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REHABILITATION OF ANTERIOR MAXILLARY HYPOPLASIA WITH CLEFT PALATE USING A SELECTIVELY HOLLOWED COMPLETE REMOVABLE PROSTHESIS – A CASE REPORT

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Abstract:

Cleft palate is a congenital facial deformity that presents clinically with anterior maxillary hypoplasia, congenitally missing teeth, nasopalatal communication, anterior open bite and a constricted maxillary arch. Aesthetic and functional rehabilitation of cleft palate patient requires the use of a prosthesis that provides adequate support to the lip and reduces the problem of nasal regurgitation. This article describes the fabrication of a removable prosthesis that has been modified anteriorly by providing added thickness to the labial flange so as to increase the lip support. This flange has been hollowed out to reduce the weight of the prosthesis and also provides comfort and ease of use. The palatal plate evades nasal regurgitation and improves speech.

Key words:- cleft palate, hypoplasia, hollow prosthesis, rehabilitation

Cleft palate is a congenital fissure or elongated opening in the soft and/or hard palate as a result of improper union of the maxillary process and the median nasal process during the second month of intrauterine development. Any interference in the normal embryonic development of face and oral cavity can result in a cleft. It is a congenital facial deformity with high incidence rate– 1 in 600 to 800 live births[1]. Combined cleft of the lip and palate has a higher incidence rate compared to secluded clefts of lip and palate. It may occur as an isolated entity or as part of a syndrome. Approximately 70% of cleft lip and palate cases are non syndromic[2] and are considered to be of multi factorial origin. This includes genetic predisposition and environmental factors such as consumption of alcohol, smoking, intake of drugs like phenytoin, maternal illness and many more, which may influence embryonic development.

Depending upon the severity of interference to normal embryonic development, clefts may vary from

the mildest 'forme frustae' of the lip or submucous cleft of the palate to complete cleft extending from lip, through ridges hard palate and soft palate[3]. One of the oldest system of classification was put forward by Davies and Ritchie in 1922 and Veau in 1931. Veau in his publication 'Division Palatine' describes four forms of cleft palate based on morphology. Since then numerous classification systems were described including symbolic representations (Schuchardt and Pfeifer, 1964), use of acronyms (LAHSN, LAPAL 2007), diagrammatic representations (Lima clock diagram, 2009), etc to organize data and simplify treatment planning. A universal structured form for description of cleft lip and palate phenotypes is the CLAP notation which is an acronymic shorthand for the longhand structured form. Uppercase letters summarize the part of the anatomy involved and lowercase prefixes and suffixes are added to describe the pre foraminal and post foraminal morphology.

Cleft lip with or without cleft palate occurs due to incomplete fusion of medial nasal, lateral nasal and maxillary processes on both sides. The site of the cleft theoretically corresponds to the lines along which the embryonic processes fuse together. Usually the cleft develops between the lateral incisor in the premaxilla and canine in the lesser segment. There is almost always a 'pre-canine' tooth on the lesser segment. If the premaxilla contains a lateral incisor it is generally abnormal and is situated above the level of the central Incisor. It tends to be undersized and decayed looking often protruding out sideways. At times it emerges high inside the cleft at the level of the nostril, which is usually removed in the course of lip surgery. Another feature is the presence of supernumerary lateral incisors labial to the cleft site in both deciduous and permanent dentition. Neonatal teeth are also seen which may exfoliate from the greater segment.

The cleft widens after birth and this is due to distorted traction of the facial muscles and the pressure exerted by the tongue. The width of the cleft increases anteroposteriorly from the free border of the lip to the anterior palatine foramen and posteroanteriorly from the uvula to the anterior palatine foramen. This can be controlled by appropriate surgical procedure at the right age due to the altered growth pattern. However, abnormal facial growth pattern such as gross maxillary arch contraction, midface retrusion and poor facial growth are usually noticed in patients with repaired cleft lip and palate. To reduce the deleterious effect of surgery on facial growth, Gillis and Fry, advocated delayed hard palate closure. According to this regimen the closure of the soft palate is carried out and a prosthetic obturator is placed, which delayed closure of hard palate[4]. Further studies have concluded that palatal surgery in infancy has the potential to cause severe midface retrusion and mandible is both smaller and retropositioned[5,6].

The hypoplastic maxilla often results in a sunken appearance of the midface which may be corrected by both invasive and noninvasive procedures. Treatment options may range from Le Fort 1 surgery and distraction osteogenesis to the use of removable prosthesis. Combined fixed and removable prosthesis can also be successfully employed for anterior maxillary defect[7]. When only few natural teeth remain removable prostheses retained with telescopic attachments[8] or overdentures[9] provide satisfactory results in retention of the prosthesis. But the restoration of bone and soft tissue defect in the anterior region of the face poses aesthetic challenge in successful rehabilitation.

Here an added thickness of acrylic employed in the labial flange region of a removable prosthesis provides an easy solution for anterior maxillary insufficiency without the need for any complex attachments. But often the added thickness and weight anteriorly can result in easy dislodgement of the prosthesis during physiologic movement. This case report presents the prosthetic rehabilitation of a repaired cleft palate patient with severe maxillary hypoplasia rehabilitated with a removable prosthesis that is hollowed out anteriorly to

reduce the weight of the prosthesis.

