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Case Study

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NEW APPLIANCE DESIGN FOR RETRACTION OF PROTRUDED PREMAXILLA IN A CLEFT PATIENT-A CASE REPORT

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ABSTRACT

Cleft lip and palate is a common congenital facial anomaly. Its incidence is usually between 1 and 1.82 for every 1000 livebirths. Cleft lip and palate is usually associated with maxillary sagittal and transverse discrepancies. Cleft treatment requires a multidisciplinary approach, starting from the birth till adulthood. **Objective**- Retraction of the premaxilla in bilateral cleft patient. **Case report**- A 6 years old female patient presented in the Department of Orthodontics and dentofacial Orthopaedics, in Haldia with chief complaint of cleft palate and forwardly placed upper teeth. Extra oral examination revealed mesocephalic head, mesoprosopic facial form, convex facial profile, normal nasolabial angle and deep mentolabial sulcus. Lips were incompetent with interlabial gap was 10 mm at rest and 16 mm during smile. Intraoral examination revealed the patient had early mixed dentition (All the primary teeth and 16, 36, 46), Deep bite, defect in hard palate and normal tongue size. As the premaxilla protruded out, labial sulcus had not formed in maxillary arch. Facial photographs indicated asymmetrical and disproportionate face. She had other additional deformity namely as syndactyly of both hands, bilateral club foot. **Treatment**- In phase 1, retraction of premaxilla was done with newly designed removable appliance. In phase 2, derotation of the permanent central incisors were achieved using a combination appliance (removable and fixed). In phase 3, a 2×2 fixed appliance was placed for stabilizing the central incisors. In phase 4, utility arch was placed for further control of the anterior segment. The retraction of premaxilla and derotation of central incisors took 1.5 years. **Result**- The maxillary labial vestibule was developed. Premaxillary protrusion was reduced. The central incisors were derotated. Deep bite correction was achieved. The interlabial gap was reduced. The face became bilaterally symmetrical and proportionate. **Conclusion**- This case report presents a new dimension for the correction of protrusive premaxilla. Which is economical, easy to fabricate and have good patient compliance.

KEYWORDS: Cleft lip and palate, Protruded premaxilla, New appliance.

INTRODUCTION

Cleft lip and palate (CLP) is the most common congenital facial anomaly. Various epidemiological studies give different incidences but the average is usually between 1 and 1.82 for each 1000 live births.[1] CLP is a congenital deformity that is associated with maxillary sagittal and transverse discrepancies. In addition to skeletal deformity, it is often accompanied by dental abnormalities, such as hypodontia, hyperdontia, and transpositions. Cleft lip and palate can be very challenging to treat. The more severe the original deformity, more difficult the treatment. The teeth in line of the cleft are commonly deformed or missing. These include peg shaped lateral incisors, incisors with enamel deformities etc. Orthodontics considerations include Class III tendency, anterior and/or posterior cross bite, spacing and/or crowding and protrusion of premaxilla, hourglass shaped palatal vault.

The etiology of this malformation is complex and includes both genetic and environmental factors. CLP patients have unfavourable smile esthetics and may have low self-confidence. The treatment for patients with CLP is challenging as:

i. A lengthy treatment time,
ii. Necessity of interdisciplinary involvement,

iii. Need for good patient and parents cooperation.

The present article presents a new method of retraction of the premaxilla which is more economical as compared to the available methods.

Objective

Retraction of the premaxilla in bilateral cleft lip and palate patient who had not undergo Naso-Alveolar-moulding.

CASE REPORT

A 6 years old female patient reported to the Department of Orthodontics and Dentofacial Orthopaedics in Haldia Institute of Dental Sciences and Research with a chief complaint of cleft in palate and protruded maxillary segment. She had a history of complete bilateral cleft lip and palate, alar deformity, syndactyly and bilateral club foot. Her cleft lip surgery was undertaken at 3 months of age. Palatoplasty and clubfoot surgery was done at the age of 11 months.

She had a good general health and an average body built with no deleterious habits. Extra oral examination showed that she had a mesocephalic head, mesoprosopic facial form, convex facial profile. Her nose was average in size. Nasolabial angle was normal; lips were incompetent at rest. The interlabial gap was 10 mm during rest position and 16 mm during smile. The mentolabial sulcus was deep.

