygoid implants is beneficial as these implants are stable biomechanically and there is no cantilevering of pontics. The success rate achieved with this implant compares favourably with implants used in other areas about the maxilla. Implants inserted in the pterygomaxillary area provide us with outstanding posterior bone support without maxillary sinus augmentation or additional bone grafting. Long term evaluation is needed to assess the visibility of implant placement in the pterygoid plate region.

The key drawback of this procedure is that the positioning of the implant is precarious because this site's anatomy is poorly defined. To fit the hand piece and the drill, mouth opening should be sufficient. The restoration of pterygomaxillary implants is a challenge for prosthodontics since the site is inaccessible and all components should be treated with extreme caution because the components are highly likely to be aspirated. While the findings are positive, the selection of cases is very critical and a detailed understanding of the procedure's pitfalls should be taken into account.

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SOFT TISSUE MANAGEMENT IN IMPLANT DENTISTRY: A REVIEW

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Abstract

Implant therapy has evolved significantly since last few decades and has become a reliable treatment of choice for the replacement of missing teeth. Soft tissue management in implant dentistry has come forth as an important matter of concern in recent years. The knowledge and concepts about periodontal and peri-implant anatomy and biology are important for successful management of soft tissues during implant therapy. Appropriate selection and timing of soft tissue management procedures help to ensure a healthy peri-implant soft tissue environment and successful reconstruction of natural looking soft tissues with esthetic implant restoration. This paper presents an insight into various procedures and techniques of soft tissue management in implant dentistry.

Key Words: Peri-implant soft tissue, Soft tissue management, Surgical techniques, Non-surgical techniques.

INTRODUCTION

Implant therapy has evolved significantly over the last few decades and so has the expectations from it in terms of esthetics and function. Soft tissue management in implant dentistry has taken precedence in recent years^[1]. The maintenance and augmentation of the soft tissue has come forth as an area of concern and focus^[2].

The success of implant therapy is dependent upon various factors including soft tissue management which is of paramount importance^[1]. The knowledge and concepts about periodontal and peri-implant anatomy and biology are important for soft tissue management in implant dentistry.

Appropriate selection and timing of soft tissue management procedures help in establishing a healthy peri-implant soft tissue environment and successful reconstruction of natural-looking soft tissues with esthetic implant restoration^[3]. This paper presents an insight into various procedures and techniques of management of soft tissues in implant dentistry.

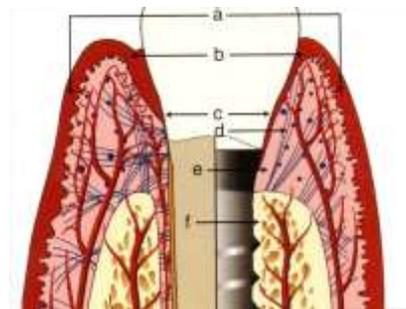


Fig. 1^[26] – Comparative anatomy of periodontal and peri-implant soft tissues

Where, a- Oral epithelium
b- Sulcular epithelium
c- Junctional epithelium
d- lack of connective tissue attachment
e- hypovascular- hypocellular connective tissue zone adjacent to the implant
f- absence of periodontal ligament blood supply

DISCUSSION

Peri-Implant Soft Tissue Anatomy

Peri-implant mucosa comprises of highly keratinized oral epithelium, sulcular epithelium and junctional epithelium along with connective tissue. Hemi-desmosomes and basal lamina are present amidst the implant surface and epithelial cells^[4]. The oral, sulcular and junctional epithelium in peri-implant soft tissues are quite identical to their periodontal counterparts in form and function. The connective tissue around teeth is cellular, rich in fibroblasts and highly vascularized whereas the connective tissue around implants has paucity of cells, is composed mainly of dense collagen fibres and has poor vascular supply. The alignment of fibres of connective tissue is in parallelism with the surface of the implant^[5].

Biological Width around Dental Implants

The biological width around dental implants provides a defensive barrier to prevent invasion and ingress of food debris into the implant/soft tissue interface.

The total extent of contact of the epithelial and connective tissue components with the implant denotes the “biologic width”^[6]. There is a biologic width of 3-4mm around the implant, slightly longer in comparison to that around natural tooth. Berglundh and Lindhe (1996) proposed that the establishment of biologic width was nature’s phenomenon in order to protect the osseointegration zone against bacterial and mechanical issues of the oral cavity^[7].

Healing of peri-implant soft tissue along with establishment of biologic width around the implant is necessary for prolonged survival of the implant. An optimal dimension of the biologic width is needed to attain a physiologic soft tissue seal. Inadequate dimension may lead to crestal bone resorption in order to attain space to establish the biologic width^[8].

Surgical Techniques for Soft Tissue Management

Several techniques have been proposed for the management of soft tissues around dental implants.

The Bio Col Technique:

This technique is exclusively used for site preservation in cases of defects involving both soft and hard tissues. An osteoconductive material such as Bio-Oss is utilized for regeneration of bone to preserve the site immediately after the extraction. Also, collaplug which is an absorbable collagen dressing, is condensed into the socket. Lastly, a provisional restoration is given to prevent tissue collapse^[9].

Flap Techniques:

Exaggerated Curvilinear Flap

This flap is indicated when exposure of the alveolar ridge on the facial aspect is necessary to allow visualization of the buccal anatomy or when hard or soft tissue augmentation is indicated as part of site development. The incisions are carefully beveled and directed through or parallel to existing anatomic landmarks such as the mucogingival junction and interdental grooves in order to provide aesthetic camouflaging^[10].

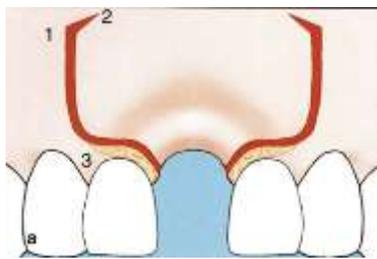


Fig.II^[26] – Curvilinear beveled incisions

U-shaped Peninsula Flap

The palatal or lingual based U-shaped peninsula flap was advocated by Miller to achieve accessibility to the site of

implant placed in an esthetic zone, when exposure of the alveolar ridge on the facial aspect is not required for tissue augmentation. Avoiding buccal incisions reduce gingival scarring and recession of soft tissues^[11].



Fig. III^[26] – Peninsula flap design

Tissue Punch:

In implant dentistry, tissue punch is basically recommended for exposing a submerged implant with ideal bulk and contour of peri-implant soft tissues in the region crucial for prosthetic emergence. Various diameters of tissue punch are provided by manufacturers according to implant sizes^[12].

Soft Tissue Grafting Around Implants:

Sub-epithelial connective tissue graft: This method for reconstruction of interdental papilla was suggested by Langer and Calagna. It involves elevation of a facial envelope type of split thickness flap. An appropriate connective tissue graft is obtained from the region of maxillary tuberosity and placed in the deficit interdental papilla area beneath the flap^[13].

Free Gingival Graft (FGG) or Epithelialized palatal mucosal graft: The epithelialized palatal graft technique was advocated by Atkins and Sullivan for increasing the width of attached tissues in the region where implant is placed. A thick split thickness palatal mucosal graft is taken to precisely match the recipient bed. The graft is sutured and immobilized followed by placement of absorbable collagen dressing over it^[14].

Modified Palatal Roll Technique: This technique was proposed by Scharf and Tarnow in which palatal connective tissue pedicle is rotated or rolled into a prepared labial pouch. This procedure is indicated for correcting minor smaller size soft tissue defects around implants in maxillary anterior region and is recommended for both labial and vertical soft tissue augmentation^[15].

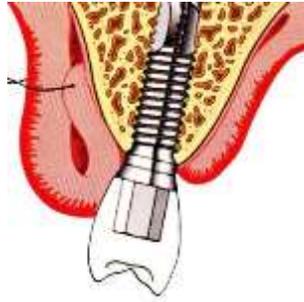


Fig. IV^[26] – The connective tissue pedicle is rolled and secured in the labial pouch via a horizontal suture initiated and tied apically in the vestibule.

Papilla Regeneration: This technique was proposed by Jemt T to be performed at the time of second stage implant surgery. This technique advocates a T-shaped incision and the flaps on either side are made to slide laterally in order to occupy the space between the abutment/gingival former and adjacent teeth^[16].

Guided Tissue Regeneration:

Melcher in 1976 proposed the use of GTR membranes to accomplish soft tissue augmentation. The procedure involves the placement of an expanded polytetrafluoroethylene barrier membrane around the implant, covering the margins of alveolar bone. Then the flaps are repositioned with adaptation around the neck of implant and suturing is done. The GTR membrane acts as a barrier and separates the gingival epithelium and connective tissue from the wound space, permitting regeneration of bone and periodontal tissues. Examples of GTR membranes are polytetrafluoroethylene, polyglactin, polylactic acid, calcium sulfate and collagen^[17].

Non-Surgical Techniques For Soft Tissue Management

Lengthening the Contact Area: A classification system was advocated by Norland and Tarnow^[18] for loss of papillary height which was related to interdental contact point as well as Cementoenamel Junction for classification of papillary loss. It was proposed that increasing the length of the contact area can decrease the black triangles and cover up the interdental papilla deficit^[19].

Gingiva coloured porcelain: It was proposed by Kamalakis^[20] and many other authors that gingival coloured porcelain can be used on the cervical region of abutments or restorations to achieve esthetically pleasing results when surgical reconstruction is unfeasible.

Custom tooth form healing abutments or Temporary restorations: It has been recommended by several authors^[21] that using custom tooth form healing abutments or temporary restorations at the early stage of implant placement or exposure helps in guiding soft tissue healing resulting in appreciable contours of soft tissue at the implant site.

Surface characteristics of implant collar: It has been documented that rough coated implant collar design bring about less crestal bone loss in comparison to smooth implant collar design, resulting in long-term maintenance of healthy soft tissues^[22].

Platform switching: Platform switching concept involves connecting an abutment that is smaller in diameter to a larger-diameter implant neck. This leads to inward shifting of perimeter of the implant abutment junction (IAJ) towards the axis through the centre which is the mid of implant. As proposed by Lazzara and Porter^[23], the inward shifting of the IAJ leads to inward shifting of inflammatory cell infiltrate away from the surrounding crestal bone which restrains the bone changes around the coronal part.

Maintenance of oral hygiene: Maintenance of proper oral hygiene and regular professional care are important for healthy peri-implant tissues. The patients' appointments should be scheduled as per required and maintenance program should be designed based on individual's needs.^[24] The clinician should be mindful of the level of effectiveness of patient's home care, systemic status, and condition of the peri-implant tissues when scheduling the recall visits^[25].

CONCLUSION

Besides osseointegration, the success of dental implant treatment also depends furthermore on the soft tissue conditions around the implants. Soft tissue management has become an important part of the implant therapy. The concepts regarding soft tissue management in implant dentistry have evolved over the years. With new surgical techniques and improved materials, much better results can be achieved for the benefit of patients, with pleasing esthetic outcomes and functional success.

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THE RISE OF VAPING AND IMPACT ON ORAL HEALTH

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Abstract

E cigarettes are being advocated as a healthier alternative to traditional smoked tobacco products i.e. cigarettes and are marketed as such. Their use as a smoking cessation treatment modality has also been extensively studied. Though studies indicate that there is a reduction in disease producing chemicals in the inhaled e cigarette vapor, the presence of nicotine and myriad flavoring agents added to the e cigarette liquid when inhaled lead to serious health issues. Nicotine addiction as well as oral and systemic health issues has been reported in various studies.

Keywords: E cigarette, Vaping, Nicotine addiction, Electronic Nicotine Delivery Systems

INTRODUCTION

Vaping¹ or the use of Electronic cigarettes (E-cigs) is on the rise. E Cigs are battery powered electronic devices that give a look and feel of a real cigarette. E cigarettes which can be refilled look structurally different (Figure1). With presence of multiple brands they are marketed as nicotine fix without the inherent dangers of cigarette smoking. It consists of a stainless steel shell housing a metal heating element connected to a cartridge containing the agent, an atomizer to vaporize the agent and a battery². The heating element activated by the battery vaporizes a solution, present in the cartridge, containing a cocktail of chemicals including nicotine, base agents, propylene glycol, glycerin or glycerol, and hundreds of flavoring agents with fruity, candy and other flavors.³ and other additives/humectants.(Figure 2)



Figure 1: Types of E-cigarettes
(Image courtesy www.fda.gov.us)

Chemical Composition

E cigarettes though marketed as a safer alternative to cigarettes, still have a considerable amount of chemicals in their aerosols. They contain high concentrations of nicotine (≥ 24) mg; aldehydes; heavy metals i.e. Ni, Cr, Cu, Ag etc; ultrafine particles, and tobacco specific nitrosamines.⁴ Other flavoring chemicals are also found including ortho-vanillin (vanilla), maltol (malt), cinnamaldehyde and coumarin. During vaporization variable levels of carbonyls (around 380 μg /10 puffs) have been detected in e-cig aerosols. A general lack of oversight in manufacturing of the products and marketing of e-liquid or e juices is also observed. Therefore,

significant concerns exist regarding the type and purity of the flavoring agents or additives used. Nicotine, which is the principle component of most e cigarettes, has been proven to be a contributor to periodontal disease.



