

## Temporary anchorage devices in orthodontics

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### Abstract

Anchorage control is one of the main aspects of orthodontic treatment plan. A good appliance system should put minimum taxation of anchorage on the anchor units. The structures present within the confinement of oral cavity are very less in number. In such cases the anchor unit gets its reinforcement from extraoral structures or intraoral appliances. Extraoral anchorages have their inherent drawbacks and most of them rely on patient cooperation. The use of implants in orthodontics to reinforce the anchorage is a recent concept. The purpose of this article is to review the implants in the context of orthodontics which are called as TAD- temporary anchorage devices.

**Key words:** Temporary anchorage devices, Orthodontics, Implants.

### Introduction

Anchorage control is one of the most important aspects of orthodontic treatment. The success of orthodontic treatment hinges on the anchorage protocol planned for a particular case. Use of extraoral anchorage devices such as headgears requires full patient cooperation, which is sometimes not possible and is unpredictable. Introduction of implants in orthodontics have solved this problem. Implants have become one of the best sources of reliable anchorage. Mini implants have revolutionized the field of anchorage in orthodontics.<sup>1-3</sup> **(Table-I)**

This new modality has been called by several names, some of the popular ones are

- Mini implants
- Microimplants
- Skeletal anchorage
- Temporary anchorage Device

Use of implants as a source of anchorage has number of advantages as compared to traditional anchorage such as no patient cooperation, easy to use, shortening of treatment time, good control on tooth movements.

Branemark and co-workers" (1965) reported the successful osseointegration of titanium implants in bone; many orthodontists began investigating

in using implants for the purpose of orthodontic anchorage. Gainsforth and Higley (1945) placed metallic vitallium screws in dog ramus, Linkow (1969, 1970) used mandibular blade-vent implants in a patient to apply class II elastics, Sherman' (1978) placed the first orthodontic implants. Block and Hoffman (1995) introduced the onplant to provide orthodontic anchorage.

### CLASSIFICATION OF IMPLANTS FOR ORTHODONTIC ANCHORAGE<sup>4</sup> (Table-II)

1. According to the shape and size:

I) Conical (Cylindrical)

- a) Miniscrew Implants
- b) Palatal Implants
- c) Prosthodontic Implants

II) Mini plate Implants

III) Disc Implants (Onplants)

2. According to Implant bone contact:

- I) Osteointegrated
- II) Non-osteointegrated

3. According to the application:

I) Used only for orthodontic purposes. (Orthodontic Implants) or TAD (temporary anchorage devices)

II) Used for prosthodontic and orthodontic purposes.

**MINISCREWS**(Fig.1) Of all orthodontic implants, miniscrews have gained considerable importance due to less surgical procedure and easy installation. Titanium

miniscrews may be an ideal anchorage system that fulfills the clinical needs of the orthodontist. Some of their benefits include dependability, are well accepted by patients, can be immediately loaded, and are simple to insert and remove, and conform to the anchorage needs of the orthodontist/ The

miniscrew can be loaded immediately with forces in the range of 50 to 300. This anchorage system can be used to support a variety of orthodontic tooth movements in clinical situations involving mutilated dentitions, poor cooperation.

**Table 1. showing the difference between conventional anchorage and implant anchorage**

CHARACTER.	TRADITIONAL ORTHODONTIC TREATMENT	ORTHODONTIC TREATMENT USING IMPLANTS
Anchorage Source	Teeth and extraoral bony structures	Implants
stability of anchorage	Position of anchor teeth is not stable during treatment	Position is stable during treatment
Number of Anchor teeth	In order to get sufficient anchorage, maximum number teeth must be included	For direct anchorage teeth are not necessary, minimal number of teeth are needed for indirect force on implant anchorage
Treatment Efficiency	Applying force on teeth, part of it is wasted, due to periodontal amortization	More efficient as force is transmitted directly to the implant
Duration of the treatment	Treatment time prolonged	Shortened treatment time
Patient's cooperation	Obligatory	Minimal
Treatment acceptability	Most of treatment devices restrict patients motion, don't meet esthetical requirements	Discomfort for patient is minimal

**MINIPLATES(Fig.2)**The Miniplate Implants are comprised of bone plates and fixation screws. The plates and screws are made of commercially pure titanium that is biocompatible and suitable for osseointegration. The miniplate consists of the three components—the head, the arm, and the body

The head component is exposed intraorally and positioned outside of the dentition so that it does not interfere with tooth movement. The head component has three continuous hooks for attachment of orthodontic forces. There are two different types of head components based on the direction of the hooks.

**Onplants ( Fig 3)**These are button type implants used in the palatal region. They serve as anchorage source for expansion as well maxillary protraction.

**Common Indications for placement of implants**  
5-8

Mini implants are used most beneficially where three dimensional stable anchorage is needed, some of these situations are:

1. Where you can not afford any movement of reactive units (maximum anchorage case)
2. Patient with several missing teeth making it difficult to engage posterior units
3. For difficult tooth movements, eg intrusion of anterior and posterior segments and distalisation
4. Where asymmetrical tooth movement is needed
5. To treat borderline cases with non extraction method
6. Doing extreme orthodontics when patient is not willing to undergo orthognathic surgery.

SITES OF PLACEMENT:

**MAXILLA(Fig.4)**

- Infrazygomatic crest area.
- Tuberosity area.
- Between 1st and 2nd molars buccally.
  
