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Case Report

Dentistry Section

Interdisciplinary Management of an Adolescent Cleft Patient with Skeletal Class III Malocclusion: A Case Report

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ABSTRACT

Cleft lip and palate are the most frequently observed congenital abnormalities affecting the maxillofacial region. They can occur isolated or together in various combinations. These deformities are also associated with features found in over 300 recognised syndromes. Additionally, there are several problems, including social limitations, such as difficulties in breastfeeding resulting in failure to grow properly, speech abnormalities, hearing loss, misalignment of teeth, significant facial abnormalities, and serious aesthetic, psychological, and psychosocial challenges. Treatment modalities involve a number of specialists, such as Maxillofacial and Plastic surgeons, Anaesthetists, Orthodontists, Restorative dentists, Paediatric dentists and Prosthodontists, who collaborate to determine the best treatment plan based on the site of the defect and the patient's age. The present case report discusses the treatment and management of a 16-year-old female patient who presented with cleft lip and palate, along with skeletal class III malocclusion, hypodontia, multiple decayed teeth and dental malformation. The patient had missing lateral incisors and canines in the maxillary arch, along with carious maxillary central incisors. The purpose of this article is to report the multidisciplinary management of a unilateral cleft lip and palate patient with class III malocclusion, utilising orthognathic surgery, as well as, incorporating endodontic and prosthodontic corrections.

Keywords: Congenital defects, Crossbite, Hypodontia

CASE REPORT

A 16-year-old female patient of Indian ethnic origin presented with chief complaints of irregularly placed teeth in the upper front region and an unaesthetic smile. Patient has a history of surgical repair of a unilateral cleft lip and palate at the age of six months and cleft palate repair at eighteen months of age. The patient has a concave profile and a faint scar on the upper lip due to the cleft alveolus in the left-side of the maxillary arch. Intraorally, there is maxillary anterior crowding with retruded maxillary anterior, missing lateral incisors, and both maxillary canines erupting in place of maxillary lateral incisors. Additionally, there is a class II molar relationship bilaterally, an open bite, and maxillary constriction [Table/Fig-1]. The patient also has decayed teeth in the right maxillary molar, left maxillary premolar, and left mandibular molar. Over-retained left maxillary and mandibular second deciduous molars are also present. The severity of the Index of Orthodontic treatment (IOTN) is above grade 5p [1].

Treatment plan:

The treatment plan based on the patient's clinical and cephalometric features is as follows:

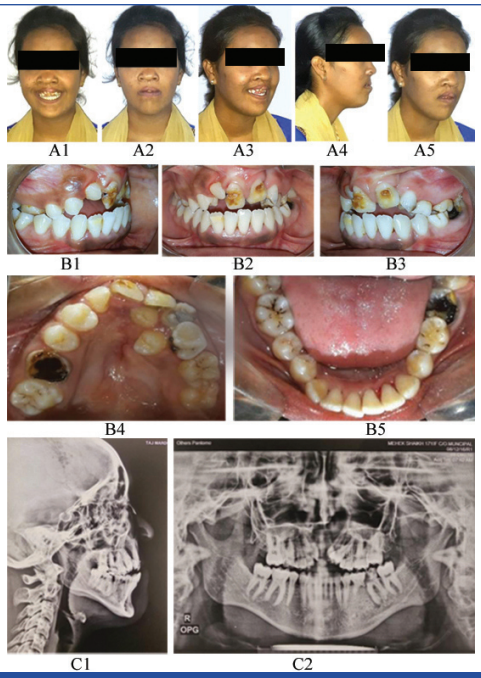
- Phase I: Palatal expansion and fixed orthodontic therapy using a 0.022"×0.028" preadjusted edgewise appliance with MBT prescription.
- Phase II: Maxillary advancement through the LeFort I procedure by 5 mm.
- Phase III: Postsurgical settling.
- Phase IV: Endodontic and prosthodontic rehabilitation.

Patient and parental consent was obtained before initiating orthodontic treatment, allowing for the utilisation of all necessary orthodontic treatment modalities.