Figure 2: Components of E-cigarette
(Image courtesy www.fda.gov.us)

Safety Issues

Most of the e cigarettes contain nicotine, which is highly addictive in nature. Stopping the use of cigarettes leads to nicotine withdrawal causing psychological as well as physiological symptoms ranging from tremors to depression and anxiety. Nicotine has also been shown to have adverse effects on the systemic health of not only the users but also the people around them being exposed to second hand smoke. E cigarettes even though marketed as a safer alternative to normal cigarettes generate toxic second hand smoke. Nicotine can cause cardiac problems in susceptible individuals and aggravate pre existing conditions. Arterial hardening has also been associated with nicotine and other chemicals present in e cigarette smoke. It also affects the CNS especially in children exposed to smoke and can cause developmental anomalies in kids affecting IQ, memory and attention⁵. Pregnant women using e cigarettes can cause damage to the unborn babies and it has been suggested that pregnant women shouldn't use nicotine at all.

Though e-cigarettes are in fashion and are being portrayed as a safer alternative to smoking and a way for smokers to give up smoking it is gathering more patronage in teenagers and young adults and is coming up in a big way as a for getting kids hooked on to a habit that is proven as a cause for diseases of the oral cavity, heart , lungs and cancer⁶.

E- cigarettes just not contain nicotine alone nowadays as some brands also contain chemicals found in building materials and antifreeze that can be cancerous. Flavors incorporated into e cigarettes also raise great concerns for e.g. the use of a chemical called diacetyl, which is often added to foods to give a buttery taste to popcorns and other snacks. When diacetyl is inhaled, this harmful chemical, among other things, can cause a life threatening lung disorder is called popcorn lung as cited by the ALA.

E-cigarettes are thought be safer than normal cigarettes and as a result are having a farther reach especially among students. A survey by Wang et al in 2020 revealed that nearly 3.6 million of middle and high school students were e cig users and 81 percent cited the availability of appealing flavors as the reason⁷. (Figure 3)

Cigarette smoking kills almost 8 million people a year due to the chemicals that are emitted during burning and inhaled as smoke. As E-cigarettes don't produce smoke due to burning, so users are not exposed to those toxins. An expert review from Public Health, England in 2015 estimated that e-cigarettes are 95% less harmful than real cigarettes and ENDS, have surged in popularity but health organizations have been wary of them as a safer alternative to tobacco and various governments are introducing bills to regulate their use more strictly⁸.

There are no definitive studies on the use of e cigarettes as an alternative and to help smokers quit smoking but this may be due to the diversity of the electronic products and low certainty among many studies. According to the FDA, no evidence has been found that e-cigarettes are a safe alternative and effective at helping smokers quit. The AHA advocates that e-cigarettes should only be used as a last resort by patients who have had no success with other treatment modalities.

A 2020 study in the journal of pediatrics concluded that teens using e-cigarettes had a higher predilection to use cigarettes compared to non user teens.⁹ A study in JAMA in 2015 found a connection between e-cigarette users and increased predilection towards graduating to smoking. A study of 2,530 high school students who had never smoked cigarettes found that e-cigarette users had more chance to smoke or use other tobacco products over the next year than non-users. CDC statistics on teen smoking showed that while e-cigarettes use went up to 24% in 2015, cigarette smoking dropped to 11%.¹⁰

Growth in E-Cigarette Use

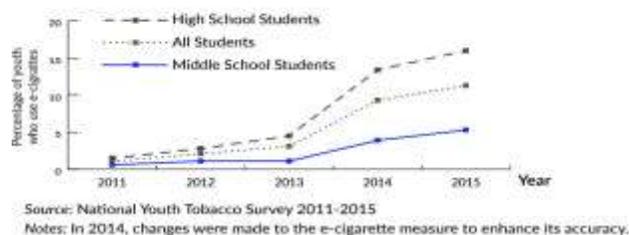


Figure 3: Rise in usage of E-cigarettes

REGULATIONS¹¹

The FDA is regulating ENDS (electronic nicotine delivery systems) which include e-cigarettes as same as cigarettes and smokeless tobacco. The basic guidelines include:

- No sale to underage individual’s whether online or in stores.
- Sellers have to check Identities of anyone less than 27 years of age.
- The ENDS cannot be sold from vending machines.
- Free samples or distributions are banned.
- Advertisements in any form for consumer sales are banned
- E-cigarettes available in the market after 2007 have to go through a stringent FDA safety and approval review to continue to be in the market.

What are the potential oral health side effects

A study in the University of Rochester in New York, gingiva of non smokers was exposed to e-cigarette vapor an inflammatory response was observed which aggravated stress and subsequent cellular damage. The findings were also duration and dose dependent. These findings contradict that the electronic devices are a healthier alternative to use of cigarettes. The research also observed that flavoring agents in e-cigarettes play a significant role in cellular damage.

A study has found that e-cigarette vapors may be as harmful to periodontal health as traditional cigarette smoke. The study, conducted by researchers at Université Laval in Quebec, Canada, involved an in vitro experiment whereby gingival epithelial cells were exposed to e-cigarette vapor in order to chart the effects. The negative effects of smoking traditional cigarettes have been well documented. Cigarette smoke has been linked to a number of diseases including cancer and bronchitis, as well as periodontal disease. Electronic cigarettes have been widely adopted by people who see them as a healthier alternative to regular cigarettes. This is because no combustion occurs while smoking, which eliminates the inhalation of harmful compounds such as tar and carbon monoxide. This study found the perception that they are healthier to be far from the reality.

For the experiment, researchers gathered gingival epithelial cells from the tissue of healthy non-smokers aged 18–25.

These cells were placed in a saliva-like liquid inside a custom-made smoke chamber. The cells were then exposed to e-cigarette vapor for 15 minutes a day in short bursts designed to mimic inhalations. When these cells were compared with the control sample, which had not been exposed to e-cigarette vapor, there was a stark contrast. The percentage of dead or dying cells was around 2% in the unexposed sample, whereas it was a remarkable 53% in the cells which had undergone three days of exposure. The authors suggested that this was due to the chemicals found in e-cigarette vapor. E-cigarettes work by vaporizing a liquid solution which typically contains glycerol, propylene glycol, nicotine and other flavorings. Studies have shown that after this solution is heated and turned into vapor it contains trace amounts of carcinogens and heavy metals, with a certain amount being converted into chemicals including formaldehyde. Continued exposure to traditional cigarette smoke can be a significant factor in tooth loss, and these findings suggest that electronic cigarettes also have potentially serious consequences for oral health, though further long-term research is required.¹³

The oral health effects of e-cigarettes are being studied extensively considering the effect of tobacco smoke with the oral environment. As several pathogenic processes in the oral cavity are attributed to smoking and use of nicotine, the contact of aerosols with the oral mucosa first when they are most concentrated and hot is also significant.

A systematic review in 2020 was done to establish if there was any evidence for effect of e-cigarettes on oral health¹². A few important studies were identified ranging from multiple user questionnaires/surveys that found the most reported side effect of e-cigarettes was the recurring symptom of mouth and throat dryness and. Another study on growth of periodontal ligament fibroblasts exposed to additives demonstrated a decreased fibroblast proliferation rate with menthol additives.

On the other hand the cessation of smoking has shown to reduce tobacco related oral diseases, i.e. oral cancer and periodontal diseases. Smoking cessation is difficult for majority of users and one-year cessation rates of only 15 percent is achieved even while using intervention techniques and therapies. Therefore e-cigarettes may improve on the success rate and may be a particularly effective tool in the majority of patients who failed to quit.

Therefore the harmful effects of e-cigarette aerosol on the oral and periodontal tissues are to be considered and a balance sought with the benefit achieved by reducing exposure due to burning of tobacco.¹⁴

Despite the rising e-cigarette use insufficient studies are available to adjudge the toxicological effects of smoking on oral health. E cigarette aerosol mixtures added with flavors increase the oxidative stress and enhance the inflammatory cytokine release in human PDL fibers, gingival epithelial pooled cells (HGEPP), other gingival tissues.¹² E-cigarette derived chemicals cause increased oxidative stress and DNA damage, leading to dysregulated repair and impaired wound healing in smokers.

Nicotine has been found to impair leukocyte activity and delay healing due to inhibiting osteoblastic differentiation and neovascularization.¹⁵ Studies have also found that smoking tobacco including e cigarettes is associated with an aggravated risk of failure of implants which could be due to impaired healing at the bone implant interface.. Berley et al. observed a decrease in level of osseointegration in implants even after 4 weeks in rat femur which received nicotine subcutaneously¹⁶. Yamano et al. found in an animal study a down-regulated genetic expression of bone matrix genes in rats who received nicotine for 8 weeks which could be due to impairing of function of MSCs or stem cells by nicotine.¹⁷ Further studies have reported damage to lungs and alveoli with Lerner et al. reporting enhanced mitochondrial ROS, increased DNA nuclear fragmentation and reduced efficacy of electron transport chain complex in human lung fibroblasts when exposed to e-cigarette vapors and its end-products namely Cu nanoparticles¹⁸. Schweitzer et al. also reported that components of e-cigarettes namely propylene glycol, glycerol, and nicotine produced a loss of lung endothelial barrier function and caused an inflammatory response¹⁹. Gerloff et al observed that e-cigarettes and the various added agents can trigger a strong inflammatory response and cause dysfunction in the barrier membrane in the human lung epithelial cells²⁰.

Explosion: According to the FDA, 134 reports of serious injuries due to overheating e-cigarette batteries and catching fire, or exploding between 2009 and 2016. The FDA has instituted stringent guidelines to implement safety standards to prevent further occurrences.

Poisoning: Concentrated nicotine in liquid form is highly toxic with LD50 of 0.5/1.0 mg/kg in adults and 0.1 mg/kg in children. Therefore poisonings especially in children is on the rise. Guidelines advice keeping all e-cigarettes and their cartridges out of reach of children to prevent accidental poisoning. The most common effects of nicotine poisoning are nausea, headache, cough, and mouth/throat dryness and irritations, and death in extreme cases. The FDA has instituted regulations that will require the manufacturers to print warnings and manufacture child-resistant packaging for products.

CONCLUSION

E-cigarettes along with the various flavoring chemicals contribute to periodontal pathogenesis and affect general health via inflammation, cellular injury and delayed & dysregulated repair responses due to the effect on cellular proliferation and differentiation. This affects their ability in healing wounds by enhanced release of various pro-inflammatory compounds. E-cigarettes and their flavoring chemicals produce harmful effects in the oral mucosa, periodontal ligament cells and their precursor stem cells, and gingival fibroblasts. There is a need for a level headed and cautious approach to e-cigarettes as they are a double edged sword and judicious use is required for their use in the fight against tobacco. Further research, with long term studies, longitudinal and comparative studies, are required to have a better understanding of the impact of e-cigarettes on systemic and oral health. It is important and should be made mandatory for full disclosure by manufacturers about the materials and

chemicals used in manufacture of e-cigarettes so as to help the consumers understand the potential dangers.

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SALIVARY STIMULATION: NEWER TECHNIQUES

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Abstract

Saliva play very important role in maintaining health. It has several functions, such as detritus dilution, lubrication of oral cavity, bolus, maintaining the oral mucosa integrity, food solubilization, mechanical cleansing action, and remineralization. Decrease in flow of saliva is hyposalivation which may be caused due to certain autoimmune diseases, connective tissue complications, as a result of radiation therapy to neck and head, certain medications, or due to some other condition. Oral dryness is a symptom of xerostomia. Treating xerostomia is very challenging in dental practice. Recently, TENS used to increases saliva production in patients with radiation therapy and even in healthy patients. There are intraoral devices or the three generation which play a key role in increasing salivary secretions. This article presents a review about new developments for the treatment of xerostomia by incorporating salivary pacemakers and its three generations.

Keywords: xerostomia, auriculotemporal nerve, neuro-electrostimulator, osteointegrated implant.

INTRODUCTION:

It can be said that saliva lacks the emotional aspects of tears, the sincerity of sweat, and the drama of blood, which is why saliva is not one of popular bodily fluids, (Mandel 1990). Although, saliva is not required for any life-sustaining functions, and is taken for granted, but its absence or diminution can lead to significant reduction in the perceptions of quality of life for a patient and may significantly increase morbidity^{1,2}. Primarily, saliva constitutes of proteins, water, and electrolytes³, these components augments and facilitates speech, lubrication, irrigation, taste, swallowing, and mucous membranes' protection in the upper digestive tract¹. Moreover, saliva prevents the dental caries of teeth with its antimicrobial and buffering activities of physiological functions³.

