

## Rapid Canine Retraction – Through Customized Hyrax Screw

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### ABSTRACT

Rapid canine retraction by means of dentoalveolar distraction serves the purpose to reduce treatment duration without any unfavourable effect on periodontium. A case of 21 yr old female with class I bimaxillary protrusion was planned for 1st premolars extraction. A custom made distractor was fabricated modifying hyrax screw for retraction of maxillary canine. Extraction of 1st premolar was done along with lengthening the apical area of premolar socket modifying it according to the roots of canine. Distal to canine micro-osteoperforation was done for accelerating the tooth movement. A planned and sequential activation of the appliance led to the bodily retraction of canine in the extraction space within 10 days. Upper Incisors were then retracted through 3 piece intrusion arch. Lower anteriors were retracted en-masse through K-Sir appliance. Total treatment time was reduced from 20-24 months to 14 months only.

**Key words:** Rapid canine retraction; Distractor; custom made distractor; micro-osteoperforation; Hyrax screw.

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## INTRODUCTION

Treatment duration in orthodontics is something which patient generally complains about. Rapid canine retraction by means of dentoalveolar distraction serves the purpose to reduce treatment duration without any unfavourable effect on periodontium. Distraction osteogenesis is a process whereby new bone is grown by mechanically stretching a pre-existing bone tissue. Here a case of 21 yr old female with class I bimaxillary protrusion is planned for 1st premolar extraction. Maxillary canine retraction is achieved through rapid canine retraction in 10 days.

## HISTORY

Distraction Osteogenesis was first performed in 1905 by Codivilla. Guerrero in 1990 and McCarthy in 1992 performed distraction in human mandible. It was popularized by clinical and research studies of Ilizarov of Russia in 1998 while distraction in alveolar bone was first done by Liou and Huang in 1998<sup>1,2,3</sup>. Wilcko et al in 2001 familiarized PAOO (periodontally accelerated osteogenic orthodontics). After osteotomy, rapid tooth movement occurs due to reduced resistance to tooth movement and increased cortical bone porosity<sup>4</sup>.

## TREATMENT PLAN AND PROGRESS

A 21 yr old female with class I bimaxillary protrusion is planned for 1st premolar extraction. Pre-treatment records

are shown in fig 1a-i. Treatment was planned for canine followed by incisor retraction in upper arch and en-masse retraction in lower. Retraction in upper arch achieved through dentoalveolar distraction. A custom made distractor was fabricated modifying hyrax screw.

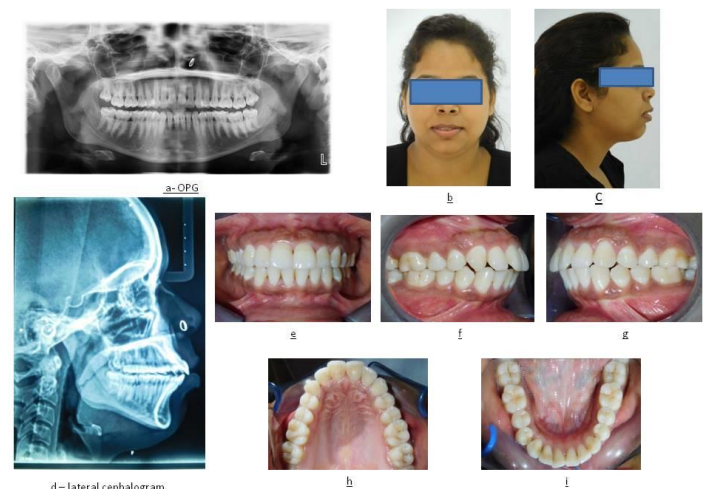


Fig 1- Pre-treatment records; a- i

**Fabrication of the Appliance–** A Hyrax screw of 11mm with pitch of 1mm is modified to form a distractor. Bands on molar and canine with a lingual button welded on canine band are made. The 2 horizontal arms of hyrax are trimmed (fig 2-a). The screw is opened slightly more than the width of premolar to be extracted and extended arms are bent to desirable shape to be soldered on molar and canine bands (fig 2-b).



a- hyrax with 2 horizontal arms



b- hyrax soldered on bands



C- E-chain attached lingually



d- appliance modified lingually with rigid lingual extension, vertical arm kept as apically as possible

Vertical arm of appliance kept apically in the vestibule to prevent tipping and to obtain bodily movement.

