Case Report

University J Dent Scie 2022; Vol. 8, Issue 4

Multidisciplinary Treatment of An Adult Patient with Maxillary Hypoplasia Secondary to Cleft Lip and Palate: A Case Report

Abstract:

The purpose of this case report is to present a multidisciplinary treatment of an adult patient with maxillary hypoplasia secondary to a cleft lip and palate using a segmental maxillary distraction osteogenesis (MSD) system. Dental-anchored Hyrax device was used to bring about the distaction to increase the upper jaw length without altering speech, with adequate and stable occlusion. Dental implants were placed in a recently created bone to replace missing teeth.

For patients with maxillary hypoplasia, AMSD is a successful treatment option. It preserves velopharyngeal function and is a stable therapy that keeps the overjet achieved with distraction osteogenesis without damaging the posterior occlusion. During the consolidation phase, intermaxillary elastics can solve the open bite caused by tooth-borne devices. At a reasonable cost, the modified Hyrax system allows the maxillary arch to be extended and pushed forward.

Key-words: Distraction Osteogenesis, Orthognathic surgery, Orthodontics

Introduction:

Maxillary hypoplasia secondary to the cleft lip and palate (CLP) is one of the most common congenital deformities in the oro-maxillary area.[1]

For orthodontists and oral & maxillofacial surgeons, correction of this deformity poses a great challenge. Despite the fact that surgical procedures and techniques have significantly improved in recent decades, maxillary advancement of more than 6 mm is difficult to achieve and maintain due to scar tissue.[2] In addition, even if the mandible is in the normal position, it is always apropriate to reverse the mandible with the advancement of maxilla to correct 6 mm or greater anterior cross-bite and achieve a functional dental occlusion. [3]

Maxillary advancement is commonly used to improve a patient's aesthetics and function; nevertheless, research have shown that this procedure worsens the patient's already existing hypernasality and speech problems.

Figuero and Olley employed DO (Distraction steogenesis) to advance the maxilla in patients with a cleft lip and palate. Maxillary distraction osteotomy, roposed in 1997 utilising a rigid external distraction (RED) system4, is effective in the treatment of CLP patients due to improved control and less limitations in the quantity and direction of advancement.

Access this article online

Website: www.ujds.in

Quick Response Code

DOI: https://doi.org/10.21276//ujds.2022.8.4.18

[1]MONIS RAZA, [2]PAYAL SHARMA, [3]SANJEEV KUMAR, [4]AMIT GUPTA

[1,2]Department of Orthodontics, I.T.S Dental College, Ghaziabad

[3,4]Department of Oral-Maxillofacial Surgery, I.T.S Dental College, Ghaziabad

Address for Correspondence: Dr. Monis Raza
Department of Orthodontics, I.T.S Dental College, Ghaziabad, U.P.-201206
Email: monis8raza@gmail.com

Received : 21 April, 2022, **Published :** 31 Dec., 2022

How to cite this article: Monis Raza, Sharma, P., Sanjeev Kumar, & Amit Gupta. (2022). Multidisciplinary Treatment of an Adult Patient With Maxillary Hypoplasia Secondary to Cleft Lip and Palate: A Case Report. UNIVERSITY JOURNAL OF DENTAL SCIENCES, 8(4).

Many other researchers have evaluated the effectiveness of DO in the treatment of maxillary deficiency in patients with cleft and lip palates. [5]

Several studies [5,6] have been conducted that have reported that the probability of velopharyngeal insufficiency (VI) following maxillary distraction was similar to that seen in Le Fort I maxillary advancement. Anterior maxillary segmental distraction (AMSD or AMDO), initially reported by Karakasis, marked the premier application for the correction of maxilary hypoplasia seconary to CLP. When compared to traditional maxillary distraction osteogenesis, AMSD had less negative effects on velopharyngeal closure. When compared to traditional methods of craniofacial reconstruction, the main advantages of AMSD are its ability to generate new bone and a lower morbidity rate without affecting the velopharynx's status. Furthermore, advancement is not as constrained as conventional osteotomies.

This segmental technique has been discussed by Liu et al. and Gunaseelan et al.7,2 with the use of customised intraoral devices. This case report, based on the Liou technique, discusses the successful application of a Hyrax screw to bring about forward movement of maxilla to correct anterior crossbite in a treated cleft palate case.

Case Report:

The main complaint of 19-year-old female patients who came to the Department of Orthodontics was a reverse bite in the anterior tooth region.

