



Interdisciplinary Treatment of an Adolescent with Unilateral Cleft Lip and Palate

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ABSTRACT

Aim: The present case report describes the importance of interdisciplinary approach and gives an understanding on management of an adolescent with unilateral cleft lip and palate.

Background: Failure of fusion between medial nasal process and maxillary process or between the palatal process leads to the formation of clefts. Clefts are result of genetic or environmental factors or a combination of both. Common dental problems associated with clefts includes anterior and posterior crossbites, hypodontia, malformation and abnormal eruption pattern.

Case report: A girl, aged 15 years reported with a chief complaint of unesthetic appearance of her maxillary anterior teeth. She had unilateral cleft lip and palate and had received cheiloplasty and palatoplasty when she was in young age and rhinoplasty when she was 14 years of age. At pretreatment evaluation, she had concave profile with maxillary arch constriction and oroantral fistula and mesially tipped maxillary left canine.

Conclusion: This patient's treatment was unconventional, but it was successful in significantly improving her masticatory function and smile, along with favorable dental and facial results. Generalized esthetics and function were significantly improved in this patient without orthognathic surgery, and treatment results were stable 3 years after the appliance removal.

Clinical considerations, sequencing of treatment phases as shown in this case report can be utilized while treating an adolescent with cleft lip and palate.

Clinical significance: If the skeletal discrepancy is mild and esthetic concerns are minimal, dental compensation by orthodontic treatment alone might be recommended. The cephalometric analysis and prediction tracings provide further information for deciding whether a patient can be treated by orthodontics alone, or by orthodontics and an orthognathic surgical procedure.

A change in axial inclination of the teeth can camouflage the skeletal relationship adequately. However, one should be cautious in a growing patient, because he or she might outgrow the dental correction so that ultimately skeletal surgery would be indicated.

Keywords: Cleft lip, Alveolar grafting, Rapid maxillary expansion, Rhinoplasty.

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INTRODUCTION

Clefts of lip and palate occur in about one in every 600 live births in India. Eighty percent of them have unilateral clefts. Failure of fusion between medial nasal process and maxillary process or between the palatal process leads to the formation of clefts. Clefts are result of genetic or environmental factors or a combination of both.¹

Common dental problems associated with clefts include, anterior and posterior crossbites, hypodontia, malformation and abnormal eruption pattern.²⁻⁶

In cleft patients, congenitally missing maxillary incisors are common. This is due to the deficiency in the blood supply near the cleft, either congenitally or as a result of surgery, or a deficiency in the mesenchymal support to the maxillary incisor near the cleft.^{7,8}

Orthodontic treatment timing and sequencing for cleft patients can be divided into definite dental developmental periods, and should be considered as specific time periods in which specific objectives should be accomplished.

The purpose of this article is to underline the importance of interdisciplinary treatment approach in management of a girl in early permanent dentition who had unilateral cleft lip and palate with maxillary arch constriction. The patient was treated with orthodontics alone; no orthognathic surgery was performed.

CASE REPORT

Patient by name Sunitha Prasanna of age 15 years, female came with a chief complaint of irregularly placed upper

front teeth since 5 to 6 years. The degree of irregularity has increased as permanent teeth were erupting and got established at the age of 12 to 13 years.

Parents had nonconsanguineous marriage and no one in the family had similar malocclusion and cleft. On extraoral examination, she was dolichocephalic and shows mild asymmetry toward left side with a scar on the upper lip. Nasal width was widened. Nose and the upper lip were deviated toward the left side. Profile was slightly concave with mild anterior divergence (Figs 1 and 2).

On functional examination, lateral deviation in path of closure was observed. There was pull of muscles during smile on to the cleft side.

On intraoral examination, 14, 12 and 22 were missing and 11, 21 and 23 are nonvital. Maxillary arch was V-shaped and asymmetrical with retroclined 11 and 21. Twenty-three was mesially tipped. Maxillary arch is constricted with an oroantral fistula. Mandibular arch was square shaped, symmetrical with mild crowding of anteriors and rotated premolars.

Upper dental midline was shifted to left side when compared to the facial midline. Lower dental midline was shifted to left side of the upper dental midline. Molar relationship was end-on with a crossbite on both sides. Anterior crossbite with reverse overjet of 2 mm was seen (Figs 3 to 5).

Pretreatment OPG, lateral cephalogram and occlusal radiographs were taken (Figs 6 to 8). Cephalometric values were analyzed and are interpreted in Table 1. MP3 radiograph showed that patient was at the end of pubertal growth spurt.