One of the symptoms of oral dryness is Xerostomia, which means that the fluid loss from the oral cavity is more than the salivary flow, which is majorly a result of loss of salivary gland hypofunction⁴. Xerostomia is a common problem, where women are 10-29% more likely to be affected as compared to men⁵ in middle to late life which suggests the anticholinergic action of several drugs, and this condition can be found in young adults also, but rarely in children.^{6,7}

Dentists face many problems while treating dry mouth patients, where treatment with salivary substitutes, lubricants, adoption of masticatory methods or salivary stimulation by gustatory can help but not for long period of time. Xerostomia reccurs once the treatment is interrupted⁸. In a recent study functional non-pharmacological method were used in treating xerostomia; however, none of the treatments present currently can fulfill these expectations⁹.

Therefore, this report presents the advances of neuroelectro-stimulation in xerostomia patients.

ETIOLOGY:

Several complications of connective tissues, autoimmune diseases, use of medications, radiation therapies to neck and head are a leading cause to xerostomia.

Hyposalivation leads to several health problems which can seriously affect the nutritional status, taste, dietary habits, speech, quality of life, and tolerance to dental prosthesis for a patient, which can further increase the risk of periodontal diseases, susceptibility to dental caries, oral infection including candidiasis, and tooth loss¹⁰.

Drugs Associated With Xerostomia¹

Category	Generic Name
Anticholinergic agents	Atropine Belladonna Benztropine Oxybutyrim Scopolamine Trihexyphenidyl
Antidepressant and antipsychotic agents Selective serotonin-reuptake inhibitors	Citalopram Fluoxetine Paroxetine Sertraline Venlafaxine
Tricyclic antidepressants	Amiripryline Desipramine
Heterocyclic antidepressants	Imipramine Haloperidol Mirtazapine
Monamine oxidase inhibitors Atypical antidepressants	Pimocide Phenelzine Dupropon Nefazodone Olanzapine
Diuretic agents	Chlorothiazide Furosemide Hydrochlorothiazide Triamterene

Sedative and anxiolytic agents	Alprazolam Diazepam Flurazepam Temazepam Triazolam
Antihypertensive agents	Captopril Clonidine Enalapril Guafacine Lisinopril Methyldopa
Muscle relaxant agents	Cyclobenzaprine Orphenadrine Tizanidine
Analgesic agents Central nervous system/opioids	Codeine Meperidine Methadone Pentazocine Propoxyphene Tramadol
Non-steroidal anti-inflammatory agents	Diflunisal Ibuprofen Naproxen Piroxicam
Antihistamines	Astemazole Brompheniramine Chlorpheniramine Diphenhydramine Loratadine Meclizine

Salivary Glands

20% of the total saliva is secreted by parotid gland, which is serous type histologically. 70% of the total saliva is secreted by submandibular gland which is mixed type both serous and mucous. 5% of the total saliva secreted sublingual salivary gland which is also mixed type. In salivary glands Acinar cells discharge secretory granules containing salivary enzymes to the ducts. Almost 1500 mL of saliva is produced per day¹¹.

Management / Treatment

Extraoral

- Tens therapy

Intraoral

- Three Generations Of Pacemakers

Transcutaneous Electric Nerve Stimulation

It was reported that when the TENS is placed over the major salivary gland i.e. parotid gland, it tends to increase the saliva production which is caused by radiation specially in healthy individuals and patients with xerostomia, auriculotemporal nerve (efferent pathway) might be stimulated by TENS which supplies

the secretomotor drive to the parotid gland.^{12,13} TENS was classified as class II device by the FDA in 1972¹⁴.

Salivary Pacemakers (Intraoral devices)

First-generation electrostimulating devices

USA (Salitron; Biosonics, Fort Washington, PA, USA) in 1988 approved a device for neuro-electrostimulation to increase salivary secretion. To generate salivation and to provide signals to related neuron probe was used each day for a few minutes between the palate and dorsum of the tongue (Figure1)^{15,16,17}. But because of its high price and large size its wider use was hampered.

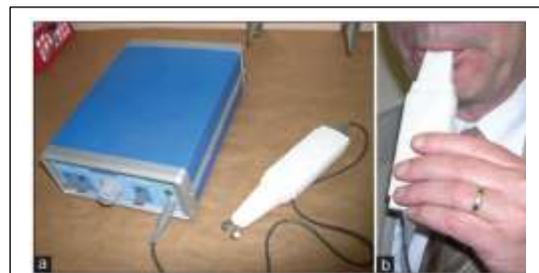


Figure 1

a) First-generation neuro electrostimulation device consisted of a hand-held probe, tipped with stainless steel electrodes, and a console that housed a battery and the electronic signal-generating power source, the size and shape of which were similar to a video or CD player.

(b) The probe was applied to the intra-oral mucosal surfaces by the user (between the dorsum of the tongue and palate) for a few minutes each day and delivered a stimulating signal to sensitive neurons of the mouth to induce salivation

Second-generation devices

(GenNarino Saliwell Ltd. Germany) Removable intraoral appliance the second-generation salivary neuro electrostimulator customized by making impression of their arches and fits on the mandibular arch like mouthguard. Its convenient for the patient to insert and remove. In order to allow safe and contamination-free intraoral application the electronic components are fixed within the appliance. It helps the patients to communicate with the device and also the function can be modified as its a remote control [Figure 2]. The dryness of the mouth can be reduced during the application and also 10 mins after its removed by using this device.



Figure 2

Second-generation removable device
(a) The miniaturized electronic stimulator
(b) The stimulator is activated by remote
(c) Used in mandibular arch in non-invasive manner

Dental implant-based third-generation intraoral device

Miniature neuroelectrostimulating device was developed by the Saliwell Crown Saliwell Ltd. Germany. Components of second-generation were miniaturized and packaged into a device which is permanently mounted on a commercially available osteointegrated implant, which is of same shape and dimensions of a molar tooth. The device also have wetness sensor which detect changes in wetness/dryness. They are implanted in lower third molar region to avoid interference with normal oral function and also the close proximity to the lingual nerve which carries both afferent and efferent salivary impulses⁹. [Figure 3].



Figure 3
Third-generation implant-supported neuroelectrostimulating device
(a) Exposure of mandibular bone
(b) Implant bed preparation in mandibular bone
(c) Dental root implant insertion
(d) Neuro electro stimulating device and applicator
(e) Saliwell crown
(f) Radiograph of both the implant and crown

CONCLUSION

Condition of hyposalivation and xerostomia interferes with nutrition, leads to decline of oral hygiene. This article highlights the role a prosthodontist plays by presenting new developments for treatment of xerostomia by incorporating salivary pace makers and its three generations that play a key role in increasing salivary flow. It is a prime concern to prevent and treat xerostomia which is a common clinical challenge in oral medicine practice.

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AGGRESSIVE PERIODONTITIS: A LITERATURE REVIEW

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1-4 - Department of Periodontology, Kotiwal Dental College and Research Centre, Moradabad***Abstract:**

The purpose of this review is to highlight the current etiological and therapeutic concepts of aggressive periodontitis which is rapidly progressing and aggressive in nature. It leads to destruction of periodontal tissues and loss of teeth. We need advanced diagnostic techniques to learn about current disease activity and rate of progression. We also require strategies to keep the disease under control with proper maintenance regime and prevent tooth loss, because it can result into complicated prosthetic rehabilitation in a very young patient. The evidence suggests that aggressive periodontitis is influenced by microbiological, genetic, and host factors. This paper reviews clinical, microbiological, immunological, and genetic aspects of pathogenesis of aggressive periodontitis, as well as diagnostic criteria of the disease and appropriate nonsurgical and surgical treatment options.

Key words: Periodontitis.

Introduction

Mankind has known periodontitis as a disease entity for more than 5000 years.¹ Aggressive periodontitis refers to the multifactorial, severe, and rapidly progressive form of periodontitis, which primarily but not exclusively affects younger patients.² Aggressive periodontitis generally affects systemically healthy individuals less than 30 years of age, though patients may be older.³ The term aggressive periodontitis does not refer to a new disease, but is used to describe the rare, but extremely progressive forms of periodontitis, which in most cases manifest themselves clinically during youth. This was replaced by the terms “juvenile” or “early onset periodontitis (EOP)”. The presence of systemic diseases, resulting in an impaired immune system of the host and thereby causing severe periodontal diseases and premature tooth loss, must be excluded.^{4,5} Aggressive periodontitis as the name suggest is a rapidly progressing type of periodontitis. It is an extreme variant type of infective-inflammatory periodontal disease [*chronic plaque induced periodontitis*] and is believed to be caused by specific microorganisms. Certain immune defects in the patient are believed to play major role in etiopathogenesis of aggressive periodontitis. It is generally seen in ‘seemingly’ healthy [systemically] individuals.

HISTORY

A variety of names have been given to a form of periodontal disease characterized by deep pockets and advanced alveolar bone loss in the young children, adolescents and adults, without any associated systemic diseases.^{3,4}

YEAR	AUTHOR	TERMS
1923	Gottlieb	<i>Diffuse Atrophy Of The Alveolar Bone</i>
1928	Gottlieb	<i>Deep cementopathia</i>
1938	Wannenmacher	<i>Parodontitis marginalis progressive</i>
1940	Thoma, Goldman	<i>Paradontosis</i>
1942	Orban, Weinmann	<i>Periodontosis</i>
1966	World Workshop	Periodontics
1967	Chaput	<i>Juvenile periodontitis</i>
1969	Butler	<i>Juvenile periodontitis</i>
1985	Page, Baab	<i>Early onset periodontitis (EOP)</i>
1989	World Workshop in Clinical Periodontics	<i>Localized juvenile periodontitis (LJP)</i>
1923	Gottlieb	<i>Diffuse Atrophy Of The Alveolar Bone</i>
1928	Gottlieb	<i>Deep cementopathia</i>

DIAGNOSTIC CRITERIA

- The key diagnostic criteria of this disease includes:⁵

- Early age of onset
- Involvement of multiple teeth with a distinctive pattern of clinical attachment loss and radiographic bone loss.
- A relatively high rate of disease progression and the absence of systemic diseases that compromise the host's response to infection.
- Although in some patients the disease may start before puberty, in most patients the age of onset is during, or somewhat after, the circumpubertal period.
- A typical patient shows disease onset at an early age (**i.e., before 25 years of age**), although identification of the affected patient usually occurs after disease commencement.
- Although the current classification is no longer principally based on the age of the patient, the evaluation of the loss of periodontal supporting tissue can be helpful in the evaluation of progression of the disease.
- The specific distribution of the periodontal lesions (molars/incisors or generalized occurrence) permits the identification of localized and generalized aggressive periodontitis.

EPIDEMIOLOGY

The prevalence of LAP varies considerably between continents, and differences in race/ethnicity seem to be a major contributing factor. Estimates of the disease prevalence are 1-5% in the African population and in groups of African descent, 2.6% in African-Americans, 0.5-1.0% in Hispanics in North America, 0.3-2.0% in South America, and 0.2-1.0% in Asia. Among Caucasians, the disease prevalence is 0.1% in northern and in central Europe, 0.5% in southern Europe, and 0.1-0.2% in North America. The prevalence of LAP is less than 1% and that of GAP is 0.13%. Blacks are at higher risk than whites, males are at higher risk of GAP than females. In Asia the prevalence rate of 1.2% for LAP and 0.6% for GAP in Baghdad and Iran population, and 0.47% in Japanese population.¹¹

PREVALENCE

The prevalence of AP varies considerably between continents, and differences in race/ ethnicity seem to be a major contributing factor.¹²

Europe

5 surveys using representative samples comprising predominantly Caucasian subjects have been conducted in European populations. 4 of these surveys targeted 14-17 year old school children in Norway, the Netherlands, Finland and Switzerland.¹²

AGE	PLACE	PREVALENCE
14 years	Norway	-
14-17 years	Netherland	0.1-0.2%
16 years	Finland	0.1%
16 years	Switzerland	0.1%
19-20 years	Switzerland	0,13%

❖ **North America**

- The National Survey of Oral Health of US has undertaken school children during 1986/1987 and represented the most comprehensive dental survey to date of school-age children in the world.
- Study estimated that 0.66% of 14-17 years subjects in the US population have AP, including 0.53% of children with LAP and 0.13% children with GAP.

