MULTI DISCIPLINARY MANAGEMENT OF CLEFT LIP AND PALATE

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Abstract

Objective: This case report aims at presenting extensive oral rehabilitation through multidisciplinary management of orofacial deformity due to cleft lip and palate in a young boy.
Method: Growth modification was achieved through maxillary protraction using modified Tandem traction bow appliance. Simultaneous maxillary arch expansion was achieved through hyrax appliance to overcome the transverse discrepancy associated with retrusive maxilla. Orthodontic alignment of teeth was done using fixed orthodontic appliance. Secondary alveolar bone grafting was done using bone harvested from iliac crest to treat the palatal as well as unilateral alveolar cleft. This was followed by closure of oroantral fistula using a pedicle flap and aesthetic lip repair. Prosthetic replacement of missing anterior teeth was done.
Findings: A 12-year-old boy presented with unilateral cleft palate sectioning the alveolar ridge between canine and central incisor on right side and extending up to posterior region of hard palate. A mid-palatine oronasal fistula was present associated with hypernasality of speech and nasal regurgitation. Extraoral examination of the patient revealed a concave profile, leptoprosopic facial type, and positive lip step. Intraoral examination of the patient revealed Angle class III subdivision malocclusion with anterior crossbite, reverse jet of -8mm, severely rotated maxillary central incisors, missing lateral incisors and crowding of lower anteriors.
Novelty: Successful oral rehabilitation in patients with cleft lip and palate is extremely challenging and requires interdisciplinary team management. This patient had severe skeletal, dental and soft tissue deformities leading to compromised oral function and facial aesthetics affecting his physical and psychological wellbeing. Meticulous treatment planning with prompt initiation of growth modification combined with timely surgical interventions and orthodontic alignment of teeth lead to significant improvement in oral function and dentofacial esthetics in this patient

Keywords: Tandem Traction Bow Appliance, Cleft lip and palate, Maxillary protraction , Secondary Alveolar Bone Graft

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1. INTRODUCTION

Cleft lip and palate is one of the most common birth defects involving facial structure. One in every 600 children worldwide is born with a cleft defect. Estimates of frequency are even higher in Asia with more than 1 million children suffering from cleft lip and palate in India [1]. The etiology of cleft lip and palate is multifactorial where both genetic and environmental factors play a role. Malocclusions associated with cleftlip and palate are related not only to dental and craniofacial morphological disfigurement but also functional disharmony in the jaw structures, especially the masticatory system.

Some orthodontic problems are directly related to cleft deformities itself such as discontinuity of the alveolar process and missing or malformed teeth whereas other aspects of the malocclusion are secondary to the surgical intervention performed to repair the lip, nose, alveolar and palatal defects [2].In patients with cleft lip and palate, a clinician not only deals with a congenital deformity with malocclusion but also psychological problems where patients can have low esteem and difficulty in social interactions. Patience with cleft lip and palate are ideally treated with a multi-disciplinary approach. The orthodontic and surgical treatment of patients with clefts is extensive initiating at birth and continuing into adulthood till craniofacial skeletal growth is completed. The role of the orthodontist in the timing and sequence of treatment is crucial in terms of overall team management [3].

This case report presents extensive oral rehabilitation through multidisciplinary management of cleft lip and palate with significant improvement in functional occlusion and dento-facial aesthetics.

2. CASE REPORT:

A 12-year-old male patient reported with a chief complaint of irregularly and backwardly placed teeth in the upper front teeth region of the jaw. Extraoral examination of the patient revealed a concave profile, leptoprosopic facial type, and positive lip step (fig 1).

