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Wilckodontics - Is it the future of Surgical Orthodontics

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Abstract

The clinical method known as Wilckodontics, also known as periodontally accelerated osteogenic orthodontics (PAOO), combines corticotomy (a surgical technique in which the bone is sliced, punctured, or mechanically altered), particulate bone grafting, and the application of orthodontic force. By harnessing and boosting the bone's intrinsic potential and applying tissue engineering concepts, this method allows the teeth to migrate through the bone quickly. When the tooth movement is finished, the surrounding bone regenerates, cutting the length of orthodontic therapy from years to months. The purpose of this article is to provide a thorough analysis of PAOO or Wilckodontics.

Keywords: Alveolar corticotomies, Accelerated orthodontics, Orthodontic tooth movement, Wilcko dontics

Introduction

According to Carranza's Clinical Periodontology, 9th Edition, the periodontium is made up of the alveolar bone, cementum, gingiva, and periodontal ligament, which act as the tooth's investing and supporting tissues. The supporting bone encircles the alveolar wall, forming an anatomical unit. The buccal and lingual cortical plates as well as the septa form the supporting bone. The interaction between the teeth and the tissues that support them after the eruption stage is dynamic because the teeth naturally move within the alveolar process. This suggests adaptive mechanisms that protect the periodontal ligament, a source of progenitor cells that regenerate tissues, and the anchoring to bone (Jean-Louis Saffar, 1997). Increased alveolar bone metabolism and bone turnover rate affect orthodontic tooth movement, which affects both the quantity and quality of movement. [1,6]

The term Wilckodontics, also known as periodontally accelerated osteogenic orthodontics (PAOO), refers to a traditional partnership between the fields of orthodontics and periodontics in which the movement of teeth can be synchronized through tissue engineering with periodontal regeneration surgery. The advantages of Wilckodontics are fast movement of the teeth through the bone, decrease discomfort brought on by appliances, enhance stability by establishing a distinctive local

osseous phenotype. This method allows teeth to travel two to three times farther in a fraction of the time needed by conventional orthodontic therapy. [2,7,3,8,9]

In 1931, Bichlmayr used a surgical procedure to provide the first instance of rapid orthodontics for the treatment of severe maxillary protrusion. For the retraction of the anterior teeth, he cut wedges out of the bone. This corticotomy for gap closure and crossbite repair was developed by Kole in 1959. Using Frost's prior theory of the regional acceleratory phenomenon (RAP), Wilcko and Wilcko developed it in 2001 and demonstrated the temporary demineralization-remineralization process of periodontally accelerated osteogenic orthodontics (PAOO). [Table -1] [4,10,11,12]

