

Accelerated Orthodontic Tooth Movement: A New Paradigm in Orthodontics

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ABSTRACT

In today's fast paced world patients require treatment at a faster rate. They want the orthodontic treatment but within a shorter time period. 'Periodontally Accelerated Osteogenic Orthodontics' today has entirely changed the treatment scenario. The time required for the treatment has been shortened and along with many added advantages. Also called WILKODONTICS, the process is orthodontic, periodontal phenomenon. In the current review, we overlook this phenomenon from a clinician's point of view.

KEYWORDS: Wilkodontics, Accelerated Orthodontic Tooth Movement, Corticotomy

INTRODUCTION

Traditional orthodontic movement is the result of periodontal ligament compression, which produces histological and biomolecular modifications of the periodontal tissues that activate dynamics of crestal bone resorption and apposition. Orthodontic tooth movement is a "periodontal phenomenon" because all the periodontal tissues are involved.¹

During orthodontic tooth movement many factors come into play. The periodontal condition of the patient and preservation of the integrity of the periodontium is important for long term stability and function. Author Rusanen J in his article- Quality of life in patients with severe malocclusion before treatment, stated that correction of malocclusion improves periodontal health and enhances psychosocial status.²

Many times orthodontic patients show un-willingness towards orthodontic treatment because it is very prolonged treatment, time duration required to complete the treatment is more.¹ But in recent years many adults patients have shown a positive to orthodontic treatment as they seek better esthetics and the treatment also improves their self- esteem and confidence.³

HISTORICAL BACKGROUND

Surgical aid in orthodontic tooth movement (OTM) has been used since the 1800s. Bryan described the first corticotomy facilitated tooth movement in 1893, published by Guilford in a textbook called 'Orthodontia: Or Malposition of the Human Teeth, Its Prevention and Remedy.'⁴ Most impressive feature of this approach was reduced treatment time to one-third of conventional treatment and promised more predictable results in adults.

In the same year, Cunningham presented "Luxation, or the immediate method in the treatment of irregular teeth" at the International Dental Congress in Chicago.

In early 1950, periodontists began using a corticotomy technique to increase the rate of tooth movement. The four types of surgical damage to the alveolar bone include: Osteotomy (complete cut through cortical and medullary bone), corticotomy (partial cut of cortical plate without penetrating medullary bone), ostectomy (removal of an amount of cortical and medullary bone) and corticotectomy (removal of an amount of cortex without medullary bone).^{5,6}

In 1959, Kole suggested that it was the continuity and thickness of the denser layer of cortical bone that offered the most resistance to tooth movement. He theorized that by disrupting the continuity of this cortical layer of bone, he was actually creating and moving blocks of bone in which teeth were embedded. He postulated this theory as "bony block movement".⁷

Köle described the combined radicular corticotomy/supraapical osteotomy technique, which has been adopted or modified by most clinicians for the current corticotomy procedures.⁷ Köle's approach consisted of creating bone blocks by buccal and lingual interproximal vertical corticotomy cuts limited to cortical layers, as these vertical corticotomy cuts are connected by horizontal osteotomy cuts approximately 1 mm beyond the root apices.⁸

Bell and Levy published the first experimental study of alveolar corticotomy in 49 monkeys in 1972. They described a model of vertical inter-dental corticotomy that should have been considered an osteotomy because

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they mobilized all the dento-osseous segments.⁹

Duker et al. conducted an experiment on beagle dogs in 1975 and demonstrated that rapid tooth movement could be achieved by orthodontic appliances after weakening the bone by corticotomy. The rapid tooth movement does not affect the vitality of the teeth which have been moved. By avoiding corticotomy of the marginal bone the health of periodontium is also maintained.¹⁰ Generson et al. in 1978 revised Kole's technique reporting successful results with a 1-stage corticotomy only technique without the supra-apical osteotomy.¹¹ Gantes et al. in 1990 also reported rapid tooth movement and reduced treatment time.¹² The original technique of wilkodontics was developed by two brothers, Bill (orthodontist) and Tom (periodontist) Wilcko, from Erie, Pennsylvania. In fact, this technique was trademarked in 1998 and received an endorsement from the American Academy of Periodontology, which suggested the name "Periodontally Accelerated Osteogenic Orthodontics" as a more descriptive term for the procedure.¹³

CLINICAL CONSIDERATIONS

Indications and Contraindications

Indications:

- To accelerate corrective orthodontic treatment,
- To facilitate the implantation of mechanically challenging orthodontic movements,
- To enhance the correction of moderate to severe skeletal malocclusions.

