

## Case Report

# Corticotomy – Accelerated Orthodontics. A Case report

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## ABSTRACT

Accelerated orthodontics is one of the desired concepts to reduce the treatment duration. It is based on the fact that when bone is surgically stressed, a series of events is initiated causing increased osteoclastogenesis, hence acceleratory phenomenon or periodontally accelerated osteogenic orthodontics. Corticotomy is the procedure of creating perforations or cuts in the cortical bone and extending minimally into the medullary bone. Surgical injury causes transient osteopenia in alveolar bone. This reduces the biomechanical resistance to tooth movement and enables faster tooth movement through trabecular bone. Periodontally accelerated osteogenic orthodontics (PAOO) technique is a combination of a selective decortication-facilitated orthodontic technique and alveolar augmentation. Based on the concept, following case report showed the application of PAOO in anterior space closure.

**Key words:** Regional acceleratory phenomena (RAP), Corticotomy, Wilkodontics, Bone remodelling, Transient osteopenia.

## INTRODUCTION

Orthodontic treatment traditionally takes over a long time to get over due to its limitations from the bone tissue surrounding the teeth. The process of applying slow continuous force to the teeth to achieve desired results is through a series of biological procedure which takes time to complete its course resulting in increased duration of the treatment. From last few decades efforts are being incorporated into the orthodontics to decrease the treatment duration. Accelerated orthodontics brings the treatment time close to what is desired by inducing osteoclasts for bone remodelling via mediating release of various chemical regulators like interleukins.

Accelerated orthodontics is based on the fact that when bone is irritated surgically, a series of events is initiated causing increased osteoclastogenesis, hence acceleratory phenomenon or periodontally accelerated osteogenic orthodontics.<sup>1</sup> Bone remodelling has been also shown to be increased by physical or mechanical stimulation. They have been proven to act by inducing osteoclastogenesis by inducing the RANK/RANKL pathway and induction of signalling molecules such as MAPK (Mitogen Activated Protein Kinase), c-fos, and nitric oxide.<sup>2,3</sup> Among all the approaches mentioned like low level laser therapy, pulsed electromagnetic fields, corticotomy accelerated orthodontics shows clear benefit.<sup>4</sup>

Corticotomy is the procedure of creating perforations or cuts in the cortical bone and extending minimally into the medullary bone. Through time it has been modified into simpler method to attain the desired results. In 1931, Bichlmayr introduced a surgical technique for rapid correction of severe maxillary protrusion with orthodontic appliances. Wedges of bone were first removed to reduce the volume of bone through which the roots of the maxillary anterior teeth would need to be retracted.<sup>5</sup> However it was first introduced in 1959 by Krole, as a mean for rapid tooth movement where he stated that moving the bony blocks easy when they remain connected only by medullary bone which act as pedicle for nutrition and viability maintenance. It has been reformed to Wilkodontics by Wilko brothers and referred as periodontally accelerated osteogenic orthodontics.<sup>6</sup> Periodontally accelerated osteogenic orthodontics (PAOO) technique is a combination of a selective decortication-facilitated orthodontic technique and alveolar augmentation. With this technique, one teeth can be moved 2-3 times further in one third or one fourth of the time required for traditional orthodontic therapy.<sup>7</sup>

*Application of corticotomy* in orthodontics fall under the categories-

1. Resolving crowding and shorten treatment time.
2. Closure of spaces
3. Accelerate canine retraction after premolar retraction.

4. Enhance post-orthodontic stability
5. Facilitate slow orthodontic expansion
6. Molar intrusion in open bite correction

#### Contradictions<sup>8</sup>

1. Periodontically compromised patient
2. Uncontrolled systemic disorders
3. As a substitute for surgically assisted palatal expansion
4. In severe skeletal class III discrepancies

## CASE REPORT

A case of anterior space closure

A 25 years old male patient reported to the department of orthodontics at Inderprastha Dental College and Hospital, Ghaziabad, with the chief complaint of spacing in his upper front teeth and no relevant medical history.

## DIAGNOSIS

Based on clinical and cephalometric findings patient was diagnosed with Skeletal class II relationship with average growth pattern and Angle's class I malocclusion with upper and lower anterior spacing and increased overjet. Both upper and lower incisors were proclined, with increased overjet of 5 mm and overbite of 3mm and convex facial profile.

#### Treatment objectives:

- Attaining class I skeletal relationship
- Maintaining Angle's class I molar relationship
- Closure of anterior spacing
- Obtaining ideal overjet and overbite
- Attaining a pleasing profile

#### Treatment progress:

The treatment progressed as non extraction case with MBT (Ormco, Glendora, CA, USA) preadjusted edgewise appliance of slot size 0.022" \* 0.028". After completion of leveling and aligning, stabilizing archwire 19\* 25 SS was placed and corticotomy was performed. The time taken for leveling and alignment was 4 months. A full thickness periosteal flap was raised from mesial surface of first premolar to other side first premolar in the maxillary arch under local anesthesia. With the help of round bur vertical interradicular corticotomy grooves were placed in the interradicular space midway between the prominences of root. The decorticated bone surfaces were covered with demineralized freeze-dried bovine bone (figure. 3).

