EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 6
Issue: 2
226-228
Year: 2019

MINI-IMPLANTS IN ORTHODONTICS- A REVIEW

Kapil Kamalkishor Fafat*, Pawankumar Dnyandeo Tekale, Vitam Kapil Fafat

Senior Lecturer, Department of Orthodontics, Dr Rajesh Ramdasji Kambe Dental College and Hospital, Akola, Maharashtra, India.

***Corresponding Author: Kapil Kamalkishor Fafat**
Senior Lecturer, Department of Orthodontics, Dr Rajesh Ramdasji Kambe Dental College and Hospital, Akola, Maharashtra, India.

Article Received on 11/12/2018 **Article Revised on 01/01/2019** **Article Accepted on 22/01/2019**

ABSTRACT
Orthodontic micro implants play an integral role in providing anchorage for orthodontic tooth movement. The success of implant depends on the device, area of placement, and patient. This article gives an overview of the possible complications and management of implants used in orthodontics.

INTRODUCTION

Although the principle of orthodontic anchorage has been implicitly understood since the 17th century,[1] it does not appear to have been clearly articulated until 1923 when Louis Ottofy[2] defined it as "the base against which orthodontic force or reaction of orthodontic force is applied." Most recently, Daskalogiannakis[3] defined anchorage as "resistance to unwanted tooth movement." It can also be defined as the amount of allowed movement of the reactive unit. As the conventional methods do not provide reliable anchorage without patient compliance and anchor loss using skeletal anchorage such as osseous dental implants, miniplates,[4] microscrews,[5],[6] or microscrews,[7],[8],[9],[10] the clinician can expect reliable anchorage without patient compliance. Among these anchorage devices, microscrew implants have been increasingly used in orthodontic anchorage because of their absolute anchorage, low cost, easy placement, and removal.

LOCATION AND INSERTION

These devices may be inserted into alveolar bone and extra-alveolar bone in the maxilla or mandible. In the mandible, the majority are placed into inter-radicular bone, with the cortical bone increasing in thickness as it moves from the midline posteriorly. The thickest cortical bone, as determined by cone beam computed tomography studies, is located approximately 6 mm apical to the alveolar bone crest.[11] Other areas in the mandible utilized for placement of TADs include (but are not limited to) the mandibular symphysis, anterior external oblique ridge and retromolar area of the alveolar crest.[12]

In the maxilla, alveolar bone is generally adequate for placement, with bone levels thinnest in the maxillary anterior region and increasing in thickness toward the posterior of the arch. However, bone thins in the maxillary posterior alveolus at 4 mm from the alveolar bone crest, as opposed to bone measured from the alveolar crest at 2 mm and 6 mm apically. One extra-alveolar site that has gained popularity among clinicians due to increased bone thickness is the palate, with the thickest bone located antero-posteriorly at the region of the maxillary bicuspids and parasagitally from 2 to 8 mm from the midline of the palate.[13] Other extra-alveolar sites in the maxilla include the infrazygomatic ridge, incisive fossa and canine fossa.[12]

As noted, the majority of TADs on the market do not require a pilot hole unless placing a large-diameter (e.g., 2 mm) device into dense bone. Although TADs may be placed into the attached gingiva (preferred, if possible) or mucosa, if the mucosa is mobile, the TAD will often eventually be covered by soft tissue, making alteration of orthodontic treatment mechanics difficult without surgically uncovering the screw head.[14] A transmucosal bar has been developed by Costa, Pasta and Bergamaschi to address this issue.[15]

There is controversy among practitioners who place TADs as to which angle of insertion provides the greatest stability. Some operators and researchers believe that all TADs should be inserted perpendicular to the cortical plate.[16–18] Others feel that a more oblique angle of insertion is preferable, as it slightly increases thread contact with the cortical bone.[17] This contact — defined as primary stability — is chiefly responsible for stability of the miniscrew, as they are not designed to osseointegrate.[18] Regardless of the insertion angle, the surrounding bone must be healthy and uncompromised to withstand the force generated through the screws.

The use of anesthesia in TAD procedures is also controversial. Some practitioners believe that 20% benzocaine or compounded "super-topicals" provide

adequate anesthesia for placement.[19] Others assert that local anesthesia is more appropriate. Local agents can be administered via conventional needle injection or via a needleless device. The argument for using topicals only is the patient can feel if the screw contacts a root. However, the operator will also feel a change in resistance to insertion. Lamberton et al[20] report that patients perceive less discomfort when local anesthesia is utilized for TADs placement in the buccal cortical plates. Anesthesia with topicals is also difficult on the palate, where areas of palatal mucosa can reach significant thickness.

The devices are inserted through the attached gingiva or mucosa, using a manual driver or, in some cases, a reduction handpiece. Recommended torque force, which can be measured with the handpiece, is in the range of 15 to 20 N/cm.[21] The miniscrew is inserted up to the mucosal collar and checked for primary stability (i.e., tightness of the insertion). Most operators load the TAD immediately with an orthodontic force, although some applications require an impression and a model with an analogue for the TAD that is sent to a laboratory for fabrication of a TAD-supported appliance.

Although various articles report TAD success and failure data, success rates vary according to any number of factors — including bone health and thickness, mucosal insertion versus insertion through attached gingiva, immediate versus delayed loading and total loading. According to Antoszewska et al,[22] success rates are reported to range between 75% and 94% in the literature.

