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REVIEW

Orthodontic Micro-implant-absoanchor…An Overview

Lalitha Ch[1] and Anitha G[2]

Dept. of Orthodontics
Kamineni Institute of Dentel Science,
Narketpally, Nalgonda District.
Andhra Pradesh

Sr. Lecturer[1]
Professor and HOD[2]

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ABSTRACT:

Orthodontists have been straightening teeth for decades relying on the ancient physics principle "every action has a reaction," in which tooth displacement in one part of the jaw causes movement on the other as well. Use of dental implants as orthodontic anchors, however, is changing that principle by expediting treatment times and expanding possibilities for previously untreatable cases. In conventional orthodontics, teeth are used to move other teeth, but implants can serve as excellent anchors from which force is applied to move the targeted teeth without causing shifts in other teeth..Cases progress faster when implants are used as anchorage, but not because teeth are subject to higher force levels. Rather, it's is the result of a more efficient appliance design that provides the ability to move multiple teeth simultaneously rather than individually, as is necessary in conventional orthodontics.

Key words: ***Intra oral anchorage, implants, micro - screws***

INTRODUCTION

According to Newton's Third Law, there is a reaction for every action, control of which is difficult to achieve intraorally. Earlier, orthodontists used extraoral traction to reinforce intraoral anchorage. Nevertheless, patients seldom used headgears 24 hours a day-7 days a week; hence this source of anchorage was often compromised. The ideal intraoral anchorage would not displace, and would require a source devoid of periodontal membrane, which tends to respond to tension and pressure allowing movement through bone. Recently, prosthetic Osseo-integrated implants have been used as intraoral orthodontic anchorage, but their bulky size, cost and invasiveness have limited their orthodontic application.[1]

Ordinary bone screws were first used to provide intraoral anchorage, but the screw heads failed to protect the gingiva from the impingement by the ligatures or attached elastomers. These became a source of constant gingival irritation and inflammation, which limited the usefulness of this type of implants. The design of the screw heads also made it difficult to connect coil springs and other elastomers to these ordinary bone screws. The development of small diameter titanium microimplants with specially designed heads that accept ligatures, coil springs and elastomers have helped to solve the main objections to previous implants and screws.[2] (fig 1)

Email for correspondence:
drplalithasunil@gmail.com

Fig 1. A typical surgical microscrew (left) and the newly designed Absoanchor microscrew with NiTi coil springs attached.

Developed by Hee-Moon KYUNG, Hyo-Sang PARK, Seong-Min BAE, Oh-Won KWON, and Jae-Hyun SUNG.

Types of Absoanchor Microimplant:

Several types of Absoanchor micro-implants are available for different tasks and sites:

Small Head (SH) Type:

Recommended Site: Maxillary & Mandibular attached gingiva including palate.

Recommended Elastomer: Nickel Titanium coil spring & Elastomeric thread etc.[3]

No Head (NH) Type:

Recommended Site: Maxillary & Mandibular movable soft tissue.

Recommended Elastomer: Elastomeric thread & Ligature wire hook etc.

Long Head (LH) Type:

Recommended Site: Mandibular attached gingiva & mucosa border area.

Recommended Elastomer: Ni-Ti coil spring & Elastomeric thread etc.

Circle Head (CH) Type:

Recommended Site: Mandibular & Maxillary attached gingiva including palate.

Recommended Elastomer: Power Chains, Elastomeric thread & Ni-Ti coil spring

Fixation Head (FH) Type:

Recommended Site: Maxillary & Mandibular buccal area for intermaxillary fixation. Palate including midpalatal suture area.

Recommended Elastomer: Ligature wire & /or rubber band for intermaxillary fixation. Power Chains, Elastomeric thread & Ni-Ti coil spring etc

Bracket Head (BH) Type - (Right & Left Handed Screw):

Recommended Site: Maxillary & Mandibular attached gingiva including palate.

Recommended Elastomer: Power Chains, Elastomeric thread Archwire insertion is possible. (Fig 2)

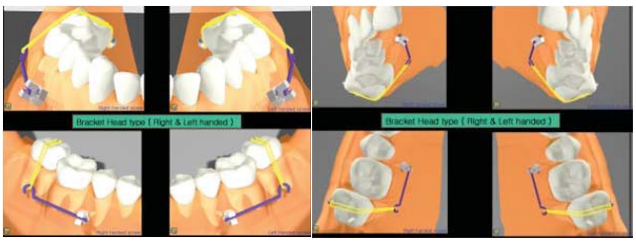

Fig 2.

Terms used in Microimplant surgical procedures:

1) According to head exposure[2] (Fig.3)

(1) Open method;

When the head of Microimplant is exposed in oral cavity, we call it open method.

Usually, this method is possible when we place a Microimplant on a tighter soft tissue area like the attached gingiva.

(2) Closed method;

When the head of Microimplant is embedded under the soft tissue, the soft tissue will grow up and embed the Microimplant head during treatment. So, in this situation it's better to embed the Microimplant under the soft tissue from the beginning. Whenever a micro-implant impinges on movable soft-tissue rather than attached gingiva, it is often preferable to use a No Head (NH) type Microimplant and place it completely under the gingiva with an emerging wire hook made from a ligature for the acceptance of elastic forces. This lessens the risk of inflammation and/or infection.

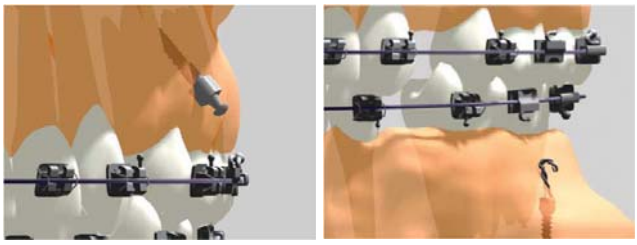

Fig 3. Open (left) & closed (right) method of Microimplant insertion

2) According to the path of Microimplant insertion (Fig.4)

(1) Diagonal (or oblique) Insertion;

In this kind, the microimplant is inserted into the bone in an oblique direction to the bony surface. The micro-implant sites need to have a 30-60 degree angulation, to the long axes of the teeth, both buccally and lingually. This method can be used when the interradicular space is very narrow.

(2) Perpendicular Insertion;

Here the microimplant is inserted into the bone, in almost perpendicular direction to the bony surface. This method can be used when there is enough space between roots.

Fig 4. Diagonal (left) & perpendicular (middle& right) insertion of Microimplants

General rule in choosing proper Size of Microimplant:

A general rule of thumb should be, to use the longest possible microimplant, without jeopardizing the health of adjacent tissues. The proper length of microimplant is best selected during the pilot drilling. It's better and quite easy to place Microimplant in a perpendicular direction to the bony surface. However, there are many situations when the Microimplant has to be placed in diagonal direction, to avoid injury to adjacent roots. When you choose to place the microimplant diagonally instead of perpendicular path, then it is prudent to use a little longer Microimplant. Clinically in order to get better mechanical retention, it's good to choose a longer and thicker Microimplant, rather than shorter and smaller one.

Various clinical sites for microimplant placement:

The following are recommended guidelines of Microimplant sites and Recommended sizes for orthodontic anchorage purpose.

1) In Maxillary zone

(1) Infrazygomatic crest area (Fig.5)

Purpose: Retraction of the whole maxillary or the anterior dentition.

Intrusion of the maxillary molars.

Recommended Microimplants: Diameter: 1.3 & 1.4mm, Length: 5-6 mm

Fig. 5

(2) Maxillary tuberosity area (Fig.6)

Purpose: Retraction of the maxillary posterior teeth Recommended Microimplants: Diameter: 1.3 -1.5mm, Length: 7- 8 mm

Fig.6

(3) Between the maxillary 1st molar & 2nd molars buccally (Fig.7)

Purpose: Retraction of the maxillary anterior teeth.[10] Intrusion of maxillary molars.

Recommended Microimplants: Diameter: 1.2 & 1.3mm, Length: 7-8 mm

Fig.7

(4) Between maxillary 1st molar & 2nd premolar buccally (Fig.8)

Purpose: Retraction of the maxillary anterior teeth.

Intrusion of maxillary buccal teeth.

Recommended Microimplants: Diameter: 1.2 & 1.3mm, Length: 7-8 mm

Fig. 8

To avoid root injury, drill the bone somewhat mesial to the contact point between the 2nd premolar & 1st molar.

(5) Between maxillary canine & premolar buccally (Fig.9)

Purpose: Distal & Mesial movement of Maxillary molars.

Intrusion of maxillary buccal teeth.

Recommended Microimplants: Diameter: 1.2 & 1.3mm, Length: 7-8 mm

Fig .9

(6) Between maxillary incisors facially (Fig.10)

Purpose: Intrusion & torque control of maxillary incisors.[7]

Recommended Microimplants: Diameter: 1.3 - 1.6mm, Length: 6-7 mm

Fig .10

(7) Between maxillary 2nd premolar, 1st molar & 2nd molars palatally (Fig.11)

Purpose: Retraction of the maxillary anterior teeth (Lingual ortho. Tx.)[5]

Intrusion of maxillary molars.

