

## Original Research

### Orthodontic mini-implant and their primary stability: A comparative study

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#### **ABSTRACT:**

**Background:** The present study was conducted for comparing the primary stability of two different types of orthodontic mini-implants. **Materials & methods:** A total of 50 patients were enrolled in the present study. All the included cases were Type-A anchorage cases with Angle's Class I bimaxillary protrusion with anterior crowding <2–3 mm. Two study groups were formed with 25 patients in each group as follows: Group A: Titanium alloy cylindrical single-threaded mini-implants, and Group B: Titanium alloy cylindrical double-threaded mini-implants. Post-surgery, the patients were prescribed 2% chlorhexidine mouth wash and antibiotics for 3 days. Maximum removal torque (MRT) and Maximum insertional torque (MIT) were then measured. All the follow-up results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software. **Results:** MIT among group A and group B subjects was 7.39 N cm and 8.57 N cm respectively. While analysing statistically, mean MIT was significantly higher among group B subjects. MRT among group A and group B subjects was 1.29 N cm and 1.95 N cm respectively. While analysing statistically, mean MRT was significantly higher among group B subjects. **Conclusion:** Titanium alloy cylindrical double-threaded mini-implants were better in comparison to single-threaded mini-implants. Proper insertion and removal torque are necessary for achieving the primary stability of orthodontic mini-implants.

**Key words:** Titanium, Mini-implant, Orthodontic

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#### **INTRODUCTION**

Anchorage plays a significant role in the success of orthodontic treatment outcomes. Some efforts have been made to gain the optimum anchorage intra or extra orally such as using chin cap, headgear, and multiple brackets. Both anchorage devices and techniques are accompanied by some deficiencies.<sup>1, 2</sup> Extra oral anchorage requires remarkable patient's cooperation which is not mostly achieved. Intra-oral anchorage (specially tooth supported) cannot provide optimum anchorage, also needs sufficient dentition. Absolute anchorage can only gain by ankylosed teeth or conventional implants.<sup>3</sup>

Mini dental implants can be compared to conventional implant systems. They are made of one piece;

however, conventional implants usually consist of two parts, the implant, and the abutment. Mini implants have a one-piece titanium screw with a ball-shaped head for denture stabilization or a square prosthetic head for fixed applications, instead of the classic abutment. A bracket like head design can aid in orthodontic treatment and serve as indirect anchorage.<sup>4- 6</sup>Hence; the present study was conducted for comparing the primary stability of two different types of orthodontic mini-implants

#### **MATERIALS & METHODS**

The present study was conducted for comparing the primary stability of two different types of orthodontic mini-implants. A total of 50 patients were enrolled in

the present study. Only those patients were enrolled which belonged to the age group of 20 to 25 years and which were scheduled to undergo orthodontic mini-implants as a part of orthodontic treatment. The Frankfort-Mandibular Plane Angle of 24°–30° depicting growth patterns as average. All the included cases were Type-A anchorage cases with Angle's Class I bimaxillary protrusion with anterior crowding <2–3 mm. Two study groups were formed with 25 patients in each group as follows:

**Group A:** Titanium alloy cylindrical single-threaded mini-implants, and

**Group B:** Titanium alloy cylindrical double-threaded mini-implants.

Post-surgery, the patients were prescribed 2% chlorhexidine mouth wash and antibiotics for 3 days. Maximum removal torque (MRT) and Maximum insertional torque (MIT) were then measured. All the follow-up results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software.

**RESULTS**

Mean age of the Group A and group B subjects was 23.4 years and 22.9 years respectively. Both the groups were comparable in terms of age-and gender-wise distribution. MIT among group A and group B subjects was 7.39 N cm and 8.57 N cm respectively. While analysing statistically, mean MIT was significantly higher among group B subjects. MRT among group A and group B subjects was 1.29 N cm and 1.95 N cm respectively. While analysing statistically, mean MRT was significantly higher among group B subjects.

**Table 1: Comparison of maximum insertion torque**

Groups	Mean (N cm)	SD	p- value
Group A	7.39	1.23	0.0001 (Significant)
Group B	8.57	0.98	

**Table 2: Comparison of maximum removal torque**

Groups	Mean (N cm)	SD	p- value
Group A	1.29	0.51	0.0004 (Significant)
Group B	1.95	0.58	

**DISCUSSION**

Mini-implants have become a very popular type of orthodontic skeletal anchorage, which is reflected in the escalating number of studies addressing this subject. However, there is still no consensus in these studies about the factors that influence the success of mini-implants. A recent systematic review could not prove an association between the type of mini-implant, patient characteristics, placement site, surgical technique, and orthodontic and implant maintenance factors and the success rates of mini-implants. The insertion of the orthodontic mini screws can be done either manually or motorized, and the

manual insertion method is usually more straightforward, it can achieve better tactile sensation than the motorized one. It is recommended that the mini-implant should be inserted at a slow speed, with low and continuous forces, and hence that the load on both the mini-implant and the surrounding bone is kept low.<sup>7- 9</sup>Hence; the present study was conducted for comparing the primary stability of two different types of orthodontic mini-implants.

Mean age of the Group A and group B subjects was 23.4 years and 22.9 years respectively. Both the groups were comparable in terms of age-and gender-wise distribution. MIT among group A and group B subjects was 7.39 N cm and 8.57 N cm respectively. While analysing statistically, mean MIT was significantly higher among group B subjects. Dutta S et al evaluated two type of mini implant (one single threaded and other double threaded) were used for this study, insertion torque and removal torque. 40 patients were selected and two equal (n=20) groups were formed. In first group (group1) single threaded mini-implants were used, in second group (group 2) double threaded mini-implants were used. Torque was compared in both groups. Max. Insertion torque (mit) was found higher than max. Removal torque (mrt) for both the groups and between the groups. Higher values for m.i.t than m.r.t was found in intergroup comparison. They concluded that mini screws are effective for temporary anchorage device. Double threaded mini-implants has more insertion and removal torque, so they have better primary stability.<sup>10</sup>

In the present study, MRT among group A and group B subjects was 1.29 N cm and 1.95 N cm respectively. While analysing statistically, mean MRT was significantly higher among group B subjects. Hong C et al, in another previous study compared the outcome of different orthodontic mini-implants. In their study, four commercially available mini-implants—single-threaded and cylindrical (SC), single-threaded and tapered (ST), double-threaded and cylindrical (DC), double-threaded and tapered (DT)—and a new implant that is designed to engage mostly in cortical bone with shorter and wider dimensions (N1) were inserted. Surface area engaged in cortical bone, however, was the greatest in dimension. The surface area of mini-implants had positive correlation with stability. Among commercial designs, both added tapering and double threading improved stability.<sup>11</sup> In another similar study conducted by Lee Y et al, authors compared the primary stability and long-term clinical success rate of dual-thread and cylindrical orthodontic miniscrews. A total of 145 cylindrical and 135 dual-thread miniscrews were inserted in the maxillary and mandibular buccal alveolar areas of 142 patients. There was no statistically significant difference in the overall clinical success rate between the two designs, with an overall success rate of 82.1% and 84.4% for the cylindrical and dual-thread miniscrews, respectively. Age and screw-root

proximity were significantly associated with failure. The dual-thread miniscrews did not show superior long-term stability and clinical success rate as compared with the cylindrical miniscrews.<sup>12</sup>

## CONCLUSION

Titanium alloy cylindrical double-threaded mini-implants were better in comparison to single-threaded mini-implants. Proper insertion and removal torque are necessary for achieving the primary stability of orthodontic mini-implants.

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