

CASE
REPORT

Orthodontic Treatment of a Patient with Unilateral Cleft Lip and Palate and Congenitally Missing Maxillary Left Lateral Incisor

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Abstract

Cleft lip and palate is among the most common congenital anomalies of the head and neck region. Treatment of cleft lip and palate is challenging and requires the cooperation of various medical teams. A 15 year-old patient with a cleft lip and palate presented to the Department of Orthodontics at ShahidBeheshti University, School of Dentistry complaining of unattractive appearance. The patient had unilateral cleft lip and palate and congenitally missing maxillary left lateral incisor and mentioned a history of surgical repair of the cleft in childhood. He had a concave profile, -5mm overjet, -5 mm Wits appraisal and abnormal eruption path of teeth especially for the maxillary left central incisor. The patient underwent orthodontic treatment without orthognathic surgery. Post-treatment records showed excellent results in terms of occlusion and facial balance and harmony.

Key words: cleft lip and palate, missing teeth, orthodontic treatment.

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Introduction

Cleft lip and palate is the most common congenital anomaly of the maxillofacial region with an incidence rate of one per 700 births. According to the statistics reported by some countries, cleft lip and palate is more prevalent among Asians. Incidence of this condition is variable among different races and is also gender-dependent (1). The cleft develops as the result of non-fusion of medial nasal and the maxillary prominences or the palatal shelf during the 4th week of gestation (2). These events occur due to various genetic and environmental factors such as the high maternal age and smoking during pregnancy (3, 4). Clefts can lead to severe esthetic and psychosocial complications, troubled feeding, orotracheal infections and speech problems (5). In patients with cleft lip and palate dental anomalies such as hypodontia, malformation and abnormal eruption patterns are a common occurrence (6-10). Central and lateral incisors adjacent to the cleft are the most commonly missing or malformed teeth in these patients. Malformations may appear as peg-shaped or T-shaped lateral incisors and enamel deformities. High prevalence of congenitally missing maxillary lateral incisor in such cases is attributed to the lack of nutritional supply adjacent to the cleft, congenital causes, surgical trauma or impaired mesenchymal support at the site (11). Mesenchymal defect can lead to inadequate mesenchymal support of the maxillary lateral incisor bud. Thus, cleft lip and palate patients with severe mesenchymal defects usually have congenitally missing maxillary lateral incisors (12). Incomplete development of mid-face (mid-face hypoplasia) due to congenital defects or following reparative surgeries on the maxilla and scar tissue formation are also among the important complications in these patients. New surgical techniques have reduced the prevalence of this condition; however, it has not reached zero. Therefore, anterior, posterior and transverse dental and skeletal crossbites are usually seen in patients with cleft lip and palate. Thus, correction of anterior-posterior and transverse jaw relationships is helpful for establishing a normal masticatory function and inter-jaw relationships (13). This paper reports a 15 year-old patient with unilateral cleft lip and palate and

congenitally missing maxillary lateral incisor who underwent non-surgical orthodontic treatment.

Etiology and Diagnosis

Our patient was a 15 year-old teenage boy referred to the Orthodontics Department for the assessment of anterior and posterior crossbites. The chief complaint of patient was unattractive appearance of maxillary anterior teeth which were hidden behind the mandibular anterior teeth. The patient had left sided cleft lip and palate and congenitally missing maxillary left lateral incisor. Also, the patient had undergone reparative surgery of the defect at early infancy and had received iliac bone graft at the age of 7. At the time of admission, resorption of the graft site was visible. On extra-oral clinical assessment, our patient had a mesoprosopic face and a concave profile. Retrusive upper lip and maxilla were noticeable as well. Frontal view radiographs and anterior posterior cephalogram revealed a flat nasal base, nasal septum deviation and facial asymmetry especially infraorbital rim cant. The maxillary and mandibular arch forms were taper and asymmetric. Maxillary arch due to the presence of cleft was constricted and had severe dental rotations, anterior crossbite and unilateral posterior crossbite. Maxilla had a moderate crowding of -6 mm and mandible had a mild crowding of -2mm and a severe curve of Spee. The patient had Class III molar and canine relationship at both sides, -5 mm overjet and 90% overbite. Maxillary anterior teeth especially the maxillary left central incisor had a 90 degree rotation relative to its normal eruption path. Maxillary midline had a 3mm deviation from the facial midline while the mandibular midline coincided with the facial midline (Figures 1, 2 and 3).