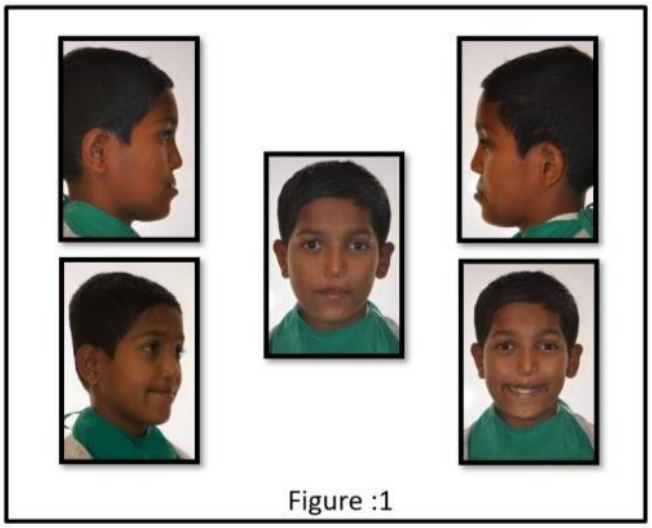

Figure :1

Intraoral examination of the patient revealed Angle class III subdivision malocclusion with retroclined upper and lower anteriors. Unilateral cleft palate was seen on the right side sectioning the alveolar ridge between canine and central incisor and extending up to posterior region of hard palate. The mid-palatine oronasal fistula was seen associated with hypernasality of speech and nasal regurgitation. In addition, there was an anterior crossbite with a negative overjet of -8mm, missing 12 and 22, severely rotated 11 and 21, and supernumerary teeth in the second quadrant. The lower arch showed moderate crowding(fig 2).

Figure :2

Radiographic Examination:
Through the panoramic radiograph, the absence of upper lateral incisors was confirmed, and all other permanent teeth were present, along with supernumerary teeth in 22 region. Lateral cephalogram along with the cephalometric tracing showed a facial patternwith increased vertical growth, skeletal Class III jawbases, Retroclined maxillary and mandibular incisors (fig 3).

Figure :3

Treatment Objectives

1. Correction of the anterior crossbite by maxillary protraction
2. Secondary alveolar bone graft for the cleft bone defect.
3. Mucoperiosteal flap surgery for oronasal fistula
4. Achieving proper axial inclination of anterior teeth
5. Perform rehabilitation procedure on the anterior teeth.

Treatment Progress

The patient was treated with a modified tandem traction bow appliance for maxillary protraction. The upper assembly comprised of a Hyrax appliance with first molars and first premolars banded and soldered with 1 mm thick stainless steel wire for RME (fig 4).19 guage stainless steel wire was bent to a shape of traction bow The precise position of the elastic hooks on the upper assembly, and the tubes on the lower first permanent molar determines the direction of the force. Hooks were soldered to achieve downward and forward pull with 20° angulation to occlusal plane.

Figure :4

The protraction hooks in the maxilla were placed distal to the permanent canines so that the elastic force passes through the center of resistance of the maxilla. The lowerassembly consisted of bonded acrylic bite plate posteriorly stabilized by a ball-end clasp anteriorly and Adams clasp posteriorly (fig 5). The expansion screw was activated half-turn twice a day for 1 week followed by activation of half-turn once a day every alternate day until the desired amount of expansion was achieved. On both sides, a force of 400–450 g was applied bilaterally for 14–16 h per day.

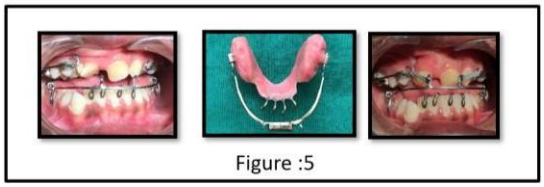

Figure :5

After achieving desired expansion, the protracted maxillary arch was stabilized using the transpalatal arch posteriorly and Catalans appliance bonded on lower anteriors (fig 7). 0.022 x 0.028-in MBT brackets were bonded, and the alignment and leveling were performed initiallywith round 0.012-in and 0.014-in NiTi wires (fig 6), and progressed until 0.019 x 0.025-in rectangular stainless steel archwires (fig 8). After alignment and leveling, spaces present between the central incisor and canine in the second quadrant were closed using elastomeric chains and adequate space was created between the contralateral central and canine using an open coil spring.

