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Mini Implants in Orthodontics – An Overview

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ABSTRACT

Anchorage control is a key factor in the success of orthodontic treatment. Recent developments in implantology now allows stationary anchorage without the use of extraoral appliances or complex biomechanical procedures. Mini-implants–enhanced anchorage has become a popular concept in orthodontics. Use of skeletal anchorage devices such as osseous dental implants, miniplates, miniscrews or microscrews offers clinicians' reliable anchorage without patient compliance. Among these anchorage devices, miniscrew implants have increasingly been used for orthodontic anchorage because of their absolute anchorage, easy placement and removal, and cost effectiveness. Therefore, the skeletal anchorage system offers a nonsurgical orthodontic treatment option for skeletal (surgical) malocclusions, as well as a nonextraction treatment for malocclusions characterized by severe maxillary or mandibular protrusion, and/or anterior crowding. The purpose of the present article is to compare the mini- implant supported mechanics with conventional mechanics with the help of cases treated in the department of orthodontics.

INTRODUCTION

Orthodontic treatment observes resistance in areas of desired tooth movement and anchorage sites. Hence, proper orthodontic anchorage preparation is important to ensure predictable tooth movement and negating insufficient reciprocal movement [1]. Understanding each patient's anchorage requirements is of paramount importance which ensures high-quality care. Unexpected or unintended anchorage loss frequently results in a compromised finish [2]. Traditionally, high-anchorage situations require excellent patient compliance with extra oral traction devices. In recent years, orthodontic mini-implants were developed to ensure complete orthodontic anchorage. Among various intraosseous anchorage systems mini-screw implants have the advantage of simpler insertion and immediate loading. Mini-implants are frequently used in cases that require absolute anchorage, intrusion and/or distalization of molars [1].

The Retromolar implants described by Roberts et al. [3] and the Palatal implants introduced by Wehrbein and Merz [4,5] are some of the orthodontic mini-implants which are smaller than the dental implants, but their surfaces are treated in the same way [3]. Both are used for indirect anchorage, meaning they are connected to teeth that serve as an anchorage unit. It was not until 1997 that Kanomi described a mini-implant specifically designed for orthodontic use [5]. Both of these were used as direct anchorage. The following year, Costa et al. described a screw with a special bracket-like head that could be used for either direct or indirect anchorage [5]. In contrast to the osseointegrated implants, these devices are smaller in diameter, have smooth surfaces, and are designed to be loaded shortly after insertion.

The intent of the present article is to give necessary information and compare the mini-implants supported mechanics with the conventional mechanics. The following cases have been taken from the patients records treated in the department of Orthodontics, given below illustrate the same.

Indications

Antero-posterior control

- Anterior retraction **(Figures 1 and 2)**

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- Distalization **(Figure 3)**
- Molar protraction **(Figure 4)**
- Molar axis control **(Figure 5)**

Vertical control

- Anterior intrusion/Extrusion **(Figures 2 and 6)**
- Posterior intrusion/Extrusion

Transverse control

- Symmetric expansion/contraction
- Asymmetric expansion/contraction

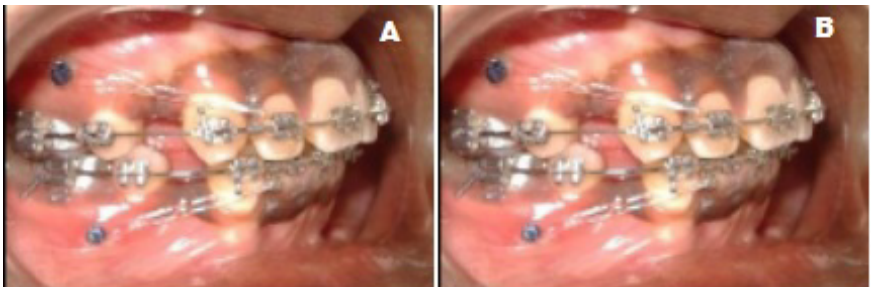

Figure 1. (a): Enmasse anterior retraction using T-loop, (b): Enmasse anterior retraction using mini-implants.

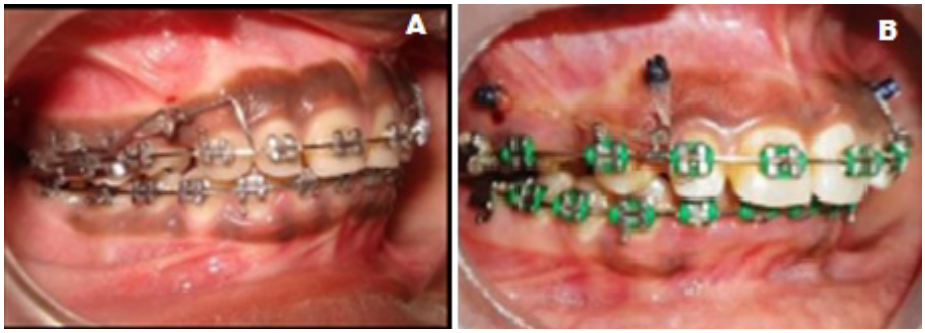

Figure 2. (a): Enmasse anterior retraction and intrusion using Burstone Arch, (b): Enmasse anterior retraction and intrusion using mini-implants.

