

Treatment of Midline Shift by Asymmetric Premaxillary Distraction: A Case Report

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SUMMARY

Premaxillary distraction osteogenesis is a new method used to correct mild mid-face deficiency. In the presented case asymmetric application of this technique was used. A patient with upper midline shifting 3mm to the left side, Class I molar relationship, and slight anterior cross bite was referred to our clinic for orthodontic treatment. Retrusion of the upper incisors and midline shifting created a space deficiency at the left side of the maxillary arch and the left canine was positioned at vestibule, over the lateral incisor and first premolar teeth. Premaxillary segment was distracted asymmetrically by a tooth-born metal casting distractor designed in our clinic. At the end of treatment midline shift, anterior cross bite, and concave profile were corrected. Additionally, the required space for the alignment of the left canine was gained by the increase of the maxillary arch perimeter.

Key words: *Distraction osteogenesis, Midline shift, Premaxillary deficiency*

ÖZET

Orta hat sapmasının asimetrik premaksiller distraksiyon ile tedavisi: olgu sunumu

Premaksiller distraksiyon, hafif dereceli orta yüz yetmezliğini düzeltmek için kullanılan yeni bir yöntemdir. Sunulan olguda, bu tekniğin asimetrik uygulaması kullanılmıştır. Üst orta hattı 3mm sola doğru kaymış, Sınıf I molar ilişkisi ve hafif ön çapraz kapanışı olan bir hasta ortodontik tedavi için kliniğimize başvurmuştur. Üst kesicilerin retrüzyonu ve orta hat sapması maksiller arkın sol tarafında yer yetmezliği yaratmış ve sol kanin diş vestibulde; yan kesici ve birinci küçük azı dişlerinin üzerinde konumlanmıştır. Kliniğimizde tasarlanan diş destekli metal döküm bir distraktör ile premaksiller segment asimetrik olarak distrakte edilmiştir. Tedavinin sonunda orta hat sapması, ön çapraz kapanış ve konkav profil düzeltilmiştir. Ayrıca, maksiller ark perimetresinin artması ile sol kanin dişin seviyelenmesi için gerekli olan yer kazanılmıştır.

Anahtar kelimeler: *Distraksiyon Osteogenesis, Orta hat sapması, Premaksiller distraksiyon*

Introduction

Distraction osteogenesis is the process of bone and soft tissue regeneration through the application of graduated tensile stress (1). The first applications in the craniofacial region were performed in the mandible following the report of Snyder (2) who lengthened the lower jaw of a dog. Later on, this approach has been used in the treatment of patients with maxillary hypoplasia (3-6). In the last decade, distraction osteogenesis of the craniofacial skeleton has become increasingly popular as an alternative to many conventional orthognathic surgical procedures and to date, the mandible, maxilla, entire midface and orbits, as well as cranial bones have been successfully distracted. Premaxillary distraction osteogenesis is a new method used to correct mild midface deficiency while gaining space by increasing the arch parameter (5-7). Asymmetric application of the premaxillary distraction osteogenesis may be an effective method to correct midline shift and anterior cross bite.

Midline coordination and relative symmetry are basic to an appreciation of facial harmony, and balance. Maxillary and mandibular dental midlines should coincide with each other and facial midline. Coincident dental midlines are an important component of functional occlusion and facial esthetic (8).

The aim of this case report was to introduce asymmetric distraction osteogenesis to the literature and to reveal the effectiveness of the technique in the treatment of anterior cross bite associated with midline shift, and arch perimeter deficiency. To our knowledge, this kind of distractor was being used for the first time in the correction of midline shift associated with anterior cross bite. This is the preliminary case report of a research planned to determine the effectiveness of asymmetric premaxillary distractor.

Case report

20-years old male patient referred to Department of Orthodontics for the treatment of his misaligned upper left canine. Intraoral examination revealed that upper midline shifted 3 mm to the left side. Class I molar relationship was observed although a slight cross bite was existing at the incisors. Retrusion and shifting of the maxillary incisors created a space deficiency at the left side of the arch and the left canine was positioned at vestibule over the lateral incisor and first premolar teeth. In the extra oral examination, slightly concave profile was examined due to the retrusion of upper lip (Fig.1). Cephalometric analysis indicated an SNA of 74° and an SNB of 77°. A moderate skeletal Class III discrepancy was confirmed by an ANB of -3°. Point A was 3 mm and pogonion was 0.5 mm behind the vertical line perpendicular to Frankfort Horizontal. Soft tissue profile analysis revealed that the tip of the upper lip

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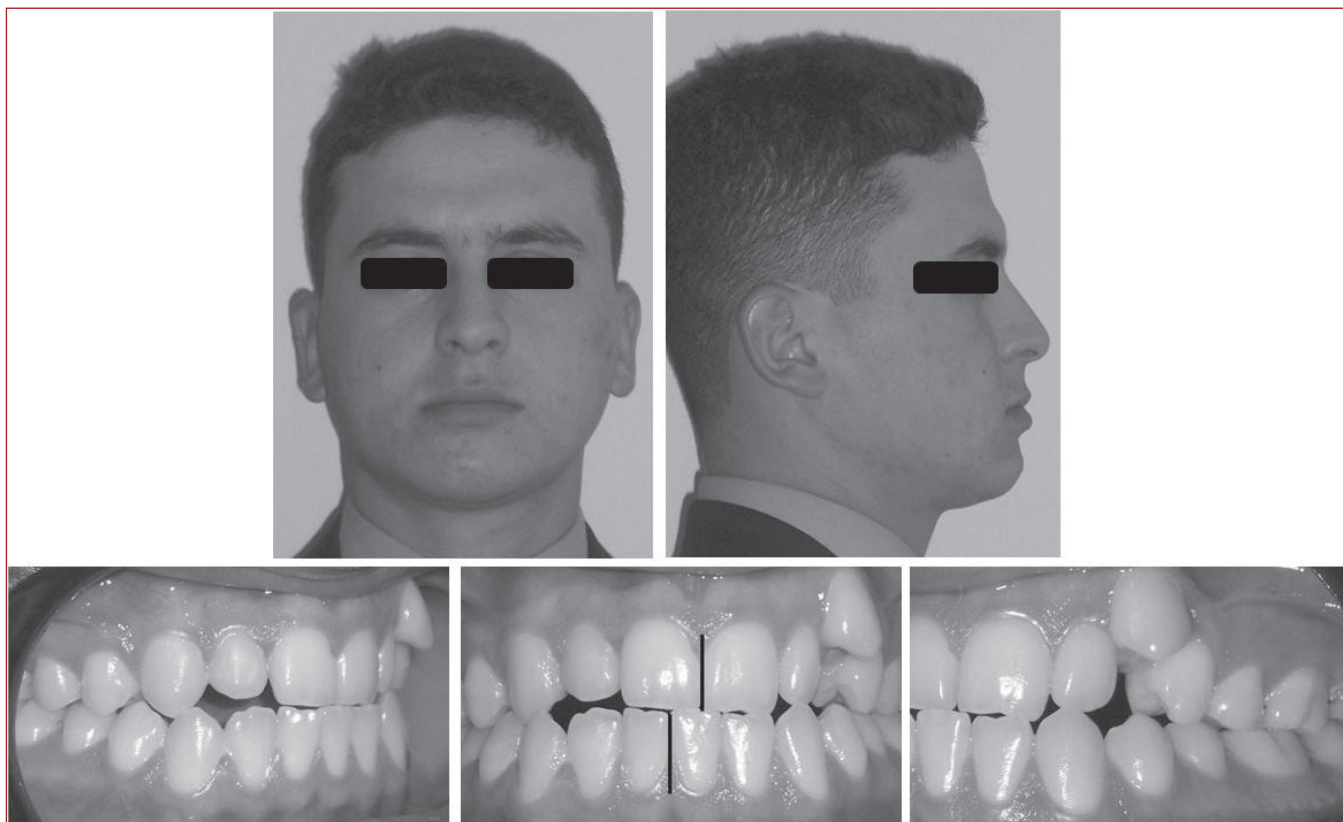


Figure1: Extraoral and intraoral photographs of the patient before treatment

was 5mm and the tip of lower lip was 1mm behind the esthetic line. The patient had a negative overjet of 1mm and the overbite was zero.

Asymmetric movement of the premaxillary segment was planned and a metal cast tooth-born distractor was designed at our clinic for this purpose. A metallic cast surrounding the gingival third of teeth, composed of three individual parts was prepared on the upper cast model. Two loops were occurring on the right of the anterior segment and neighbor part of the right posterior segment. Hyrax screw was used to apply distraction force and it was embedded closer to the shifting side (left side). The anterior arms of the screw were soldered to the anterior segment of the metallic cast and they were closer to the left side. Posterior arms were soldered to the right and left posterior segments (Fig.2).

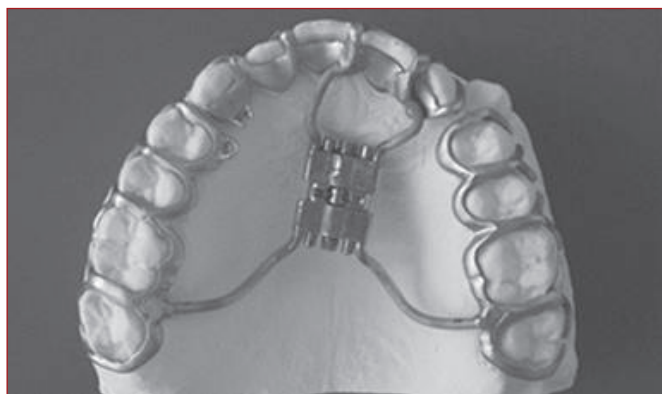


Figure2: Metallic tooth-born distractor

Maxillary anterior segmental osteotomy was performed under general anesthesia. A horizontal incision was made approximately 5 mm above the attached gingiva between the first premolars and a mucoperiosteal flap was dissected superiorly. Vertical osteotomy lines were marked between the incision and aperture priformis with a round bur. These marks were connected by using a surgical saw. Interdental, palatal, and nasal surface osteotomies were performed by an interdental osteotome and with the guidance of the vertical osteotomies; the osteotomy lines were joined with each other to make the anterior segment moveable. The osteotomy was made meticulously to prevent the apexes of the tooth on each side of the osteotomy line. Intersection of nasal spina and aperture priformis was abraded with a bur at the rotation side so as to prevent the narrowing of the nostril at this region.

The distractor was cemented on the teeth and an acrylic bite plane was applied to the lower arch one day after the surgery. The loops existing on the anterior and right posterior segments of the distractor were ligatured to each other. Following the latent period of 7 days, screw was activated by the patient at a rate of 0.75 mm/day performed in 3 increments with 8 hour intervals. After the distraction period of 12 days and Roth brackets were attached on the left canine and premolar teeth and force was applied by an elastic chain for the distalization and eruption of the misaligned canine. During the consolidation period of eight weeks, the canine tooth was approximately aligned. After the removal of the distractor, fixed orthodontic treatment that lasted for 8 months began. Posttreatment photographs were presented in figure 3.

Superimposition of the pre-treatment and post-treatment cephalograms revealed that the length of palatal plane increased 2 mm, and ANS moved in the forward and downward

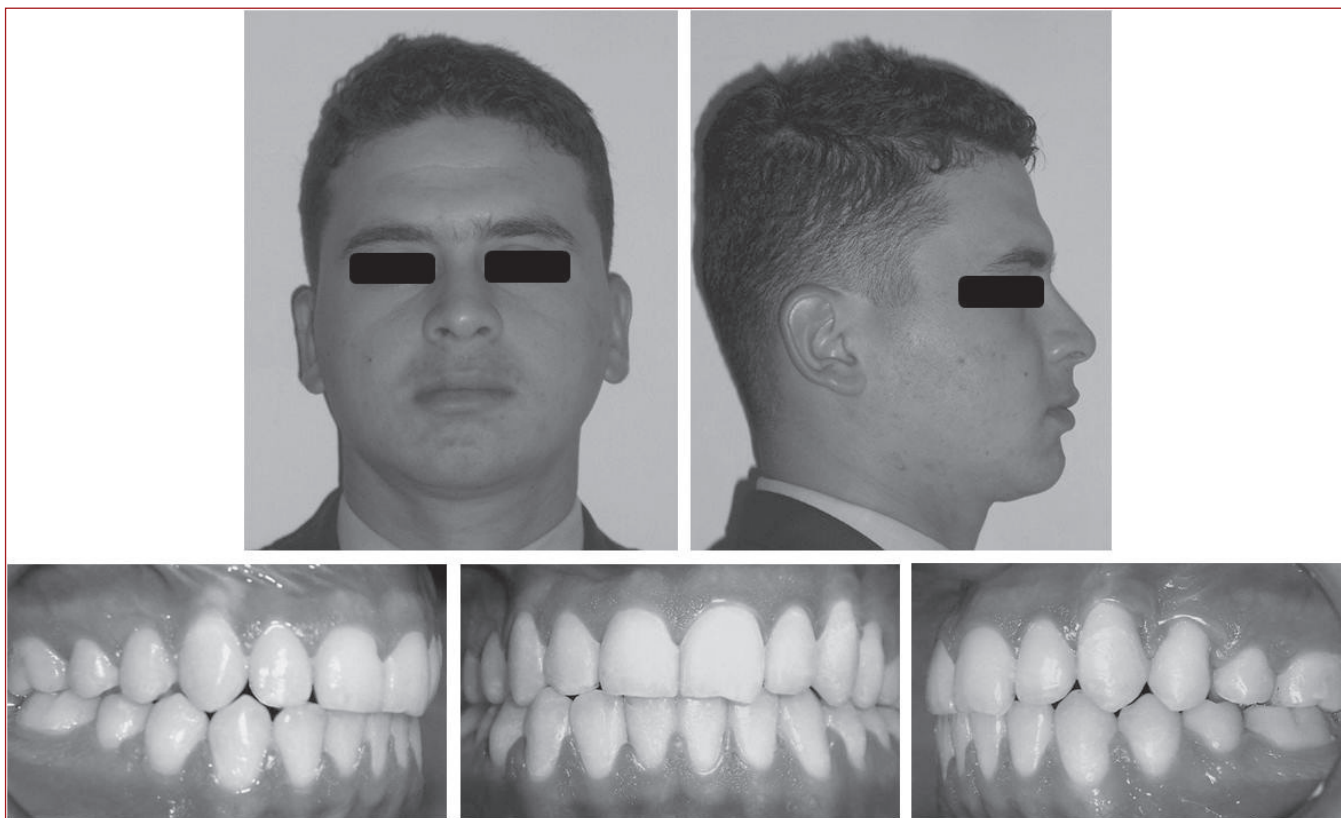


Figure3: Extraoral and intraoral photographs of the patient after treatment

direction. Point A moved 4 mm in the forward direction revealing the anterior positioning of the maxilla. Maxillary central incisors were protruded. Concave profile was corrected due to the anterior positioning of the upper lip (Fig. 4).

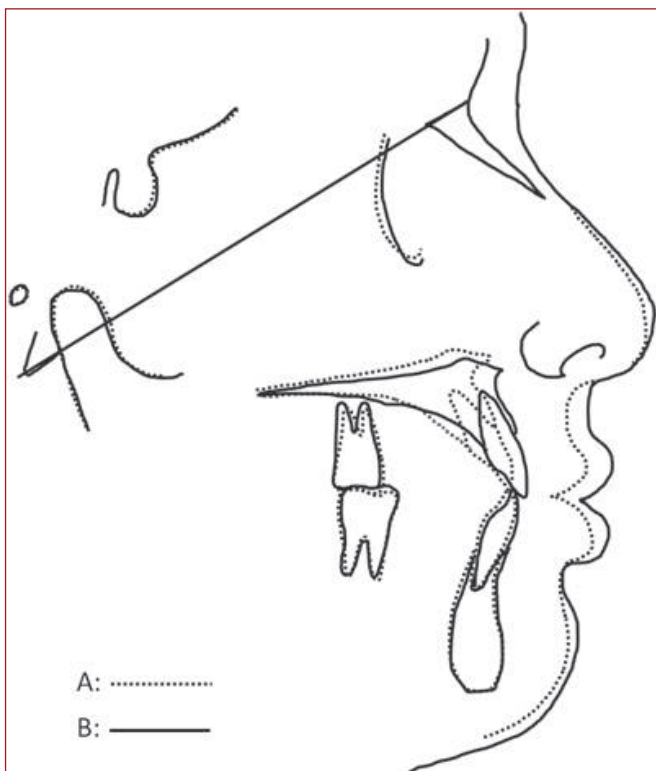


Figure4: Superimposition of the cephalometric radiographs taken before treatment (red line) and after treatment (black line)

Discussion

Minor discrepancies in midline coordination can be corrected in the finishing stage of orthodontic treatment by using unilateral Class II and Class III intermaxillary elastics supported with anterior diagonal elastic (9). A double vertical spring loop assembly to move the four incisors “en masse” has also been introduced. However it is quite difficult to correct large discrepancies after extraction spaces have been closed in the extraction cases. The treatment in the instant of slight discrepancy in the transverse position of posterior teeth must include force system to alter the transverse arch relationship which can be created by parallel cross elastics. When the midline discrepancy results from a skeletal asymmetry, surgical approach may be inevitable (10). In the presented case, molar relation was Class I so in the treatment protocol protrusion of upper incisors while shifting them to right side was necessary. The patient had a mild concave profile and retruded upper lip so we preferred asymmetric premaxillary distraction to provide all the requirements of the case while correcting the profile.

The distractor was constructed as a metallic cast. In our previous case reports (5,6), an acrylic distractor was used for premaxillary distraction but acrylic distractor created hygiene problems as acryl is a plaque retentive material. Additionally, eating and chewing were difficult for the patient as the appliance was covering the occlusal surfaces of posterior teeth. Besides, the occlusal coverage may create a see-saw effect during chewing and the appliance may apply undesirable forces to the anterior segment that can affect the healing process of the distracted side negatively. In the presented case, hygiene problems and chewing difficulties were not observed and the patient got used to the distractor in a few days. Distraction period was not an uncomfortable experience for the patient.

Anterior and right posterior segments of the distractor were ligatured to each other and anterior arms of the hyrax screw were soldered closer to the left side. Due to this mechanism, the distractor worked like a fan type screw and distracted one side more by forcing the premaxilla to a rotation on its axis and corrected the midline shift and anterior cross-bite. This rotation may create nostril asymmetry so the intersection of nasal spina and aperture priformis was abraded with a bur at the rotation side. In the presented case, any asymmetry at the patient's face, nose tip or nostrils was not observed after distraction.

Asymmetric premaxillary distraction was able to correct the midline shift, anterior cross bite, and concave profile. Additionally, space was gained by increasing the maxillary arch perimeter and the maxillary teeth were successfully aligned and these results were convenient with our previous reports (5,6). Further investigations with a large number of patients are needed to determine the efficiency of this technique.

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