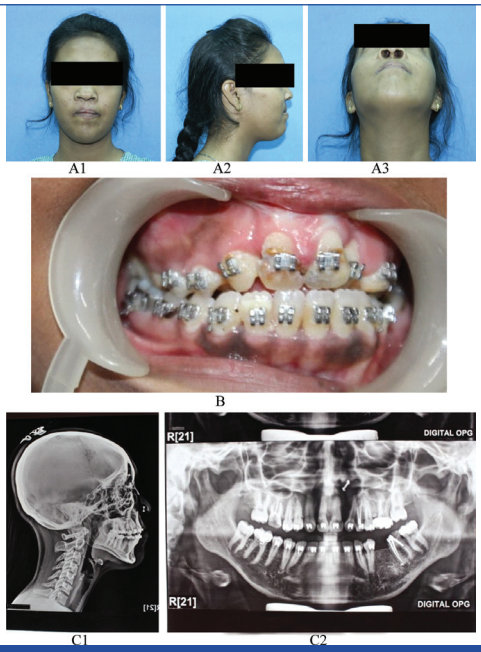
Treatment progress and results: After the initial prophylaxis and extraction of the over-retained left maxillary and mandibular second deciduous molars, the patient was treated with a 0.022"×0.028" preadjusted edgewise appliance with MBT prescription (Gemini, 3M) using a non extraction approach. A full fixed appliance was placed for both the maxillary and mandibular arches. Maxillary arch expansion was achieved using a 36 mm Nickel Titanium (NiTi) palatal expander (Ortho Organiser) [2]. Initial levelling and alignment were performed using 0.014" and 0.016" NiTi wires to align the palatally placed premolars and canines in the maxillary arch. After alignment and levelling, residual space closure and arch consolidation were carried out, along with correction of the canine and molar relationship. Subsequently, orthognathic presurgical workup was conducted [Table/Fig-2].

Assessment	Normal	Pretreatment	Presurgical	Postsurgical
SNA	82°	76°	78°	81°
SNB	80°	80°	81°	81°
ANB	2°	-4°	-3°	0
A-N perpendicular	0-1 mm	-3 mm	1 mm	1 mm
Pog-N	S: -8 to -6 M: -2-0 L: -2-5	2 mm	2 mm	2 mm
AO-BO	0	-3 mm	1 mm	1 mm
Co-A	Varies	76 mm	81 mm	81 mm
Co-Gn	Varies	115 mm	115 mm	115 mm
U1-NA	22, 4 mm	8°, -1 mm	22, 5 mm	22, 5 mm
L1-NB	25, 4 mm	31°, 6 mm	29°, 5 mm	29°, 5 mm
Y-axis	53-66°	71°	78°	78°
GoGn-SN	32°	35°	36°	36°
FMA	25° (16-35)	27°	28°	27°
IMPA	90 (85-95)	96°	98°	98°

[Table/Fig-1]: Cephalometric changes.
SNA: Angle between sella/nasion plane and the nasion/A plane; SNB: Angle between sella/nasion plane and the nasion/B plane; ANB: Angle between A point and B point; A-N: A point to nasion; Pog-N: Pogonion to nasion; AO: Point A to occlusal plane; BO: Point B to occlusal plane; Co-A: Condylion to Point A; Co-Gn: Condylion to gnathion; U1-NA: Upper incisor to nasion-A; L1-NB: Lower incisor to nasion-B; GoGn-SN: Angle formed by lines S-N and Go-Gn; FMA: Frankfort-mandibular plane angle; IMPA: Incisor mandibular plane angle



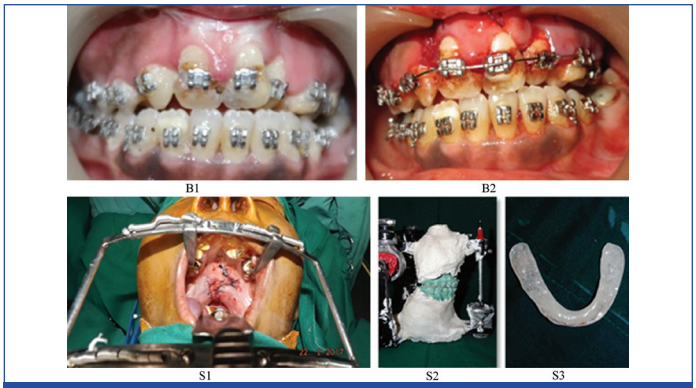
[Table/Fig-2]: Pretreatment extraoral (A1-A5), intraoral (B1-B5) photographs and radiographs (C1-C2).