METHOD of placement

There are two methods of placement of mini-implants.:

1. Self-tapping method: In this method, the miniscrew is driven into the tunnel of bone formed by drilling, making it tap during implant driving. This method is used when we use small diameter miniscrews.
2. Self-drilling method: Here, the miniscrew is driven directly into bone without drilling. This method can be used when we want to use larger diameter (more than 1.5 mm) miniscrews.

Problems associated

- A screw can fracture if it is too narrow or the neck area is not strong enough to withstand the stress of removal.
- Infection can develop around the screw if the transmucosal portion is not entirely smooth.
- Application of excessive pressure during inser-tion of a self-drilling screw can lead to fracture.
- Overtightening a screw can loosen it.
- Loosening can occur, even after primary sta-bility has been achieved, if a screw is inserted in an area with considerable hone remodeling because of either the resorption of a deciduous tooth or post-extraction healing.
- Mini-implants arc contraindicated in patients with systemic alterations fit the bone metabolism due to disease, medication, or heavy smoking.

CONCLUSION

This article was intended to highlight the use of mini implant as temporary anchorage devices. In my opinion, skeletal anchorage is clearly not a replacement for other proven anchorage systems. Skeletal anchorage should serve merely to expand the orthodontic services we can offer our patients Further research and studies are needed to shed additional light on process involved in skeletal anchorage so that failures can be reduced even further.

REFERENCES

1. Creekmore TD, Eklund MK. The possibility of skeletal anchorage. J Clin Orthod. 1983; 17: 266–9. [PubMed]
2. Ottofy L. Chicago: Laird and Lee, Inc; 1923. Standard Dental Dictionary.
3. Daskalogiannakis J. Leipzig: Quintessence Publishing Co; 2000. Glossary of Orthodontic Terms.
4. Umemori M, Sugawara J, Mitani H, Nagasaka H, Kawamura H. Skeletal anchorage system for open-bite correction. Am J Orthod Dentofacial Orthop 1999; 115: 166-74.
5. Creekmore TD, Eklund MK. The possibility of skeletal anchorage. J Clin Orthod 1983; 17: 266-9.
6. Costa A, Raffani M, Melsen B. Miniscrews as orthodontic anchorage: A preliminary report. Int J Adult Orthodon Orthognath Surg 1998; 13: 201-9.
7. Kanomi R. Mini-implant for orthodontic anchorage. J Clin Orthod 1997; 31: 763-7.
8. Park HS. The skeletal cortical anchorage using titanium micro-screw implants. Korean J Orthod 1999; 29: 699-706.
9. Park HS. The use of micro-implant as orthodontic anchorage. Seoul, Korea: Narae; 2001.
10. Park HS, Kwon TG, Sung JH. None extraction treatment with microscrew implants. Angle Orthod 2004; 74: 539-49.
11. Baumgaertal S, Hans MG. Buccal cortical bone thickness for mini-implant placement. Am J Orthod Dentofacial Orthop. 2009; 136: 230–235.
12. Papadopoulos MA, Tarawneh F. The use of miniscrew implants for temporary skeletal anchorage in orthdontics: A comprehensive review. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2007; 103: e6–e15.
13. Baumgaertel S. Cortical bone thickness and bone depth of the posterior palatal alveolar process for mini-implant placement in adults. Am J Orthod Dentofacial Orthop. 2011; 140: 806–811.
14. Park HS, Jeong SH, Kwon OW. Factors affecting the clinical success of screw implants used as orthodontic anchorage. Am J Orthod Dentofacial Orthop. 2006; 130: 18–25.

15. Costa A, Pasta G, Bergamaschi. Intraoral hard and soft tissue depths for temporary anchorage devices. Semin Orthod. 2005; 11: 10–15.
16. Petrey JS, Saunders MM, Kluemper GT, Cunningham LL, Beeman CS. Temporary anchorage device insertion variables: effects on retention. Angle Orthod. 2010; 80: 634–641.
17. Lee J, Kim JK, Choi YJ, Kim KH, Chung CJ. Effects of placement angle and direction of orthopedic force application on the stability of orthodontic miniscrews. Angle Orthod. 2013; 83: 667–673.
18. Noble J, Karaiskos NE, Hassard TH, Hechter FJ, Wiltshire WA. Stress on bone from placement and removal of orthodontic miniscrews at different angulations. J Clin Orthod. 2009; 43: 332–334.
19. Deguchi T, Nasu M, Murakami K, Yabuuchi T, Kamioka H, Takano-Yamamoto T. Quantitative evaluation of cortical bone thickness with computed tomographic scanning for orthodontic implants. Am J Orthod Dentofacial Orthop. 2006; 129: e7–e12.
20. Migliorate M, Signori A, Silvestrini-Biavati A. Temporary anchorage device stability: an evaluation of thread shape factor. Eur J Orthod. 2012; 34: 582–586.
21. Reznik DS, Jeske AH, Chen JW, English J. Comparative efficacy of 2 topical anesthetics for the placement of orthodontic temporary anchorage devices. Anesth Prog. 2009; 56: 81–85.
22. Lamberton JA, Oesterle LJ, Shellhart WC, et al. Comparison of pain perception during miniscrew placement in orthodontic patients with a visual analog scale survey between compound topical and needle-injected anesthetics: A crossover, prospective, randomized clinical trial. Am J Orthod Dentofacial Orthop. 2016; 149: 15–23.
23. Anka G. Use of miniscrews as temporary anchorage devices in orthodontic practice: I–Introduction. Aust Orthod J. 2006; 22: 131–139.