Cephalometric analysis revealed a Class III skeletal relationship (ANB:-6, Wits appraisal:-5) and horizontal growth pattern (SN-MEGO: 30). Maxillary and mandibular teeth were retroclined (U1-SN:92, IMPA:88)(Figure 4). The patient had a severely decayed mandibular right first molar tooth and poor oral hygiene. The maxillary left central incisor had gingival recession and other teeth had bleeding on probing.



Figure 1. Pre-treatment frontal view at rest (A), smile (B), right side profile (C), left side profile (D)

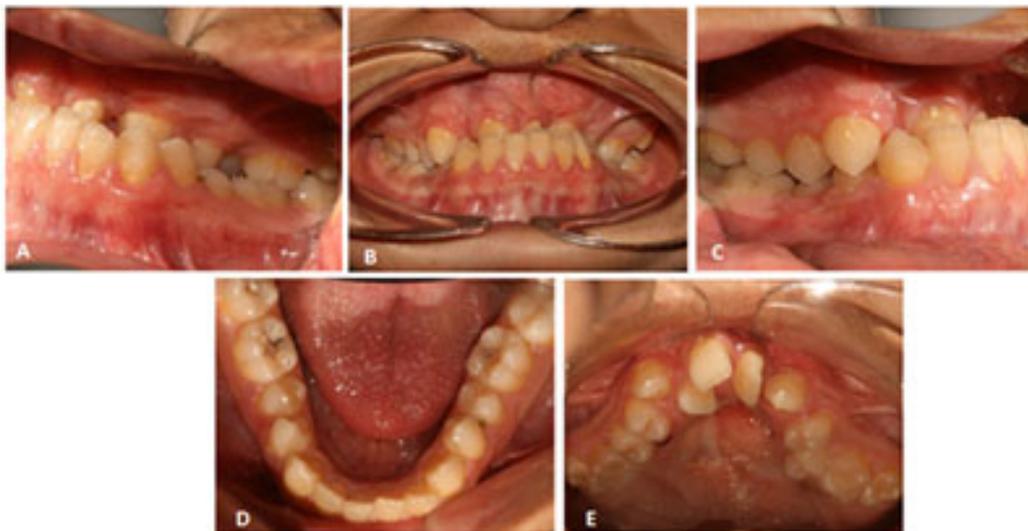


Figure 2. Intra-oral view of the left side occlusion (A), anterior occlusion (B), right side occlusion (C), occlusal view of the mandibular teeth (D), occlusal view of the maxillary teeth (E)

