ISSN Print: 2394-7489
ISSN Online: 2394-7497
IJADS 2022; 8(2): 642-644

www.oraljournal.com
Received: 31-03-2022
Accepted: 15-05-2022

Dr. Shuvadeep Dutta
PG 3rd Year, Department of Orthodontics and Dentofacial Orthopaedics, IDST, Modinagar, Uttar Pradesh, India

Jan Mohd Bhat
PG 3rd Year, Department of Orthodontics and Dentofacial Orthopaedics, IDST, Modinagar, Uttar Pradesh, India

Corresponding Author:
Dr. Shuvadeep Dutta
PG 3rd Year, Department of Orthodontics and Dentofacial Orthopaedics, IDST, Modinagar, Uttar Pradesh, India

Orthodontic mini implant and their primary stability: A comparative study

Dr. Shuvadeep Dutta and Jan Mohd Bhat

DOI: https://doi.org/10.22271/oral.2022.v8.i2i.1660

Abstract
Background: Mini implants has been widely used now a days as anchorage for achieving best orthodontic outcome. Good primary stability of mini implants is key for their success. Two type of mini implant (one single threaded and other double threaded) were used for this study, insertion torque and removal torque was evaluated.
Material and Method: 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 (m.r.t) were recorded for two groups. Statistical analysis was done.
Results: Torque was compared in both group. 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.
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.

Keywords: Mini implants, anchorage, torque

Introduction
For a successful orthodontic treatment we need a stable anchorage [1-3]. With the introduction of mini screws it has been great help in achieving skeletal anchorage. When compared with classic dental implants, mini screws plate has many advantage i.e low price, easy application, less anatomical limitations and we can use immediately after implant placement [4-6]. Achieving good primary stability is required for anchorage in orthodontic treatment and in this type of anchorage device it is done by mechanical bond between bone and mini implant [7]. Osseointegration through bone remodeling is responsible for secondary stability of orthodontic mini-implants.
The method which is used to test primary stability are periotest (device to measure initial stability of implants) and resonance frequency analysis. Orthodontic mini screw can be placed either manually or motorized. Manual method is easy and has higher accuracy because of better tactile sensation [8]. Slow speed with low and continuous force is recommended for mini implant placement as this will keep load on mini implant and bone less [9].
We the frequent use of mini-implants, these days many brands are now available. Various implant designs are available and there is need to compare primary stability of mini implant of different manufacturers. There are fewer studies which compared primary stability of different implant design. Two different types of mini-implants were used and there primary stability was compared in this study using torque test.

Material and Methods
This present clinical trial was performed at institute of dental studies and technologies Modinagar UP. Patients in between age 19-28, with sound mental and physical health who reported in department were used in this study. A total of 45 patients were selected for study, 5 patient refused to participate. Out of these 22 female and 18 male patient participated. Patients with average growth pattern pattern (Frankfrt-Mandibular plane angle of 24°-30°) were selected.

Type A anchorage cases with Angles's Class 1 bi-max protrusion with anterior crowding (2-3 mm) were selected. Patients with systemic disease like diabetes mellitus and bone disease like arthritis were excluded from study. The informed consent was taken from all the patients.

In all the participants' standard MBT technique with sliding mechanics were used. Implant guide were used for implant placement. Between second premolar and first molar region of maxilla all the mini implants were placed in every patients. Two groups with equal number of patient (n=20) were made. In first (group1) single threaded cylindrical mini implants were used and in second group (group2) double threaded cylindrical mini implants used. Contra angled hand piece and surgical engine were used for insertion as well as removal of mini implants. Speed of 30rpm was used. Maximum removal torque (m.r.t) and maximum insertion torque (m.i.t) was then measured. After surgery amoxicillin + clavullanic acid was prescribed for 3 days and 2% chlorhexidine mouth wash for 5 days.

All data were collected and statistically analyzed using one-way ANOVA (analysis of variance).In one-way analysis of variance $p<0.05$ was taken as statistically significant. Standard deviation and means were reported.