Contraindications :

- Patients with any sign of active periodontal disease,
- Inadequately performed or prognostic poor endodontic treatment,
- History of prolonged corticosteroid usage,
- Current medication interfering bone metabolism such as bisphosphonates or non-steroidal anti-inflammatory drugs (NSAID).¹⁴⁻¹⁸

REGIONAL ACCELERATORY PHENOMENON (RAP)-THE BASIC MECHANISM OF WILKODONTICS

As the name suggest, RAP is a localized response of the hard and soft tissue to injury. This phenomenon was first described by HERALD FROST.¹⁹⁻²⁰ He described it as a healing response of the hard and soft tissue to a surgical wound. He stated that a surgical wound acted as stimuli for the tissue both hard and soft around the site of surgery and an accelerated healing response is generated which cause tissue regeneration at a faster rate, hence the name RAP- Regional Acceleratory Phenomenon.²¹The rate at which regeneration occurs directly depend upon the severity of the wound, and the respective tissue involved.

In humans, after the injury it takes few days to initiate

RAP and around 6 to 24 months to complete the entire phase. The peak of this phase is at 1 -2 months after injury.²²

RAP causes a decrease in regional bone density that is osteopenia, but maintaining a constant volume of bone matrix. This helps in a rapid tooth movement.¹⁹

TREATMENT PLANNING

Case selection should be done according to the given criteria or as per indications. Treatment planning should be done by achieving a good coordination between the orthodontist and periodontist or an oral surgeon.^{14,23} Both orthodontic tooth movement while maintaining the integrity of the periodontium is important.

The Procedrue: Before the corticotomy procedure, the pre orthodontic treatment planning is completed. The entire arch of interest is bonded and leveling and alignment phase is completed. The traditional Orthodontic procedure remains the same, both metal or ceramic brackets can be used. Then either a periodontist or an oral surgeon conducts the corticotomy procedure –

- a) An intra-crevicular incision is made under local anesthesia, that connects the releasing incisions buccally and lingually.²⁴
- b) A full thickness mucoperiosteal flap is reflected beyond the apex of the tooth.¹³
- c) With the help of round bur, vertical corticotomy cuts are made that extends in between roots from the distal of second premolars to the distal of the opposing second premolars on both arches .
- d) These vertical cuts are made 2 mm more deep than the apex of the tooth, and then connected to horizontal corticotomy cuts.¹³
- e) The addition of bone graft is done such as Demineralized Bone Matrix (DBM), along with Xenograft extender, or any suitable grafting material can be paced according to the choice.²⁵⁻²⁶
- f) Then the flap is repositioned back with Interrupted loop sutures in place and periodontal dressing is given to avoid uneventful healing. During suturing tension in tissue should be avoided to predict bone augmentation.²⁷

After the procedure, the orthodontic treatment can be continued.

After the Procedure: Around 7 to 10 days are required to recover from the surgery, patients can complain of some amount of swelling or oedema which can be relived with ice packs.²³ Narcotic pain killers and cholorexidine mouthwash can be prescribed. Dr. Wilko advised not to prescribe NSAIDS- Non-Steroidal Anti-inflammatory Drugs, as they inhibit Prostaglandin synthesis and inhibit tooth movement.

Orthodontic Treatment After Surgery: After complete recovery from surgery, orthodontic treatment can be continued, the fixed appliance can be adjusted every 20 days depending upon the case.

PROS AND CONS OF WILCODONTICS

PROS:

- Wilkodontics reduces the time frame required for completion treatment that accelerates the orthodontic treatment procedure.
- Reduced chances of root resorption.
- Reduced chances of relapse.

CONS:

- It's a minor surgical procedure, hence invasive procedure.
- There are chances of swelling, pain and infection.
- Cannot be performed in patients with systemic diseases.

CONCLUSIONS

Many orthodontist today advocate the procedure of Wilkodontics, as the rate of tooth movement is enhanced the time required to complete the treatment is reduced. In today's fast paced world, this can be a major tool for a clinician to give optimum results in a shorter time frame, which in turn can motivate patients to take up orthodontic treatment. The only problem being the cost factor and the slightly a minor surgical procedure may have a negative impact factor for the process. Yet for now corticotomy-facilitated tooth movement along with bone grafting is to be evaluated thoroughly by randomized clinical trials, review of the literature suggest it's a useful procedure for a clinician as well as the patient.

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