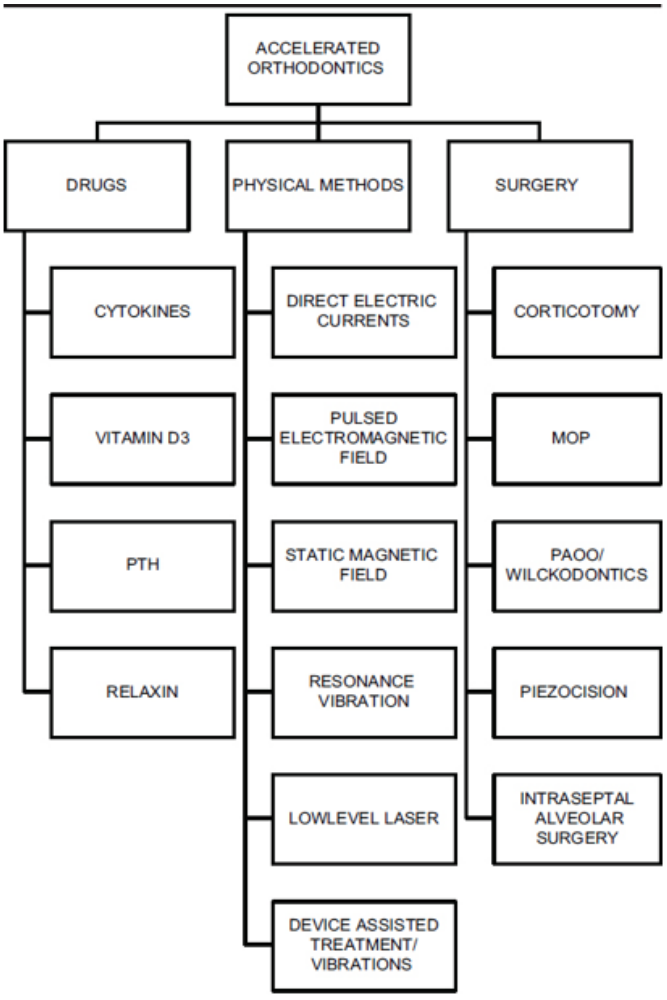

Table 1: Methods of accelerated orthodontics.[4]

Historical Background

Since the first century, the first surgically aided orthodontic tooth movement has been recorded. First described by L.C. Bryan in 1893, corticotomy facilitated tooth movement. However, Heinrich Kole devised a more gruesome method in 1959 as a means for quick tooth movement. This method involves osteotomy cuts 10 mm supra-apically that are linked with vertical inter-radicular corticotomies both facially and lingually. His theory states that teeth are shifted through the use of orthodontic stresses on bony blocks of bone. The segments of bone in which teeth are lodged could move quickly and independently of one another due to the restriction to bone continuity caused by corticotomy. Compared to the normal adult orthodontic treatment time, which ranges from 18.7 to 31 months, major active tooth movement can be achieved in 6-12 weeks.

In a 1975 study, Duker et al. used beagle dogs to demonstrate that, after corticotomy, the bone to weaken it, orthodontic tools could move teeth quickly. The vitality of the moving teeth is unaffected by the rapid tooth movement. Avoiding corticotomy of the marginal bone helps to maintain the periodontium's health.

Periodontally accelerated osteogenic orthodontics (PAOO), which combines the selective decortication-facilitated orthodontics technique and alveolar augmentation, was recently proposed in 2008 by Wilcko et al. By employing bone grafts made of demineralized material, this procedure reduces the length of time needed for treatment to a third of that required for conventional orthodontic therapy, increasing the net alveolar volume following orthodontic treatment.

The main drawbacks of conventional orthodontic management include the need for extractions in most cases, the possibility of relapse without the use of retainers, the risk of endangering periodontal health

owing to excessive force, and the need for extended treatment times, particularly for adults. [5,19,13,20,21,22,23]

Principle of Periodontally Accelerated Osteogenic Orthodontics (PAOO)

The five steps of the surgical procedure for PAOO include flap lifting, decortication, particle grafting, closure, and application of orthodontic force. Any surgical technique needs a good flap design to be successful. In PAOO, the flap should provide for adequate access to the alveolar bone, which is where corticotomies will be carried out. The cortical section of the alveolar bone is removed during decortication. However, it should not result in movable bone segments; rather, it should be just enough to start the RAP reaction. Interproximal Ly made vertical cortical scarring incisions that reach far past the tooth apices are used. At 10 mm above the apex of the anterior teeth, a sub apical horizontal osteotomy is performed, piercing the buccal and lingual cortical plates as well as the post medullary bone. This joins vertical incisions to enable the "Bony Block concept," which shortens the length of the therapy (6-12 weeks). It is commonly known that in order to move the tooth-bone block following corticotomy, stronger forces must be used. Although distraction osteogenesis is analogous to the dynamic microenvironment created by bone block movement following osteotomy, medullary bone does not exhibit regional demineralization (Anholm et al., 1986). After decortication, it was believed that rapid tooth movement was caused by the movement of bony blocks of bone. Heinrich Kole reported this in 1959. Wilcko et al. reported in 2001 that regional acceleratory phenomenon, a common healing process, was responsible for the demineralization and remineralization of the alveolar bone around the tooth. This rapid tooth movement was not caused by the movement of bony blocks (RAP). [2,5,13,14]

Regional Acceleratory Phenomenon (RAP)

Frost and Jee created the regional acceleratory phenomenon in 1983. An increase in alveolar spongiosa turnover and patches of alveolar demineralization are effects of decortication of bone. This causes osteopenia, where the mineral concentration momentarily drops, and allowing teeth to migrate through the collagenous soft tissue matrix of the bone more quickly and farther. Remineralization takes place after orthodontic treatment is finished, increasing the stability of the treatment's outcome. [5,15,16,17,18]

Indications

- Resolve crowding and shorten treatment time.
- Accelerate canine retraction following extraction of the premolars.
- Improve stability after orthodontic treatment.
- Aide in the emergence of impacted teeth.
- Encourage gradual orthodontic growth.
- Correction of molar intrusion and open bite.[5]

Contraindications

- Those who suffer from severe active periodontal disease.
- Patients with endodontic issues who have not received proper care.
- Patients on NSAIDs and bisphosphonate, two long-term medicines that impair bone metabolism. Prostaglandin inhibition brought on by NSAIDs decreases osteoclastic activity, which disturbs bone remodelling.
- Patients who have devitalized regions of bone are receiving long-term steroid therapy.
- Patients whose attached gingiva's breadth is compromised.[5]

Surgical Method

It is essential for the treatment to be successful to choose the right patients. A week prior to the surgery, orthodontic brackets are put in place and a light wire is engaged after the orthodontist and periodontist have discussed the treatment plan. Surgery can be performed under Anesthesia or not. [5,24]

Flap Design

The goals of flap design are to maintain the height and volume of the interdental tissues, to give access to the alveolar bone for corticotomies, to cover the bone graft, and to improve the aesthetics of the gingival form. Following the injection of local anaesthetic, lingual and labial incisions are done to release the sulci. A split thickness flap is properly reflected at the apices of the teeth to allow mobility of the flap and enable suturing with the least amount of stress. Full-thickness flaps are carefully reflected labially and lingually in the coronal aspect of the flap.

To avoid harming these structures, it is crucial to correctly identify the neurovascular structures. To avoid vertical releasing incisions, the flaps should extend mesially and distally beyond the corticotomy sites. The flap can be used to mirror the interdental papilla or it can be left in place. However, for aesthetic reasons, the interdental papilla between the maxillary central incisors is left in place. After flap reflection, the area is completely debrided, and if any inflammatory tissue is found, curettage is performed to remove it. [5,17,20]

Decortication

An operation known as a corticotomy involves simply the cortical bone being cut, punctured, or mechanically changed. Decortication should not result in the formation of bone segments; it should only trigger the RAP response. Using spherical burs and water irrigation, specific decortications are carried out lingually and labially to activate the alveolar bone. Piezoelectric knives can also be used to perform corticotomies. Between the roots of teeth, vertical corticotomy incisions are performed just short of the alveolar crest. The corticotomy spans a distance of 2 mm beyond the apices of the roots to a position 2-3 mm below the bone's crest. Scalloped horizontal corticotomy cuts link these incisions. To enhance the blood flow to the graft material, cortical holes are made in certain locations. [5,14,25,26,27]

Particulate Grafting

Decorticated regions are used to insert bone transplant materials. Deproteinized bovine bone, autogenous bone, decalcified freeze-dried bone allograft, or a mix of these materials, are the most often employed materials. The use of a mixture of demineralized freeze-dried bone, bovine bone, and clindamycin was first reported by Wilcko et al. To make the implantation of the graft easier and to improve the durability of the graft material, the particulate bone graft can also be moistened with plate-rich plasma. Per tooth, 0.25 to 0.5 ml of particulate bone graft are employed. To avoid obstructing flap insertion, excess grafting material should be avoided. Any recession situations can be treated with a connective tissue transplant or acellular dermal matrix allograft (Alloderm). [5,19,24,27]

Closure

With minimal tension, non-resorbable interrupted sutures are used to approximate the flaps. The particular suture employed depends on the tissues' thickness. After that, the sutures are kept in place for at least two weeks. It's crucial to let the sutures stay in place for long enough for the epithelial connection to re-establish itself. Gingival recession, flap displacement, and dark triangles can all be effects of premature suture removal. Nothing needs to be packed. [5,24,27]

Orthodontic Treatment

Following flap relocation, the teeth should immediately be subjected to a strong orthodontic force. As there is a short window of opportunity to achieve faster tooth movement, the start of orthodontic force should not be postponed for longer than two weeks.[5]

Post-Surgical Management

The patient should be given prescriptions for antibiotics, analgesics, and antibacterial mouthwash. Nonsteroidal anti-inflammatory drug use over an extended period of time is not advised since it may hinder the regional acceleratory process. Ice packs can be used in the afflicted areas to reduce any postoperative swelling. During orthodontic treatment, the patient should have a follow-up appointment with the periodontist every three months to have their periodontal health and oral hygiene status evaluated. [5,27,28]

Conclusion

Adult orthodontics is now possible thanks to the Wilckodontics technique. Because of the Regional Acceleratory Phenomenon, the therapy can be completed in a shorter amount of time (RAP). By using this method, root resorption and periodontal dehiscence—two side effects of traditional orthodontic treatment—are avoided. When compared to traditional orthodontic treatment, this method also exhibits higher alveolar thickness because bone grafts were used, superior post orthodontic stability, and a lower rate of root resorption. Wilckodontics is a relatively new operation, hence long-term follow-up studies with larger sample sizes are needed to further certify this technique as a surgical orthodontics technique.

References

1. Wilckodontics - A Novel Synergy in Time to Save Time - Sirisha K.,1 Srinivas M.,2 Ravindranath D.,3 and Pratap Gowd4 - J Clin Diagn Res. 2014 Jan; 8 (1): 322–325. Published online 2014 Jan 12. doi: 10. 7860/ JCDR/ 2014/ 7576. 3978 PMCID: PMC 393 9575 PMID: 245 96806

2. Wilckodontics- a novel procedure for rapid orthodontics! - 1, *Dr. Grishmi Nis wade and 2Dr. Deepti Gattani International Journal of Information Research and Review Vol. 04, Issue, 01, pp.3586-3588, January, 2017 Wilcko dontics: The Periodontal Orthodontics - RI Tunja Singh, Shilpa Chourasia, Palak Sharma, Soumya Gupta, Gangesh B. Singh, Ankita Srivastava - CC BY-NC-ND 4.0 · Dental Journal of Advance Studies 2018; 6 (02/03): 053-056 DOI: 10. 1055/ s-0038-1677628

3. Fast track tooth movement: An amalgamation of periodontics and orthodontics - Aanchal Agrawal**,** Gaurav Gaur**,** Lokendra Singh Dagur**,** Upendra Singh Bhadauria**,** Karan Seth**,** Siddha raj Parmar - DOI: 10. 4103/ sidj. sidj_2_20

4. Role of Periodontal Therapy in Rapid Tooth Movement - Pan Chern Hwei 1, Dr. Julie Toby Thomas 2 - IOSR Journal of Dental and Medical Sciences (IOSR -JDMS) e-ISSN: 2279 - 0853, p-ISSN: 2279-0861. Volume 13, Issue 2 Ver. II. (Feb. 2014), PP 62-65 www.iosrjournals.org

5. Verna C, Dalstra M, Melsen B. The rate and the type of orthodontic tooth movement is influenced by bone turnover in a rat model. Eur J Orthod. 2000; 22:343–52. [PubMed] [Google Scholar]

6. Casko, J., Vaden, J., Kokich, V. 1998. American Board of Orthodontics objective grading system for dental casts and panoramic radio graphs. Am J Orthod Dentofacial Orthop., 114: 589-99.

7. K. S, M. S, D. R, Gowd P. Wilckodontics—a novel synergy in time to save time. J Clin Diagn Res 2014; 8 (01) 322-325

8. Murphy CN. In vivo tissue engineering for orthodontists: a modest first step. In: Davidov itch Z, Mah J, Suthanarak S. eds. Biological Mechanism of Tooth Eruption, Resorption and Movement. Boston, MA: Harvard Society for the Advancement of Ortho dontics; 2006: 385-410

9. Bichlmayr A. Surgical orthodontics and the behaviour of the bone and the tips of the sausage after it. Dtsch Zahnaerztl Wschr 1931; 34:835-42.