Result

Calculation of maximum insertion torque (m.i.t) was done in N cm for both groups individually. Statistically significant difference between the groups was found on comparing m.i.t for both the groups (Table 1).When statistical calculation was done we found that m.r.t value for double threaded cylindrical mini screw (Group 2) was higher as compared to group1 with mean vale and standard deviation (Table 2). When m.i.t and m.r.t of group1 mini implants were compared we found m.i.t statistical value significantly higher with mean and standard deviation (Table 3).Comparison of intragroup of group2 showed a statistical significant difference between m.i.t and m.r.t (Table 4).In intergroup comparison m.i.t value was significantly higher than m.r.t for both the groups, statistical significant difference value was showed between the groups (Table 5).

Table 1: Maximum insertion torque comparison in intergroup using one-way analysis of variance

Groups	*n*	mean	SD	SER	*P*
Group 1	20	7.2222	1.5551	0.3665	0.000642
Group 2	20	8.7222	0.6691	0.1577	

Table 2: Maximum removal torque comparison in intergroup using one-way analysis of variance

Groups	*n*	mean	SD	SER	*P*
Group 1	20	1.2222	0.4278	0.1008	0.000436
Group 2	20	1.7778	0.4278	0.1008	

Table 3: Maximum insertion torque and maximum removal torque comparison in intragroup using one-way analysis of variance for group1

Groups	*n*	mean	SD	SER	*P*
Group 1	20	7.2222	1.5551	0.3665	<0.00001
Group 2	20	1.2222	0.4278	0.1008	

Table 4: Maximum insertion torque and maximum removal torque comparison in intragroup using one-way analysis of variance for group 2

Groups	*n*	mean	SD	SER	*P*
Group 1	20	8.7222	0.6691	0.1577	<0.00001
Group 2	20	1.7778	0.4278	0.1008	

Table 5: Maximum insertion torque and maximum removal torque comparison in intergroup

Groups	*n*	mean	SD	SER	*P*
Group 1	20	7.2222	1.5551	0.3665	0.000642
Group 2	20	8.7222	0.6691	0.1577	

SD: Standard deviation, SER: Standard error of the regression, m.i.t: Maximum insertion torque, m.r.t: Maximum removal torque

Discussion

Torque plays an important role in proper insertion and removal of orthodontic mini implant. Mini impant design, characteristics, placement condition and insertion site are key factors in attaining implant stability [8]. Insertion torque and quality of bone are few indirect measures for implant stability [10] compromised implant stability can also result from inordinately low and high torque [11]. Various authors have recommended 5-10 ncm values of m.i.t for implant success [12]. For self-tapering mandibular mini implants mean value of MIT as 13.28 Ncm with a standard deviation of 0.34 was suggested in a systemic review [13]. Length of implant and thickness of cortical bone are related to insertion torque positively [14], in contrast, it negatively for predrilling diameter [6]. Large implant diameter, high thread angle, thicker cortical bone are factors that predicate higher value of m.i.t *in vitro* with a value of 24.7%, 12.3%, and 10.7%, respectively [15]. m.i.t values, pull out values were not affected by bone density, for a cortical bone thickness of 1 mm in an *in vitro* study [16]. Above results were same with the present study.

Insertion torque should be kept high in case of immediate implant loading. Delayed implant loading (6-8 week) should be done in less insertion torque. Immediate loading is survived well with implants with minimum insertion torque value of 15Ncm [18]. Survival time of implant was sufficient even in case of longer treatment duration [19].

Conclusion

Many factors influence success of implant it includes proper selection of implant length, insertion site, diameter, tapering. The assessment of adequate insertion is done by primary stability, proper loading, lack of inflammation at implant placement site, absence of mobility, predrilling angle, insertion site and no injury. However for primary stability of orthodontic mini implants proper insertion and removal torque are necessary. For a definite conclusion study with more patients, different design of mini screws, extended monitoring period is required.

Conflicts of interest

There are no conflicts of interest.