Fig – 2; a-d

Surgical procedure - After adequate local anesthesia, full thickness mucoperiosteal flap was raised buccally and palatally, apical to the 1st premolar. Subsequently that tooth was extracted very gently followed by deepening of extraction socket using IOPA as guide through 2mm diamond carbide bur. Corticotomy in the form of series of holes was done using normal saline for irrigation to prevent adverse thermal changes in the periodontium(micro-osteoperforation). This results in weakening of cortical plate and reduction in resistance of tooth movement. Finally both the flaps were sutured with interrupted 4-0 black silk. Patient was advised to take antibiotic and anti-inflammatory.

Distractor was cemented immediately after surgery with E-chain attached to the canine with molar palatally(fig 2-c).

Activation of distractor by closing the screw twice daily was started after 2 days of surgery. Patient was instructed to practice a good oral hygiene along with Betadine mouth rinse during the active distraction phase with hard diet restriction. Canine was retracted completely within 10 days without any discomfort to the patient(fig 3).

In the upper arch for incisor retraction 3 piece intrusion arch was installed for further completion of treatment<sup>7</sup> while



Occlusal view – Sequence



fig 3

A mid treatment(5days) radiographic comparison was made (fig 4a-b)that revealed the successful movement of maxillary canine.

after initial alignment and leveling K-SIR was installed in lower arch for retraction<sup>8</sup>. The total treatment duration for this patient

was 14 months. 1yr Post-treatment photographs and radiographs after active phase of treatment is shown in fig 5.

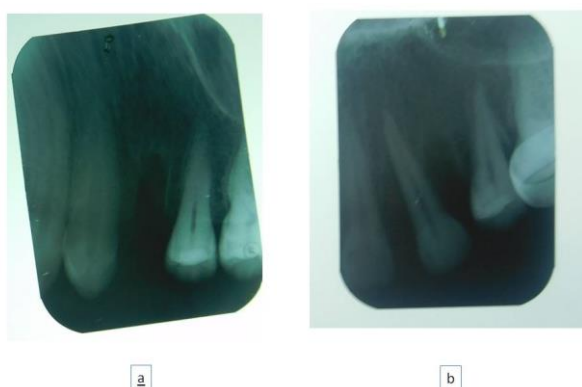


Fig 4; a- pre-operative x-ray , b- post-operative x-ray



Fig 5: 2 year post treatment radiographs(OPG, Ceph and IOPA-13,15;23,25) and photographs

## DISCUSSION

Accelerated tooth movement can be achieved through either drugs (vit D, prostaglandin, Interleukin, parathyroid hormone, misoprostol) or by surgical means like corticotomy, corticision, MOP, piezocision, surgery 1st etc. Through surgery, the trauma cause an increase in inflammatory mediators that cause transient burst of bone remodeling and turnover. ALP(alkaline phosphatase) and ICTP(C-terminal telopeptide of Type-I collagen) play chief role for increased osteoblastic and osteoclastic activity<sup>5,6</sup>. The micro-osteoperforation holes also reduce the resistance for the tooth movement. The above case utilizes the advantage of trauma through extraction and MOP. The apical area of extraction socket of premolars are deepened taking IOPA as guide for easy retraction and bodily movement of canine roots in the extraction area. The 5 phases involved in distraction are- Osteotomy, latency, distraction, consolidation and remodeling. After the surgical phase, a latency phase of 2 days was provided for the clot and woven bone to form. The tension through distractor then helped in traction of the woven bone. After successful

traction of canine into extraction space, active forces are removed and canine is ligated and involved in posterior unit. During the period of active retraction of anteriors, canine remain passive and remodeling changes occur. During this phase, the woven bone calcifies to form sound bone around canines.

## CONCLUSION

Canine retraction through dentoalveolar distraction is an efficient way of canine retraction which not only decrease treatment duration but is an efficient and simple method for clinician too. By simply modifying hyrax screw canine can be retracted in less than 12 days. Further the treatment can be reduced by 6-8 months as retraction of canine alone takes 4-6 months. For the successful retraction patient co-operation and atraumatic surgery remain the most essential.

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