After taking a thorough medical history and performing a thorough clinical examination, it was determined that she had a treated case of cleft lip and palate with a resultant maxillary hypoplasia, resulting in a skeletal Class III malocclusion with a 6mm anterior crossbite and a deficient chin projection. She had missing upper laterals and a history of upper first premolar extractions from earlier orthodontic treatment. The clinical findings were supported by cephalometric analysis. [Figure 1]

Figure 1: Pre-treatment extra oral and intra-oral photographs of the patient

Treatment Objectives:

For this patient, the treatment goals were to correct the following:

1. A defective maxillary arch, ideally corrected by moving the maxilla forward.
2. Anterior crossbite
3. Achieve the best overjet and overbite possible.
4. Missing tooth replacement

Treatment Alternatives:

Therapy simulation in Dolphin Software was used to generate a variety of treatment alternatives for this case. A therapeutic option for this case was anterior maxillary movement through Le Fort 1 osteotomy. However, because of the risk of patients' hypernasality worsening after Le Fort 1 osteotomy, as well as the risk of velopharyngeal insufficiency worsening, AMDO with genioplasty was chosen as the treatment approach. Furthermore, using AMDO to create space for replacement of previously extracted premolars was a desirable outcome that prompted us to choose AMDO in this situation.

Treatment Progression:

MBT 0.022x0.0028" was used to begin fixed orthodontic therapy. The patient was prepared for a modified Lefort 1 osteotomy after the initial phase of levelling and alignment. A piezo knife was used to make vertical cuts on both sides between the first molar and premolars. Horizontal cuts were made in the same way as traditional Le Forte 1 osteotomy was done. The premolar and molar were fitted with Hyrax expanders once this segment was movable. [Figure 2]

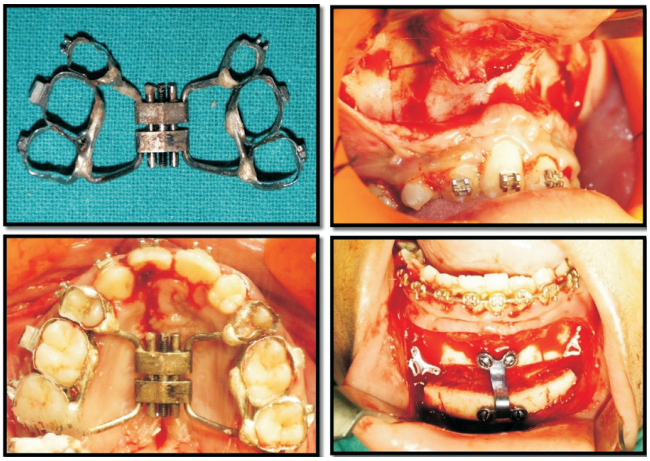

Figure 2: Osteotomy followed by cementation of Hyrax Expander and Genioplasty

Distraction Protocol:

After a four-day period of latency, the distraction treatment was started. At a pace of 0.5 mm of hyrax screw (1mm/day), the distraction device was activated twice each day. After achieving a 3 mm overjet, the distraction was stopped. To address the patients' open bite, intermaxillary anterior box elastics were employed. The Hyrax device was only removed after signs of callus appeared on the radiographs after an 8-week consolidation period.

SNA, SNB, ANB,Wits, amount of distraction, U1 to SN (angle between the long axis of the upper central incisor and anterior cranial base), IMPA (angle between the long axis of the lower central incisor and mandibular plane), inclination angle (the angle between Pn–perpendicular and the palatal plane), gonial angle (angle determined by the points Ar, Go, and Me), Jarabak ratio (the ratio between posterior and anterior face heights; S–Go/N–Me), GoGn–Sn (angle between gonion–gnathion/sella–nasion), and nasolabial angle were measured on T1 and T2 radiographs.[Figure 3] [Table 1]

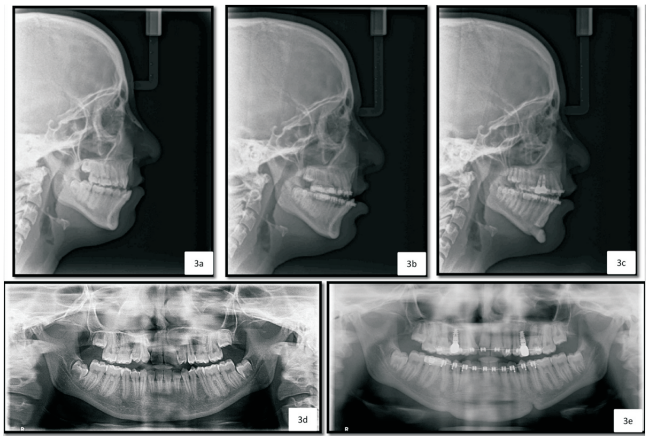

Figure 3: Pre-treatment (3a), Pre distraction (3b) and Post distraction lateral cephalograms (3c) along with Pre-treatment (3d) and Post-treatment (3e) orthopantomograms (OPG)