Recommended Microimplants: Diameter: 1.3 - 1.6mm, Length: 10-12 mm

Fig.11

(8) Mid palatal area (Fig.12)

Purpose: Unilateral constriction.[6]

Molar movement with Transpalatal arch.

Recommended Microimplants: Diameter: 1.5 & 1.6mm, Length: 6-7 mm

Fig.12

2) In Mandibular zone

(1) Retromolar area (Fig.13)

Purpose: Uprighting of tilted mandibular molar.

Retraction of the mandibular teeth or whole dentition.

Recommended Microimplants: Diameter: 1.3 - 1.6, Length: 6-10 mm

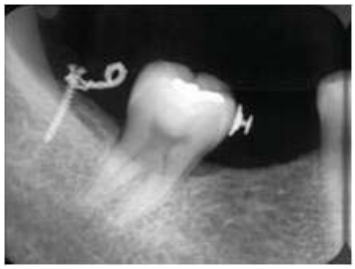

Fig 13

(2) Between mandibular 1st & 2nd molars buccally (Fig.14)

Purpose: Retraction of mandibular anterior teeth.

Intrusion & distal movement of the mandibular molars.[8]

Recommended Microimplants: Diameter: 1.2 - 1.4mm, Length: 5-7 mm

Fig .14

(3) Between the mandibular 1st molar and 2nd premolar buccally (Fig.15)[8]

Purpose: Retraction of mandibular anterior teeth.

Intrusion of mandibular buccal teeth.

Recommended Microimplants: Diameter: 1.2 - 1.4mm, Length: 5-7 mm

Fig.15

(4) Between the mandibular canine & premolar buccally (Fig.16)

Purpose: Protraction of mandibular molars.

Recommended Microimplants: Diameter: 1.2 & 1.3mm, Length: 5-7 mm

Fig 16

(5) Mandibular symphysis facially (Fig.17)

Purpose: Intrusion of mandibular anterior teeth.

Recommended Microimplants: Diameter: 1.2 & 1.3mm, Length: 4-6 mm

Fig 17

(6) Edentulous area (Fig.18)

Purpose: Controlling the adjacent teeth of edentulous area including molar uprighting, distalization, mesialization, intrusion, extrusion & torque (using Two Microimplants)[11]

Recommended Microimplants: Diameter: 1.2 & 1.3mm, Length: 7-8 mm

Fig.18

Implant Driving methods:

(1) Self-tapping method (Fig.19): In this method the micro implant is driven into the tunnel of bone formed by drilling, making it tap during implant driving. This method is used when we use small diameter microimplants.

(2) Self-Drilling method (Fig.20): Here the microimplant is driven directly into bone without drilling. This method can be used when we want to use larger diameter (more than 1.5mm) microimplants.

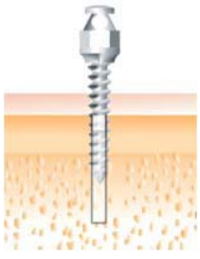

Fig .19. Self tapping method.

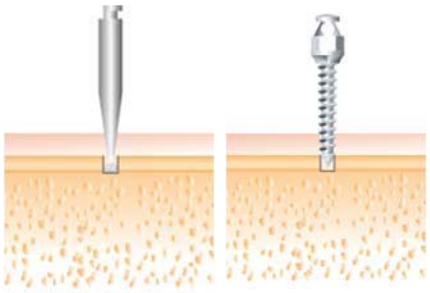

Fig .20. Self drilling method

INSTALLATION DEVICES:

HAND DRIVEN DEVICE

SPEED REDUCTION CONTRANGLE ENGINE DRIVER

STERILIZATION PACKAGE; DRIVER INSERTED TO ENGAGE IMPLANT

Orthodontic Force application:

Actually, there was no clinical difference in failure rate between immediate loading and delayed loading, if we keep the applied the force to less than 300gm. Light continual forces as generated by NiTi coils are more favored over elastomerics that often have excessive initial forces.

Postoperative patient management:

Microimplant sites will require excellent oral hygiene with soft brushing and possibly water irrigation. From time to time chemotherapeutic rinses may ward off inflammation and infection.

Micro-implant removal:

In the open method, clinician can engage the microimplant head with the driver and turn it in the opposite direction of the insertion that will easily remove it.

Limitations:

Successful microimplantation depends on several features:

Clinician's skill;

Patient's physical condition; Site selection;

Patient's oral hygiene.

Occasionally, even tight microimplants loosen from subsequent inflammation, so excellent patient's oral hygiene with proper soft brushing and frequent irrigation will greatly increase the chances of success.

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