Figure 3. (a): Distalization of upper 1st molars using pendulum appliance, (b): Distalization of upper 1st molars using sliding JigFig.

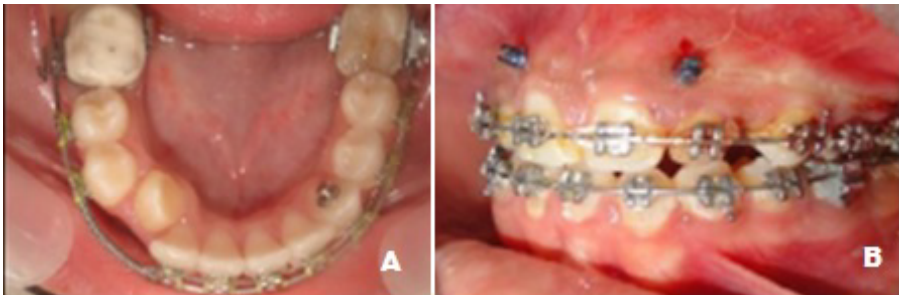

Figure 4. (a): Molar protraction using T-loop, (b): Molar protraction using mini-implants.

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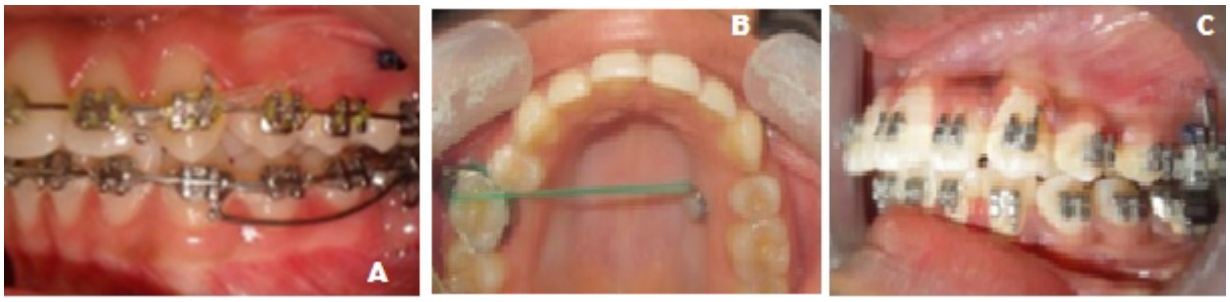

Figure 5. (a): Correction of buccally tipped 1st molar using modified TPA and cantilever arm, (b,c): Correction of buccally tipped 1st molar using palatal and buccal mini-implant.

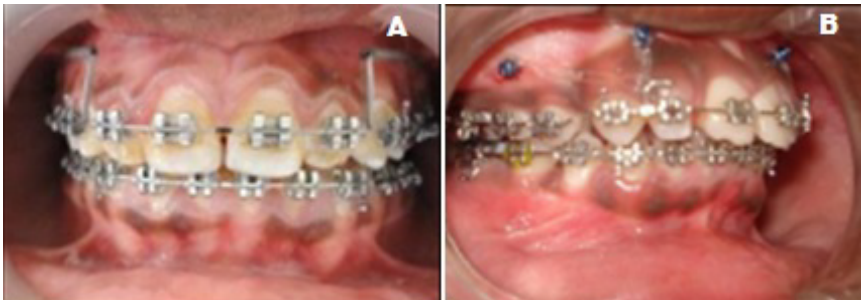

Figure 6. (a): Intrusion of anterior segment using intrusion utility arches, (b): Intrusion of anterior segment using mini-implants.

DISCUSSION

For a long time, orthodontists have struggled to achieve efficient control of anchorage. Dissatisfaction with conventional methods of anchorage led some practitioners to explore the use of implants as a source of absolute anchorage. Mini-implants offer advantages like temporary fixture in bone, small size, rapid and atraumatic placement in almost all sites within mouth and cost effectiveness. The cases cited above have compared mini implant supported mechanics with conventional one. Enmasse retraction of anterior teeth can be done conventionally using different wire configurations like T-loop or Burstone arch but anchorage control in all three dimensions of space is difficult. So to overcome that mini-implants have been used **(Figures 1 and 2)**. Similarly, movement of first or second molar in all three planes of space i.e., protraction or distalization; correction of bucally tipped molar in either arch can be achieved using mini-implants **(Figures 5 and 6)**.

CONCLUSION

Orthodontic mini-implants are a powerful aid for the orthodontic practitioner in resolving challenging malocclusions. Mini-implants placed in alveolar bone are effective in adolescent patients, and marked improvement is often observed, even in patients with skeletal problems.

Thus skeletal anchorage should serve merely to expand the horizon of orthodontic services we can cater to our patients and can take up new challenges which were considered limitations earlier.

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