Canine Retraction by Dento Alveolar Distraction device for Rapid Orthodontic movement - Prospective Study

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Abstract : The aim of this clinical prospective study is to apply and evaluate an approach to reduce the overall Orthodontic treatment time, by means Dentoalveolar Distraction Osteogenesis to achieve Rapid Canine Retraction using an indigenously fabricated Intra-Oral Tooth-borne Distraction device.

1. Introduction:

Distraction Osteogenesis is a gradual bone lengthening technique that was first introduced by Codivilla in 1905 and was popularized by extensive work of Ilizarov in Orthopedics in 1970’s External devices were used initially for Distraction and was later on followed by Intraoral devices.

Conventional Orthodontic treatment with either fixed or functional appliances rely on biological tooth movements. However using conventional techniques, biological tooth movements can be achieved at limited rate. This feature is thought to be of a shortcoming, especially when major tooth relocation is necessary.

The time required for tooth movement within the Alveolar bone may lengthen the overall Orthodontic treatment time. In this clinical report we describe a surgical technique for Rapid tooth movement. The principles of Distraction by mean of transportation of a bone disc are used to move a Dento Alveolar segment.

2. Patients & Methods:

Three patients were selected for the purpose of canine distraction with a custom-made, intra-Oral Distractor on the basis of the following selection criteria.

3. Inclusion Criteria:

1. Patients in the age range of 16-25 years.
2. Patients with Skeletal and Dentoalveolar angles class I malocclusion with Bidental protrusion.
3. Cases which require Bilateral extraction of the 1st Premolars.
4. Cases that require Maximal Anchorage.
5. Canine teeth that were reasonably placed within the arch without rotation and without considerable tipping
6. Patients with Periodontally healthy teeth

4. Exclusion Criteria

Patients with:
1. Canines placed in Linguoversion or excessive Labioversion.
2. Canines with severe rotation and or tipping.
4. Abnormal curvature of the canine roots.
5. Poor oral hygiene and periodontally weak teeth.
7. Patients with poor internal motivation.

5. Procedure:
Three patients in the age range 15-25 yrs (mean-20 yrs) scheduled for Orthodontic treatment with Bilateral First Bicuspid extractions and subsequent Bilateral Canine teeth Distalization were selected for the study and they underwent Distraction Osteogenesis procedure bilaterally. The entire procedure was explained to the patient and their parents and the study commenced after acquiring due consent from the patients parents.

♦ Under LA, Sulcular flap reflected from mesial of Lateral to second Premolar.
♦ Extraction of first Premolar done along with its buccal bone.
♦ Using 701 bur and copious irrigation, Osteotomy cuts placed mesial to Canine, 4mm apical to Canine and distally enter into the extraction socket.
♦ All bony interferences between Canine and second Premolar removed for easy movements of Dento Alveolus (i.e. Portion of Canine + its Bucal bone + its spongy bone and lingual cortex).
♦ Fine osteotomes in appropriate sizes are used along the anterior aspect of the Dento Alveolus, that includes the canine tooth to split the surrounding bone around its root off of the lingual cortex and neighboring teeth.
♦ Hemostasis achieved and wound closure done using 3-0 silk.
♦ Pre fabricated Distraction device Cemented to Canine and first Molar teeth and activation started after 2 days (0.4mm in the morning and 0.4 mm in the evening) and stopped when the canine tooth came in contact with second Premolar.

6. Results:
♦ The results were evaluated based on clinical, radiographic findings.
♦ The follow period ranged from 4-10 months.
♦ In all the patients canine teeth moved posteriorly and made contact with the second premolars in 14-16 days, after which they were kept passively with the appliance for a period of 12 weeks of consolidation period. Conventionally it takes 4 to 5 months for Canine to move in the extraction socket of first Premolar. Bodily movements of canines were noticed in all the cases with tipping and buccal flaring.
♦ Till 3rd post-operative day there was pain and swelling over the surgical site in all the patients which was treated by medications and this subsequently resolved by 1 week post-operatively.
♦ All patients showed first evidence of Trabecular bone formation during 4th week of the consolidation period and the completion of normal mature radio-opaque bone formation occurred by about 3 months post-activation period.
♦ There was no evidence of External Root Resorption or Tooth Ankylosis formation after distraction device removal and the alveolar bone levels around the canine tooth were normal.
♦ Teeth were vital before treatment and they proved to be vital after the removal of the Distraction appliance by the end of 3 months post-activation period (i.e. each quadrant from central incisor to the first molar.
♦ All patients had no problems with the distraction device and the device was tolerated well although they complained of unaesthetic appearance and speech alterations, which they got accustomed during the treatment period.
♦ Distraction process was over by around 14-16 days, consolidation phase in about 3 months and the whole Orthodontic treatment was over by 8th month.

The technique that is described here may have applicability for those who seek Rapid Orthodontic therapy or for patients who are not good candidates to receive conventional treatment.

Of course, the widespread application of this ‘approach awaits further follow up, in which issues concerning tooth vitality, periodontal attachment levels and periodontal health of the rapidly moved teeth should be further investigated elaboratively.

Thus, the concept of Distraction Osteogenesis for rapid Orthodontic Tooth movement is thought to be promising and feasible for clinical practice.

References:


DISTRACTION DEVICE

MOVEMENT OF RETRACTED MAXILLARY CANINE AFTER DISTRACTION