References

1. Crismani AG, Bertl MH, Celar AG, Bantleon HP, Burstone CJ. Miniscrews in orthodontic treatment review and analysis of published clinical trials. Am J Orthod Dentofac Orthop. 2010;137:108-113.
2. Hong C, Troung P, Song HN, Wu BM, Moon W. Mechanical Stability of Novel Orthodontic Mini-Implant Designs: Part 2. Angle Orthod. 2011;81:1001-1009.
3. Redzepagic VL, Mesi E, Pervan N, Hadziabdic V, Delic M, Glusac M. Impact of Implant Design and Bone Properties on the Primary Stability of Orthodontic Mini-Implants. Appl Sci. 2021;11:1180-83.
4. Lee YK, Kim JW, Baek SH, Kim TW, Chang YI. Root and Bone Response to the Proximity of a Mini-Implant under Orthodontic Loading. Angle Orthod. 2010;80:452-458.
5. Petrey JS, Saunders MM, Kluemper GT, Cunningham LL, Beeman CS. Temporary anchorage device insertion

variables: Effects on retention. Angle Orthod. 2010;80:634-641.
6. Pittman JW, Navalgund A, Byun SH, Huang H, Kim AH, Kim DG. Primary Migration of a Mini-Implant under a Functional Orthodontic Loading. Clin Oral Investig. 2014;18:721-728.
7. Wilmes B, Ottenstreurer S, Su YY, Drescher D. Impact of Implant Design on Primary Stability of Orthodontic Mini-implants. J Orafac Orthop. 2008;69:42-50.
8. Ueda M, Matsuki M, Jacobsson M, Tjellstrom A. Relationship between insertion torque and removal torque analyzed in fresh temporal bone. Int J Oral Maxillofac Implants. 1991;6:442-7.
9. Motoyoshi M, Uemura M, Ono A, Okazaki K, Shigeeda T, Shimizu N. Factors affecting the long-term stability of orthodontic mini-implants. Am J Orthod Dentofac Orthop. 2010;137:588-595.
10. Motoyoshi M. Clinical indices for orthodontic mini-implants. J Oral Sci. 2011;53:407-12.
11. Meursinge RA, Ronchi L, Ladu L, Jamaludin VF, Bipat S. Insertion torque and success of orthodontic mini-implants: A systematic review. Am J Orthod Dentofac Orthop. 2012;142:596-614.
12. Cunha AC, Veiga AM, Masterson D, Mattos CT, Nojima LI, Nojima MC. How do geometry-related parameters influence the clinical performance of orthodontic mini-implants? A systematic review and meta-analysis. Int. J Oral Maxillofac Surg. 2017;46:1539-51.
13. Pithon MM, Figueiredo DS, Oliveira DD. Mechanical evaluation of orthodontic mini-implants of different lengths. J Oral Maxillofac Surg. 2013;71:479-86.
14. Katic V, Kamenar E, Blazevic D, Spalj S. Geometrical design characteristics of orthodontic mini-implants predicting maximum insertion torque. Korean J Orthod. 2014;44:177-83.
15. Marquezan M, Souza MM, Araujo MT, Nojima LI, Nojima MC. Is miniscrew primary stability influenced by bone density? A systematic review. Braz Oral Res. 2011;25:427-32.
16. Meursinge RR, Ladu L, Ronchi L, Girolamo GN, Lange J, Roberts N. Insertion torque recordings for the diagnosis of contact between orthodontic mini-implants and dental roots: A systematic review. J Orthod. 2016;5:50-55.
17. Lee SJ, Ahn SJ, Lee JW, Kim SH, Kim TW. Survival analysis of orthodontic mini-implants. Am J Orthod Dentofac Orthop. 2010;137:194-9.
18. Cunha AC, Veiga AM, Masterson D, Mattos CT, Nojima LI, Nojima MC. How do geometry-related parameters influence the clinical performance of orthodontic mini-implants? A systematic review and meta-analysis. Int J Oral Maxillofac Surg. 2017;46:1539-51.
19. Pithon MM, Nojima MG, Nojima LI. *In vitro* evaluation of insertion and removal torques of orthodontic mini-implants. Int J Oral Maxillofac Surg. 2011;40:80-5.