Intraoral examination revealed a protruded premaxilla. All the primary teeth and the permanent first molars were present except the right upper permanent first molar. She had a normal tongue size. Residual cleft was present in the hard palate.

Panoramic radiographic examination revealed the missing of upper permanent lateral incisors. Pre-treatment cephalogram and analysis indicated a class II skeletal relationship (ANB 7°. β – *angle* 7°), Retrognathic mandible (SNB 75°), orthognathic maxilla (SNA 82°) convex profile as (angle of convexity 18°). Average growth pattern (y-axis 59°, mandibular plane 31° in rickets analysis).A functional analysis indicated normal mouth opening. No abnormality was detected in temporomandibular joint. She had a normal respiration, swallowing and perioral muscular activity. Facial and intraoral photographs indicated asymmetrical and disproportionate face.

Figure1: PRETREATMENT EXTRAORAL PHOTOGRAPHS

Fig1. A: Frontal normal

Fig1.B: frontal smile

Fig1.C: oblique smile

Fig1.D: Right lateral

Fig1.E: Left lateral

Figure 2: PRETREATMENT INTRAORAL PHOTOGRAPHS

Fig 2.A: Right lateral

Fig 2.B: Left lateral

Fig 2.C: Front

Fig 2.D: Maxillary Occlusal

Fig 2.E: Mandibular Occlusal

Treatment

1) In phase I, a **premaxillary retraction appliance** was indigenously designed and fabricated. It consisted of two Components, a) Premaxillary component and b) Palatal component.

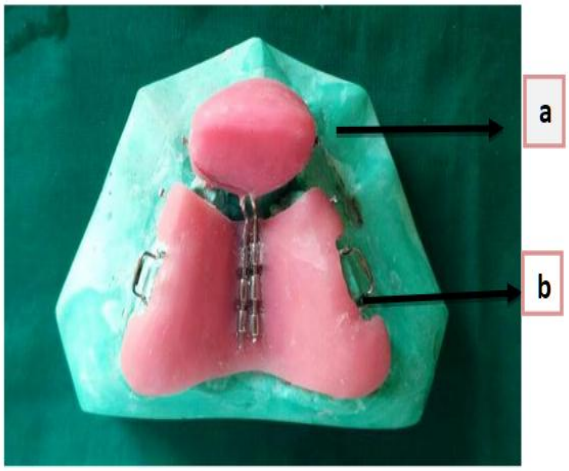

Fig. 3: Premaxillary retraction appliance on Cast a) Premaxillary Component, b) Palatal Component.

a) Premaxillary component: It consists of a 0.7mm SS wire encircling the two permanent central incisors. The central incisors were capped by acrylic plate. Two hooks were incorporated on the labial side facing distally in the lateral incisor tooth region to engage elastics.

b) Palatal component: It made of an acrylic plate with lingual sheath incorporated along the midpalatal line and was extended up to the distal of the 1st permanent molar. The lingual sheath allowed the 0.7 mm SS wire (incorporated in the anterior component) to move posterior during retraction without any hindrance. It had two Adams clasps on the permanent 1st molars on both sides for retention and had two hooks facing the mesial side in the canine region for retraction of the premaxillary segment. The appliance design allowed the anterior component to freely slide on the posterior component.

The 0.7 mm SS wire which encircled the central incisors was extended in the midpalatal region up to the distal of the 1st permanent molar through the lingual sheath .E-chain was given from the hooks incorporated in the premaxillary component to the hooks present in the

palatal component. The e-chain was changed every 3 weeks. The distal end of the mid palatal wire of the anterior component was cut every time during the scheduled appointment as it extended owing to the premaxillary retraction. The premaxilla was thus retracted in about 8 months.

Fig 4: Occlusal and palatal part of the premaxillary retraction appliance.

Fig. 5: Frontal view of the premaxillary retraction appliance.

Fig. 6: Lateral view of the premaxillary retraction appliance.