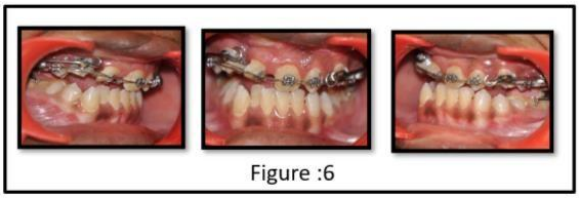

Figure :6

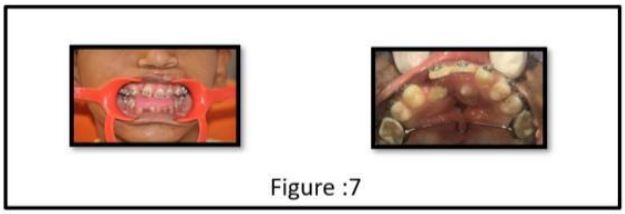

Figure :7

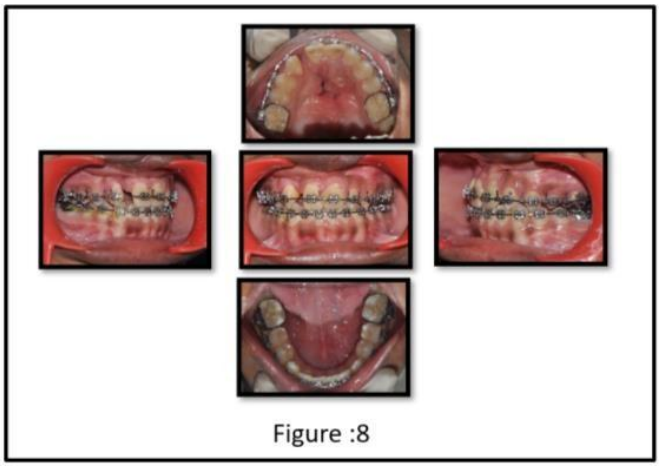

Figure :8

A secondary alveolar bone grafting procedure was performed under nasoendotracheal intubation in general anesthesia (fig 9). The surgical site was prepared using the standard protocol. The iliac crest was used as a donor site for harvesting the graft. Appropriate postoperative antibiotics were given for 5 days. Postoperative complications were evaluated weekly at the donor site such as pain, infection, paraesthesia, hematoma formation, difficulty in walking or change in gait and at the recipient site such as pain, infection, exposure of graft, and rejection of the graft. Post-surgery, acrylic retention platewas given to the patient for 3 months.

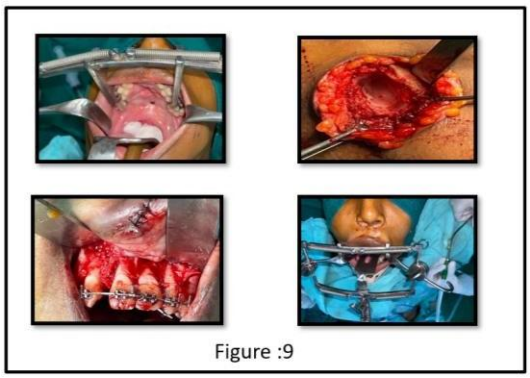

Figure :9

In the finishing phase of the treatment settling elastics were used to settle the occlusion. Porcelain fused to metal Maryland bridge was placed for the missing lateral incisor on the cleft side (fig 10). On the noncleft side conservative reshaping of the canine into the lateral incisor was done and gingivectomy was performed on the first premolar to give a canine-like appearance and enameloplasty was done on the palatal cusp of first premolars (fig 11). Hawley retainers were given in both the arches for retention.