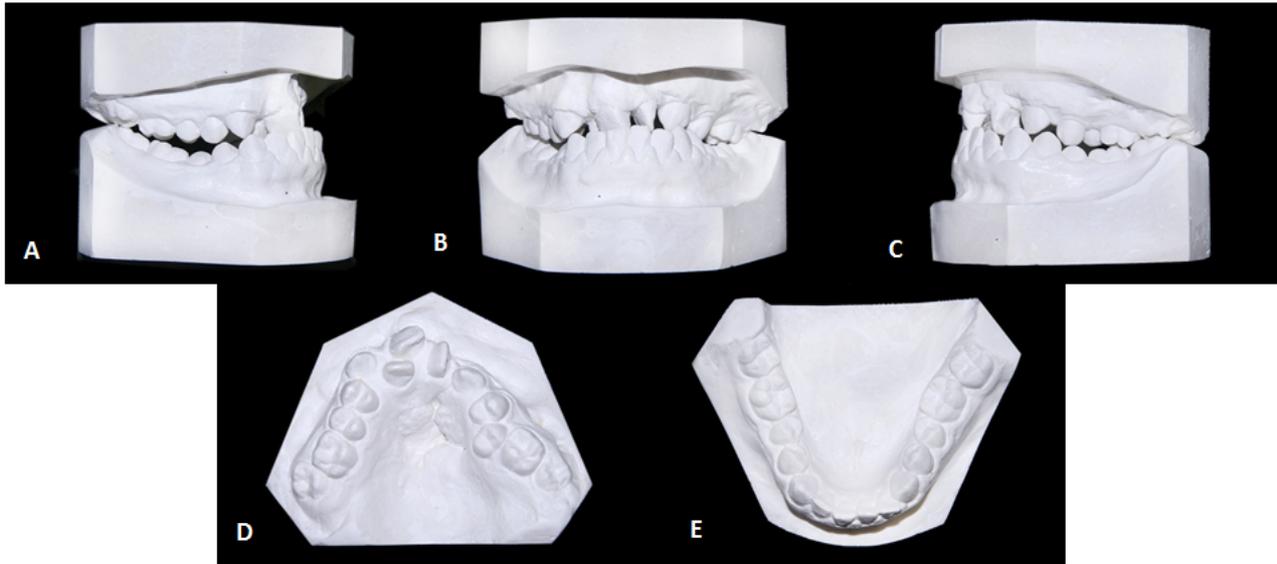


Figure 3. Pre-treatment stone casts: the right side occlusion (A), anterior occlusion (B), left side occlusion (C), occlusal view of the maxillary teeth (D), occlusal view of the mandibular teeth (E)

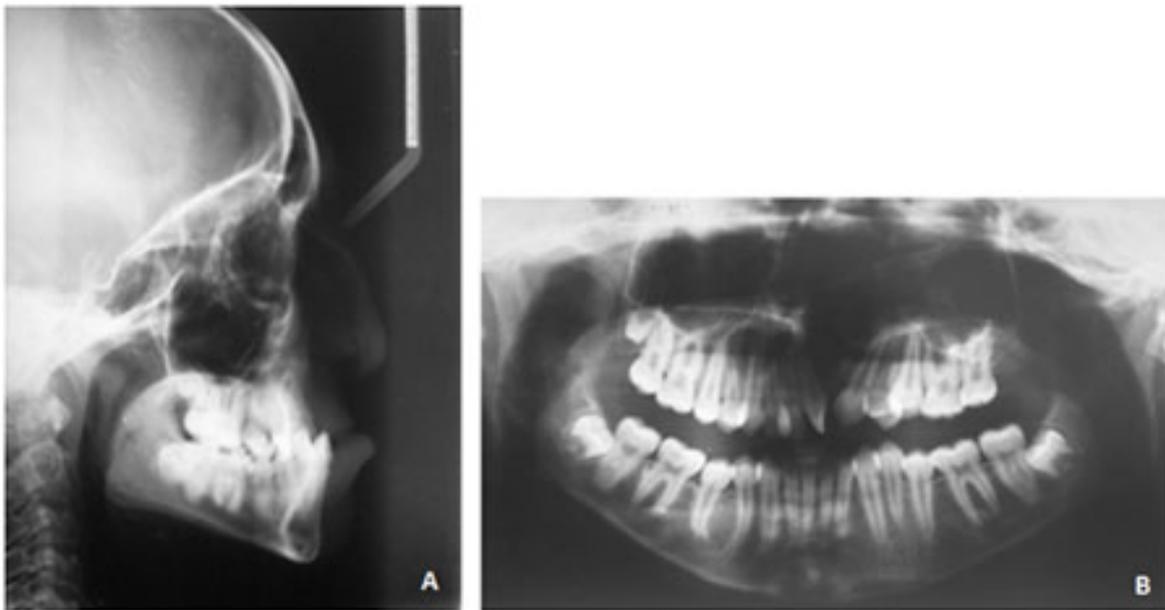


Figure 4. Pre-treatment radiographs: lateral cephalogram (A) and panoramic radiograph (B)

Treatment Objectives

Treatment objectives were obtaining normal overjet and overbite, Class I molar and canine relationship and correction of maxillary midline shift. Leveling curve of Spee, correction of anterior and posterior crossbites, correction of crowding in both arches and improvement of occlusion and facial profile were among other goals of the study. We considered expansion of buccal segments followed by maxillary protraction. Considering the fact that palatal expansion could cause further gap at the cleft site, secondary bone grafting was also planned for the area. Replacement of the missing lateral incisor with a fixed partial denture or a dental implant following orthodontic treatment was also included in the treatment plan.