Second report assessed in the US population:¹²

AGE	PLACE	PREVALENCE
13-15 years	US	0.4%
16-19 years	US	0.8%

❖ **South America**

- Two surveys were conducted:
 1. First survey studied 15-19 years school children in Santiago, Chile, using an initial clinical examination to screen the probing depth at 1st molars and incisors, and then used clinical and radiographic examinations of subjects identified as possibly having AP to validate the diagnosis of the disease.
 2. Second survey was in Porto Alegre, Brazil and was household-based. It clinically examined 14-29 years individuals and found a disease prevalence of 5.5%

❖ **Asia**

- 3 Asian populations were studied using probability samples:¹³

AGE	PLACE	PREVALENCE
13-19 years	Ankara, Turkey	0.6%
15-18 years	Tehran, Iran	0.13%
18-19 years	Israeli	0.86%

- In Asia, prevalence rate of 1.2% for LAP and 0.6% for GAP in Baghdad and Iran population, and 0.47% in Japanese population.

❖ **Africa**

- Only one study using a representative sample was found for African populations.¹³

AGE	PLACE	PREVALENCE
13-19 years	Khartoum, Sudan	3.4%

- The prevalence of LAP is <1% and GAP is 0.13%.

❖ **Prevalence of aggressive periodontitis by demographics:**¹²

➤ **Age**

- AP is detected more frequently among older children and young adults than in younger children.
- Albandar et al. estimated the prevalence of AP in US school children to be 0.4% among 13-15 years children and 0.8% among 16-19 years children.

➤ **Race/ethnicity**

- In 1986/1987 National Survey of US school children, 2 studies assessed the prevalence of AP:

Black Americans (2.6% and 2.64%) > Hispanic Americans (0.5% and 1.08%) > White Americans (0.06% and 0.17%)

- A study in US military recruits found a higher disease prevalence in Black people (2.9%) compared with Caucasians (0.09%).
- In the UK the reported prevalence is 0.02% in Caucasians, 0.2% in Asians and 0.8% in Afro-Caribbeans.
- In Brazil, AP was found in 2.4% of white people Vs. 6.1% of non-white people
- In Israel AP was detected in 3.2% of European compared with 10.4% of Africans.

A study in Sudan found a significantly higher prevalence in children of African tribes (6%) compared with those of Afro-Arab tribes (2.3%).

➤ **Gender**

PLACE	MALE	FEMALE
US (National Survey)	0.78%	0.52%
Porto Alegre, Brazil	5.7%	5.3%
US (Military Recruits)	0.73%	0.81%
Denmark	0.1%	0.1%
UK	0.1%	0.1%
Khartoum, Sudan	4.9%	2.0%

SCHOOL CHILDREN	MALE	FEMALE
Brazil	5%	2.7%
Iraq	0.4%	1.4%

- Black male school children were 2.9 times more likely to have LAP compared with black female school children, whereas white female school children were 2.5 times more likely to have the disease compared with white male school children.
- Another study conducted a longitudinal investigation of a group of 13 year old Brazilian at baseline and 3 years later and found that 1.3% and 1.8% of children had AP at 13 and 16 years respectively.
- Loe & Brown estimated that the odds ratio for detecting localized aggressive periodontitis in 17 years US children compared with those of 14 years was 3.8.
- Similarly, a study of US military recruits reported a higher disease prevalence in black male subjects than female subjects (3.81% vs. 1.99%), whereas in Caucasians and in other ethnic groups the prevalence was higher in female than in male.
- The study reported the following female:male ratios of disease prevalence: 0.52:1 in Black people; 4.3:1 in Caucasians; and 3:1 in other races.

❖ **Prevalence of aggressive periodontitis in India:**¹⁴

- A study was done to know the prevalence of aggressive periodontitis among teenagers and young adults.
- The prevalence of aggressive periodontitis in district Yamunanagar in a population attending schools and colleges in the age group of 15–30 years was 0.15% which was in accordance with the earlier epidemiological studies worldwide.

CLASSIFICATION

1. Localized aggressive periodontitis (LAP)
2. Generalized aggressive periodontitis (GAP)

Localised Aggressive Periodontitis:

- Localised Aggressive Periodontitis is localized in nature and doesn't involve all teeth in the dentition.
- It is confined to the incisors and first molars or at least two permanent teeth one of which is a molar and not more than two teeth other than molars and incisors.

-
- There is a lack of local factors such as plaque and calculus.
- Clinically there is lack of inflammation. But it presents with deep periodontal pockets.
- Distolabial migrations of the maxillary incisors with diastema formation are also present.
- There is an increased mobility of the maxillary and mandibular incisors and first molars.
- Dentinal hypersensitivity of denuded root surfaces is observed to thermal and tactile stimuli if present.
- Deep, dull, radiating pain during mastication probably caused by irritation of the supporting structures by mobile teeth and impacted food are present.
- Periodontal abscesses formation can be seen in the localized areas in such cases.
- Regional lymph node enlargement are also common in some cases. Rate is 3 to 4 times more and severe than in Chronic Periodontitis.
- Blacks are more prone to suffer from LAP. Among whites, females are more prone and among blacks, men are prone more to have LAP.
- It has been seen that in Localized Periodontitis Robust serum antibody response to infecting agents
- It usually occurs at puberty to 30 years of age.

Generalized Aggressive Periodontitis:

- Generalized aggressive periodontitis is characterized by “generalized interproximal attachment loss affecting at least 3 permanent teeth other than first molars and incisors.
- It is a multifactorial disease where interplay of microbiologic, genetic, immunologic, and environmental/behavioral risk factors decides the onset, course, and severity.
- The pathogenic bacteria in the dental plaque especially *Aggregatibacter actinomycetemcomitans* and *Porphyromonas gingivalis* have an indispensable role which elicits an aggravated host response which in turn is determined by the genetic and immunologic profile of the patient modified by environmental risk factors like smoking.
- Patients may complain of halitosis and pus discharge from gums in some cases.
- Pronounced episodic nature of the destruction of attachment and alveolar bone can be seen
- In generalized periodontitis poor serum antibody response to infecting agents.
- Mobility of the affected teeth will be seen towards the later stages of the infection. Patients will be otherwise systemically healthy.
- Severe pain is rarely experienced by the patients except in situations where a periodontal abscess

develops or a periodontal-endodontic infection occurs via accessory canals or tooth apex.

CLINICAL FEATURES

LAP starts at circumpubertal age, involving interproximal attachment loss of first molar, and or incisors, there will be lack of inflammation with presence of deep periodontal pocket and advanced bone loss. Amount of plaque is minimal which is inconsistent with the amount of destruction, and rarely mineralizes to form calculus, but the plaque is highly pathogenic due to the presence elevated levels of bacteria like *Aggregatibacter actinomycetemcomitans* (A.a) and *Porphyromonas gingivalis* (P.g). Secondary clinical features like distolabial migration of incisors with diastema formation, mobility of the involved teeth, sensitivity of the denuded root, deep dull radiating pain to the jaw, and periodontal abscess lymph node enlargement may occur.¹⁰

GAP has generalized interproximal attachment loss affecting at least three permanent teeth other than incisors and first molar involving individuals under age 30 with destruction appears to occur episodically. There will be presence of minimal plaque which is inconsistent with destruction and presence of bacteria like P.g, A.a, and *Tannerella forsythia* are detected in plaque.¹⁰ Two kinds of gingival responses are seen in GAP patients. First response is severe acutely inflamed tissue which is ulcerated and red in colour with spontaneous bleeding indicating destructive stage and the other one with pink gingiva free of inflammation, with some degree of stippling and deep periodontal pockets are present representing quiescence stage.¹⁰

RADIOLOGICAL FEATURES

Radiographic findings in aggressive periodontitis show bilateral, usually symmetrical bone resorption is seen in relation to the first molars and /or incisors.¹¹ The extent of bone loss depends upon the stage of the disease at the time of diagnosis, whether early or advanced. Bone loss starts usually on the mesial aspects of molars, while buccal and lingual or palatal plates resorbs last, leading to furcation involvement only in advanced cases. Periapical radiographs may show a cupped out (arc shaped) bony defect extending from the distal surface of the second premolar to the mesial aspect of the second molar.¹¹ The rate of bone destruction is very rapid and radiographic evidence of a three-fourths loss of bony support of involved teeth can be achieved in a 5-years interval or even less. This progression rate is about four times as much as for adult periodontitis.¹⁵

HISTOPATHOLOGY

Histopathology of aggressive periodontitis is not well documented as compared to chronic periodontitis because of less numbers of aggressive periodontitis patients, changing the definition of disease entity, and variations in the timing of the biopsies. However, an increase in the numbers of acid phosphatase positive macrophages (phagocytic macrophages) in aggressive

periodontitis patients. In the pre-treatment biopsies of LAP, there was predominant plasma cell inflammatory infiltration, and the root surfaces of individuals with aggressive periodontitis were observed to be heavily covered by neutrophils.¹⁶ A fully developed lesion consists of plasma cell dominated infiltration in the connective tissue with neutrophils migrating through the pocket lining epithelium and creating a layer between the plaque and tissues.

MICROBIOLOGY

Use of advanced microbiological methods has improved our knowledge regarding the composition of bacteria in subgingival deposits which can cause different forms of periodontitis. There are geographic and ethnic variations in relation to periodontitis associated microorganisms. Since long time A.a has been considered the primary pathogen for aggressive periodontitis, especially in its localized form. Six serotypes of A.a (a, b, c, d, e, and f) are described based on the composition of O polysaccharide of their lipopolysaccharide and there are phenotypically non serotypeable strains of A.a which lack expression of serotype-specific polysaccharideantigen.¹⁷ A highly leukotoxic clonal type of A. A serotype b was first isolated, in the early 1980s, from an 8-year-old male child with localized aggressive periodontitis.¹⁷ Prevalence of A.a in LAP varies from 70 to 90%,but there are studies which states there is no association between A.a and the periodontal disease rather prevalence of levels of P.g, *T.denticola*, and *P.intermedia* are significantly associated with aggressive periodontitis.^{18,19} In a study done by Takeuchi for detection of microorganisms in sub gingival flora of Japanese population using polymerase chain reaction (PCR) it was found that the prevalence of A.a was less in patients with LAP whereas elevated levels of P.g, *Tannerella forsythia*, *T.denticola*, *P.intermedia*, and *Campylobacterrectus* was detected.²⁰ Albander found elevated levels of IgG and IgA to P.g and A.a and IgA to *P.intermedia* in subjects with GAP than LAP and no difference was found at the antibody levels of *C.rectus*, *E. corrodens*, *F.nucleatum*.²¹ *Filifactor alocis* is gram positive anaerobic rod which has the potential of being periodontal pathogen and the levels of these bacteria is elevated in aggressive periodontitis patients.²² *Treponema lecithinolyticum* and *Treponema socranskii* are elevated in GAP.²³ Sulfate reducing bacteria, *Desulfomicrobium orale*, has been suggested to be involved in various categories of periodontal destruction, possibly synergistically with the red complex periodontal pathogens.²⁴ Yamabe suggested Archaea a methanogenic organism, especially *Methanobrevibacter oralis* putative periodontal pathogen for aggressive periodontitis.¹⁷ Herpes viruses, especially Epstein-Barr virus (EBV) and human cytomegalovirus, have been suggested to play a role in the onset of aggressive periodontitis by interacting with periodontitis-associated bacteria, such as A.a, P.g, *T. forsythia*, *C. rectus*, *Dialister pneumosintes*²⁵

META-ANALYSIS OF GENOME-WIDE ASSOCIATION STUDIES OF AGGRESSIVE PERIODONTITIS

Periodontitis has been widely classified into the widespread moderate form chronic periodontitis (CP) and the rare early-onset and severe phenotype aggressive periodontitis (AgP). These different disease manifestations are thought to share risk alleles and predisposing environmental factors. Both forms have an estimated heritability of 50%, with aggressive periodontitis having a stronger and better established heritable component compared to chronic periodontitis.²⁶

Chronic periodontitis and aggressive periodontitis have a similar etiology and histopathology and can be considered as parts of the same disease spectrum.

To obtain novel insights into the shared genetic etiology and the underlying molecular mechanisms of both forms, a study was done by Matthias et al where they performed a two step-wise meta-analysis approach using genome-wide association studies of both phenotypes. Genotypes from imputed genome-wide association studies (GWAS) of aggressive periodontitis and chronic periodontitis comprising 5,095 cases and 9,908 controls of North-West European genetic background were included.²⁷

Two loci were associated with periodontitis at a genome-wide significance level. They located within the pseudogene MTND1P5 on chromosome 8 (rs16870060-G, P=3.69×10⁻⁹, OR=1.36, 95% CI= [1.23–1.51]) and intronic of the long intergenic noncoding RNA LOC107984137 on chromosome 16, downstream of the gene SHISA9 (rs729876-T, P=9.77×10⁻⁹, OR= 1.24, 95% CI= [1.15–1.34]). This study by Matthias et al identified novel risk loci of periodontitis, adding to the genetic basis of Aggressive periodontitis and chronic periodontitis.²⁷

HERPES VIRUSES IN ETIOPATHOGENESIS OF AGGRESSIVE PERIODONTITIS.