Table 1: Cephalometric Analysis for Orthognathic Surgery by Burstone:

Parameter	Normal	Pre-treatment	Pre-surgery	Post treatment
Ar-PTM (HP) mm	32 mm	28 mm	28 mm	28mm
PTM-N(HP) mm	50 mm	54 mm	54 mm	54mm
N-A-Pog	2.6 degree	8	8	12
N-A (HP)mm	-2 mm	-11 mm	-11	-6
N-B(HP)mm	-6.9 mm	-15 mm	-15	-15
N-Pog(HP)mm	-6.5 mm	-19 mm	-19	-16
N-ANS(perp HP) mm	50 mm	50 mm	51	52
ANS-Me (perp HP) mm	60.6 mm	58 mm	58	58
PNS-N (perp HP) mm	50.6 mm	45 mm	46	46
Mand plane-HP	24.2 degree	27	27	28
U1-NF(perp NF) mm	27.5 mm	26 mm	26	27
L1-MP(perp MP) mm	40.8 mm	38mm	38	39
U6-NF(perp NF)mm	23 mm	22mm	22	22
L6-MP(perp MP) mm	32 mm	29mm	30	30
PNS-ANS mm	52.6 mm	46 mm	47	50
Ar-Go mm	46.8 mm	40 mm	39	40
Go-Pog mm	74.3 mm	70mm	69	73
B-Pog mm	7.2 mm	5mm	5	6
Ar-Go-Gn	122 degree	125	126	126
OP-HP	7.1 degree	8	9	9
A-B (OP) mm (Wits)	0.4 mm	-4	-5	-1
U1-NF (degree)	112.5 degree	97	97	98
L1-GoGn degree	95.9 degree	94	94	93

Treatment Results:

Anterior maxillary distraction osteogenesis was used to successfully treat the patient. After achieving satisfactory over jet and occlusion, treatment was discontinued. During

the distraction phase, the patient developed an anterior open bite, which was corrected with intermaxillary box elastics. [Figure 4]

Figure 4: Post distraction extra-oral and intra-oral photographs

We had achieved proper overjet and overbite, an improved profile, and no change in speech by the end of the distraction phase. The gained mesial space between teeth 16 and 26 was approximately 7mm, which was used to place dental implants. After another three months, both sides were fitted with prostheses. Canines replaced first premolars, while lateral incisors replaced canines.

The patient had Class II molars, Class I canines, and a normal overjet and overbite at the end of treatment. To improve the patient's smile, aesthetic modifications to the upper anterior teeth were performed conservatively. [Figure 4] [Figure 5

Figure 5: Post debond extra oral and intra oral photographs

Discussion:

Several procedures are described in the literature to enable maxillary advancement in patients with maxillary hypoplasia:

Conventional Lefort I maxillary advancement; Lefort I maxillary distraction with external or internal distraction devices; and anterior segmented distraction AMDO was found to be successful in the treatment of patients with a cleft lip and palate suffering from maxillary deficiency with the help of a hyrax screw. [7,3,5,8]

The anterior segment of the maxilla was mobilised to achieve free movement of the osteotomized segments for smooth distraction. When compared to traditional methods, the technique adopted in this case is simple and has no adverse effects on the velopharyngeal space. The patient's compliance with the anterior maxillary distraction hyrax appliance was outstanding. In addition, the cost of this appliance is negligible when compared to internal and external distactors.

DO has recently been utilised to correct a wide range of craniofacial defects. A severe maxillary deficiency may be accompanied by a broad residual alveolar and maxillary cleft lip and palate in patients with such defects. It is possible to gradually advance a severely deficient maxilla to the ideal horizontal and vertical positions using DO protocols.[7,9,10,5]

DO can be utilised with either internal or external devices like tooth-supported, hybrid, and bone-supported intraoral devices. One of the disadvantages of bone-supported devices is the need for a second operation to remove the device, as well as a longer operation time and additional costs. However, there is no requirement for surgical insertion or removal of the intraoral device in the method used in this study. Another disadvantage of DO is a lack of vector control, which can lead to anterior open bite.[11] Nonetheless, this disadvantage can be overcome by callus molding immediately following the completion of the distraction phase. As can be seen in this case, open bite closure was achieved in by applying inter-maxillary elastics in the anterior region.