10. Wilcko W, Wilcko MT. Accelerating tooth movement: The case for corticotomy-induced orthodontics. Am J Orthod Dentofacial Orthop 2013; 144:4-12

11. Frost HM. The regional acceleratory phenomenon: A review. Henry Ford Hosp Med J 1983; 31:3-9.

12. H. Kole. Surgical operations on the Alveolar Ridge to Correct Occlusal Abnormalities. Oral Surg Oral Med Oral Path, 12(5), 1959, 515-529.

13. W.M. Wilcko, M.T. Wilcko and J.E. Bouquet. Rapid orthodontics with alveolar reshaping: two case reports of DE crowding. Int J Periodontics Restorative Dent, 21(1), 2001, 9-19.

14. H.M. Frost. The regional acceleratory phenomenon: a review. Henry Ford Hosp Med J, 31(1), 1983, 3-9.

15. J.D. Sebaoun, A. Kantarci, J.W. Turner and R.S. Carvalho, T.E. Van Dyke, D.J. Ferguson. Modeming of trabecular bone and lamina dura following selective alveolar decortication in rats. J Periodontol 79(9), 2008, 1679-1688.

16. D.J. Ferguson, W.M. Wilcko and M.T. Wilcko. Selective alveolar decortication for rapid surgical-orthodontic resolution of skeletal malocclusion treatment. Distraction osteogenesis of the facial skeleton. (Italy, pmph USA, 2006) 199-203.

17. M.S. Shih and R.W. Norrdin. Regional acceleration of remodelling during healing of bone defects in beagles of various ages. Bone, 6(5), 1985, 377-379.

18. H. Now Zari, F.K. Yorita and H.C. Chang. Periodontally accelerated osteogenic orthodontics combined with autogenous bone grafting. Comp end Contin Educ Dent, 29(4), 2008, 200-206.

19. M.T. Wilcko, W.M. Wilcko, and N.F. Bissada. An evidence-based analysis of periodontally accelerated orthodontic and osteogenic techniques: a synthesis of scientific perspectives. Seminars in Orthodontics, 14(4), 2008, 305-316.

20. P.S. Vig, J.A. Weintraub and C. Brown. The duration of orthodontic treatment with and without extractions: a pilot study of 5 selected practices. Am J Orthod Dentofacial Orthop, 97(1), 1990, 45-51.

21. I. Kocadereli. Changes in soft tissue profile after orthodontic treatment with and without extractions. Am J Orthod Dentofacial Orthop, 122(1), 2002, 67-72.

22. J. Duker. Experimental animal research into segmental alveolar movement after corticotomy. J Maxillofacial Surg, 3(2), 1975, 81- 84.

23. M.T. Wilcko, W.M. Wilcko, J.J. Pulver, N.F. Bissada and J.E. Bouquot. Accelerated osteogenic orthodontics technique: A 1-stage surgically facilitated rapid orthodontic technique with alveolar augmentation. J Oral Maxillofac Surg, 67(10), 2009, 2149-2159.

24. G. Amit, J.P.S. Kalra, B. Pankaj, S. Suchinder and B. Parul. Periodontally accelerated osteogenic orthodontics (PAOO)- a review. J Clin Exp Dent, 4(5), 2012, 292-296.

25. S. Dibart, J.D. Sebaoun and J. Surmenian. Piezocision: a minimally invasive, periodontally accelerated orthodontic tooth movement procedure. comp end Contin Educ Dent, 30(6), 2009, 342-344, 346, 348-50.

26. K.G. Murphy, M.T. Wilcko, W.M. Wilcko and D.J. Ferguson. Periodontally accelerated osteogenic orthodontics: a description of the surgical technique. J Oral Maxillofac Surg, 67(10), 2009, 2160-2166.

27. A.S.T. Al Ghamdi. Corticotomy facilitated orthodontics: Review of the technique. The Saudi Dental Journal, 22 (1), 2010, 1-5.