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Original Research

Assessment of orthodontic mini- implant and their primary stability

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ABSTRACT:

Background: The keystone of a successful orthodontic treatment is assuring the proper anchorage. The present study was conducted to assess orthodontic mini- implant and their primary stability.**Materials & Methods:**50 type A anchorage cases with Angles's class 1 bi-maxillary protrusion with anterior crowding (2-3 mm) of both genders were divided into two groups. In group I, single threaded cylindrical mini- implants were used and in group II, double threaded cylindrical mini-implants used. Contra angled hand piece and surgical engine were used for insertion as well as removal of mini- implants. Maximum removal torque (MRT) and maximum insertion torque (MIT) was then measured.**Results:** Group I had 12 males and 13 females and group II had 11 males and 14 females. The mean MRT in group I as 1.24 and in group II was 1.73. The mean MIT in group I was 7.12 and in group II was 8.05. The difference was significant (P< 0.05).**Conclusion:** Mini screws are effective for temporary anchorage device. Double threaded mini- implants has more insertion and removal torque, so they have better primary stability.

Key words: Anchorage,Orthodontic mini screw,maximum insertion torque

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INTRODUCTION

The keystone of a successful orthodontic treatment is assuring the proper anchorage. According to the definition by Proffit et al "anchorage is the prevention of unwanted dental dislocation."[1] Anchorage methods in a traditional orthodontic treatment can be external (headgear) and intraoral (transpalatal arch, lingual arch intermaxillary latex pulling) appliances.[2] Due to the disadvantages (patient cooperation, loss of anchorage, esthetic disadvantages, and overexertion of teeth) of external appliances, among the temporary anchorage devices, mini-screws have become more popular in recent times. The screws of a diameter of 1.4–2.5 mm and 6–12 mm length allow immediate loading thus shortening treatment time.[3] Both their insertion and removal due to lack of osseointegration are simple. In self-tapping mini-screws, a pre-drilling is needed before insertion whereas in self-drilling mini-screws, there is no need for this.[4]

The method which is used to test primary stability are periotest (device to measure initial stability of implants) and resonance frequency analysis.[5]Orthodontic mini screw can be placed either manually or motorized.[6] Manual method is easy and has higher accuracy because of better tactile sensation. Slow speed with low and continuous force is recommended for mini- implant placement as this will keep load on mini-implant and bone less.[7,8] The present study was conducted to assess orthodontic mini- implant and their primary stability.

MATERIALS & METHODS

The present study consisted of 50 type A anchorage cases with Angles's class 1 bi-maxillary protrusion with anterior crowding (2-3 mm) of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. Standard MBT technique with sliding mechanics were used. Between second premolar and first molar region of maxilla all the mini- implants were placed. Patients were divided into two groups. In group I, single threaded cylindrical mini- implants were used and in group II, double threaded cylindrical mini- implants used. Contra angled hand piece and surgical engine

were used for insertion as well as removal of mini-implants. Maximum removal torque (MRT) and maximum insertion torque (MIT) was then measured. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I: Distribution of patients

Groups	Group I	Group II
Method	single threaded cylindrical mini- implants	double threaded cylindrical mini- implants
M:F	12:13	11:14

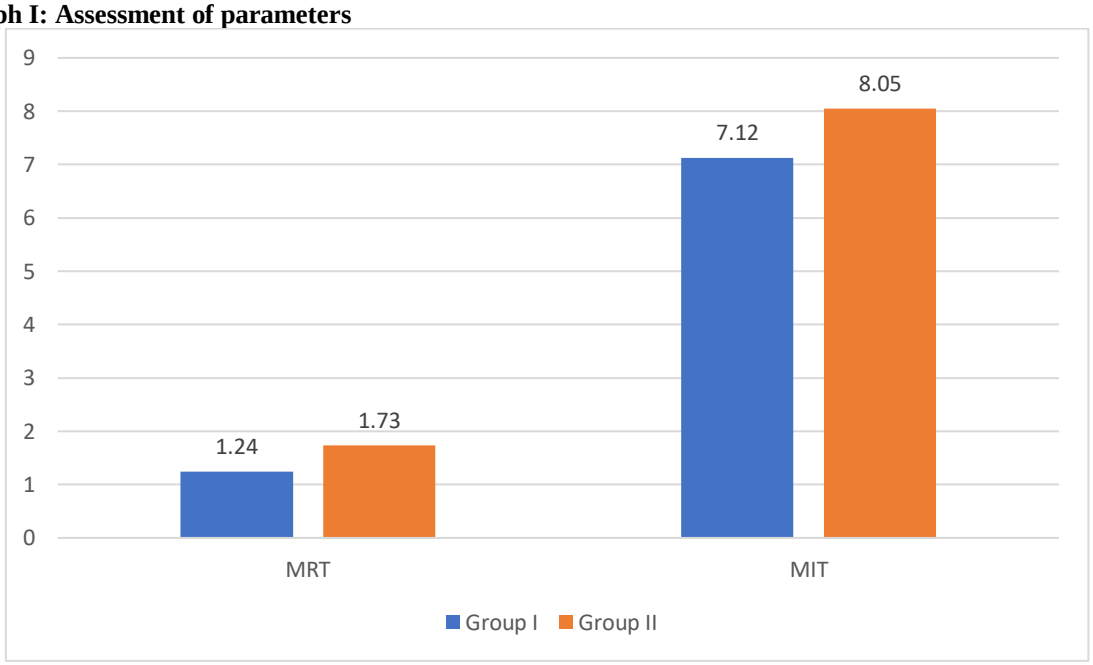
Table I shows that group I had 12 males and 13 females and group II had 11 males and 14 females.