Among orthodontists and oral and maxillofacial surgeons, orthognathic surgery is a well-recognized procedure for treating maxillofacial deformities. After a patient has been orthodontically prepared, movement of the maxilla and mandible can be completed in a matter of hours. However, when compared to this DO method, a larger risk of morbidity, the necessity for a longer surgical time, the requirement for fixation, and relapse tendency can be considered some disadvantages of Le Fort 1 osteotomy.[12,2,11,5]

Conclusion:

By combining anterior maxillary DO with an intra-oral device, a successful treatment outcome, with improvements in jaw function, good aesthetics, and occlusal stability was achieved in a maxillary deficient case secondary to cleft lip and occlusal stability.

Declaration of Patient Consent:

The authors certify that they have obtained all appropriatepatient consent forms. In the form the patient has given her consent for her images andother clinical information to be reported in the journal.The patient understands that her name and initials willnot be published and due efforts will be made to concealher identity, but anonymity cannot be guaranteed.

References:

1. Fariña R, Diaz A, Pantoja R, Bidart C. Treatment of Maxillary Hypoplasia in Cleft Lip and Palate: Segmental Distraction Osteogenesis With Hyrax Device. *J Craniofac Surg*. 2018;29(2):411-414.
2. *Gunaseelan R, Cheung LK, Krishnaswamy R, Veerabahu M.* Anterior Maxillary Distraction by Tooth-Borne Palatal Distractor. J Oral Maxillofac Surg 2007; 65:1044-1049.
3. Li H, Dai J, Si J, Zhang J, Wang M, Shen SG, Yu H. Anterior maxillary segmental distraction in the treatment of severe maxillary hypoplasia secondary to cleft lip and palate. Int J Clin Exp Med 2015;8(9):16022-16028.
4. Upadhyay N, Singh AK, Prashad V, Upadhyaya DN. Use of hyrax distractor in maxillary hypoplasia associated with cleft lip and palate patients. J Cleft Lip Palate Craniofac Anomal 2019;6:17.
5. Lin X, Zhou N, Huang X, Song S, Li H. Anterior maxillary segmental distraction osteogenesis for treatment of maxillary hypoplasia in patients with repaired cleft palate. J Craniofac Surg. 2018 Jul;29(5):e480-e484.
6. Farronato G, Kairyte L, Giannini L, Galbiati G, Maspero C. How various surgical protocols of the unilateral cleft lip and palate influence the facial growth and possible orthodontic problems? Which is the best timing of lip, palate and alveolus repair? literature review. *Stomatologija*. 2014;16(2):53-60.
7. Liou EJ, Chen PK, Huang CS, et al. Interdental distraction osteogenesis and rapid orthodontic tooth movement: a novel approach to approximate a wide alveolar cleft or bony defect. Plast Reconstr Surg 2000;105: 1262–1272
8. Marcantonio C, Nícoli LG, Pigossi SC, Araújo RF, Boeck EM, Junior EM. Use of alveolar distraction osteogenesis for anterior maxillary defect reconstruction. J Indian Soc Periodontol 2019;23:381-6.
9. Keinprasit C, Danthumrongkul S, Chengsuntisuk T, et al. Distraction osteogenesis treatment of maxillary deficiency for cleft patient using internal distraction device: a case report. J Med Assoc Thai 2010;93(suppl. 4):S83–S90.
10. Silveira A, Moura PM, Harshbarger RJ3rd. Orthodontic considerations for maxillary distraction osteogenesis in growing patients with cleft lip and palate using internal distractors. Semin Plast Surg 2014;28:207–212.
11. Kuroda S, Watanabe K, Ishimoto K, Nakanishi H, Moriyama K, Tanaka E. Long−term stability of LeFort III distraction osteogenesis with a rigid external distraction device in a patient with Crouzon syndrome. Am J Orthod Dentofacial Orthop 2011;140:550−61.
12. Figueroa AA, Polley JW. Management of severe cleft maxillary deficiency with distraction osteogenesis: Procedure and results. Am J Orthod Dentofacial Orthop 1999;115:1−12.