Force application to close the anterior spaces was started after one week of corticotomy procedure with the help of

power chain (figure 4). The patient was recalled every 21 days and power chain was replaced. The power chain applied force ranging from 140 to 150 grams, measured using Dontrix gauge. The anterior spaces were closed in 3.5 months. The total treatment duration was 10 months.

Figure 1 Pretreatment photographs (extraoral and intraoral)



Figure 2 Pretreatment Lateral cephalogram and OPG



Figure 3 Corticotomy photographs with A. Flap raising, decortication, B. bone graft and C. sutures placement

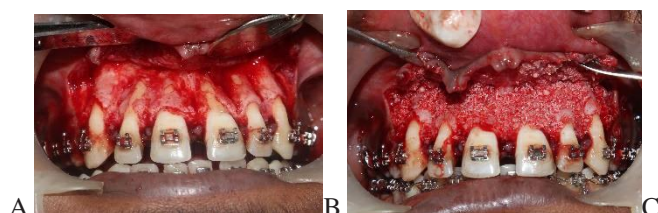




Figure 4 Force application post corticotomy procedure photograph



Figure 5 Posttreatment photographs (extraoral and intraoral)



Figure 6 Posttreatment Lateral cephalogram and OPG



## RESULT

Case was finished with decreased maxillary prognathism, molars and canine in class I relationship bilaterally with ideal overjet and overbite with pleasing profile (Figure 5) and with decreased treatment duration.

## DISCUSSION

The conventional orthodontic treatments rely on biological tooth movements. Using conventional techniques, biological tooth movement can be achieved at a limited rate. Individual factors such as optimum force, turn over in periodontal ligament, and bone metabolism plays a role in determination of rate of tooth movement.<sup>9</sup>

In this case report, 19\*25 SS wire was used as the stabilizing wire to prevent any untoward tipping and torque loss. The corticotomy procedure was limited only are areas of spacing while keeping anchorage considerations in mind.

The closure of space of done at a much faster rate than that of conventional method. The corticotomy procedure was carried after initial leveling aligning as it has been suggested by Wilcko<sup>10</sup> bothers and Hasler et al<sup>11</sup> that the effect of corticotomy induced tooth movement is present only till 4 months and one has to perform the corticotomy again. Mostafa et al also found the same that corticotomy increased the rate of the tooth movement.<sup>12</sup> Surgical injury causes transient osteopenia in alveolar bone (i.e., a temporary and reversible decrease in bone mineral density)<sup>13</sup>. This reduces the biomechanical resistance to tooth movement and enables faster tooth movement through trabecular bone.

Corticotomy procedures provide accelerated tooth movement due to regional acceleratory phenomenon (RAP). This is an intensified bone response (increased osteoclastic and osteoblastic activity, and increased levels of local and systemic inflammation markers) in areas around cuts that extend to the marrow.<sup>14</sup> The induced increase in bone turnover and decrease in mineral content of the bone (demineralization) are conducive to accelerated tooth movement. This phenomenon causes bone healing to occur 10–50 times faster than normal bone turnover.<sup>10,11</sup>

In this case report, the technique used had a full flap raising with decortication of bone only on the buccal side to maintain the vascular supply to interdental papilla, placement of corticotomy cuts interdentially and placement of DFDBA graft. The flap was closed back by 3-0 vicryl sutures. To utilize maximum effect of corticotomy force application was done on 7 day itself. Placement of bone graft ensured correct amount of alveolar bone thickness and thus reduce any chance of dehiscence. Corticotomy of the anterior maxillary teeth also reduced the maxillary prognathism. It reduces the biomechanical resistance to tooth movement and enables faster tooth movement through trabecular bone. Case I result were similar to the ones obtained by Reddy et al.<sup>15</sup>

For retention also PAOO as stated by Ferguson, PAOO has



greater stability of orthodontic clinical outcomes and less of chances relapse.<sup>6</sup>

S no.		Pre treatment	Post treatment
1.	SNA	88°	85°
2.	SNB	83°	82°
3.	ANB	5°	3°
4.	Wits appraisal	5 mm	3 mm
5.	Facial Axis angle	55°	56°
6.	Effective maxillary length	92 mm	90 mm
7.	U1 to NA (mm)	7mm	3 mm
8.	U1 to NA (angular)	32°	19°
9.	Interincisal angle	96°	127°
10.	Overjet	6 mm	2 mm
11.	Nasolabial Angle	114°	120°

Table 1 Pretreatment and Posttreatment cephalometric values

## CONCLUSION

PAOO is gaining widespread acceptance with its advantage of reducing the treatment duration. With newer and easier technique, it is possible for orthodontists to attain favorable result with, much of effort. Proper diagnosis and treatment planning of cases beforehand, PAOO can facilitate orthodontic treatment with a multidisciplinary approach.

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