Table II: Assessment of parameters

Parameters	Group I	Group II	P value
MRT	1.24	1.73	0.02
MIT	7.12	8.05	0.01

Table II, graph I shows that mean MRT in group I as 1.24 and in group II was 1.73. The mean MIT in group I was 7.12 and in group II was 8.05. The difference was significant (P< 0.05).

Graph I: Assessment of parameters



DISCUSSION

Anchorage stability is a basic success factor in orthodontic treatment.[9,10] That is why skeletal anchorage is established, especially in complex cases.[11] The clinical advantages of skeletal anchorage over dental and extraoral anchorage are absolute stability and independence from patient compliance. The basic requirement for the success of orthodontic mini- implants is sufficient primary stability.[12] Primary stability basically comes from mechanical interlocking with the cortical bone when the mini-implant is placed. Primary stability is influenced by bone quality and quantity, surgical technique, and screw geometry. Bone of soft quality with <0.5 mm of cortical thickness has been suggested to increase the risk of failure.[13]These implants have mechanical retention and provide short duration anchorage in orthodontics. The small diameter of these screws provides high versatility for placement site. Inter-radicular bone is the most common site for placement.[14]The present study was conducted to assess orthodontic mini- implant and their primary stability.

We found that group I had 12 males and 13 females and group II had 11 males and 14 females. Dutta et al[15] in their study 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. Maximum insertion torque (m.i.t) and removal torque (MRT) were recorded for two groups. 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.

We found that the mean MRT in group I as 1.24 and in group II was 1.73. The mean MIT in group I was 7.12 and in group II was 8.05. Wilmeset al[16]analyzed the

factors influencing primary stability: bone quality, implant-design, diameter, and depth of pilot drilling. Thirty-six pelvic bone segments (ilium) of country pigs were dissected and embedded in resin. To determine the primary stability, we measured the insertion torque of five different mini-implant types 08 and 10 mm, and Dual Top 1.6 x 8 and 10 mm plus 2 x 10 mm). Twenty-five or 30 implants were inserted into each pelvic bone segment following preparation of the implant sites using pilot drill diameters of 1.0, 1.1, 1.2 and 1.3 mm and pilot drill depths of 1, 2, 3, 6 and 10 mm. Five implants were inserted for reference purposes to establish comparability. Thicknesses of bone compacta were measured via micro-computer tomography. Insertion torques of orthodontic mini-implants and therefore primary stability varied greatly, depending on bone quality, implant-design, and preparation of implant site. Compared with the tomas-pin, the Dual Top screw showed significantly greater primary stability. Torque moments beyond 230 Nmm caused fractures of 9 Dual Top screws.

Singh et al[17] in their study Tomas and S.K surgical mini-implants were tested. For this purpose custom fabricated attachment was fabricated to attach the smart peg on orthodontic mini-implant head, and 45 mini-implants were inserted in fresh swine pelvic bone in the density matched sites to that of most common sites where mini-implants are placed in human mandible. Mini-implants of two different lengths with diameter constant were also placed to assess the effect of length on primary stability. The mean ISQ of Group 1 (Tomas 10 mm) was 55.53±3.39 while that of group 2 (S.K Surgical 10mm) was 56.63±3.48 and that of group 3(S.K Surgical 8 mm) was 55.90±3.48. Difference among the groups were not statistically significant when ANOVA test was used (P >0.05).

The limitation the study is small sample size.

CONCLUSION

Authors found 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.

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