

Wilckodontics

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ABSTRACT

Wilckodontics is also known as periodontally accelerated osteogenic orthodontics (PAOO). The periodontium is a dynamic tissue and regulation of its remodeling gives an edge in the traditional orthodontic treatment. The synergistic effort from the periodontic and orthodontic fields in the PAOO technique can shorten the conventional orthodontic treatment time to 3 to 9 months. This technique has roots in orthopedics, dating back to the early 1900s. Only recently, it was modified to assist in straightening teeth and fix bites. This article will help you to understand the indications, contraindications and the technicalities of Wilckodontics.

Keywords: Wilckodontics, Periodontally accelerated osteogenic orthodontics, Selective alveolar decortications, Bone activation.

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INTRODUCTION

The periodontium comprises of gingiva, periodontal ligament, cementum and alveolar bone. The alveolar bone is the most mineralized of all and is not an easily malleable tissue. It has its own dynamicity and to regulate its remodeling capacity has always been a challenge on the periodontic as well as the orthodontic front. The spirit of interdisciplinary collaboration in dentistry has taken traditional orthodontic tooth movement protocols and synthesized periodontal tissue engineering and regenerative surgery, not only toward a method of rapid orthodontic tooth movement but also provided every young clinician with a protocol that also reduces side effects, like root resorption, relapses, inadequate basal bone, bacterial caries and infection. Besides, this apprehension among the adolescent population regarding the period of the treatment has come to a resolution with this newly designed approach.¹

The commonly held notion that pre-existing alveolar volume is immutable has placed substantial limitations on the amount of tooth movement thought to be safely achievable and still provide a stable result. However, synthesis of the synergistic collaborative treatment between the specialists also helps to develop the harmony that results in less damage to both components of the periodontium, the soft tissue 'gingival unit' around the crown, and the 'attachment apparatus' that connects the root to bone and side by side provide a rapid outcome.

HISTORY

Distraction osteogenesis (DO) was first used in orthopedic medicine in the early 1900s, but the method was not widely employed until the 1950s, when Russian orthopedic surgeon Dr Gabriel Ilizarov perfected the technique. Dr Ilizarov often did bone surgery to correct deformities and repair defects in arms and legs. While treating a patient with a short amputation stump, Dr Ilizarov performed an osteotomy—that is, he cut the bone, intending to lengthen it with a bone graft in the middle. He then put a metal frame around the stump, creating a gap (technically called a 'distraction gap'). By chance, he discovered that new bone grew in the distraction gap, eliminating the need for the bone graft. Intrigued, Dr Ilizarov researched the phenomenon and proved that stressing a bone increases metabolic activity and cellular generation, also known in orthopedic science as 'bone remodeling,' resulting in growth of new bone. The phenomenon was named DO—growth of new bone by means of surgically 'distracting' the bone.

In 1960, Heinrich Krole set the stage for the subsequent evolution of refined decortication-facilitated orthodontics.² In the early 1960s, craniofacial surgeons began using DO techniques to rapidly expand palates in growing patients. In the 1970s, the technique was introduced to jaw surgery. During the next two decades, interest in craniofacial distraction grew slowly and sporadic experiments were performed, mainly on dogs. In the early 1990s, the technique began to be more widely used on human patients with jaw defects. Meanwhile, distinguished orthopedist Harold Frost realized that there was a direct correlation between the degree of injuring a bone and the intensity of its healing response.³ He called this the rapid acceleratory phenomenon (RAP). In RAP, there is a temporary burst of localized soft and hard tissue remodeling (i.e. regeneration) which rebuilds the bone back to its normal state.

As early as the 1950s, periodontists began using a corticotomy technique to increase the rate of tooth movement. An oral corticotomy is surgical procedure where cuts are made in the alveolar bone. In the 1990s, the Drs Wilcko, using computed tomography, discovered that reduced mineralization of the alveolar bone was the reason behind the rapid tooth movement following corticotomies. They used their knowledge of corticotomy and their observations of RAP to develop their patented periodontally accelerated osteogenic orthodontics (PAOO) technique in 1995.