Course of Treatment

Before the orthodontic treatment onset, an operative dentistry consultation was requested for the patient regarding the replacement of the missing maxillary left lateral incisor. A periodontal consultation was also required regarding the need for a gingival graft for the maxillary left central incisor; which was performed prior to the orthodontic treatment. Mandibular right first molar tooth underwent root canal therapy and restored. The patient was also referred to the Department of Maxillofacial Surgery for evaluation of third molars. Because of poor oral hygiene, our patient received several dental cleanings. Maxillary right central incisor and mandibular left canine tooth were also restored.

After performing the required consultations, maxillary molar and first premolar teeth were banded and rapid palatal expansion was done with the Hyrax appliance (the screw was activated twice daily) to correct the posterior crossbite and release the maxillary sutures. Two weeks later, a facemask along with 3/16 inch heavy elastic attached to hook on maxillary first premolar were used for maxillary protraction. Activation of screw continued for 2 more weeks. After 2 months, maxillary teeth were bonded with 0.22 inch Roth brackets (American orthodontics) and 175 coaxial wire was used for initiation

of leveling and aligning. For completion of leveling and aligning, steel wires were consecutively used. During this phase of treatment, an omega loop was inserted on the mesial side of the maxillary first molars to maintain arch length. Six months after cementation of Hyrax appliance, the device was removed. In order to correct the maxillary cant, we decided to intrude the maxillary right teeth and extrude the maxillary left teeth. Thus, we used a cantilever made of 17x25 inch TMA wire along with 17x25 SS base wire. A unilateral posterior bite plate was also used in the right side. Two months after the activation of cantilever spring, mandibular teeth were bonded by edgewise brackets and 175 coaxial wire was used for leveling and aligning of mandibular teeth. During the treatment course, mandibular canine-to-canine teeth were ligated to each other by a ligature wire and the wire was cinched back distal to second molars. Activation of spring for intrusion of teeth was continued for 3 months. Once the mandibular wire reached 16x22 SS size, the cantilever springs were removed and replaced with 0.16 inch continuous SS wire in the maxilla. Medium 1/8 inch elastics in the form of small triangles along with a posterior bite plate in the right side were used for continuation of extrusion in the left side. After correction of maxillary cant, use of elastic and posterior bite plate was terminated and coinciding 0.18 inch SS continuous wires were used in the maxillary and mandibular arches. Also, 17x25 inch TMA wire and palatal crown torque were used and the bracket was inverted to reverse the maxillary left central incisor torque. A panoramic radiograph was obtained to ensure root parallelism and the required modifications were made accordingly. The treatment was accomplished after 36 months and a fixed retainer was used in the mandible and a removable Hawley retainer in the maxilla.

Treatment Outcome

Post-treatment records indicated the achievement of the respective treatment goals. Facial photographs revealed esthetically-improved facial profile (Figure 5).



Figure 5. Post-treatment frontal view at rest (A), smile (B), left side profile (C) and right side profile (D).

Class I molar and canine relationships along with a canine protected occlusion were also achieved. The inter-canine and inter-molar widths significantly increased after treatment. Maxillary inter-canine width was 26 and 36 mm before and after treatment, respectively. Maxillary inter-molar width was 45 and 51 mm before and after treatment, respectively. Ideal overjet and

overbite were obtained and the curve of Spee was successfully leveled. Teeth rotations and abnormal eruption path of maxillary left central incisor were corrected as well. Moderate maxillary and mild mandibular crowding were also corrected. However, the maxillary midline shift could not be completely corrected (Figure 6 and 7).