Diagnosis

A case of Kernahan's block 4, 5, 6 (cleft lip and palate on left side), borderline skeletal class III with mild retrognathic maxilla and orthognathic mandible, average growth pattern, bilateral posterior and anterior crossbite.



Fig. 1: Pretreatment frontal view

Fig. 2: Pretreatment profile



Fig. 3: Pretreatment intraoral overbite



Fig. 4: Pretreatment intraoral maxilla



Fig. 5: Pretreatment intraoral mandible



Fig. 6: Pretreatment OPG



Fig. 7: Pretreatment lateral cephalogram

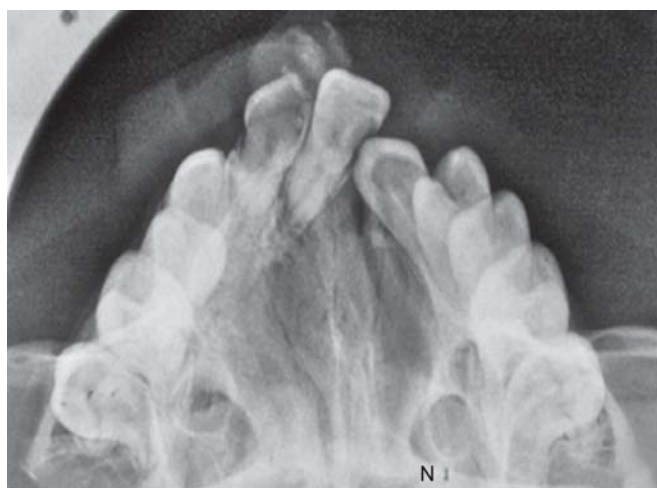


Fig. 8: Pretreatment maxillary occlusal

Treatment Objectives

To achieve skeletal class I, correct the facial asymmetry, level and align the arches and get ideal arch forms, achieve proper occlusion, close the oroantral fistula, maintain the arch expansion and bone graft, replace the missing teeth and to achieve the ideal soft tissue norms.

Treatment Alternatives

Initially, we presented her with two treatment plans. Plan 1 consists of going for three surgeries at different times. The first surgery being alveolar grafting followed by orthognathic surgery and finally rhinoplasty. Plan 2 consists of going for two surgeries which includes alveolar grafting and rhinoplasty without orthognathic surgery. However, she declined for three surgeries and opted for plan 2 (surgical camouflage).

To accomplish these objectives, treatment has been divided into treatment phases (Table 2) for ease of planning and to cross check at the end of each phase whether the goals of previous phase were reached or not.

TREATMENT PROGRESS

Preorthodontic Phase

Initially, the patient was sent to conservative dentist for management of 11, 21 and 23. Thermal sensitivity test and vital pulp test indicated pulp necrosis. A standard endodontic procedure was carried out after local anesthesia of 4% articaine hydrochloride containing 1:100,000 epinephrine.

Table 1: Pretreatment and post-treatment cephalometric values

Parameters	Normal values	Pretreatment	Post-treatment
SNA	80° ± 2°	75°	74°
SNB	80° ± 2°	76°	74°
ANB	2° ± 2°	-1°	0°
Wits-appraisal	BO is 1 mm ahead of AO	BO is 2 mm ahead of AO	AO = BO
FH-MP (FMA)	25°	27°	29°
Ar-Go-Me	128° ± 7°	124°	121°
LAFH	68-70 mm	57 mm	60 mm
UI-SN	102°	85°	95°
LI-MP (IMPA)	90°	82°	77°
Interincisal angle	132°	158°	151°
UI-NA	4 mm	-2 mm	2 mm
LI-NB	4 mm	2 mm	0 mm

Table 2: Treatment phases

Phase I	Phase II		Phase III
Preorthodontic	Orthodontic	Orthodontic	Postorthodontic
	Presurgical	Surgical	Postsurgical
Endodontic treatment of—11, 21, 23	Partial levelling and aligning, rapid maxillary expansion	Alveolar grafting	Final levelling and alignment, lower molar protraction, settling of the occlusion
			Retention appliance, prosthodontic work, rhinoplasty

All canals were easily negotiated and were chemo-mechanical prepared by crown-down technique using machine NiTi instruments (Liberator, Miltex) and 5.25% NaOCl, 17% EDTA and saline as irrigating solutions. Prepared canals were obturated using the lateral condensation technique and Apexit Plus (Ivoclar Vivadent) as a sealer. Filled orifices were sealed adhesively with Coroseal (Ivoclar Vivadent) to avoid any coronal bacterial penetration into canal system (Figs 9 and 10).

Appliance System

Preadjusted edgewise appliance of 0.022 (MBT prescription) slot was used for this patient to achieve bodily movement of teeth and to stabilize against the stress encountered at the surgery.