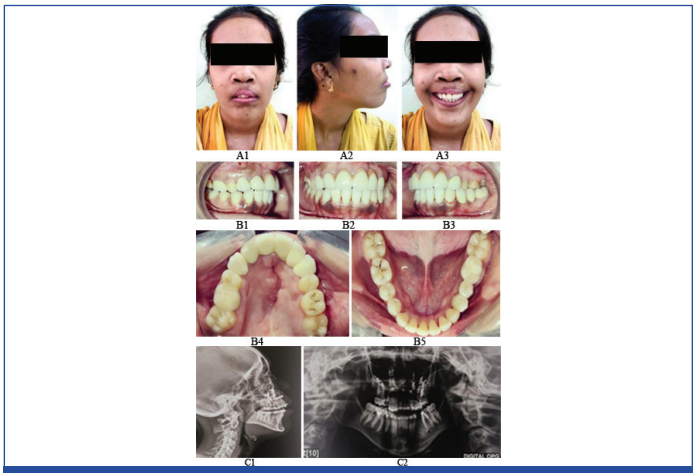
[Table/Fig-3]: Presurgical extraoral (A1-A3), intraoral (B) photographs and radiographs (C1,C2).

Based on the surgical treatment objectives, a maxillary advancement of 5 mm was performed (due to a reverse overjet of 2 mm) under general anaesthesia using the LeFort I procedure [Table/Fig-3]. Slight overcorrection was applied to compensate for postsurgical relapse. Postsurgical orthodontic settling was carried out to achieve a harmonious occlusion. Cephalometric changes are shown in [Table/Fig-4]. Endodontic treatment was performed on the right maxillary first molar and left maxillary first premolar in the upper arch, as well as, the left mandibular first molar in the lower arch. Prosthetic replacement of the upper anterior teeth was accomplished using a fixed prosthesis, converting the maxillary canines into the maxillary lateral incisors and the maxillary first premolars into maxillary canines. Additionally, a three-unit bridge was used to replace the lower left second premolar with teeth 34, 35 and 36 [Table/Fig-5].

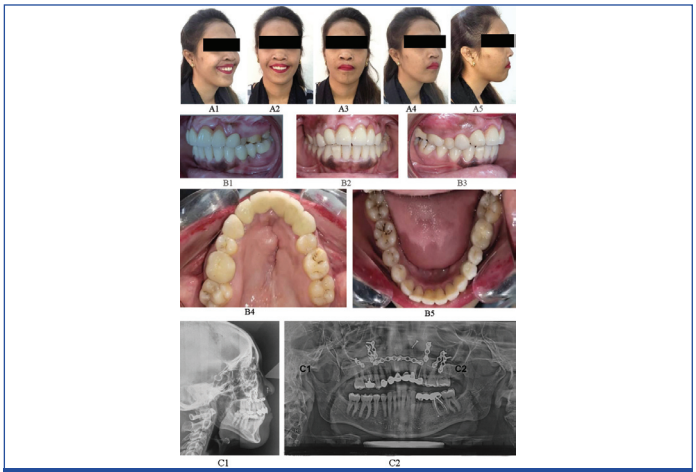
After the treatment, the patient was instructed to use an orthodontic retainer, and the post-retention stability after two years has been satisfactory [Table/Fig-6]. This case report adheres to the CARE guidelines for case report documents from 2017, as well as, journal compliance [3].



[Table/Fig-4]: Presurgical (B1-B2) and mock (S1-S3) photographs.



[Table/Fig-5]: Post-treatment extraoral (A1-A3), intraoral (B1-B5) photographs and radiographs (C1-C2) after prosthetic rehabilitation.



[Table/Fig-6]: Post-treatment extraoral (A1-A5), intraoral (B1-B5) photographs and radiographs (C1-C2) after two years follow-up.

DISCUSSION

Cleft lip is a congenital deformity resulting from the failure of fusion between the frontonasal and maxillary processes. It leads to a varying extent of cleft in the lip, alveolus and nasal floor. Cleft palate, on the other hand, is a birth defect affecting the back part of the roof of the mouth, including both the soft and hard palates. The appearance of these conditions can be described by changes in laterality, with the cleft occurring on one or both sides, as well as, variations in completeness, ranging from total involvement of both the hard and soft palate to partial expression affecting only one component [4].

