REGIONAL ACCELERATED PHENOMENON: A MINIATURE REVIEW

Aswathy Krishna¹, Lukka Jagadish Babu²

¹,²Post graduate Students, Maharaja Ganga Singh Dental College and Research Center, Rajasthan India.

Abstract: One of the main disadvantages of orthodontic treatment is TIME required to complete the treatment. Conventional treatment with fixed appliances is likely to last about 20 to 24 months. Unfortunately many potential orthodontic patients jeopardize their dental health and decline treatment, due to this long treatment times. So many methods are invented to reduce the duration of orthodontic treatment. Regional accelerated phenomenon (RAP) is an biological response of bone due to the noxious stimuli of surgical interventions where the tooth movement is accelerated. Acceleration of tooth movement is a frontier topic in orthodontics these study will discuss a miniature review on the topic of regional accelerated phenomenon and its procedures.

Keywords: Orthodontics, Regional accelerated phenomenon, Wilkokodontics.

INTRODUCTION:
It’s been a challenging task to every professional orthodontist to reduce the duration of orthodontic intervention in adult patients due to the increasing the risk of caries, gingival recession, root resorption and concerns related to facial and dental esthetics. A number of procedures are carried out to decrease the duration of the orthodontic treatment. In that the REGIONAL ACCELERATION PHENOMENON and phenomenon based on the bone healing pattern followed by the surgical intervention to affect the alveolar housing and tooth movement

To shorten the time for orthodontic tooth movement, various attempts have been made till now. These attempts fall into 3 categories.


- The second category is mechanical or physical stimulation such as direct electrical current (Davidovitch-1980) or a samarium-cobalt magnet (Kusy et al- 1995).

- The last category is oral surgery, including
  1. Distraction of the periodontal ligament, (Liou and Huang-1998),
  2. Dento alveolar distraction (Iser and Kisnisci- 2001),
  3. Alveolar surgeries to undermine interseptal Bone (Ren et al-2007) and
  4. Alveolar corticotomies (Kole et al-1959), which have been used to correct malocclusions for over 100 years.

REGIONAL ACCELERATORY PHENOMENON:

Surgical wounding of osseous hard tissue results in striking reorganizing activity adjacent to the site of injury in osseous and/or soft tissue surgery. He collectively termed this cascade of physiologic healing events THE REGIONAL ACCELERATORY PHENOMENON (RAP) local response to a noxious stimulus, it describes a process by which tissue forms faster than the normal regional regeneration process. And induces a response in the alveolar bone that can demineralize the bone around the dental roots. Once the bone has demineralized, there is a 3–4 month window of opportunity to move teeth rapidly through the demineralized bone matrix before the alveolar bone remineralizes.¹

The term “regional” refers to the demineralization of both the cut site and adjacent bone. The term “acceleratory” refers to an exaggerated or intensified bone response in the cut that extend to the marrow. For both normal and accelerated tooth movement, RAP may be an important prodromal action to effective tooth movement². By enhancing the various healing stages, this phenomenon makes healing occur 2–10 times faster than normal physiologic healing³.
RAP begins within a few days of injury, typically peaks at 1–2 months, usually lasts 4 months in bone and may take 6 to more than 24 months to subside. As long as tooth movement continues, the RAP is prolonged. When RAP dissipates, the osteopenia disappears and the radiographic image of normal spongiosa reappears. When orthodontic tooth movement is completed, an environment is created that favors alveolar re-mineralization. RAP explains how damaged bone can repair itself in a timely fashion through increased cellular activity, initially manifesting with demineralization but resolving with remineralization. Osteoclasts are capable of demineralizing bone via a proton pump. It has been demonstrated that parathyroid hormone can act on the remodeling system to encourage osteoclast formation.

