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Review Article

A literature review on implants in orthodontics

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ABSTRACT

In the process of providing temporary anchorage, orthodontic implants have become one of the best method in the field of orthodontics in providing anchorage in clinical practice. They are very much useful in controlling the skeletal anchorage, or in some of the cases where absolute anchorage is required. In the field of orthodontics, anchorage is always the worrying factor. There were so many anchorage devices were used whether extra orally and intra orally till date, but no satisfactory solution was found for the same, till the introduction of implants in the field of orthodontics. There are lot of advantages for the using implants in orthodontics as, they are very much easy to be inserted, available in the market in low price, the level of the patient discomfort was reduced with the use of implant, immediate loading can be done for the same, they are easy to clean, and are quite easy for removal.

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1. Introduction

TAD is the other name of the implants used in the field of the orthodontics, TAD stand for temporary anchorage devices. They are becoming popular day to day in orthodontics because they are small, they are easy to insert, they are easy to remove, and they can be loaded immediately after the placement of the implant. These implants that are used in orthodontics, they are used for specific period of time. Other name that are used for implants in orthodontics are mini implants, mini screws, mini screw implants, and temporary anchorage devices. These orthodontic implants are fabricated from stainless steel, titanium, cobalt chromium alloy and also from poluurethane material, rigid one.^{1,2}

Orthodontic implants are the devices that are inserted with in the bones of the cranio maxillary complex, with there primary function to provide anchorage to the orthodontic appliance.

The first concept of implant supported anchorage was given by Gainsforth & Higley in the year 1945, they used screws of vitallium and stainless steel wires in the ramus of the dog, to bring the retraction of the maxillary canine. This was found to be the first case of implant supported anchorage in the literature.¹

2. Orthodontic Anchorage

Mini implants or the orthodontic implants have become prime most choice as an alternative to the intra oral or extra oral anchorage devices. The resistance to unwanted movement of the tooth is defined as orthodontic anchorage. The traditional techniques that utilizes the use of extra oral

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anchorage device like head gear and intra oral anchorage device like bars, lingual arches, elastics inter maxillary are not able to provide the anchorage effectively because of inaccuracies that is provided from the support structure.

Mild orthodontic anchorage refers to the slight retraction of the anterior teeth, while absolute anchorage means that, majority of the closure of the space needed to be achieved by the retraction of the incisors. On the other hand moderate type of anchorage entails a management of anterior retraction and protraction of the posterior teeth.³

Now a days pure titanium dental implants are used in the field of orthodontics, because they have better osseointegration in the bones of the naso maxillary complex. According to the literature kaomi introduced the usage of orthodontic dental titanium implant having 1.2 mm of diameter and length of 6mm.⁴

3. Classification of Orthodontic Implant

It can be classified as head type button, head type bracket orthodontic implant, tip type self-tapping orthodontic implant, tip type self-drilling dental implant.

Different types of head design of orthodontic dental implant are: button type, bracket type. Diameter of the orthodontic implant ranges from 1.2 mm to 2mm. length of the orthodontic dental implant varies from 5 mm to 12 mm. design of the body of the dental implant vary from tapered design to cylindrical design i.e. two type of body design of the orthodontic implants rae available one is tapered design and the second one is cylindrical design. Trans mucosal profile of the orthodontic dental implant varies from 0.0 mm to 3mm. insertion technique for the orthodontic dental implants are either self-tapping technique or self-threading technique. Alloys most commonly used for the fabrication of the orthodontic dental implants are titanium alloys or stainless steel.