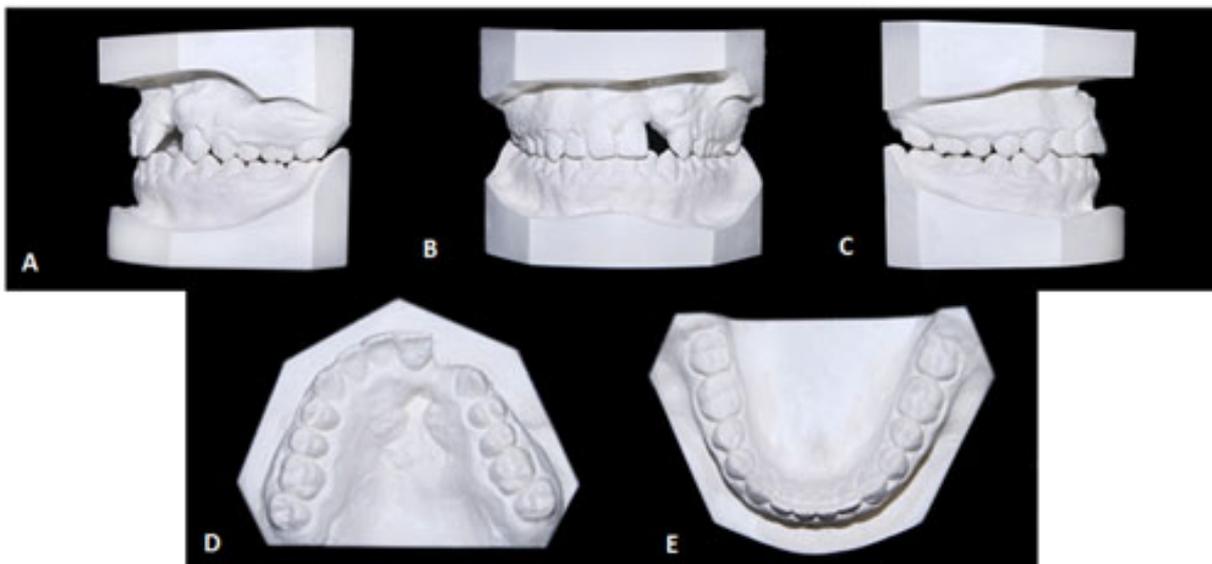


Figure 6. Post-treatment stone casts: the left side occlusion (A), anterior occlusion (B), right side occlusion (C), occlusal view of the maxillary teeth (D), occlusal view of the mandibular teeth (E)



Figure 7. Post-treatment intra-oral view of the left side occlusion (A), anterior occlusion (B), right side occlusion (C), occlusal view of the mandibular arch (D) and occlusal view of the maxillary arch (E)

Cephalometric analyses before and after treatment (Table 1) and also superimposition of cephalograms revealed improvements in skeletal and dental relationships (Figures 8 and 9).

Table 1. Pre- and post-treatment cephalometric analyses

	Normal	Pre Tx.	Post Tx.
SN-FH	6-8°	8	8
N S Ar (Saddle a.)	123°±5°	107	107
S Ar Go (Articular a.)	143°±6°	146	146
Ar GoMe (Gonial a.)	130°±7°	137	137
Sum of posterior angles	394°	390	390
NS-Gn(Y-axis a.)	66°	62	66
Pn-Pal(Incl. a.)	85°	84	86
SGo: NMe×100	62-65%	61%	64%
Pal-GoMe(basal a.)	25°	22	24
SN-MeGo	34°	30	33
MeGo-Occ. P.	14°	13	15
SNA	81°	75	79
SNB	79°	78	79
ANB	2°	-6	0
SN-Pog	80°	80	81
Wits	1	-5	-2
U 1-SN	102 ±2	92	107
L 1-MeGo	90 ±3	88	85
N-Pog toU 1	-2 to +4mm	-5	+1
N-Pog toL1	-2 to +2mm	0	-1
Interincisal	135	155	140
U1-Palp a.	110	108	130