Presurgical Phase

The objective of presurgical orthodontics was to partially level, align and expand maxillary arch. Treatment started with placement of upper and lower fixed appliances with



Fig. 9: Initial bonding with expansion screw

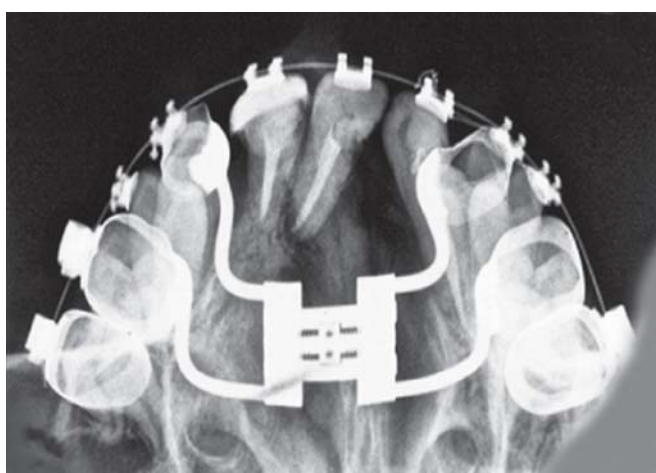


Fig. 10: Maxillary occlusal view after expansion, before bone grafting

0.016 heat activated nickel titanium arch wires into the upper and lower arches. Care was taken while doing bracket positioning of 21 and 23 such that no root movement into the cleft area will happen. Semirapid expansion (1 turn = 0.25 mm expansion/day) was done. Expansion was done till posterior buccal occlusion is established (Figs 9 and 10) and the screw was sealed with composite and left in place for 3 months.

Surgical Phase

0.018 × 0.025 stainless steel arch wires were placed for stabilization against the stress encountered during surgery. Sectioning of the upper arch wire at the cleft site was done for ease of access to the surgeon during grafting. The donor site for alveolar graft was iliac crest (autogenous graft). Extra attention was paid to avoid any injury to the root structure and the surrounding bone covering the roots (Fig. 11).

Postsurgical Phase

After 4 weeks of healing, root movement of 21 and 23 into alveolar graft was attempted with 0.017 × 0.025 rectangular nickel titanium arch wires by repositioning of the brackets (Fig. 12). After 4 weeks, 0.019 × 0.025 nickel-titanium arch wires were placed in both arches followed by placement of 0.019 × 0.025 stainless steel arch wires. Extractions of lower second premolars were done followed by protraction of lower molars using closed coil springs. After protraction of molars treatment was aimed at settling, levelling and root paralleling. Debonding photographs (Figs 13 and 14) and radiographs (Figs 15 and 16) were taken.

Postorthodontic Phase

For replacement of teeth in upper anterior region, we advised her to go with either implants or fixed partial denture. Patient