Figure :10

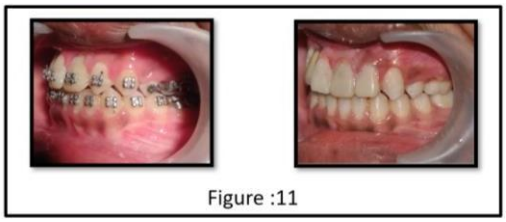

Figure :11

3. TREATMENT RESULTS

At the end of the treatment, it was possible to observe a significant improvement in the aesthetics of the smile and a straight profile (fig 12). The speech was significantly improved and nasal regurgitation completely stopped. Secondary alveolar bone was successfully accepted and stability was achieved in maxillary arch length and width. Intraorally, it was verified that a coincidence was established between the midlines, class I molar relation on the right side and class II molar relation on the left side was obtained, with good intercuspation, adequate overjet, and overbite, and the space of the upper left lateral incisor was successfully closed by the canine replacement, obtaining good aesthetics and adequate function by the anterior and lateral guidances (fig 13).

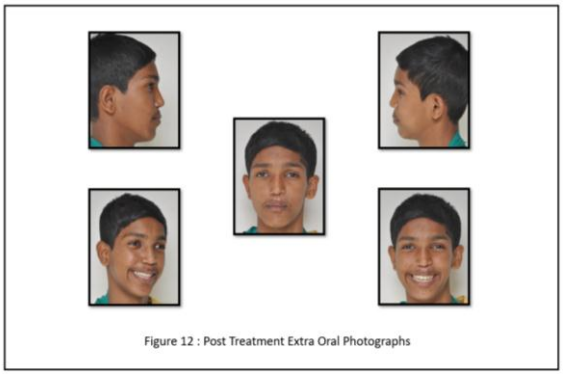

Figure 12 : Post Treatment Extra Oral Photographs

Figure 13 : Post Treatment Intra Oral Photographs

In the lateral cephalogram, cephalometric analysis and superimpositions, revealed a significant improvement in the anteroposterior skeletalpattern and favorable changes in the maxillary and mandibular incisors positions (fig 14) (fig 15) (Table 1).

Figure : 14

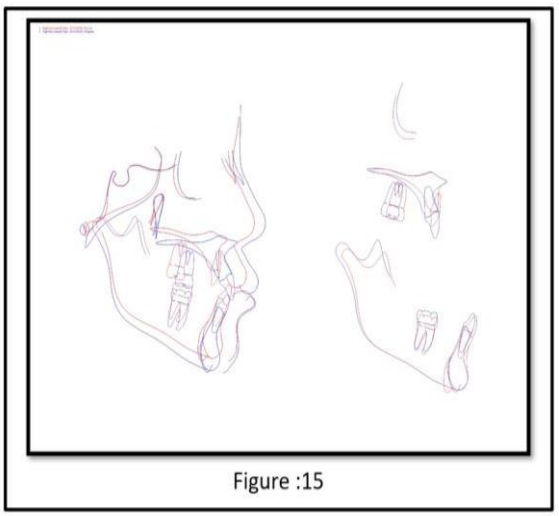

Figure :15

4. DISCUSSION

Patients with cleft lip and palate always represent a challenge for the orthodontist, due to the complexity of the mechanics involved in the correction of asymmetries, elimination of crossbite, correction of individual dental positions and closure of spaces and missing teeth.

According to McNamara and Turley, rapid maxillary expansion (RME) enhances the protraction effect of the face mask by disrupting the maxillary suture [4]. It is widelyaccepted that midface deficient Class III patients should be treated before 7–8 years of age. RME along with facemask therapy is the most common orthopedic treatment protocol for Class III malocclusion [5]. Maxillary expander facemask appliances achieve excellent orthopedic effects, but they demand special patient compliance and are not as esthetic or comfortable due to their physical appearance and discomfort from the anchorage pads. The major problem with extraoral anchorage is of patient compliance, due to the appearance of the extraoral appliance[6].