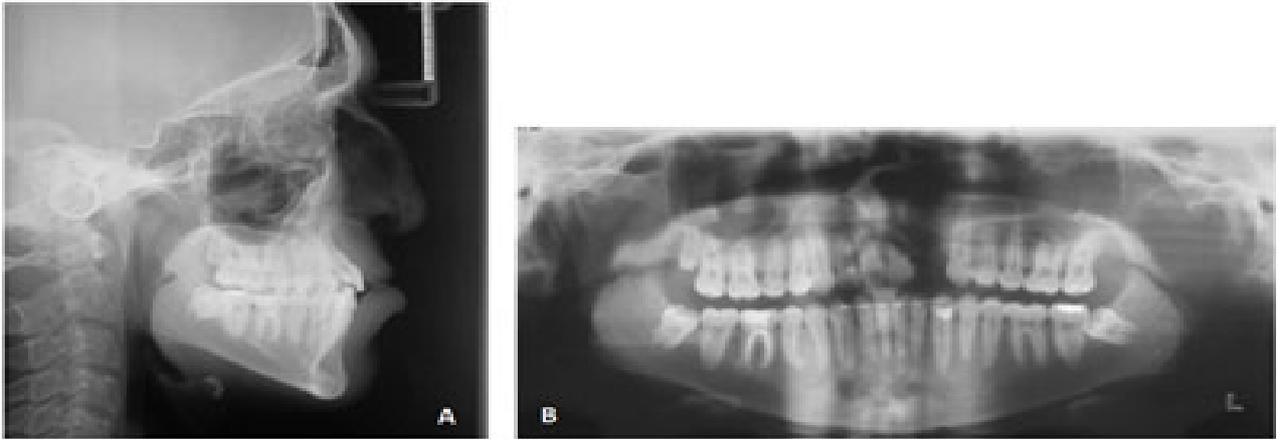


Figure 8. Post-treatment radiographs: Lateral cephalogram (A) and panoramic radiograph (B)



Figure 9. Superimposition of patient's cephalograms obtained before (black) and after (green) treatment

References:

- 1: Ching GH, Chung CS. A genetic study of cleft lip and palate in Hawaii.I. Interracial crosses. *Am J Hum Genet* 1974;26:162-76.
- 2: Berkowitz S. State of the art in cleft palate orofacial growth and dentistry. A historical perspective. *Am J Orthod* 1978;74: 564-76.
- 3: Bille C, Skyttthe A, Vach W, Knudsen LB, Andersen AM, Murray JC, Christensen K. Parent's age and the risk of oral clefts. *Epidemiology*.;16(3):311-6, 2005
- 4: Chung KC , Kowlaski CP Kim HM , Buchman Sr.- Maternal cigarette smoking during pregnancy and risk of having a child with a cleft lip/palate . *PlastReconstrSurg*105 : 485-491,2000.
- 5: Millard DR. Cleft lip. In: McCarthy JG, May JW, Littler JW, eds. *Plastic Surgery*. Philadelphia, Pa.:WB Saunders Co;1990.
- 6: Olin WH. Dental anomalies in cleft lip and cleft palate patients.*Angle Orthod* 1964;34:119-23.
- 7: Fishman LS. Factors related to tooth number, eruption time, and tooth position in cleft palate individuals. *ASDC J Dent Child*1970;37:303-6.
- 8:Ranta R, Tulensalo T. Symmetry and combinations of hypodontia in non-cleft and cleft palate children. *Scand J Dent Res* 1988;96:1-8.
- 9: Kang JH, Kang JS, Son WS. A study of the frequency of congenitally missing and supernumerary teeth in cleft lip and palate patients.*Korean J Orthod* 1993;23:319-26.
- 10: Bok JK, Son WS. The effects of cleft on mesiodistal dimension of permanent teeth in unilateral cleft lip and palate patients. *Korean J Orthod* 1995;25:447-51.
- 11: Vichi M, Franchi L. Abnormalities of the maxillary incisors in children with cleft lip and palate. *ASDC J Dent Child* 1995;62:412-7.
- 12: Ranta R. A review of tooth formation in children with cleft lip/palate.*Am J OrthodDentofacialOrthop* 1986;90:11-8.
- 13: Tindlund RS, Rygh P, Bøe OE. Orthopedic protraction of the upper jaw in cleft lip and palate patients during the deciduous and mixed dentition periods in comparison with normal growth and development.*Cleft Palate Craniofac J*. 1993 Mar;30(2):182-94.