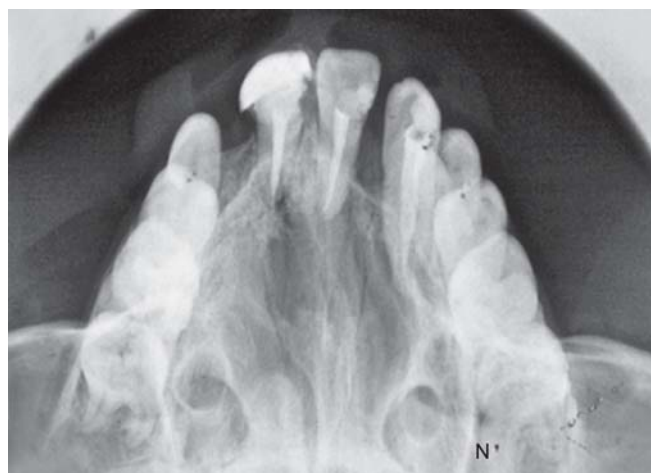


Fig. 11: Maxillary occlusal view after bone grafting



Fig. 12: Root up righting with bracket repositioning after alveolar grafting

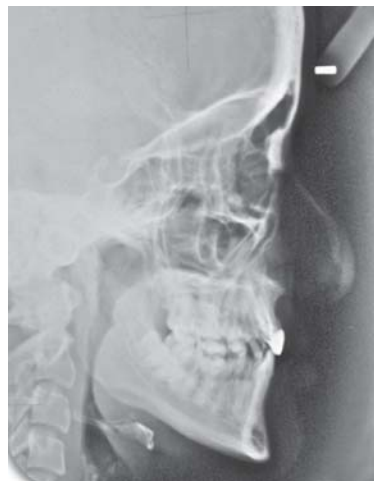


Fig. 15: Post-treatment lateral cephalogram



Fig. 13: After debonding maxilla

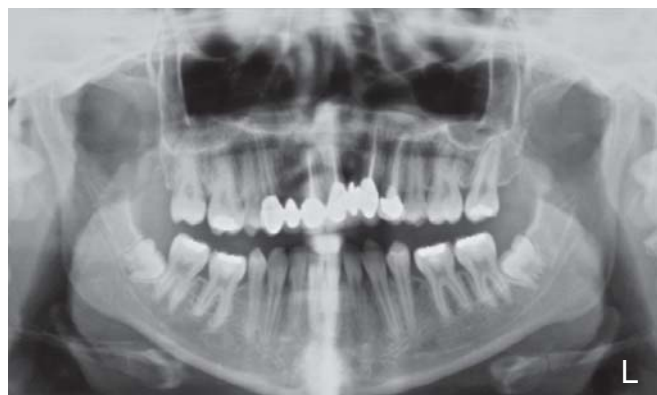


Fig. 16: Post-treatment OPG



Fig. 14: After debonding mandible



Fig. 17: Maxillary anterior prosthesis and lower retainer

has chosen to go with fixed partial denture. Followed by making of fixed prosthesis by prosthodontist, she was advised to wear lower removable Begg retainer and an acrylic plate in maxilla which maintains the expansion achieved (Figs 17 and 18). Patient was instructed to wear retainers for 2 years. After 4 months, patient has undergone second rhinoplasty at the age of 19 years with septal graft (Fig. 19).

DISCUSSION

Residual alveolar defect in patients with cleft lip and palate is generally treated by bone grafting.⁹ If a bone graft is placed before the eruption of teeth adjacent to the cleft, it will improve the periodontal support of those teeth. If bone grafting is done after the eruption of the canine, the bone will not improve the crestal height and resorbs quickly to its original level.



Fig. 18: Post-treatment extraoral smile photograph



Fig. 19: Two weeks after rhinoplasty

Controversies concerning alveolar bone grafting exists. These controversies relate to the timing of the alveolar bone grafting, the sequencing of orthodontic treatment to correct a transverse discrepancy with palatal expansion, and the sites and types of bone for the graft.^{10,11}

Permanent canine root formation generally occurs between the ages of 8 and 11 years. Rarely is the graft placed before this time, although occasionally it can be placed at an earlier age to improve the prognosis of a lateral incisor. Once teeth have erupted into the cleft site, their periodontal support will not improve without a bone graft. For this reason, performing the grafting before the eruption of the permanent canine is recommended.

As seen in this case, alignment of the incisor and canine adjacent to the cleft, which typically are rotated and tipped, are limited by the alveolar bone into which the roots of these teeth can be moved. Even though fixed appliance was placed presurgically, orthodontic root movement was delayed until 4 weeks after the bone grafting. Movement of the roots into grafted bone appears clinically to consolidate the alveolar bone and to improve crestal alveolar height.

Results from primary bone grafting indicate an adverse effect on maxillary development, but, because maxillary growth is almost completed by 10 years of age, a secondary alveolar bone graft at this age should have a minimal, if any, effect on subsequent facial growth and development.

In our patient, expansion of maxillary arch established good posterior occlusion and widening of cleft before grafting. Movement of roots early into alveolar graft improved its stability and prognosis. Extraction of lower second premolars and protraction of lower molars helped to correct the class II dental relationship.

As a general rule in interdisciplinary treatment, orthodontic intervention, skeletal surgery and final prosthetic rehabilitation should be completed before final

soft tissue revisions, such as a rhinoplasty to achieve a predictable outcome. The same treatment sequencing was followed in treating this patient.

CONCLUSION

This patient's treatment was unconventional, but it was successful in significantly improving her masticatory function and smile, along with favorable dental and facial results. Generalized esthetics and function were significantly improved in this patient without orthognathic surgery and treatment results were stable 3 years after the appliance removal.

Clinical considerations, sequencing of treatment phases as shown in this case report can be utilized while treating an adolescent with cleft lip and palate.

CLINICAL SIGNIFICANCE

If the skeletal discrepancy is mild and esthetic concerns are minimal, dental compensation by orthodontic treatment alone might be recommended. The cephalometric analysis and prediction tracings provide further information for deciding whether a patient can be treated by orthodontics alone, or by orthodontics and an orthognathic surgical procedure.

A change in axial inclination of the teeth can camouflage the skeletal relationship adequately. However, one should be cautious in a growing patient, because he or she might outgrow the dental correction so that ultimately skeletal surgery would be indicated.

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