Wilckodontics is a comparatively new sub-branch which aids in providing an increased net alveolar volume after orthodontic treatment. This is also called the PAOO technique. It is a combination of a selective decortication facilitated orthodontic technique and alveolar augmentation.^{4,5} With this technique, one is no longer at the mercy of the pre-existing alveolar volume, and teeth can be moved 2 to 3 times further in [1/3] to [1/4] the time required for traditional orthodontic therapy.⁵⁻⁷ The same phenomenon was described simultaneously in the periodontal literature by Yaffe et al.⁸ Gantes in 1990 reported on corticotomy-facilitated orthodontics in five adult patients in whom space closing was attempted with merely orthodontic forces.⁹ More recently, Drs William and Thomas Wilcko have demonstrated rapid orthodontic tooth movement following selective labial and lingual decortication of alveolar bone in the area of desired tooth movement using a technique called accelerated osteogenic orthodontics TM (AOOTM) orthodontic forces (Figs 1 and 2). The Wilcko brothers gave a novel dimension to the historical achievements so far and said in selectively decorticated patients it was discovered that the rapid tooth movement was not the result of bony block movement, but rather to a transient localized demineralization-remineralization phenomenon in the bony alveolar housing consistent with the wound healing pattern of the regional acceleratory phenomenon. The demineralization of the alveolar housing over the root surfaces apparently leaves the collagenous soft tissue matrix of the bone, which can be carried with the root surface and then remineralizes following the completion of the orthodontic treatment.^{4,5} The Wilcko duo further emphasized on the degree of tissue metabolic perturbation *per se* for this rapid orthodontic movement.¹

Interestingly, Dr Owen researched Invisalign treatment in conjunction with PAOO surgery. He had some minor crowding in his mouth and had the procedure done on himself. After surgery, he used Invisalign appliances to move his teeth. He reported his findings in the Journal of Clinical Orthodontics in June 2001. Of course, the aligners

were changed much more quickly than traditional Invisalign treatment (every 3 to 4 days instead of every 2 weeks). Dr Owen was pleased with the result. He concluded that because the aligners had to be worn full-time, this technique required a high degree of patient compliance. He also said that because he did not have the PAOO surgery done on his entire mouth (only on the areas adjacent to the crowded teeth), the 'nonsurgery' teeth hurt a lot more than the 'surgery' teeth because of the force applied by the aligners. According to officials at Align Technologies, Dr Owen is the only dental professional (to their knowledge) that has used Invisalign after AOO surgery.

PRINCIPLE OF PAOO SURGERY

Unlike a usual corticotomy, PAOO does not just cut into the bone, but decorticates it—that is, some of the bone's external surface is removed. The bone then goes through a phase known as osteopenia, where its mineral content is temporarily decreased. The tissues of the alveolar bone release rich deposits of calcium, and new bone begins to mineralize in about 20 to 55 days. While the alveolar bone is in this transient state, braces can move teeth very quickly, because the bone is softer and there is less resistance to the force of the braces.

Research has shown that after the alveolar bone heals and the teeth are in their new desired positions, additional alveolar bone has formed. The Drs Wilcko, and other researchers have proven that the aftermath of PAOO is as stable and long-lasting as conventional orthodontic treatment.

So, after PAOO, the alveolar bone is apparently not only as strong as it was before the procedure but there is actually more to it—which is advantageous if the profile needs to be built up to improve your facial esthetics. Dr Wilcko says that the PAOO technique can correct most of the orthodontic problems that are treated with traditional long-term braces. The only exception is a class III condition, in which the lower jaw is too long relative to the rest of the face, and the chin protrudes class III cases have many physical constraints which may not lend themselves to PAOO treatment.

TECHNIQUE OF PAOO SURGERY

PAOO is an outpatient procedure done in the office of a periodontist or an oral surgeon or other dental professional trained in the technique. Usually, braces are put on a few days before the PAOO procedure. 'PAOO is not as invasive as taking out teeth', Dr Wilcko said. 'There is some swelling and very little bleeding involved.'

The alveolus is compromised of lamellar bone and configured into cortical bone plates and trabecular bone. In the steady state condition, bone apposition and mineralization is balanced. It takes much less time to remodel



Fig. 1: William Wilcko



Fig. 2: Thomas Wilcko

trabecular than cortical bone because of the difference in surface volume ratios.³ The region of selective alveolar destruction resulted in alveolar osteopenia, rich deposits of calcium are released predominately from the spongiosa by two forms of osteoclastic activity: Osteoclasts and osteocytic osteolysis. This catabolic condition is followed by deposition of new bone. The new bone, osteoid, begins to mineralize in about 20 to 55 days.¹⁰ Before opting for the periodontal surgical technique and beginning with the procedures, a complete medical review of the patient is done to rule out any systemic and local factors that may interfere with the surgery. A thorough clinical and radiographic evaluation for the patient is done to evaluate the periodontal status of the patient. A meticulous phase 1 therapy involving scaling and root planing and oral hygiene instructions to the patient is given. Once the local factors have been controlled, patient is recalled for the periodontal surgery.