Considering this problem, Chun *et al*. in 1999 developed the tandem traction bow appliance (TTBA) for the treatment of growing Class III patients [7]. Klempner did some modifications in the appliance later on.[8] Chun *et al*. in 1999 defined TTBA as a comfortable and more esthetic device than conventional appliances because it is removable and worn intraorally. A comparison was done between the effects of the modified TTBA (MTTBA) and the facemask in treating patients with Class III malocclusion by Tortop *et al*. and found both appliances were effective in the treatment of Class III malocclusion. Changes in ANB, overjet, and molar relation showed that both treatment approaches were effective. Uprighting of the lower molar was found to be greater in the modified tandem traction bow appliance group [9]. Mohamed *et al* did three-dimensional assessment of modified tandem appliance in maxillary protraction of cleft lip and palate patients and found the MTTBA effectively managed skeletal Class III malocclusions with cleft lip and palate via skeletal and dental effects [10].

Secondary osteoplasty is performed in patients between the ages of 6 and 12 years. The position of the crown of the tooth decides the exact timing of graft. The optimum time iswhen the root of the permanent canine has formed by one-fourth to two-thirds of its length. Grafting before eruption of the permanent canine teeth generally results in more stability with better crestal bone support[11]. The ribs, iliac crest, calvarium, mandibular symphysis, and tibia are the most common donor sites. Cancellous bone from the iliac crest is considered the best material for bone grafting of alveolar clefts. Modern studies prove that endochondral

cancellous specimens have a higher percentage increase in actual bony volume than cortical membranous and cortical endochondral inlay bone grafts [12]. Palatal fistulas are often symptomatic due to their size and location. Symptoms include hypernasality in the phonation related to nasal air escape during speech, nasal cavity fluid leakage, and infection due to food accumulation. Palatal rotational flaps have advantages such as local availability, strong tension force with reliable blood support and good mobility. Similarly with the thickness of the gingiva, good aesthetics and good accessibility are among the other advantages of this technique [13] .

Absence of the lateral incisor is often associated with cleft lip and palate and the orthodontist along with the rehabilitation team should define the best treatment option in this region. Even after a successful secondary graft in the cleft region, there is a tendency for persistence of vertical defect, which in most situations contraindicates rehabilitation through implant and prosthesis [14]. Two treatment alternatives are generally considered: space closure with orthodontic movement, or rehabilitation with conventional prosthesis. In the presented case both the options were used as on the cleft side conventional Maryland bridge was placed and on the non cleft side space was closed orthodontically.

5. CONCLUSION

Cleft lip and palate involves multitudinous factors required to be considered while treatment planning and execution. The treatment of patients with cleft lip and palate is challenging for both the orthodontist and the multidisciplinary team. Based on the results observed in the reported case and literature review, excellent results regarding functional occlusion, dental and facial aesthetics can be achieved with well-established diagnosis and treatment planning

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Table 1: Cephalometric Measurements

Measurements	Norms	Pre-treatment	posttreatment
SNA (Degree)	82	71	79
SNB (Degree)	80	78	77
ANB (Degree)	2	-7	2
Beta angle	27-35	40	34
Yen angle	117-123	124	121
W angle	51-56	59	55
Wits Appraisal	-1	-4	2
Upper incisor to NA	4mm/22	1mm/18	4mm/22
Lower incisor to NB	4mm/25	6mm/19	5mm/22
IMPA(Degree)	90	85	90
Upper incisor to NF	102+/- 2	95	106
SN To mandibular plane	32	34	39
Jaraback Ratio	62-65	59	59
FMA	25	28	31
Nasolabial angle	90-110	110	96
Stms -stmi	2+/- 2	0	0
E line upper: Lower:	2-3mm 1-2mm	1 7	2 4
S line Upper Lower	0 0	3 4	2 3