The exact causes of these birth defects are not fully understood, but it is believed that both environmental and genetic factors play significant roles. Consuming folic acid before conception and during the first trimester has been linked to a significant decrease of 25-50% in the occurrence of cleft lip and palate [5]. The occurrence rate of these abnormalities is around 1 in 700, with variations mostly determined by ethnic and regional factors [6].

Managing class III malocclusion in individuals with cleft lip and palate poses particular challenges due to associated abnormal growth patterns and the residual effects of soft-tissue mutilations and surgical scars. Therefore, treatment planning for most young patients with class III malocclusion focuses on growth modification, camouflage and skeletal corrections with surgery [7]. Individuals with cleft lip and palate may exhibit additional atypical characteristics, including underdeveloped midface leading to a class III inclination, significant insufficiency in the width of the upper jaw, gaps in the gum line and irregularities in dental structure [8,9]. Dental abnormalities such as hypodontia, malformation, and abnormal eruption patterns are also common in cleft patients [10].

The timing and sequencing of orthodontic treatment for patients with cleft lip and palate can be divided into developmental periods. These developmental phases are defined by the patient's age, where dental and skeletal development should be considered as time frames in which specific treatment objectives could be achieved. The process of reconstructing cleft lip and palate involves several stages. It begins with repairing the cleft lip and performing primary nasal reconstruction, typically starting when the child is around 10 weeks and 12 weeks of age. This is followed by cleft palate repair, which is usually done when the child is between 9 weeks and 18 weeks of age. However, the timing of these surgeries can vary depending on the child's speech-language development and is still a subject of debate and controversy. While early closure of surgical procedures can aid in speech development, several regimens recommend delaying the surgery as much as possible to avoid potential maxillary growth retardation caused by surgical scars.

After palatal surgery, phase I orthodontic treatment may be started as needed to improve the alignment of the teeth and jaw structures and promote growth in the correct proportions [5]. This can be achieved by utilising devices such as a hyrax palatal expander. At the age of 6-9 years, bone graft reconstruction can be done to close any remaining cleft in the maxilla or the alveolus. Subsequently, phase II orthodontic treatment can commence promptly upon the eruption of the permanent canine and premolars. This treatment involves the use of fixed appliances to align the teeth. For intricate situations, this stage of treatment can be integrated with orthognathic surgery and is usually carried out at the age of 16-18 years for boys and 14-16 years for girls. Prosthodontic therapy with dental implants, if necessary, can be carried out between the ages of 16 years and 18 years. Subsequently, adjustments to the lip and nose can be made [11]. It is also feasible to alter the development of the maxilla or mandible during growth spurts in order to achieve the ideal position, thus reducing the necessity for orthognathic surgery.

Patients who have undergone surgery for cleft lip and palate may experience midfacial deficits and retrusion, which can lead to skeletal class III malocclusion. Due to the potential impact of the severity of the cleft on the growth of the upper jaw, individuals with cleft lip and palate may have a significantly backward position of the upper jaw, which can lead to a tendency for class III malocclusion, even after undergoing palatoplasty [11]. In the present case, the patient presented with a complete repair of cleft lip and palate. She had an anterior and posterior crossbite, Angle's class III malocclusion. Successful dentoalveolar expansion of the maxilla and palate was achieved using a NiTi palatal expander, resulting in the correction of the posterior crossbite. The NiTi expander provides an alternative to rapid expansion for the correction of transverse discrepancies. The expander is neither unwieldy nor painful, allowing it to be retained and anchored in place even during concurrent treatments [12]. Surgical repositioning of the maxilla was achieved by a 5 mm maxillary advancement, resulting in acceptable profile correction and improved smile aesthetics, with proper overjet and overbite.

Patients with cleft lip and palate may have an abnormal number, shape, or size of teeth, which presents a greater challenge in achieving an ideal occlusion and aesthetic restorative result. In the present case patient, aesthetic corrections were achieved by using a prosthesis on the maxillary incisors and canines. Following comprehensive treatment, the patients showed improved profile and smile aesthetics, and their occlusion remained stable after two years of retention.

CONCLUSION(S)

The present case report successfully presents the multidisciplinary management of a patient with operated unilateral cleft lip and palate and skeletal class III malocclusion, with a two-year retention follow-up. The treatment involved orthodontic and orthognathic surgery, followed by endodontic and prosthodontic rehabilitation.

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