Previous studies have found that herpes viruses are associated with aggressive periodontitis (AgP). However, these findings are controversial. A meta-analysis based on a case control study by Fei et al was conducted which aimed at clarifying the association between herpes viruses and aggressive periodontitis.²⁸

The etiopathogenesis of aggressive periodontitis involves complex interaction between multifarious microorganisms and the host immune system.²⁹ Bacteria have long been proposed as the causative and most important agents in the course of periodontal disease. However, the periodontal tissue destruction in AgP is usually site-specific, bilaterally symmetrical, occasionally breakout, and self-limited. These typical clinical manifestations of AgP cannot be well explained by bacterial infection alone.³⁰ Hence, many scholars thought that pure bacterial aetiology of AgP may have been over-emphasised.³¹

Herpes viruses have been implicated in the etiopathogenesis of human periodontal disease since 1990s.³² The etiopathogenesis of aggressive periodontitis

differs from chronic periodontitis and the association between herpesviruses and aggressive periodontitis is still unclear. Numerous studies have investigated the association between herpesviruses and aggressive periodontitis.^{33,34} However, the results of these studies remained controversial. Some researchers believed that herpesviruses do play a role in the etiopathogenesis of AgP, whereas others do not. Nibali et al failed to detect herpesviruses in any of the subgingival plaque samples from patients with AgP.³⁵ Saygunetal reported no significant difference in copy numbers of herpes viruses between patients with AgP and periodontally healthy individuals.³⁶

The typical clinical manifestation of AgP like little plaque formation at sites with rapid periodontium destruction could be better explained by alteration between active and latent periods of herpes virus infection.³⁷ Some research scholars have reported weak connection even opposite results between aggressive periodontitis and herpes viruses. Therefore, it is necessary to give overall estimations on the association between herpes viruses and aggressive periodontitis based on existing research data.

Several recent reviews have summarized the published findings on interaction between herpes viruses and aggressive periodontitis.^{36,37} Hence, the different meta-analysis studies by different research scholars may help to provide more convincing evidence.

Periodontopathic bacteria might activate periodontal herpesviruses through inflammation-inducing factors. Recent studies found that *Porphyromonas gingivalis* has the potential to trigger EBV by increasing the activity of the BZLF1 gene, which encodes the key protein for the transition from latency to the lytic replication cycle.^{38,39} Another study found that the co-infection of *Porphyromonas gingivalis* and EBV increase the gingival crevicular fluid visfatin levels, which might stimulate the expression of matrix-degrading enzymes and the breakdown of periodontal tissues.⁴⁰

CONCLUSION

Aggressive periodontitis affects smaller percentage of population, which is influenced by specific bacterial etiology, host response, and genetic factors. As the disease is rapidly progressing and aggressive in nature, these patients require early diagnosis and treatment to prevent further progression of the disease and tissue damage. However more extensive researches and studies are required to be able to efficiently and effectively diagnose and manage AP

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APPLICATION OF 3D PRINTING IN MAXILLOFACIAL SURGERY: A LITERATURE REVIEW

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Abstract

3D printing also known as rapid prototyping is a manufacturing technique that constructs objects one layer at a time, adding several layers to create an entity. In order to recreate a physical model, this method uses specifically calculated tomography (CT) data. Among the first to implement this technology were Orthopaedics and OMFS surgeons. The key fields benefiting from this technology are restoration, rehabilitation and regeneration, as it possibly provides reproducible, reliable and robust models which are specific for patient, available for various surgical applications; however, it was further expanded to include education as well as teaching.

Key Words: 3D printing, Rapid prototyping, Stereolithography (STL).

INTRODUCTION

3D printing also known as rapid prototyping/additive manufacturing in general, is used to describe a production technique that creates objects by incorporating several layers.¹In the 1980s, three-dimensional printing (3D) first came into existence. Scientists have been modifying this technology, materials used and its precision since then. They have made huge improvements and advances over the past three decades. 3 dimensional prototypes have been used in the area of craniofacial surgery as guide for extracting grafts of bone, to customize implants which are bio prosthetic, for bending of plates, osteotomy cutting guides, and for intraoperative oral splints. It has been shown that using 3D models and guides shortens the operating period and decreases the difficulties related to it. The definitive aim of any operating practice is to focus on improving peri-operative shape & function & to reduce surgical and post-operative complications. Over the last few years, many exhilarating and novel technical developments have unlocked a new age in the field of Maxillofacial surgery, and 3D printing is one of the most innovative.²Objects in this technology are created by controlled material addition rather than subtraction. Charles Hull first patented the invention, which began as a tool used for rapid prototyping, in 1984. Hull, is regarded as the creator of the process of stereolithography (SLA), which is created by solidifying the sheets on photopolymer resin. 3dimensional printing has traditionally been used for industrial and engineering needs. The idea of using 3dimensional medical imagery, precisely CT data (tomography), was first introduced in 1979 to recreate a physical model. With the expanding access to 3dimensional medical imaging practices in late 1980s, its applications in the health field started to be seriously thought-through with the launch of the first industrial 3D printing system. The first 3D printing technique which was available was SLA and, in 1994, it was the first one to be used in the biomedical field. The

first specialties to embrace this technology were orthopedic & maxillofacial surgery. Almost every, operating specialty currently has a published application for 3dimensional printing. RP (Rapid prototyping) is a technique of add on production that goes by constructing a prototype from the very beginning, by placing material in layers. RP first was used in the late 1980s, and was built to apply CAD (computer assisted design) precision and functionality to production. Using this technology, it was possible to rapidly create a prototype that accurately reflected the draft of engineers. In addition, engineers were able to effortlessly digitally modify the preliminary form (draft) & print the reformed component if adjustments needed to be made. The aircraft and automotive industries rapidly adopted this idea for the rapid development of prototype components. The word Rapid prototyping is, therefore. The key areas benefiting from this 3d printing technique were restoration, recovery and regeneration, as it theoretically provides reproducible, reliable and robust customized patient models for various surgical applications; its application was further expanded for training & education purpose.⁵

DISCUSSION

The 3dimensional printing process includes data collection of 3D imaging, often using CT or MRI. After that the image collected from these modes are saved in DICOM format (Digital Imaging and Communications in Medicine) and later with the help of CAD software (computer-aided design), a virtual 3dimensional prototype with STL (Standard Tessellation Language) format is created to allow 3dimensional printing & layer-by-layer material deposition is done to accomplish the ultimate structure. Reasonable printing techniques are chosen depending on the application, and the printed items ultimately pass through a post-printing adjustment to achieve the finished printed body.

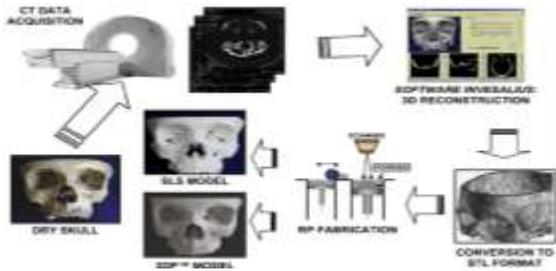


Fig.1. Step by step sequence to fabricate a 3DP and SLS model⁷

The different materials used for 3D printing include

- Stereolithography (STL)
- Photo jet
- Digital light processing
- Selective laser sintering
- Electron beam melting
- Fused deposition modeling

Usage	Description
Contour models	Positive-space models to allow preapplication of hardware before surgery
Guides	Negative-space models of actual patient data to guide cutting and drilling
Splints	Negative-space models of virtual postoperative positions to guide final alignment
Implants	Negative-space 3D printing implantable materials or 3D printing molds into which nonprintable materials are poured

Table1. Classification of the use of 3-D printing methods for craniomaxillofacial surgery.

Categories of surgeries	Specific operations
Mandibular surgeries	Mandibular reconstruction
	Mandibular resection
	Orthognathic surgeries
	Osteoradionecrosis
	Mandibular angle ostectomy
Maxillary surgeries	Mandibular condyle repair
	Orthognathic surgeries
Orbital surgeries	Maxillary reconstruction
	Hypertelorism
Nasal surgeries	Orbital fracture repair
	Nasal reconstruction
Cranial surgeries	Nasal prosthesis retention
	Cranioplasty
	Surgery for craniosynostosis
	Fronto-orbital advancement surgery
	Frontal sinus reconstruction

Table 2. Specific surgeries of craniomaxillofacial that use 3-D technology.⁸

ADVANTAGES of using 3d prototyped models include:

- Save time
- Improves precision in regards to symmetry, as they are designed from healthy side by mirroring techniques⁹
- Better understanding of anatomy
- proper adaptation of plate i.e reduced bone-plate distance
- pre-bending of the plate
- Accurate bone harvesting by the use of negative defect templates, decreased time period of surgery
- Less loss of blood, and reduced time period of G.A (general anaesthesia) are the key benefits of using this technique.

LIMITATIONS

- 1 Rapid Prototyped Model Artifacts
2. Increased cost and time

CONCLUSION

A modern and evolving technique with the potential to create physical items from digital files is three-dimensional printers. This technology has been made reasonable for its use in the environment of office by declining the costs of hardware. 3D printing technology allows patient consultations to be more effective, increases the efficiency of diagnostic, improves the planning of surgery, by aiding in orientation during operative procedures, & manufactures segmental resections directing (guiding) prototype. In the coming future, organ bio-printing may perhaps be possible by additive manufacturing. Surgery is a realistic art. Surgery for each patient should be precisely planned, to avoid complications and to maximize its benefits. Potential applications of 3d printing in maxillofacial surgery lengthen to preparation of surgery, education, designing & creation of prosthetic devices. In traditional clinical applications, RP is not used, but in the coming future, it might revolutionize the field of oral and maxillofacial surgery. Time taken for the manufacturing of the object & cost also should be studied to explain and appreciate what is the prime estimate hereafter; regarding the future of technology. Various analysts have suggested that, they have identified a reasonable technology for 3D printing. Some other investigators, however, have questioned the RP's efficiency and price. Compared to other methods, 3d printed copies are known to be extra reliable and reasonable for patient as well as trainees education. This technique also excludes the need for animal experiments. In the twenty-first century, 3dimensional printing technique is here; to better our everyday life and wellbeing program.²

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MESIODENS- AN OBSTACLE TO ERUPTION: A CASE SERIES

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Abstract

Generally fixed number of teeth are present in human jaw but when this number increase from the normal value either clinically or radiographically called hyperdontia and the additional tooth known as supernumerary tooth. Supernumerary tooth is a developmental anomaly which is more common with permanent dentition in comparison to primary dentition. The supernumerary tooth may be few or many in number as well as they can occur at any part of the jaw. On the basis of the arrangement it can be symmetrical or asymmetrical. The presence of the supernumerary tooth may develop malocclusion or they be asymptomatic. On the basis of the site of the eruption they named as disto-molar, para-molar, mesiodens etc. Supernumerary teeth may delay the eruption of the permanent teeth, may develop crowding and sometime this supernumerary teeth can cause cystic lesion. Mesiodens is the one of the most common supernumerary teeth which is present at the midline between two permanent central incisors. Treatment options may include surgical extraction of the mesiodens. This case series presents surgical management of mesiodens in early stage which prevent the need of the fixed orthodontic treatment and the development of other pathological conditions.

Key Words: Mesiodens, Supernumerary tooth, Surgical extraction, Midline.

INTRODUCTION

Generally fixed number of teeth are present in human jaw but when this number increase from the normal value either clinically or radiographically called hyperdontia and the additional tooth known as supernumerary tooth. Supernumerary tooth is a developmental anomaly which is more common with permanent dentition in comparison to primary dentition. The supernumerary tooth may be few or many in number as well as they can occur at any part of the jaw. On the basis of the arrangement it can be symmetrical or asymmetrical. The presence of the supernumerary tooth may develop malocclusion or they may be asymptomatic. On the basis of the site of the eruption they named as disto-molar, para-molar, mesiodens etc. supernumerary teeth may delay the eruption of permanent teeth, may develop crowding and sometime this supernumerary teeth can cause cystic lesion.¹

Mesiodens is the one of the most common supernumerary teeth which is present at the midline between two permanent central incisors.²This mesiodens may be single and multiple in the number and similarly to the other supernumerary teeth it also be unilateral or bilateral on the basis of the arrangement. If mesiodens tooth is multiple in the number then it called "mesiodentes".³ Mesiodens present between the two central incisors, so it develops anterior crowding and rotation of central incisors. It commonly affects aesthetics of the patient. Mesiodens is more common in male in comparison to female and the prevalence of the mesiodens in the general population is 0.15% to 0.19%.⁴ The cause of the supernumerary tooth is not fully known but hereditary factor and environmental factor may responsible for it. Single mesiodens is more common in comparison to multiple. It develops from the accessory tooth bud proliferating from the dental lamina. Due to its site of eruption of mesiodens get more attention by the clinician as well as patient because it may cause delayed

eruption of central incisors, crowding of anteriors which leads aesthetic problems. Clinician should diagnosed it in

the early stage of the development so early management of can be done with minimal treatment. The main treatment option for the mesiodens is surgical removal. It is difficult to decide that when this mesiodens will remove due its proximity to the root of adjacent teeth. Completion of the root formation is also a factor which decides the timing of the extraction of that mesiodens. Therefore, we need to evaluate the criteria to decide the appropriate extraction timing of mesiodens.^{5,6}

This case series present surgical management of mesiodens in mixed dentition stage which prevent the need of fixed orthodontic treatment and occurrence of other pathological conditions.

