A CHANGED PARADIGM OF ORTHODONTIC ANCHORAGE: EXTRAORAL OR INTRAORAL

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ABSTRACT

The main focus of this article is to highlight some of the key aspects of a novice intraoral Orthodontic anchorage system, mostly recommended for those Orthodontic patients who show poor compliance towards extraoral anchorage devices because of psychosocial problems. Using these intraoral devices ^{1,9}, one can confidently achieve almost all treatment goals in his Orthodontic patients without relying on compliance-dependent auxiliaries.

INTRODUCTION

Demand for orthodontic treatment has increased significantly, mainly because patients today are more concerned about their dental health and esthetics. We are expected to customize the treatment strategy according to each individual requirements.

Orthodontists use anchorage to move teeth and jaws in various desired directions². The conventionally used extraoral devices like headgears pose a lot many problems including psychosocial adjustment particularly in adults.

Various serious eye injury reports have been observed in various teenagers while playing with the headgears. Patients have lost their eyes and orthodontists have been allegedly blamed and sued in one way or the other.

To reach the target and to achieve the desired treatment goals one has to depend on the patient's compliance of wearing the headgear for the prescribed hours. But unluckily it has been observed that treatment is delayed and some times jeopardized because of the poor compliance of the patients.

This definitely affects the rapport between orthodontist and the patient and his/her parents. The ongoing concern of orthodontist about his patient effects the future treatment planning.

In order to overcome these negative effects of the extraoral devices, various intraoral anchorage systems have been developed and proved the most effective anchor units in orthodontics. This has made the orthodontic treatment easier in helping achieve optimal results and objectives. Neither it needs patient compli ance nor it has any adverse effect on psychosocial adjustment. Thus within the stipulated time period orthodontist is more capable in providing the desired esthetic and functional demands of his patients.

DISCUSSION

The need to develop a technique which should demand minimal compliance by the patient led to the expansion of implant technology.

The inception of osseointegration opened up a new vista in the world of Dentistry. Specific fixtures like implants, onplants and even sometimes Orthopedic mini screws are gaining tremendous demand in the emerging dentistry particularly in the field of Orthodontics and Dentofacial Orthopedics. Progress in the use of these specific fixtures and in the development of specialized new products has made this method more simple and predictable.

Different materials are used for different fixtures. Whatever the material, it must be biocompatible, have favorable mechanical properties, and be able to resist stress and strain. The material commonly used for implants can be divided into three types: biotolerant (stainless steel), bioinert (titanium), and bioactive (vetroceramic apatite hydroxide).

Commercially available pure titanium is the material of choice most commonly used in implantology because of its particular characteristics. Titanium is considered an excellent material: no correlation has been shown between titanium and the development of neoplasm, and no allergic or immunological reactions have been noted that could be traced to the use of pure titanium. It is very light and has excellent resistance to

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breaking and traction, enabling it to withstand both masticatory loads and the stresses of orthodontic source of rigid Orthodontic anchorage is the treatment of forces.

The osseointegrated fixture is conceived as an anchoring unit that creates attachment to the surrounding osseous tissue through sharing of organic and inorganic elements. This fixation of bone to the fixture is in a dynamic state of equilibrium, provided that the biologic metabolism is not violated.

Implants/onplants can be used as supplemental anchorage for closing spaces, retracting anchorage segments, generating new periodontium, or for preprosthetic alignment⁸⁻⁹.

These dependable intraoral anchorage devices are excellent alternative to the conventional extraoral anchorage system. They become a viable option when extraoral devices become impractical due to one or other reasons. Most common of which are psychosocial problems, which leads to the poor compliance of the patient.

The fixture used for orthodontic anchorage alone needs single-phase minor surgical procedure and this is always a preferred method. Esthetics requirements are not as important, and the fixture particularly retromolar implant can be loaded instantly.

The three most commonly used orthodontic fixtures are:

- 1 Retromolar Implants.
- 2 Palatal Onplants.
- 3 Mini Implants/Screws.

RETROMOLAR IMPLANTS The ascending ramus of the mandible provides a volume of bone that can receive screws of large size in the retromolar area, between the internal and external oblique lines. This area is not prone to disuse resorption and the only vital structure to consider is neurovascular bundle. Orthodontists have made use of this anatomic opportunity.

Critical anchorage during Orthodontic treatment in the mandible needs both time and effort and patient round SS wires mechanics using .022 edgewise bracket compliance. The retromoar implant 2, 4-5 provides the slots. Sliding wire mechanics should be used for mesial absolute anchorage for Orthodontic tooth movement. First mandibular molar is the tooth, which is some times prematurely extracted because of the poor prognosis. The space thus created mutilates dental occlusion, leading to deranged axial inclination of the neighboring and the opposing teeth followed by periodontal problems.