- Retromolar Area.
- Between 1st and 2nd molars buccally.
- Between 1st molar and 2nd premolar buccally.
- Between canine and premolar buccally.

**MANDIBLE( Fig 5)**

- Between 1st molar and 2nd premolar buccally.
- Between canine and premolar buccally.
- Between incisors facially.
- Mid palatal Area.

**Table 2. TYPES AND FEATURES OF ORTHODONTIC IMPLANTS**

SI. NO.	CHARACTER	ORTHODONTIC IMPLANTS			
		MINI SCREWS	PALATAL	MINI PLATES	ONPLATES
1	<b>Anatomical sites for implantation</b>	Every structure where there is enough cortical bone	Median suture of the palate, paramedian	Every structure where there is enough cortical bone	Median suture of the palate, paramedian
2	<b>Patient's age</b>	no age contraindications	Used after ossification of the median suture of the palate	no age contraindications	Used after ossification of the median suture of the palate
3	<b>Time of Loading</b>	Immediate loading	Loading after osseointegration is complete (3-6 months)	Loading after healing	Loading after osseointegration is complete (3-6 months)
4	<b>Type of Surgery</b>	Only perforation of the mucosa is needed	Perforation of the mucosa and bone preparation is needed	Flap surgery is needed	Flap surgery is needed
5	<b>Postsurgical period</b>	Minimum patient's discomfort	Pain and Swelling remains for a week	Pain and Swelling remains for a week	Pain and Swelling remains for a week
6	<b>duration</b>	For Orthodontic anchorage, removed after treatment	For Orthodontic anchorage, removed after treatment	For Orthodontic anchorage, removed after treatment	For Orthodontic anchorage, removed after treatment
7	<b>Size</b>	1, 2-2, 3mm diameter,6-14mm length	3,3mm diameter, 4-6mm length	2mm diameter,5m m length(screw)	10mm diameter, 2mm thickness



**Onplant: Block & Hoffman**

- It is a flat disk shaped fixture available in 8 and 10 mm in diameter
- It has a HA-coated surface for integration with the surrounding bone.

Fig. 3 Onplants

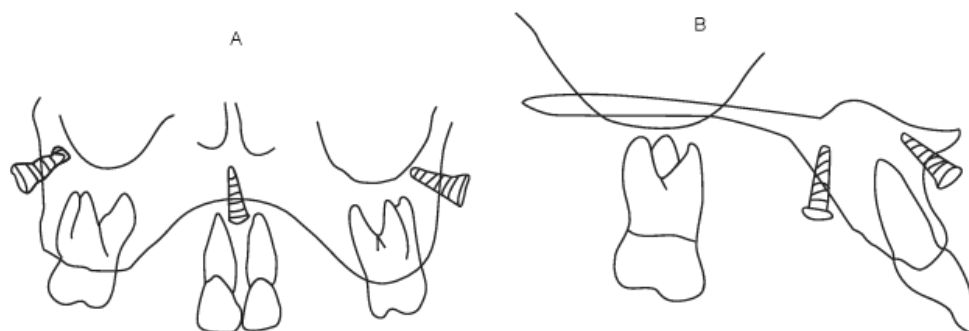


Fig. 4 Examples of possible sites for miniscrew implant placement and direction of insertion in the maxilla. A. Frontal view; B. Lateral view

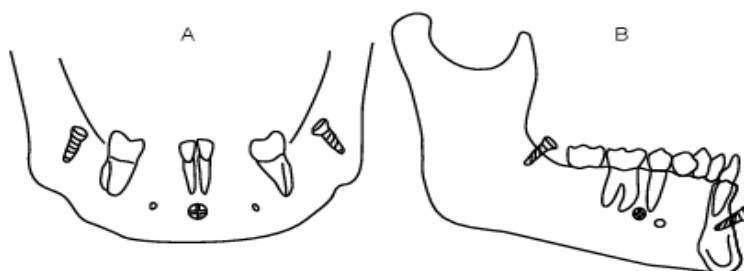


Fig. 5 Examples of possible sites for miniscrew implant placement and direction of insertion in the mandible. A. Frontal view; B. Lateral view

**Methods of placement**

- (1) **Pre-tapping method:** In this method the miniscrews is driven into the tunnel of bone formed by drilling, making it tap during implant
- (3) miniscrews is driven directly into bone without drilling.

driving). This method is used when we use small diameter miniscrews

- (2) **Self tapping:** Here a slight notch is made and then the screw is tapped in bone.



### Uses of orthodontic implants<sup>1-11</sup> ( fig 6)

- Used for retraction of anterior teeth (Class II Div I ),
- Uprighting of molars,
- Mesiodistal tooth movement,
- Open bite correction (achieved by intruding posterior. Molar Intrusion teeth: skeletal anchorage)
- Molar Mesialization:
- Distalization of 1st and 2nd molars (Graz implant supported pendulum: GISP)
- Intrusion of anterior teeth as well as molars
- Onplants for expansion and protraction of maxilla—orthopedic use.

### CONCLUSION:

Implants provide absolute anchorage i.e. complete bone anchorage. Implants have revolutionized the field of anchorage in orthodontics. So by choosing a correct anchorage source we can get good results in orthodontic treatment

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