CASE -1

A 9 year old patient reported to the department of paediatric and preventive dentistry with the chief complaint of missing permanent anterior teeth. In medical and dental history patient having the history of trauma one year ago in the anterior region following which retained primary anterior teeth were extracted.



Figure 1: Pretreatment Intraoral photographs



Figure 2: Surgical removal of Mesiodens



Figure 3: Extracted mesiodens

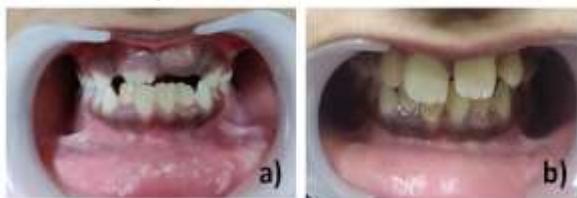


Figure 4: Follow up: a) One month follow up; b) Six months follow up.

Medical and family histories were non contributory. Extra oral examination didn't reveal any abnormalities. Intraoral examination revealed mixed dentition (figure 1). Occlusal radiograph was advised and it was found that there was an unerupted supernumerary tooth present. Patient was advised to undergo radiographic investigation (CBCT) to diagnose the accurate position and proximity of mesiodens to the adjacent teeth.

Surgical extraction (figure 2 & 3) was planned under L.A. Surgical extraction of unerupted mesiodens was carried out by raising mucoperiosteal flap. Adequate amount of bone was removed and the extraction socket was checked for any pathological tissue. The flap was relocated and interrupted sutures were placed. After 1 week sutures were removed and patient was kept on a follow up.

After one month right central incisor was seen in the oral cavity (started erupting) and after 3 months both right and left central incisors erupted (figure 4).

CASE - 2

A 9 year old male patient reported to the department of paediatric and preventive dentistry with chief complaint of missing left front tooth. There was no history of associated trauma. Medical history was noncontributory. Extra oral examination revealed symmetrical face. Intraoral examination (figure 5) revealed missing 21 and partially erupted 11. Alveolar ridge i.r.t 21 revealed enlargement. Patient was advised IOPAR and Occlusal radiographs. Radiographic evaluation showed presence of supernumerary tooth in path of eruption of 21. Tube shift technique was used to assess the position of supernumerary I.r.t to 21, and it was found that supernumerary tooth was positioned lingual to 21. So

parents were counselled and surgical removal of supernumerary was planned.



Figure 5: Pre-treatment Records



Figure 6: Surgical removal of mesiodens



Figure 7: Follow up: a) Three months follow up; b) Nine months follow up.

Profound anesthesia was obtained. Full thickness palatal mucoperiosteal flap was raised and supernumerary tooth was exposed and removed atraumatically (figure 6). Sutures were placed. Patient was advised to practice meticulous oral hygiene and was recalled after 7 days. Healing was uneventful and sutures were removed. Patient was kept on recall examination at 1, 3 and 6 months. At 3 months follow up tooth appeared in oral cavity and at 9 months follow up tooth was in occlusion and well aligned in the arch (figure 7).

DISCUSSION

Paediatric dentistry is the branch of dentistry which deals with preventive as well as interceptive measures and provides guidance to the developing occlusion. This case series presents management of mesiodens in two cases in mixed dentition stage.

The development of the mesiodens was explained by various theories but it still debated for explaining the accurate etiology. A lot of theories present in the literature to elaborate the etiology of mesiodens.⁷ Among all of these theories one theory states that the development of mesiodens is the outcome of the proliferation and splitting of a tooth bud. This theory is known as the dichotomy theory. Dichotomy theory was proposed by the Taylor. According to him if a supernumerary tooth developed from the splitting of the tooth bud then they develop into two teeth which may be equal sized or one normal tooth with one dysmorphic tooth.⁸ If two equal sized normal teeth developed by a

splitting of a tooth bud then it is called as supplemental tooth.

For the management of the mesiodens two treatment options were suggested by the Hogstrum and Andersson.⁹ First modality includes non invasive approach. It means the treatment of the supernumerary tooth should be delayed till the completions of the adjacent roots were done. Second treatment modality consist early management of the supernumerary tooth. It suggested the removal of that supernumerary tooth as soon as possible so it can not develop any eruption and alignment problem of the permanent teeth. But this modality can leave a psychological effect on the very young child behavior or it may cause the devitalization or deformation of adjacent teeth.

To prevent the crowding and ectopic eruption of the normal teeth adjacent to the supernumerary tooth, clinician should diagnose it early and do the needful treatment on the basis of clinical and radiographic observation. Generally it is recommended to extract the supernumerary tooth as early as possible to prevent malocclusion of teeth and the need of the orthodontic treatment. The unerupted permanent teeth adjacent to the supernumerary tooth may take six months to three years for eruption after extraction of the supernumerary tooth.¹⁰ Clinician should take care of the erupting adjacent teeth during removal of the mesiodens that the developing root can be damaged during this procedure. Some authors suggested delayed removal of the mesiodens and allow the adjacent teeth to complete their root formation. They suggested the age of 10 year is the appropriate time for the extraction of mesiodens because at that age the apex of the central incisors is near to closure.¹¹ Further delay in the removal of mesiodens or other supernumerary tooth may lead the development of malocclusion and required more complex surgical procedure. As well as it develops the need of the orthodontic treatment.

CONCLUSION

Mesiodens is the one of the most common developmental anomaly found in the oral cavity. Generally females are more commonly affected by mesiodens. Early diagnosis and treatment of mesiodens may prevent further complications. Surgical extraction is the only treatment option suggested for the mesiodens so clinician should evaluate the clinical condition like proximity with adjacent teeth/root, development of adjacent root by appropriate diagnostic radiographic examinations like IOPAR/ CBCT.

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ANKYLOGLOSSIA: FROM TIED TO UNTIED- A CASE SERIES

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Abstract

Ankyloglossia is a congenital condition which shows the short, tight lingual frenum attached to the tip of the tongue. It also restricts the movement of tongue and causing difficulty in speech. Due to restricted movement of the tongue ankyloglossia also called “tongue tie”. Lingual frenulum frenectomy is the only treatment option for the management of ankyloglossia. In this case series two cases of tongue tie were successfully treated by two different treatment modalities. In first case we used advanced technique diode laser for the frenectomy and the second case was treated by conventional surgical frenectomy. Laser technique has their benefits over the conventional surgical technique. Laser frenectomy less time consuming and provides bloodless field during and after the surgery and it also promote fast healing in comparison to conventional surgical frenectomy.

Key Words: Ankyloglossia, Tongue Tie, Lingual frenulum frenectomy, Laser frenectomy.

INTRODUCTION

The tongue is a muscular part of the oral cavity which plays an important role in speech. It helps in mastication and swallowing of the food. The tongue also affects the position of the teeth, periodontal tissue.¹ Ventral surface of the tongue attached to the floor of the mouth by frenulum. If this frenulum extends towards the tip of the tongue then it restricts the tongue movement, this condition we called “tongue tie”. In other words tongue tie is the nonmedical term for a relatively common physical condition that limits the use of the tongue. The condition of the tongue in which tongue movement got restricted is actually called as ankyloglossia.² “Ankyloglossia” originates from the Greek words “agkilos” (curved) and “glossa” (tongue). Ankyloglossia is defined as a developmental anomaly of the tongue characterized by an abnormally short, thick lingual frenum resulting in limitation of tongue movement.³ Wallace⁴ defined tongue-tie as “a condition in which the tip of the tongue cannot be protruded beyond the lower incisor teeth because of a short frenulum linguae, often containing scar tissue.” In this case series we discuss two cases of tongue tie in which one of the case is treated by diode laser and another was treated by the conventional surgical method of frenectomy.

CASE -1: Management of Ankyloglossia with Diode Laser

An 11 year old female patient reported to the department of Pedodontics and preventive dentistry, Jaipur with the chief complaint of difficulty in speech and impaired tongue movements. She was not able to touch the roof of her mouth with the tip of the tongue and facing difficulty in pronunciation of some words. On clinical examination (figure 1 & 2) it was observed that tongue movements were restricted and short lingual frenum was present. The patient was assessed for ankyloglossia and “free tongue length” was measured. According to Kotlow et al² criteria it was diagnosed as class II ankyloglossia with a free tongue length of 9mm. No relevant medical and family history was reported. There was no gingival recession in the lingual surface with respect to

mandibular anteriors. LASER frenectomy⁵ of the lingual frenum was planned and the patient was informed about the treatment procedure and informed consent was obtained. Routine blood investigation report was analyzed and was found to be within normal limits. Safety measures were taken for dentist, patient by wearing the recommended protective goggles.

Diode laser (figure 3 & 4) was used for frenectomy which showed minimal pain and healing was uneventful. After anesthetizing the lingual frenum locally, tongue traction was done with the help of a suture material. The diode laser beam was then applied lingually both laterally and vertically to the frenum to disrupt the mucosal continuity. Diode laser emitting 980 nm was used in continuous contact mode at 1.24 joules/second energy. Total time taken during the procedure was 5 minutes (figure 5). There was no bleeding present during the procedure and no post operative sutures were given. Follow up record showing improved tongue movement (figure 6).



Figure 1: Intraoral photographs



Figure 2: Ankyloglossia



Figure 3: Diode Laser Unit



Figure 4: Armamentarium



Figure 5: Surgical procedure: a) Local Anesthesia infiltration, b) Suture traction of the tongue, c) Intraoral picture during Laser surgery, d) Immediate post operative view.



Figure 6: One week follow up: a) healing of surgical site, b) improved tongue movement.

CASE -2: CONVENTIONAL SURGICAL LINGUAL FRENECTOMY

12 years old male patient reported to department of paediatric and preventive dentistry with chief complaint of difficulty in moving tongue inside and outside of the mouth. There was no relevant past medical and family history. Extra oral examination revealed that lower third of face showed increased length. Intra oral examination (figure 7 & 8) revealed constricted maxillary arch and spaced mandibular arch with mandibular anterior crowding. Clinical examination of tongue revealed short lingual frenum. Length of frenum from base of tongue was measured 7mm. it was classified in class III severe ankyloglossia of kotlow's classification. Hazel baker's⁶ assessment tool was used to assess appearance and function of tongue (Table 1). Based upon this scale, score of 6 for appearance and 9 for function of tongue was obtained. Speech analysis of patient was done. Based upon clinical evaluation diagnosis of ankyloglossia was made. After patients and parents counseling, and written consent was obtained. Before performing conventional surgical frenectomy (figure 9) patient was admitted to the department on day care basis.



Figure 7: Intraoral photographs

Profound local anesthesia was obtained. Tongue was retracted with the help of suture material. Using scalpel and no. 15 surgical blade wedge shaped tissue was removed and hemostasis was achieved. Sutures were placed and patient was advised to practice good oral hygiene. Patient was recalled after 7 days (figure 10). Healing was uneventful. Sutures were removed. Patient was advised tongue exercises and was referred to speech therapist. At six months (figure 11) of follow up there was significant improvement in normal range of tongue movement and speech of the patient. As form follows function, there was reduction in crowding and better alignment of dentition in the arch. At nine months (figure 11) follow up following results were obtained.



Figure 8: Ankyloglossia

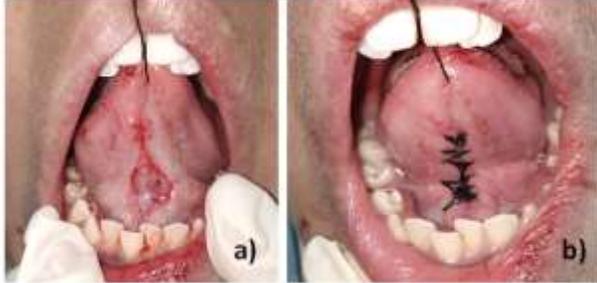


Figure 9: Conventional surgical lingual frenectomy: a) flame shaped incision of lingual frenum, b) suture at base of tongue.