With the conventional Orthodontic procedure some times it becomes very difficult to close that space by mesialising second and third molars into that extraction using 0.020 ss wire, it should be replaced with .019 x space, while when retraction of the anterior teeth into .025 ss wire, having closing loop distal to the canine and the extraction site is undesirable

The introduction of the retromolar implants, as a choice in these conditions.^{1-2,4-5} The total treatment time is reduced as the implants can be loaded immediately. Treatment does not depend on patient cooperation.

PROCEDURE The retromolar implant⁴⁻⁵ is placed either by a Surgeon, Periodontist, or even by an Orthodontist. The dimension of retromolar implant is normally 3.75 mm x 7 mm Following local anesthesia the implant is placed in the retromolar area about 5 mm distal to the mandibular third molar. The cervical portion of the implant should be about 2 mm above the bone, allowing easier subsequent attachment of the transmucosal anchorage wire. The procedure is very smooth and normally patient doesn't need any analgesics.

The transmucosal anchorage wire to be used is TMA (.019x.025). A loop is formed at the end of this wire and is secured at the time of surgery to the retromolar implant using the same cover screw. There is no need to go for phase two surgery. The mesial end of the TMA wire is initially ligated loosely to the main arch wire during the healing phase of implant placement. The wire should be 4-5 mm distal and buccal to the third molar and should not impinge on the marginal gingiva of buccal segment. This wire should be long enough so that it should be easily inserted into the vertical slot of the bracket of a well-aligned ipsilateral cuspid.

During the course of treatment, the anchorage wire lay passively over, adjacent or under the buccal segment brackets. At each appointment, the wire is ligated passively to one or more of the brackets to prevent bending that would decrease the effective length of the anchorage segment, and to provide a slight intrusive force that would minimize occlusal prematurities during leveling. The patients tolerate the anchorage wire passing through the oral mucosa relatively well. Occasional episodes of irritation in retromolar area can be managed by keeping strict oral hygiene measures.

The lower arch is to be leveled with progressive translation of the molars so as to close the atrophic extraction space of the lost molar. A 30-degree gingival gable bend should be placed in the arch wire distal to the second bicuspid of the same side and adjusted as required to maintain bodily movement of the teeth during space closure. Approximately 200 grams offorce should be applied on buccal and lingual surfaces of the teeth to be translated.

When half of the extraction space is closed while an inverted 'v' bend across the extraction site so as to

ligated to mandibular second molar on the lingual.

While undertaking maxillary space closure, the maxillary second and third molars should be TPA is to be inserted into to connect the posterior teeth uprighted about 15 degrees with the help of TPA while to the onpiant. Retraction of the canines and incisors space is closed in the mandibular arch. Molar space are accomplished with out the use of compliance closure in maxillae 2,4-5,9 is not that huge problem as dependent headgear or class II elastics. Anchorage loss compared to mandible if principles of biomechanics is in the range of 0.7 to 1 mm This small anchorage are strictly followed; the reason being maxilla has got loss is most likely from the deformation of TPA by very soft spongy bone as compared to the tough Orthodontic forces. After the anterior teeth have been cortical bone of the mandible.

The rate of molar translation in the maxilla is about double as compared to mandible. In other words the rate of tooth moment is inversely proportional to the anchorage devices, can be alarming in critical Orthdensity of the bone in the path of tooth movement. The posterior mandibular alveolar process is predominately cortical bone, compared to the largely spongy bone in is worn religiously; when not in place, anchorage is less the corresponding area of the maxilla. Therefore the anchorage requirements are much less for mesial translation of maxillary molars than for the mandibular molars.

PALATAL ONPLANTS We know that endosseous implants require bone availability without the presence of a vital structure at the site of implant. The presence of impacted teeth, the inferior dental nerve, the close proximity of the nasal cavity and maxillary sinus may prevent the use of an endosseous implant as an orthodontic anchorage unit.

Devices that can be used in the majority of patients require that these should be placed on the bone, not with in the bone. These Palatal onplants have been used to eliminate headgear wear and to establish stationary anchorage.

The Paramedian region of the palate is normally preferred over the median region, so as to avoid connective tissues of the palatine suture and because it is considered to be a suitable host for onplant placement. After three months of healing, all onplants are osseointegrated. Palatal onplants can be used effectively for anchorage maintenance and space regaining procedures.