A full-thickness mucoperiosteal flap is reflected under local anesthesia, after an intracrevicular incision that connects the releasing incisions, buccally and lingually.^{1,4} Special care is taken not to perforate the flaps, and any interdental tissue that remained interproximally is left in place. The flap is reflected beyond the apices of the teeth if possible.⁵ Post reflection, the area is thoroughly debrided, and curettage is done to remove any inflamed tissue, if present. Alveolar bone is activated with selective alveolar decortications, both on lingual and labial side using piezosurgery technique or the routine burs for removal of the bone. Vertical corticotomy cuts stopping just short of the alveolar crest are made between the roots of the teeth; these cuts are connected beyond the apices of the teeth with a scalloped horizontal corticotomy cut, and numerous corticotomy perforations are made in cortical layer.^{4,5} Preservation of vital structure is taken into consideration. Bone grafting material, such as demineralized bone matrix, or DBM; along with xenograft extender, along with antibiotics is placed over the activated bone. Excessive graft material should not be placed to avoid interference with the repositioning of the flap.⁵ The flap is repositioned back to allow sufficient bone coverage. The interrupted loop sutures are given and periodontal dressing is placed to ensure uneventful healing. The patient is then subjected to the orthodontic treatment to explore the advantage of the bone activation done through the above procedure (Figs 3 to 6).

According to Dr Wilcko, pain relievers like Ibuprofen are not recommended, since they are NSAIDs (nonsteroid anti-inflammatory drugs). NSAIDs can interfere with the production of prostaglandin hormone in the body and slow down the bone growth process which is vital to PAOO. In addition, NSAIDs given during the first 24 hours following trauma (surgical or otherwise) inhibit clotting.



Fig. 3: Preoperative view



Fig. 4: Decortication



Fig. 5: Regeneration using bone grafts

Therefore, one should not take NSAIDs on a regular basis before or after undergoing PAOO surgery.

RECOVERY FROM PAOO SURGERY

Total recovery from the procedure takes 7 to 10 days. There might be some swelling and it might require use of ice packs. Narcotic pain killer is prescribed for one week postsurgery. The surgery usually does not result in facial bruising. During this time, chlorhexidine mouthwash is prescribed.



Fig. 6: Postoperative view

ORTHODONTIC ADJUSTMENTS AFTER PAOO SURGERY

After complete recovery from the procedure, orthodontist adjusts the braces about every 2 weeks. Depending on case, braces are put for 3 to 9 months. After the braces are removed, a retainer for at least 6 months is usually recommended. The same types of braces and retainers are used in PAOO as in traditional orthodontics, so you will have your choice of metal or ceramic brackets.

PATIENT QUALIFICATIONS FOR PAOO TREATMENT

PAOO can be done on people of any age, as long as they have a healthy periodontal situation. According to Dr Wilcko, the technique has been done on children as young as age 11 and on senior citizens as old as 77 (mainly as preparation for dental implants or devices).

You are not a candidate for this procedure if you have dental bone loss, periodontal disease, root damage or poor roots. In addition, if you have a disease, such as rheumatoid arthritis which requires you to take regular doses of NSAIDs, you may not be a good candidate for PAOO.

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PROS AND CONS OF PAOO SURGERY

Pros

- Less time than traditional orthodontics
- Less likelihood of root resorption

- History of relapse has been very low
- There is less need for appliances and headgear (depending on the case)
- The technique has its roots in proven orthopedic research and treatments
- Both metal and ceramic brackets can be used.

Cons

- Expensive procedure
- Mildly invasive surgical procedure and like all surgeries, it has risk of some pain, swelling and the possibility of infection
- Patients who take NSAIDs on a regular basis or have other chronic health problems cannot be treated with this technique
- It does not lend itself to class III malocclusion cases.

SUMMARY AND CONCLUSION

Conventional orthodontic treatment typically takes between 18 and 24 months to achieve the desired results, and patients with complex cases may find themselves in braces even longer. PAOO, also known as Wilckodontics, can straighten most patient's teeth within 3 to 8 months. This option is particularly appealing to adult orthodontic patients who do not want to spend upward of 2 years sporting a mouth full of appliances. Younger patients who would prefer to finish their course of orthodontics quickly. PAOO puts orthodontics on a fast track by incorporating changes in the structure of surrounding bone to accompany repositioning of the teeth. Traditional orthodontic treatment focuses solely on forces applied to the teeth, while PAOO alters the bone in the process as well, facilitating faster movement.

Regarding the mode of movement, this is the technique that requires the demineralization of a relatively thin layer of bone on the root surface of the tooth in the direction of the intended movement. This transient, reversible osteopenia of the thin layer of bone permits the root of the tooth to carry the demineralized collagenous matrix of the bone with it and a reactionary bone formation.¹¹ These results in net increased alveolar volume, which can provide for a more intact periodontium,⁹ a decreased need for extractions, a degree of facial reshaping, and an increase in the bony support for both the teeth and the overlying soft tissues. The PAOO technique requires the utilization of numerous modified diagnostic and treatment parameters, but once these are mastered the orthodontist after the PAOO technique has a powerful new treatment option to offer the patients.¹

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