Figure 10: One week follow up



Figure 11: Six months follow up

Table 1: Pre and Post operative characteristics of tongue tie.

Characteristics	Pre-operative score	Post-operative score
Free tongue movement	7 mm	15 mm
Kotlow's category	Class III (severe)	Class I (mild)
Hazel bakers's function score	9	14
Hazel baker's appearance score	6	9
Speech	Defective	Improvement

DISCUSSION

In the anatomical definition of tongue tie or ankyloglossia we can include descriptive and absolute measurements. In the descriptions category extent of lingual frenulum were include foe example where it attached to tongue and where it attached to the inferior alveolar ridge. Description measurement also includes the frenulum elasticity and the tongue appearance uplifting movement. In the category of absolute measurements length of the lingual frenulum and free part of the tongue were measured. Lingual frenulum measurement was taken when the tongue is lifted upward direction. The part of the tongue measured as a free tongue length from anterior to the lingual frenulum attachment of ventral tongue surface to the tongue tip.⁷ According to wallace⁴, functional definition includes it as a condition in which the tip of the tongue cannot be protruded beyond the lower incisor teeth because of a short frenulum.

Hazel bakers assessment tool⁶ was used to assess the functional movement of the tongue as well as appearance of the tongue also determined by this tool. In this tool, scores are given to each movement of the tongue and appearance of the tongue. If the functional and appearance score is below 11 and 8, then surgical invention should be considered.

Lingual frenulum frenectomy is the only treatment option for the management of ankyloglossia. In this case series two cases of tongue tie were successfully treated by two different treatment modalities. In first case we used advanced diode laser for the frenectomy and the second case was treated by conventional surgical frenectomy. Laser technique has their benefits over the conventional surgical technique. Laser frenectomy less time consuming and provides bloodless field during and after the surgery and it also promote fast healing in comparison to conventional surgical frenectomy.

Tongue tie also affects the speech. Certain words which start from "l", "s", "d", "t" and "th" were asked to pronounce by the patient. The clinician should check the pre and postoperative pronunciation of these words and if they found any defective speech then they should refer the patient to the therapist for the speech therapy. Speech therapist advised some tongue exercise to guide the tongue muscle which helps in the speech modification. This exercises includes licking the upper lip, touching hard palate with the tip of tongue, and side-to-side movements should be explained to the patient for enhanced tongue movements.⁸⁻¹²

CONCLUSION

Tongue ties a simple congenital condition which affects number of infants/ children. This case series offers the surgical management of tongue ties by two methods; first bloodless and painless method in which we used diode laser and second conventional surgical frenectomy

method in which surgical blade used to perform the surgery. Both methods are equally effective but the result of diode laser was more acceptable in case of infant/ children because of its painless, bloodless and fast healing nature.

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ORAL HEALTH AWARENESS AMONG SCHOOL TEACHERS

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Abstract

School is an important platform for promoting oral health however; school teachers have little information on oral health awareness and practice. The present study was carried out to investigate the oral health awareness and practices of primary school teachers in Derabassi.

Materials and Methods: A cross sectional study of randomly selected public primary school teachers of Derabassi was conducted to access the knowledge, attitude and practice of oral health among them. Descriptive frequency was calculated using SPSS 22.0.

Results: 49% school teachers deemed regular tooth brushing as the best method for oral hygiene maintenance. 78.8% school teachers are familiar with common oral health diseases. 78% school teachers believed that one should brush twice a day. 60% of school teachers believed that they should visit dentist after every 6 months for regular dental checkups. No major difference was seen in knowledge and attitude towards dental awareness in both male and female genders.

Conclusion: Teachers should be trained at regular intervals regarding importance of oral health promotion for the students to educate and motivate children to maintain their oral health.

INTRODUCTION:

Oral diseases presents a major public health problem. About 90% of school children experience caries, with the disease being most prevalent in Asian and Latin American countries(1). Therefore, education of school children on oral health should be provided because healthy oral habits are developed in early life and teachers being the first one to impart education plays an important role in it.

If teachers themselves are aware of various oral hygiene practices then only they will be able to provide the same knowledge to their students. The number of teachers worldwide at primary school level has been reported to be about 23.9 million. (2) There are many advantages of utilizing the services of school teachers in health education and health promotion activities such as; it provides continuity in instructions being given, integration of general and oral health with other activities as well as low cost associated with such programs(3)(4).

The lack of oral health knowledge and training on aspects of oral health (5),lack of resources (6),lack of time and failure to incorporate oral health into curriculum have been implicated as a barrier in teaching oral health education in schools (7). The study is done to investigate teachers' attitude towards oral health awareness and practices among them. It also provides information regarding the dental health which is imparted by school teachers to children.

METHODOLOGY

A survey was conducted to access the knowledge, attitude and practice of oral health among primary and middle school teachers of Derabassi.

120 study participants were selected randomly from 5 different public schools in Derabassi , namely , LALA DEEP CHAND JAIN PUBLIC SCHOOL , DEEP MALA PUBLIC SCHOOL , DAV PUBLIC SCHOOL ,RK PUBLIC SCHOOL and LORD MAHAVIR JAIN PUBLIC SCHOOL. With the permission of the head of the school, the dental health questionnaires were distributed among school teachers and collected after 20 minutes. Teachers who were absent during the three consecutive visits to the schools and those with incomplete questionnaire were excluded from the study.

The data was compiled in MS Excel version 2016. The descriptive frequencies were calculated. The analysis was performed with the help of SPSS 22.0.

RESULTS:

Final study sample consisted of 85 school teachers (male = 6, female = 79). Evaluation was done through a questionnaire, comprising 20 questions. Table no. 1 showed descriptive statistics of study population. Most teachers (78.8%) were familiar with the common oral diseases .To maintain oral hygiene, most teachers (49%) deemed regular tooth brushing as the best method. And while most teachers (78%) believed that one should brush twice a day, 69 % actually brush twice a day. Also 60% of the teachers believe that one should visit the dentist every 6 months for regular dental check – up. Table no. 2 showed knowledge, attitude and practice based on gender, school and years of employment. No major difference was seen in the knowledge, attitude and practice of males and females. It was also seen that teachers who had been employed for more than 10 years showed greater knowledge, attitude and practice regarding oral health.

TABLE NO. 1 DESCRIPTIVE STATISTICS OF STUDY POULATION:

S.NO.	QUESTION	No.	%
1.	SOURCE OF KNOWLEDGE OF ORAL HEALTH		
	DENTAL OFFICE/CLINIC	15	17.6
	NEWSPAPER	7	8.2
	FRIENDS/NEIGHBOURS /FAMILY	8	9.4
	MAGAZINES/BOOKS	11	12.9
	TV/RADIO	18	21.1
	PHYSICIAN'S CLINIC	0	0
	MORE THAN ONE	23	27
	ALL	2	2.3
2.	FAMILIAR ORAL DISEASES		
	KNOW	67	78.8
	DON'T KNOW	18	21.2
3.	FACTORS AFFECTING ORAL HEALTH		
	DIET	26	30.5
	ORAL HABITS	12	14.1
	ORAL HYGIENE	9	10.5
	DENTAL AWARENESS	15	17.6
	ALL	0	0
	MORE THAN ONE	22	25.8
4.	HOW TO MAINTAIN ORAL HYGIENE		
	REGULAR BRUSHING	42	49.4
	USE OF TONGUE CLEANER	4	4.7

	USE OF MOUTH WASH	13	15.2
	REGULAR DENTAL VISITS	1	1.1
	ALL	0	0
	MORE THAN ONE	22	25.8
5.	NEED TO MAINTAIN ORAL HYGIENE		
	TO PREVENT TOOTH DECAY	25	29.4
	TO PREVENT BAD BREATH	11	12.9
	TO REDUCE DENTAL CARE COSTS	13	15.2
	TO PREVENT GUM DISEASES	8	9.4
	TO ENHANCE APPEARANCE	1	1.1
	MORE THAN ONE	26	30.5
6.	CAUSES OF TOOTH DECAY		
	IMPROPER BRUSHING	31	36.4
	NOT VISITING THE DENTIST	3	3.5
	CONSUMPTION OF STICKY FOOD	11	12.9
	BACTERIA	8	9.4
	ALL	0	0
	MORE THAN ONE	31	36.4
7.	CAUSE OF GUM DISEASE		
	IRREGULAR BRUSHING	18	21.1
	VIRAL INFECTION	5	5.8
	BACTERIAL INFECTION	41	48.2
	LACK OF REGULAR SCALING AND ROOT PLANING	4	4.7
	ALL	0	0
	MORE THAN ONE	15	17.6
8.	METHOD OF PREVENTING ORAL DISEASES		
	ADVICE AGAINST CONSUMPTION OF	22	25.8

	CARIES CAUSING FOOD ITEMS		
	MAKE CHILDREN AND THEIR PARENTS AWARE ABOUT ORAL HEALTH	20	23.5
	REFER STUDENTS WITH DENTAL PROBLEMS TO SCHOOL NURSE	1	1.1
	MORE THAN ONE	2	2.3
	ALL	3	3.5
16.	HOW MANY TIMES DO YOU BRUSH A DAY		
	ONCE	18	21.1
	AFTER EVERY MEAL	2	2.3
	TWICE	59	69.4
	I DON'T BRUSH	0	0
17.	DO YOU USE DENTAL FLOSS		
	YES	11	12.9
	NO	50	58.8
18.	HOW OFTEN DO YOU VISIT DENTIST		
	ONCE A MONTH	26	30.5
	ONCE IN 6MONTHS	24	28.2
	ONCE IN 3 MONTHS	21	24.7
	ONCE IN 10 YEARS	5	5.8
	MORE THAN ONE	2	2.3
	ALL	0	0
19.	WHY DID YOU LAST VISIT THE DENTIST		
	FOR REGULAR CHECKUP	23	27
	ADVICE AGAINST CONSUMPTION OF CARIES CAUSING FOOD ITEMS	22	25.8
	MAKE CHILDREN AND THEIR PARENTS AWARE ABOUT ORAL HEALTH	20	23.5
	FOR GETTING DECAYED TEETH FILLED	7	8.2

	FOR GETTING TEETH CLEANED	12	14.1
	FOR RELIEVING DENTAL PAIN	11	12.9
	DIDN'T VISIT EVER	2	2.3
	MORE THAN ONE	3	3.5
20.	MEASURES YOU TAKE TO PROMOTE ORAL HEALTH IN YOUR CLASS		
	GOOD ORAL HEALH	2	2.3
	TOOTH BRUSHING	52	61.1
	FLOSS AND MOUTHWASH	4	4.7
	VISIT TO DENTIST	9	10.5
	OTHERS	18	21.1

TABLE NO.2 CORRELATION OF KNOWLEDGE, ATTITUDE AND PRACTICE OF ORAL HEALTH WITH GENDER , SCHOOL AND YEARS OF EMPLOYMENT

CRITERIA	KNOWLEDGE	ATTITUDE	PRACTICE
GENDER			
MALE	3.83	2.83	3.5
FEMALE	3.74	3.39	3.39
SCHOOL			
LALA DEEP CHAND	5.81	3.54	3.36
DEEP MALA	4.82	3.41	3.82
DAV PUBLIC SCHOOL	4.61	3.76	3.23
RK PUBLIC SCHOOL	3.44	1.55	2
LORD MAHAVIR JAIN	2.71	3.35	4
YEARS OF EMPLOYMENT			
1-5	3.17	3.01	3.13
6-10	2.47	1.90	2.04
GREATER THAN 10	4.53	3.26	3.6

DISCUSSION:

School teachers play a major role in influencing the knowledge, attitude and behavior of school children. But it has been observed from different studies carried out in India that there is need to improve the oral health education and awareness among school teachers(8)(9).

According to our knowledge, no study has been carried out in Derabassi region to assess oral health awareness among school teachers. So, the present study was carried out to assess oral health awareness among school teachers-representatives of Derabassi.

Around 62.3% teachers had the knowledge of cause of dental caries namely improper tooth brushing, not visiting the dental clinic, consumption of sticky foods, bacterias; while the percentage is only 50% in the study conducted in Pondicherry (2014) (8).

About 69.4% school teachers in Derabassi brush twice daily. The findings are comparable to study conducted in Thiruvallur (2016), by John et al where 73.7 % of school teachers brush their teeth twice daily.(9)

78% of school teachers in Pondicherry used tongue cleaner as an additional oral hygiene measure (8) as compared to school teachers in Derabassi where only 24.7% used tongue cleaners. The percentage is less because of lack of oral health knowledge in regards to tongue cleaning. There is need to raise awareness among school teachers regarding the tongue cleaners

Only 21.1% of teachers in our study were aware of the fact that irregular brushing causes gum diseases. Although this rate was more when compared with the studies done by al Tamini and Peterson which showed that one third of the total school teachers did not know anything about relation between tooth brushing and gum diseases(10) in Saudi Arabia in 1998.

In the survey, 12.9% of teachers know that eating sticky food causes tooth decay. These findings are very less as compared to the studies conducted by Peterson et al(11) in Romania in 1993 where 23.3% of teachers ascertained eating sweets and ice-cream causes tooth decay.

About 61% teachers attributed that reducing intake of sticky food decreases oral diseases which is almost similar to the study conducted by Ramroop et al in which two third of teachers thought dental decay could be prevented by eating less sugar(12) in 2011.

Only 12.9% of teachers visited the dentist when they experienced dental pain. This finding is consistent with the study done in Nigeria by A Ehizele et al in 2011(13).

About 68.5% of teachers knew about the role of fluoride in preventing tooth decay which is same as to the study done in Northern Israel by Dr. Horold D. sagan et al in 1999(14).

Around 74.9% of teachers believe that a child should brush at least twice a day while according to study done by Ankita Mota et al in 2016, 88.7% of teachers in Mumbai believed in brushing twice a day can reduce dental diseases(15).

The teachers believed that children's teeth should be regularly checked by dentist for prevention of oral diseases.

The Ministry of Health and Family Welfare, Government of India under National Oral Health Policy has emphasized on oral health training(16) and education in school curriculum. In the study carried, teachers also reported an interest in giving oral health education to school children. Therefore, such training programmes should be held at regular intervals in schools to impart dental knowledge.

This study has got certain limitations such as it is cross-sectional in nature and has a small sample size. So, there is need to carry longitudinal study with a large sample size.

CONCLUSIONS:

Oral hygiene practices were found to be satisfactory among school teachers, but knowledge regarding the same is lacking and there is still a definite need for teacher training program on basic health knowledge. Oral health education must be included in school curriculum on a regular basis for better response.

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Is there any need of antibiotics after orthodontic teeth extraction - A split mouth randomised clinical trial

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Abstract

Background: Extraction of tooth is probably the most frequently and one the most common procedure performed in oral surgery procedure. Subsequently much debate has been emerged about this subject during recent decade concerning about the necessity of antibiotic in teeth extraction particularly in asymptomatic patients. Hence, we conducted a study to evaluate that is it necessary to prescribe antibiotics in orthodontic 1st premolar tooth extraction.

Method: In this split mouth randomised clinical trial study was carried out in 100 patients needing bilateral extraction of maxillary 1st premolar. There was no any sign of pain, inflammation or any kind of swelling at the time of teeth removal. A couple of group were founded. In the first group, antibiotic therapy with amoxicillin + potassium clavulanate a (625mg) thrice a daily together with diclofenac potassium 50mg twice a daily for 3 days administrated 30 minutes after the extraction and second group all patients were not prescribed antibiotics only diclofenac potassium 50mg twice daily administrated 30 minutes after the extraction were prescribed. The surgical technique was the same in all cases, and the follow-up period were 1st post operative day (T1), 3rd Post operative day (T2) and 7th post operative days(T3). Parameters that were evaluated such as pain, local infection and dry socket was evaluated.

Results: The distribution of VAS score was compared postoperatively. Higher number of subjects reporting VAS score “0” (No pain). Only Few Patients reported pain score in rest of group such as 1-3 (Mild Pain), 4-6 (Moderate Pain) and 7-10 (Severe Pain) groups. No considerable results were seen among both the groups (1&2) in VAS score ($p>0.05$). There was only 1(1%) patients was dry socket on T2 (3rd Post op) in both of the group with no significant finding. ($p>0.05$)

Conclusion:

Antibiotics are not necessary in simple exodontia in patients who are not medically sufferer. Antibiotics have no any role in avoiding postoperative infection. Dentist should be much more responsible and very selective while prescribing antibiotics

Keywords: Antibiotics, Extraction, Pain.

INTRODUCTION

Typically the oral cavity is probably the most various types of bacterial flora habitat in the body.^{1,2} When it is not examined regularly, it can lead to many local and systemic health problem.³ The capability to diminishing infection, it has made probably the most frequently recommended drugs in dentistry. Their use is validated in certain situations including serious pericoronitis, cellulitis, facial space infections, and osteomyelitis. Some other normal dental circumstances for example periapical abscess, alveolar osteitis, mild pericoronitis, and in conservative dentistry do not longer required for antibiotics therapy.⁴

Prescription of antibiotics after simple exodontia has still a arguable subject matter in between dental academia. Antibiotics are usually understood that it will boost up postoperative comfort following exodontia by protecting against wound contamination and pain. Despite the fact bacteraemia definitely occurs during basic exodontias, it additionally occurs during many other regular dental procedures in which there may be no reason for antibiotic therapy. This is due to the fact that body's host response is extra than enough to counter this degree of bacteraemia.

The goal of this study is to determine the requirement for postoperative antibiotics following simple exodontia and

determining its role in minimizing patient discomfort and postoperative complications.

Aim

The patients will be assessed for- Pain(Visual analogue scale Score) Signs of infection ((local swelling, hyperemia, purulent drainage) Incidence of dry socket.

MATERIALS & METHODS

A split mouth randomized clinical trial was conducted at the Department of Oral and Maxillofacial Surgery. In which 100 patients with similar kind of orthodontic extraction of 1st premolar was done in this study. A mouth wash of 0.2% chlorhexidine for 1 minute was applied before tooth removal in all patients. Lignocaine HCL with epinephrine (1:80,000) had been utilized for local anesthesia. In order to control the bias, all the procedures were done by single surgeon which usually included the removal of a individual tooth through the intra-alveolar method of extraction, a time boundation of 30 min was given for each & every patient; any other method apart from the typically intra-alveolar method of extraction or longer duration of procedure than recommended duration of the procedure had been excluded. All the clinical parameters were assesed on postoperatively 1st day (T1), 3rd day (T2), and 7th day(T3) day.

Inclusion criteria will be 100 American Society of Anesthesiologists (ASA) grade I and Grade II patients of age 12-25 years undergoing simple extraction. Those individuals who did not like to take an interest in this study or not willing for follow up visits, individuals hypersensitive to substances utilized in this study, medically compromised patients and smoker were excluded.

The subjects will be grouped into two major categories:

Group 1: patients took antibiotics.

Group 2: patients did not took antibiotics.

Group 1: Patients took antibiotics. All patients in this specific category had been recommended amoxicillin with potassium clavulanate 625mg thrice daily for 3 days together with

diclofenac potassium 50 mg twice daily 3 days starting 30 minutes after the tooth removal.

Group 2: Patients did not took antibiotics. All patients in this specific category had been recommended only diclofenac 50mg twice daily for 3 days starting 30 minutes after the tooth removal.

Statistical analysis :

A null hypothesis was put forward i.e. $\mu_1 \neq \mu_2$. An alternate hypothesis also was advocated, which stated that a relevant difference would exist between groups for pain and side effects.

Data was entered into Microsoft Excel spreadsheet and was checked for any discrepancies. Summarized data was presented using Tables. The data was analyzed by SPSS (21.0 version) Shapiro Wilk test was used to check which all variables were following normal distribution. The data was normally distributed. Chi square test was used for categorical data. Level of statistical significance was set at p-value less than 0.05.

Result:

In the present study patients age is ranged from 12-25 years with mean age of 17 ± 3.38 years. Among, all patients female were predominance and it was 80(80%) female patients and 20 (20%) male patients. The distribution of VAS score was compared postoperatively 1st (T1), 3rd(T2), and 7th day(T3). Higher number of subjects reporting VAS score 0. Mean value of 93% of group 1 patients reported no pain and also group 2, 93 % patients

VAS Score	T1(1 st post op day)		T2(3 rd post op day)		T3(7 th post op day)	
	Group 1 (No. of subjects)	Group 2 (No. of subjects)	Group 1 (No. of subjects)	Group 2 (No. of subjects)	Group 1 (No. of subjects)	Group 2 (No. of subjects)
Vas	90(90)	88(88)	92(92)	95(95)	97(97)	96(96)

score	%)	%)	%)	%)	%)	%)
“0”No Pain						
Vas score “1-3” mild pain	5(5%)	7(7%)	6(6%)	3(3%)	1(1%)	1(1%)
Vas score “4-6”Moderate Pain	3(3%)	2(2%)	1(1%)	1(1%)	1(1%)	1(1%)
Vas score “7-10” Svere Pain	2(2%)	3(3%)	1(1%)	1(1%)	1(1%)	2(2%)

Table 1: Distribution of patients on Vas Score.

reported no pain (VAS Score 0) on consecutive days at T1,T2and T3days. Only Few Patients reported pain score in rest of group such as 1-3, 4-6 and 7-10 group. Mean value 4% of group 1 and 3.6% of group 2 reported mild pain (Vas Score 1-3). Mean Value 1.6% of total population of group 1 and 1.3 % Group 2 patients reported moderate pain(Vas score 4-6). Mean Value 1.33% of patients in group1 and 2% group 2 patients reported severe pain score(Vas Scale 7-10). No Significant outcomes had been seen between these two category (1&2) in VAS score on consecutive days at T1,T2 and T3 days. ($p>0.05$) (Table 1) There was no considerable difference was found in between these two category in connection with the generalised presence of local infection (local swelling, hyperaemia, purulent drainage) symptoms after surgery ($p>0.05$). There was only 1(1%) patients was dry socket on T2 (3rd Post op) in both of the group with no significant finding. ($p>0.05$)

Discussion:

We believed that peri-operative antibiotics might now no longer have a statistically impact on postoperative inflammatory condition after bilateral orthodontic 1st premolar extraction. These findings are similar with several different research study such as Van Eeden et al.⁶ and Agrawal et al.⁷ On the other hand, these outcomes had been distinctive in study done by Arteagoitia et al.⁸ who found there was enhance chances of infection associated with complication in people who have been now no longer prescribed antibiotics (as much as 12.9%). Nevertheless, it is important to specified that this study had been done on impacted molars and consequently might have very limited impact on this current study. It is necessary to mentioned that our study was also few complication. 1(1%) patients in each group was presented with dry socket upon 3rd post operative days and higher number of subjects reporting VAS score “0” ie; mild pain. Mean value of 93% of group 1 patients reported no pain and also group 2, 93 % patients reported no pain (VAS Score 0) on consecutive days at T1,T2and T3days .Only Few Patients reported pain score in rest of group such as 1-3, 4-6 and 7-10 group. Finding of dry socket (1%) was almost similar in both groups. These finding corresponds with other outcomes studied by Arteagoitia et al⁸ and and lopez –cedrun et al,⁹ which noticed that no any incidence of dry socket was found in group in which antibiotics were prescribed. Nevertheless it should be noted that by Van Eeden and B`utow that they found there was no any case of dry socket in those patient in which antibiotics were prescribed, but there was few case of dry socket (15.8%) in those patients who were not prescribed antibiotics.⁶ One more study hold up our view was conducted by Curran et al.¹⁰ Within their study they compare two group those had antibiotic dose and those who didn’t took antibiotic therapy and they observed no variation regarding postoperative infections. A couple of study was carried out by by MacGregor¹¹ and Sands et al¹² who didn’t advised the use of antibiotic for intralveolar extraction but they advised antibiotic for transalveolar extraction.

An extremely important point in the argue about prophylactic antibiotics in extraction of teeth that it should be administred pre-operatively or post-opertively. Typically antibiotics are

recommended post-operatively as an oral medication, and thus there is high chance of increase serum level after few hours of extraction of teeth. Nevertheless there is some proof that preoperative medication of antibiotics has an essential influence on reduction of postoperative infections.¹³

One more important point about possible adverse effect after antibiotics administration. Some of the risk are associated with indiscriminate antibiotics therapy such as toxicity regarding substance itself, allergic reaction and also growth of resistant organisms. There is propensity to unnecessary advise for antibiotics and medications generally.¹⁴ The determination of medical practitioner to wise advise for antibiotics will prevent all these circumstances.

In our study we could not observe any kind of considerable difference among these two groups regarding assessing of different variable such as pain, local infection and dry socket. The group were uniform pertaining age, clinical and radiographic presentation preoperatively. On such basis we are unable to recommend routine postoperative antibiotics administration.

Conclusion:

Antibiotics are not generally require after basic exodontia in individuals who are not medically compromised nor they have any role to reduce pain and prevent local infection and dry socket. Dental practitioner should show their greater responsibility to prevent development resistant microorganisms. They should very selective to prescribe antibiotics and if necessary then very selective to the narrow spectrum antibiotics. It must be emphasize that our findings applied to situation where precise aspect condition was maintained in a highly equipped modern operating room and simply in those cases where signs of acute preoperative inflammation was not present.

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CONSORT 2010 Flow Diagram