The new Orthodontic onplant anchor system (Orthosystem) is a one-piece device.6-7 The fixture is designed for a one-stage application. It consists of an implant of pure titanium, the surface of which is treated as acid etched and/or sandblasted. It consists of a screw type endosseous section (3.3 mm diameter and 4 or 6 mm length), a polished cylindrical transmucosal neck which follows as an abutment where transpalatal arches (TPA) made of rigid wires (0.032 x 0.032 inch)

deliver equal and opposite moments. Translation to are fixed by means of a slotted clamp cap. These complete space closure is accomplished by 4-6 weeks onplants are mostly used to maximally reinforce activations of about 1 mm. To prevent distal out the anchorage of the posterior teeth especially in rotation of the mandibular third molar, it should be dental class-II malocclusions where 1st premolars are extracted as part of treatment plan.

> After a mean unloaded onplant healing period, retracted into their new positions, the TPA and the onplants should be removed.

> As we have already mentioned that poor extra oral odontics anchorage situations. However, it is certain that the headgear anchorage becomes effective when it controlled and undesired tooth movement can elicit.

> Headgear devices are not ideal because of lack of patient compliance and questions about their safety. Poor patient compliance complicates Orthodontic treatment. An anchor that eliminates the need for patient compliance devices like headgear, elastic wear, and removable appliances, helps the Orthodontist provide predictable treatment for the patient.

> An orthodontic palatal onplant should fulfill the following characteristics:

- Not be placed into the bone
- Be relatively thin and should have low profile
- Be patient friendly
- Be atraumatic to the patient oral structures.
- Be biocompatible •
- Have a versatility of attachments.
- Have substantial strength to resist Orthodontic forces and withstand the forces placed upon it.
- Be easy to place, remove, and utilize in the Orthodontic office
- Be cost effective.

Another version of orthodontic anchor onpiant is a two-piece assembly. It is a relatively thin button measuring approximately 8mm in diameter and less than 3 mm in height. The surface that lies against bone is textured and is coated with a thin layer of hydroxyapatite¹⁰. This bioactive surface joins to the underlying bone via a mechanically significant bond, called biointegration. The superficial surface of the onpiant that lies against the periosteal soft tissue is smooth

surfaced titanium. It has an internally threaded hole with an external hexagonal head to accept a variety of attachments.

The onpiant has an abutment device, which is secured to it by a screw. For patients requiring anchorage of the posterior maxillary teeth, an abutment with a 0.051-inch wire is placed onto the transgingival abutment. A transpalatal wire, engaged against the abutment, is then soldered to the molar bands.

In case of well-aligned mandibular arch, there is no need to bond lower dentitions for anchorage support (Class II elastics).

PROCEDURE For the implantation a simple one-stage only surgical procedure of 10 min length is normally required while no further invasive action is needed. This way the strain and inconvenience on the patient is reduced. The onplant is placed by a surgeon or an Orthodontist himself through a well-defined subperiosteal tunnel or proper incision followed by elevation of full thickness flap. A healing time of 3 months is required for proper integration of the onplant with the osseous surface of the palate.

If a two- piece device of the onplant is used, then a small soft tissue trephine is used to a circular patch of tissue over the healing screw. An abutment of an appropriate length is fixed into place and protrudes through the palatal mucosa into the mouth.

The abutment is designed to accept various types of screw-retained attachments. For the use of TPA mechanics in the two-piece version, the abutment has a 0.051-inch wire in place. Custom attachments may be designed to expand the use of this device for protraction, distraction osteogenesis and distalization procedures.

The implanting and retrieval procedure of the onplant is simple and atraumatic.

MINI IMPLANTS/SCREWS Because of the space restraint, this part has been truncated and thus will be described in brief only.

Mini screws are small size intra oral anchorage devices used for Orthodontic tooth movement in all three planes of space. But clinically they are predominantly used for intrusion of teeth in a localized area. They should not be confused with mini dental implants (MDI) used in prosthodontics.

They are made of titanium and can be used in either of the jaw, hosting sound and stable bone¹³ for the onplants. They are fixed into the basal bone at a distance of 4-5 mm from the apices of the teeth. Some times they are fixed in between the dental roots of two teeth. They are having small attachments to which the tooth to be moved is engaged and the required force vector is applied. Once the desired treatment goal is achieved, they should be removed quite easily in the orthodontic office using topical anesthesia.

The two major disadvantages of mini screws at the time of their implantations are;

- A Damage to the roots of the adjacent teeth.
- B Damage to the vital structures like inferior dental nerve etc.

SUMMARY AND CONCLUSIONS

Orthodontics is poised at the dawning of a great expansion of its abilities to treatment many types of challenging malocclusions. Elimination of the compliance factor and control of the result simplify the Orthodontist's task to overcome the imminent hazards of extraoral devices.

The cost of the intraoral Orthodontic and Orthopedic anchorage therapy can be offset by substantial reduction in the treatment time period. Because of the sole and absolute stability of these intra oral anchor devices, Orthodontist becomes quite capable to handle and complete all his cases according to the desired optimal standards with in the stipulated time framework.

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