Additionally, prostaglandins have been shown to produce an increase in osteoclast numbers. Decalcified bone matrix can induce new cartilage and bone formation when implanted at non bone sites. It was also shown that protein extracts from the decalcified bone matrix are responsible for the new bone formation. A key factor in bone morphogenesis appears to be bone morphogenetic proteins (BMP), which influence primitive uncommitted stem cells to become the more specific cell types that participate in bone formation. More recently, recombinant human bone morphogenetic protein-2 (rhBMP-2) has been shown to induce new bone formation.

**VARIOUS METHODS OF RAP:**

**Corticotomy:**

Main resistance to tooth movement was the cortical plates of bone and by disrupting its continuity treatment could be completed in much less time.

In 1984, Goldie and King enhanced tooth movement and decreased root surface resorption after creating an osteoporotic condition in rats. The test animals were lactating females fed a calcium-deficient diet; the control group was non-lactating animals on a balanced diet.

Increased parathyroid hormone secretion in the test group led to increased osteoclasia (an observation later confirmed by Horowitz et al) and loss of bone mineral, resulting in osteoporosis.

- The increase in bone metabolism and decrease in bone density were responsible not only for enhanced tooth movement in the rats, but also for a decrease in the area of root surface resorption.
- The medullary bone around anterior teeth can be easily bent by retraction force if the cortical layer between basal bone and alveolar bone is removed. Once bone is deformed after corticotomy, recovery to its original dimension is impossible.

**Heinrich Kole’s Procedure:**

Kole’s procedure involves the reflection of full thickness flaps to expose buccal and lingual alveolar bone, followed by interdental cuts through the cortical bone and barely penetrating the medullary bone (corticotomy style).

**Suya’s Technique:**

Suya (1991) reported corticotomy-assisted orthodontic treatment of 395 adult Japanese patients and referred this procedure as “Corticotomy Facilitated Orthodontics”.

**Wilckodontics:**

A more recent surgical orthodontic therapy was introduced by Wilcko et al. (2000, 2001, 2003, 2008) which included the innovative strategy of combining selective alveolar decortication, alveolar augmentation, and orthodontic treatment. The technique is referred to as Accelerated Osteogenic Orthodontics (AOO) and more recently as Periodontally Accelerated Osteogenic Orthodontics (PAOO). This technique advocated for comprehensive fixed orthodontic appliances in conjunction with full thickness flaps and labial and lingual corticotomies around teeth to be moved. Bone graft consisting of demineralized freeze-dried bovine bone and clindamycin was applied directly over the bone cuts and the flap was sutured in place. Tooth movement was initiated two weeks after the surgery, and every two weeks thereafter by activation of the orthodontic appliance. This technique will reduce treatment time to one-third the time of conventional orthodontics.

**Alveolar Augmentation:**

Alveolar augmentation of labial and lingual cortical plates were used in an effort to enhance and strengthen the periodontium, reasoning that the addition of bone to alveolar housing of the teeth, using modern bone grafting techniques, ensures root coverage as the dental arch expanded. Safe, effective, extremely predictable, less root resorption and reduced treatment time, and can reduce the need for orthognathic surgery in certain situations.
Corticotomy Facilitated Intrusion of Posterior Teeth:
Corticotomy done for the intrusion of supra erupted molars. Under full thickness flaps, vertical cuts are made mesial and distal interproximal areas - 2 to 3 mm above the alveolar crest and extending 2 to 3 mm past the estimated root apices and a horizontal corticotomy was performed connecting the interdental cuts. Small round perforations equivalent to the bur diameter were also made inside the areas circumscribed by those cuts to increase the healing stimulus. All surgical cuts were made in the cortical plate. After careful irrigation, the gingival flaps were repositioned and sutured appropriately. Antibiotics were prescribed from 24 hours before to 3 days postsurgery10.

CONCLUSION:
All these procedures decreases the duration of the orthodontic treatment, Nevertheless all procedures has its own advantages and disadvantages, it will pave with unnecessary complications followed by surgical methods, which is inconvenience to both professional and patient.so keep treatment as simple as KISS principle.

REFERENCES: