

Anterior maxillary distraction: a case report depicting its significance over a repeated lefort I surgery case

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Abstract

A 19-year-old female patient with complete cleft lip and palate on the left side (repair done) with unpleasing profile despite repeated lefort I surgery was reported. On clinical examination patient presented with concave profile, retrusive upper lip and a negative over jet of 3-4 mm. Intra orally patient had angles class II molar and canine relation, congenitally missing upper left lateral incisor with distally tipped anteriors towards the missing tooth region. Treatment involved was anterior maxillary distraction followed by fixed mechanotherapy. A distraction of 7-8 mm was achieved over a period of 2 weeks. The case was finished in a reasonable occlusion and the profile was improved. This case report depicts the significance of anterior maxillary distraction over a repeated lefort I surgery case.

Keywords: Cleft lip & palate; Anterior maxillary distraction; Lefort I; Maxillary Hypoplasia

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Introduction

Correction of the hypoplastic maxilla in cleft patients is a great challenge due to difficulty in mobilizing the hypoplastic maxilla because of the scarring resulted from palatoplasty. Generally, Lefort I surgeries are done to correct the maxillary hypoplasia. The limitation of conventional Le Fort I osteotomy is that a major advancement may make stabilization difficult, and the added effect of palatal scarring can result in significant postsurgical relapse. In contrast, the advantage of distraction osteogenesis is its ability to do major advancement without much relapse due to the formation of mature lamellar bone. In a study done on sheep, the maxilla was advanced 40 mm by distraction osteogenesis, with only 7% relapse at 1-year follow-up [1]. In another experimental study using dogs, cephalometric evaluation

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of 14 mm of maxillary advancement by maxillary distraction demonstrated stable results at 1-year follow-up [2]. Anterior maxillary distraction is the procedure in which the maxilla is distracted forward with the help of an intraoral appliance after the surgical osteotomy cuts are given.

The aim of this article is to describe a technique involving the distraction of the hypoplastic maxilla after failed repeated lefort 1 surgeries in a cleft lip and palate patient.

Case Report

Diagnosis and treatment planning

A 19-year-old female patient (Figure 1) with chief complaint that despite repeated lefort I surgeries to correct her maxillary retrusion she was not satisfied with the results. On extra oral clinical examination, patient presented with class III skeletal pattern and average growth pattern. She had a scar of cleft lip repair on the left side, asymmetrical nose, retrusive upper lip and protrusive lower lip. She had a concave profile, acute nasolabial angle and normal mentolabial sulcus. She had a non-consonant smile with exposure of lower incisors. On intra oral examination, she had an Angles class II molar and canine relation with congenitally missing upper left lateral incisor with distally tipped anteriors towards the missing tooth region creating a midline shift. She presented with 4mm negative over jet, normal deep bite, anterior cross bite and minor crowding in both the arches. Her midline was shifted with respect to facial midline and lower mid line by 4-5 mm.



Figure 1: Pre-treatment photographs and radiographs.

	Norm	Pre-Treatment	Post Treatment	Difference
SNA	82° ± 2	76°	81	3°
SNB	80° ± 2	79°	80°	1°
ANB	3° ± 1	-3°	1°	4°
Upper incisor to maxillary plane angle	108° ± 5	102°	107°	-5°
Lower incisor to mandibular plane angle	92° ± 5	98°	95°	-3°
Interincisal angle	133° ± 10	128°	125°	-3°
Effective maxillary length	93.6 ± 3.2 mm	84 mm	90 mm	6 mm
Effective mandibular length	121.6 ± 4.5 mm	120 mm	121 mm	1 mm
NLA	90-110°	89°	98°	9°
SN-Go Gn	32°	300	320	20

Table 1: Pre and Post treatment cephalometric values.

Treatment objectives were to correct Class III skeletal pattern & maintain skeletal proportions, correct the negative over jet, correct the midline, relief of anterior crowding and to improve her smile. Treatment plan decided was to perform anterior maxillary distraction to bring about maxillary advancement to correct her class III skeletal proportion followed by fixed orthodontic treatment. Non-extraction treatment plan was decided with the conversion of upper left canine to lateral incisor and first premolar to canine. The case was decided to finish in a class II molar and class I canine relationship in the left side.

Treatment Progress

A Hyrax orthodontic appliance (Hyrax expansion screw, Leone) is prepared beforehand on a maxillary dental model (Figure 2). The appliance is oriented so that its activation will produce anteroposterior movement rather than the traditional transverse expansion. It normally has 4 arms. The 2 anterior arms were soldered to the orthodontic bands of the first premolars of each side and the 2 posterior arms were soldered to the first molars.

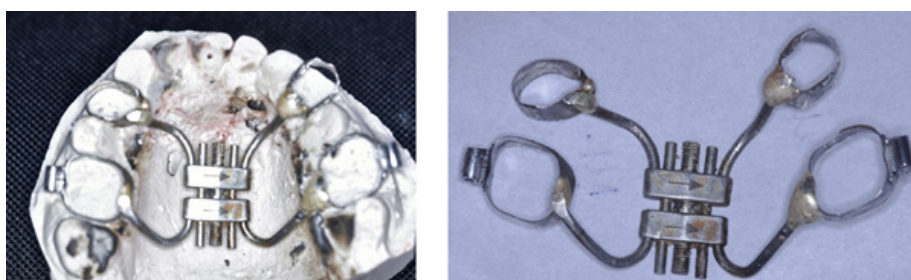


Figure 2: AMD appliance.

Under general anaesthesia, a horizontal maxillary vestibular incision is made from first molar to the other (Figure 3). The mucoperiosteum is then reflected upward, exposing the osteotomy site up to the infraorbital foramen. A buccal linear osteotomy cut is made above the apices between the maxillary first molar and second premolar on both the sides. The lateral nasal wall is cut from the pyriform rim by a small osteotome at the same horizontal level with the nasal mucosa protected. The anterior maxilla is then down fractured and slightly mobilized, while the palatal mucosal pedicle is maintained the prefabricated Hyrax appliance is then inserted into the maxilla (Figure 4). The orthodontic bands attached to the four appliance arms are then cemented to the selected teeth. The maxilla then becomes reasonably stable and the mucosal wound is closed primarily. The appliance was activated after 2 days onwards at a rate of 1 mm per day, using

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4 quarter turns. The patient was admitted for 14 days and an advancement of maxilla was achieved by 8 mm (Figure 5). The appliance was continued for the next 8 months as a consolidation period.



Figure 3: Osteotomy cuts.

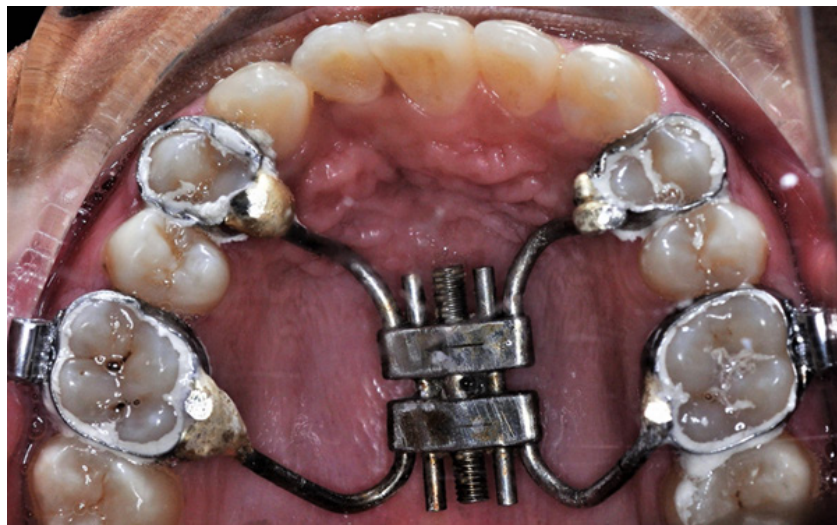


Figure 4: AMD appliance inserted in the patient.

Upper and lowers were bonded with pre-adjusted edgewise fixed appliances (0.022 "x 0.028" slot) with MBT prescription and 0.014" nickel titanium arch wire were placed. The wires were sequentially changed from 0.016 NiTi to 0.019 X 0.025 NiTi arch wire. After sufficient levelling and aligning was achieved the conversion of upper left canine to lateral incisor and first premolar to canine was done. Settling elastics were given to settle the posterior occlusion. Fixed appliance was debonded after overall active treatment of 26 months. Beggs wrap around retainers were given for the upper arch and lower lingual fixed retainer was given.



Figure 5: Anterior maxillary distraction was done for 8 mm.

Treatment Results

The patient was successfully treated by anterior maxillary distraction with the advancement of maxilla by 8mm followed by non-extraction treatment approach over 26 months. Her post treatment smile was improved exceptionally. A reasonable functional and aesthetic result was achieved being a cleft lip and palate case (Figure 6). A class I skeletal base with average proportions were achieved along with an Angles class II molar and class I canine relation in the left side, but the right side had a compromised finish in a relation close to class I molar and canine. The negative -4 mm over jet was successfully reduced to within normal limits. The distally tipped anteriors towards the missing tooth region was corrected and later the conversion of upper left canine to lateral incisor and first premolar to canine was done correcting the midline discrepancy especially with respect to her facial midline. Patient profile was improved to a near straight profile. Nasolabial angle was corrected to its normal. Lips were competent at rest. Incisal show at smile was dramatically improved compared to pre-treatment.



Figure 6: Post-treatment photographs and radiographs.

On cephalometric analysis (Table 1), SNA was increased by 3° suggesting forward movement of maxilla. There was no much change in SNB. ANB was increased by 4° indicating a class I skeletal pattern, thus showing improvement in the sagittal relationship. Effective maxillary length was also increased by 6 mm suggesting forward movement of maxilla. The overall super imposition demonstrated the forward movement of maxilla with slight upper incisor proclination. In analysis of dental parameters upper incisor to maxillary plane angle increased by 4° and the lower incisors to mandibular plane were decreased by 3° bringing it to the normal inclination. Overall the patient was happy with the results improving her confidence and social life being a cleft patient and she is now pursuing nursing course in a reputed university.

Discussion

Patients with severe maxillary hypoplasia secondary to congenital facial deformities are challenging problems for the surgeon. The primary cleft lip and palate repair done during infancy and early childhood improves the facial appearance, speech and deglutition, but these early surgical interventions cause impairment of maxillary growth, producing secondary deformities of the jaw and malocclusion. Traditional orthodontic and surgical procedures are done to overcome this deformity.

Distraction osteogenesis [3-6] is a good armamentarium for surgeons especially patients with major skeletal discrepancy. With distraction osteogenesis, the maxillary advancement can exceed the 10-mm limitation compared with traditional orthognathic procedures. In a meta-analysis [7] of cleft maxillary osteotomy and distraction osteogenesis based on 98 articles from 1966 to 2003, Cheung and Chua found that 72 articles related to cleft maxillary osteotomy performed on 1,418 cleft patients, and that the other 26 articles described 276 cleft patients who had undergone maxillary distraction osteogenesis. This study concluded that distraction osteogenesis tends to be preferred to conventional osteotomy for younger cleft patients with more severe deformities. In such cases, it is feasible to use distraction to achieve moderate to large movement of the maxilla. More studies [8,9] have demonstrated the efficiency of maxillary distraction over the conventional Le Fort I osteotomy. Kloukos [10], *et al.* did a meta-analysis in 2016 regarding the effects and long-term results of maxillary distraction osteogenesis compared to orthognathic surgery for the treatment of hypoplastic maxilla in people with cleft lip and palate.

They concluded that distraction osteogenesis may produce more satisfactory results; however, further prospective research comprising assessment of a larger sample size with participants with different facial characteristics is required to confirm possible true differences between interventions. The advantages of distraction over conventional orthognathic are many but specifically in cleft palate operated patients it helps in two ways. (1) Avoidance of relapse due to scar tissue [11]. (2) Preventing any further speech disturbance due to the increase in velopharyngeal insufficiency caused by sudden maxillary advancement [12]. One of the disadvantage of distraction osteogenesis is lack of vector control which can result in anterior open bite. The precision of distraction depends primarily on the vector planning to avoid open bite. This can be achieved preoperatively by simulated model surgery.

The newly formed soft bone after distraction could be moulded by using inter arch elastics to achieve better interdigitation of teeth. This settling of the occluding teeth might contribute to maintain the sagittal advancement. The forward movement of the entire anterior maxillary segment also improves upper lip and paranasal prominence in cleft lip and palate patients.

Distraction Osteogenesis with the help of a hyrax screw placed in such a way that anteroposterior movement is achieved was found to be effective in the treatment of this patient. Patient's compliance with hyrax appliance for anterior maxillary distraction was good. In addition, the cost of this appliance is very minimal compared with internal external distractors. Cases are being reported with distractions done up to 18 mm by similar technique and have given stable outcomes [13]. An integrated treatment plan by orthodontists, prosthodontists, and surgeons are important to bring optimal improvement of the malocclusion and aesthetics.

Conclusion

The case report depicts the significance of anterior maxillary distraction over a failed repeated lefort I advancement surgical case in a cleft lip and palate patient. Inverted Hyrax appliance as an internal distractor was effective, patient compliant and provided good vector control. Maxillary distraction is an alternative technique to correct maxillary hypoplasia.

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