2) In phase II, a combination appliance (removable and fixed) was designed. Lingual buttons were placed on the lingual surface of central incisors. A removable acrylic plate was fabricated with posterior bite plane to keep the bite open. It consisted of two lingual buttons placed lateral to the mid-palatal suture which aided in applying light forces on to the lingual buttons attached on to the permanent central incisors. The acrylic plate was the removable part and the lingual button attached in the palatal surface of central incisor was the fixed part of the combination appliance. The derotations of the incisors was thus carried out in the phase II treatment with e-chain given from the central incisor to the lingual button incorporated in the acrylic plate. It took about 4 months.

The rotation correction method mentioned earlier was applicable to the distally rotated central incisor tooth, but such method might not be apply for all kinds of malposition and needs to be modified as per the requirement.

Fig. 7: Combination appliance.

3) In phase III, a 2×2 fixed appliance was placed for stabilizing the central incisors. It also assisted in the rotational control which was started in the phase II and maintained in this stage which took about 3 months.
4) In phase IV, a utility arch was placed for further control of the anterior segment.

The retraction of premaxilla with derotation of central incisors took about 1.5 years in four phases. Currently the maxilla is in stabilized phase. Further treatment will be done with routine fixed orthodontic therapy.

Fig 8: MID TREATMENT EXTRAORAL PHOTOGRAPHS

Fig 8.A: Frontal at rest

Fig 8.B: Frontal smile

Fig 8.C: Oblique smile

Fig 8.D: Right Lateral

Fig 8.E: Left Lateral

Fig 9: MIDTREATMENT INTRAORAL PHOTOGRAPHS

Fig 9.A: Right Lateral

Fig 9.B: Left Lateral

Fig 9. C: Frontal

Fig 9.D: Maxillary Occlusal

Fig 9.E: Mandibular Occlusal

DISCUSSION

Cleft lip and palate is a type of birth defect that affects the upper lip and the roof of the palate. The cleft of lip and palate are due to malunion of maxillary and nasal processes. During the fusion, the covering epithelium of these processes of the site of union disintegrates and mesodermal tissue comes in contact and unites. Failure of this union produces total cleft of primary palate, while partial fusion produces subtotal cleft. The etiology of this malformation is complex and includes both genetic and environmental factors. The etiology includes chemical exposures, radiation, maternal hypoxia, teratogenic drugs, nutritional deficiencies, physical obstruction, and genetic influences. About 70% of all the CLP cases and 50% of cleft palate patients only fall within non-syndromic pathologies. Some syndromes associated with cleft palate are Down's syndrome, Pierre Robin syndrome, Treacher Collins syndrome, Marfan syndrome, Stickler syndrome, Edward syndrome etc. The other cases are found to be linked to cardiac, limbs, ophthalmological syndromes. The manifestation of the disease (syndromic and nonsyndromic) has been linked to some defects of growth factors and their receptors, such as fgf8 and fgfr1 genes. Tgfβ is another family gene involved in the formation of the oral cleft, in particular: tgfβ3, with the inactivation of its receptor tgf3βr2, and the inactivation of bmp7.[2]

Different types of cleft includes,

1) Cleft Lip → Unilateral or Bilateral
   → Complete or Incomplete
2) Palatal Cleft → Bifid Uvula
   → Soft palate only
   → Both hard and soft palate
3) Combined lip and palatal defect → Unilateral , complete or incomplete
   → Cleft palate with bilateral cleft lip, complete or incomplete

Treatment should start shortly after birth to assist in feeding, and "infant orthopaedics" may assist the surgeon in lip closure. Later treatment includes mixed dentition expansion and alignment in patients with significant deformities. Treatment at later ages includes orthodontics, possible presurgical orthodontics and orthognathic surgery.[3] In patients with minimal deformities, the patient can often be managed like a routine orthodontic patient. Treatment of a patient with a cleft lip and palate requires multidisciplinary approach. Healthcare providers, in addition to the orthodontist, who may become involved with the treatment of these patients include pediatricians, plastic surgeons, otolaryngologists, speech therapists, audiologists, pediatric dentists, oral and maxillofacial surgeons, and prosthodontists.[4]