Normally the orthodontic dental implant are fabricated form titanium alloy i.e. Ti-6Al-4V, and these implants surface are not treated with any chemical or lasers, on the other hand they have tool marks present over there or have grooves present over the surface. Adequate implant surface helps in increasing the bone to implant contact and this helps in immediately loading the orthodontic implants for the purpose of orthodontic anchorage.⁴

3.1. Various uses of orthodontic dental implants

they are used in the correction of anterior open bite by the application of intrusion of the molars, they are used in patients those are having high angle by the application of lower molar intrusion, patients of deep bite can be treated with this by the application of intrusion of incisors, they are very much useful in the treatment of class II malocclusion, that is associated with unpleasant profile of the patient, bi protrusive patients those are not willing for wearing extra

oral anchorage devices like head gear, or with intra oral anchorage device too, i.e. with inter maxillary elastics. They are very much useful in cases where premolar protraction is required. In some of the cases where only single tooth movement required only and that too without the use of fixed appliance therapy.⁴⁻⁶

3.2. Design of the orthodontic dental implant

It consists of head, which has a place or slot for the placement of the arch wire. Neck of the implant which act as a link between head and platform for the attachment of the elastic or coil spring. Platform for the orthodontic dental implant is available in three different sizes i.e. 1mm, 2mm, 3mm for the accommodation of different soft tissue thickness. Body of the implant is parallel and is self drilling it helps in providing better mechanical retention along with stronger anchorage.⁷⁻⁹

The most common site for the placement of mini implant in the maxilla is, between maxillary 1st and 2nd pre molar, between maxillary 1st and 2nd molar, in between the two central incisors, in the zygomatic buttress, mid palatal area and in the maxillary tuberosity.⁵

In the mandible the most common site of placing orthodontic dental implant are between mandibular 2nd premolar and mandibular 1st permanent molar, between 1st and 2nd permanent mandibular molar, between two mandibular central incisors, in between mandibular permanent canine and 1st premolar, in the retromolar pad area, on the buccal aspect of the mandibular symphysis.⁵

The sites which are near the vital structures like inferior alveolar nerve, inferior alveolar artery, vein, maxillary air sinus, mental foramen these anatomical areas should be avoided for the placement of the orthodontic dental implant.

Generally for the maxillary arch the length of the orthodontic dental implant should be 8 mm to 10 mm and for the mandibular arch the length of the orthodontic dental implant should be 6 mm to 8 mm.

3.3. Steps for orthodontic implant placement

First of all the height of the bone at the placement of the orthodontic implant site should be determined with the help of the probe along with making considerations regarding the vital. structures present around or at near by site of the implant placement, for e.g. inferior alveolar nerve, maxillary air sinus, mental foramen etc.^{10,11}

After than topical anesthesia is been given at the site of local infiltration to avoid needle prick pain while giving the local anesthesia. After than local anesthesia is given at the site of orthodontic implant placement. A guide bar can be placed at the implantation site before exposing the site to intra oral peri apical view. The guide bar should be placed in such a manner that it should remained placed while placing the orthodontic dental implant at the implantation

site. The selected mini implant is being loaded in the driver and ready for the implantation at the implantation site. The first direction in to which the mini implant is inserted is the horizontal direction after than the direction of placement is changed 30 degrees to 40 degrees in case of maxillary arch and 10 degrees to 20 degrees in case of the mandibular arch. The screw should be tightened smoothly with alternating turns in between it. For the sake of proper stability operator should avoid the wobbling of the driver.¹²

Loading of the orthodontic dental implant can be done in two different ways, the first one is delayed loading that follows the principal of healing period of 4 to 6 weeks after the placement of the implant and the second one is immediate loading of the implant. Many studies revealed that pre mature loading of the orthodontic dental implant leads to micro motion of the implant that ultimately leads to implant failure. In terms of orthodontic dental implants, primary stability is much important than the process of Osseo integration. Literature revealed that there is no difference found between the delayed loading and immediate loading when a force of 200 gms to 300 gms were applied. However for a safer side it was stated that giving time of 2 to 3 weeks for soft tissue healing is good.^{13,14}

3.4. Complications during placement of orthodontic dental implant

1. Trauma to the soft tissue
2. Trauma to the periodontal ligament
3. Trauma to the underlying vital structure like nerve, maxillary air sinus, mental foramen.
4. Slippage of the orthodontic implant.
5. Sub cutaneous emphysema
6. Perforation of the maxillary air sinus
7. Fracture of the orthodontic implant done.¹⁴

4. Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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