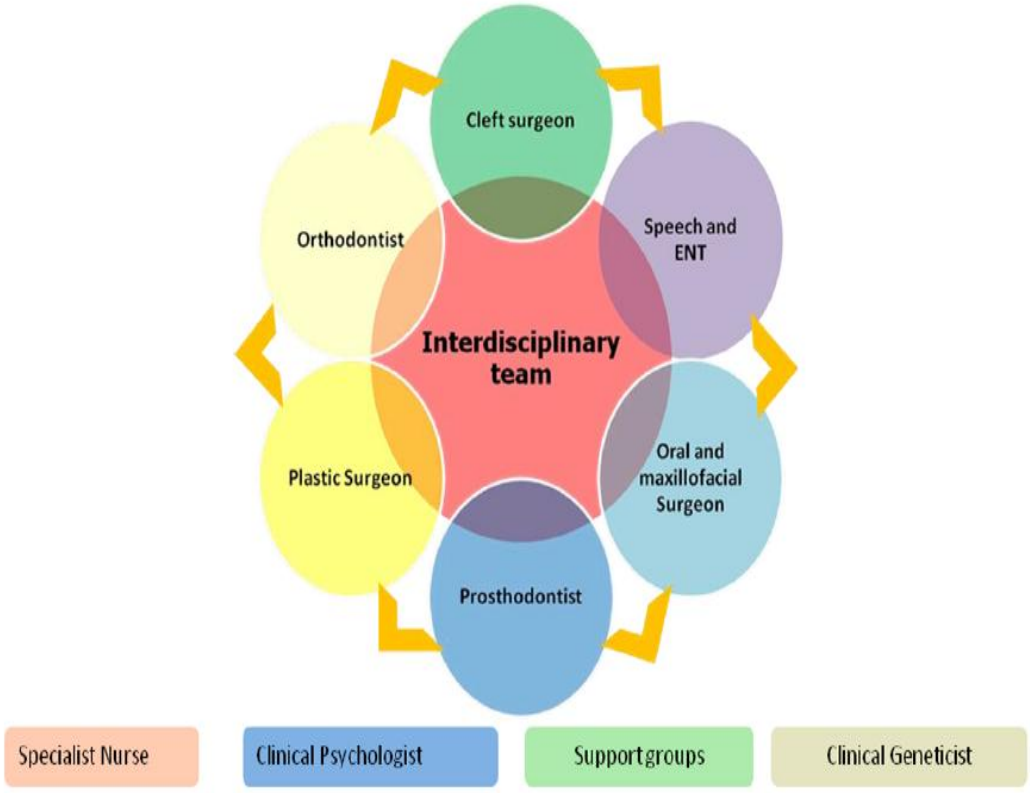

Fig. 10: Interdisciplinary team.

Table 1: Schedule of treatment A.

Age	0 m	3 m	6 m	9 m	1 y	2 y	3 y	4 y	5 y	6 y	7 y	8 y	9 y	10 y	11 y	12 y	13 y	14 y	15 y	16 y	17 y	18 y
? Palatal obturator /Feeding Appliance																						
Primary cleft lip Surgery																						
Palate repair																						
Tympanostomy tube																						
Speech therapy/Pharyngoplasty																						
Bone grafting jaw																						
Orthodontics																						
Orthognathic Surgery and Rhinoplasty																						

In the present case the premaxilla was protruded and there was residual cleft in the hard palate because Naso Alveolar Moulding was not done in her infant age.

Naso Alveolar Moulding (NAM) technique, a new approach to presurgical infant orthopaedics, developed by Grayson reduces the severity of the initial cleft alveolar and nasal deformity. This enables the surgeon and the patient to enjoy the benefits associated with repair of a cleft deformity that is minimal in severity. It is a self-cure acrylic plate, trimmed with a denture soft material having the thickness of 2–3 mm. The retention arm is 40 degrees to get appropriate activation and to avoid dislodgement of the NAM plate from palate.

Fig. 11: Naso alveolar moulding plate.

The child was not so co-operative at first. But the TELL-SHOW-DO technique made her co-operative soon. Without the patients co-operation the treatment would not have been possible as the removable appliance required patient's compliance.

CONCLUSION

This case report presents a new dimension for the correction of protrusive premaxilla. The new appliance could bring about the desired changes including deep bite correction and the formation of the labial vestibule. The appliance is economical and easy to fabricate.

The results were achieved because of the excellent patient compliance. Further studies need to be done for knowing the effectiveness of the appliance and the necessary modifications need to be done as required.

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