Case Report

A 70 year old female patient reported to the Department of Prosthodontics, Government Dental College, Thiruvananthapuram with the chief complaint of difficulty in speech, nasal regurgitation of food and aesthtics (Fig 1). On examination, it was found that the patient had a residual cleft of the anterior alveolus involving primary palate, belonging to category 1b of American Cleft Palate-Craniofacial Association (ACPA) classification[10]. There was no evident residual cleft in the hard palate as she had undergone a series of surgical repairs prior. Intraoral examination also revealed that the maxillary arch was severely constricted such that the entire maxilla was contained within the mandible (Fig 2). She had only few posterior teeth remaining which were palatally placed in relation to mandible and were not able to establish occlusion with the opposing arch. The mandibular arch had full compliment of teeth upto second molar on both sides, except the root stump of the left first molar. The palatally placed teeth had short mutilated crowns which were periodontally compromised and cannot be utilised for retention purposes. Hence it was decided to relieve the respective teeth in the denture base.

The patient's primary concern was about the unsupported nature of the upper lip and the sunken

Fig 1: Hypoplastic maxilla

Fig 2: Contracted maxillary arch

Fig 3: Addedthickness labially

Fig 4: Waxed up denture profileview

Fig 5: Waxed up denture palatal view

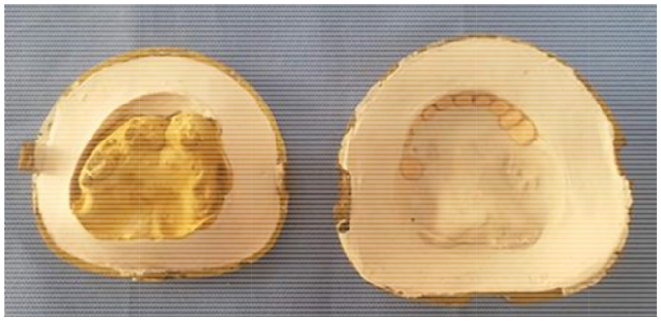

Fig 6: Trial prosthesis after dewaxing

anterior region beneath the nose. She had been wearing a removable prosthesis ever since her younger days and hence willing to accept a removable prosthesis that would make her speech legible and also provide adequate fullness to the lip.

Procedure

Preliminary impression was made using irreversible hydrocolloid in a stock tray and primary casts were poured. After blocking out the teeth and undercuts present, a custom tray was fabricated using self cure acrylic resin. Border moulding and final impression was carried out subsequently and a master cast was poured with dental stone. During the jaw relation appointment special attention was given to provide added thickness of wax labially as per the patient's demand (Fig 3). The patient had an anterior open bite and posteriorly, few natural teeth contacted the opposing arch. The excessive thickness of wax anteriorly was found to be a challenge in retaining the prosthesis in the patient's mouth. The existing natural teeth had short clinical crowns which did not facilitate clasp placement. Hence it was planned in such a way that the labial flange be made hollow to reduce the weight of the prosthesis and also to extend into the buccal sulcus for extra retention and at the same time providing adequate fullness. After evaluation of jaw relation and try in the denture was finished and polished (Fig 4 and 5).

The waxed up denture was invested and dewaxed in a conventional manner (Fig 6). Then steps were taken to produce a hollow labial flange.

To provide uniform thickness of acrylic resin around

Fig 7 : Wax adapted on labial and palatal aspect

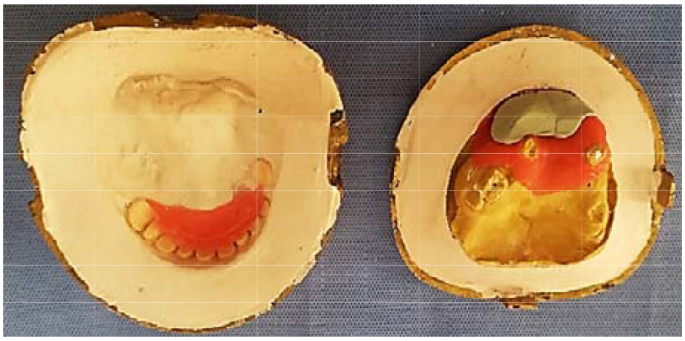

Fig 8: Putty block replicating the hollowregion

Fig 9,10 and 11: Putty block invested in alginate and duplicated with glycerine soap

the hollow space two strips of wax where adapted on the labial and palatal aspect of the mould corresponding to the labial flange (Fig 7). A putty block was placed in the mould corresponding to the labial flange region and the flask was closed to replicate the shape of the hollow region (Fig 8). The set putty block so obtained was invested in alginate and duplicated in glycerine soap (Fig 9, 10, 11).

After packing a small amount of acrylic resin on the labial and palatal side of the labial flange the initial putty block was placed and the trial closure was done. Once the flask was opened, it was ensured that sufficient thickness of resin was present along the margins of the hollow space (Fig 12).

Then the putty block was replaced with soap and the flask closed and cured in conventional manner. After curing the denture was trimmed and finished. Two holes were made on the palatal surface of the labial flange and the denture was kept immersed in water to dissolve the soap. Final cleaning of the hollow cavity was done by injecting water through one hole and the remnants of the soap exited through the other hole. After thorough removal of soap, the holes were closed using self cure acrylic resin. This lightweight prosthesis was then delivered to the patient (Fig 13). Moreover the cusil nature of the denture enhanced the retention and comfort considerably (Fig 14 and 15). The patient was satisfied with the aesthetics as well as with the better articulation of speech achieved with the new prosthesis (Fig 16 and 17).

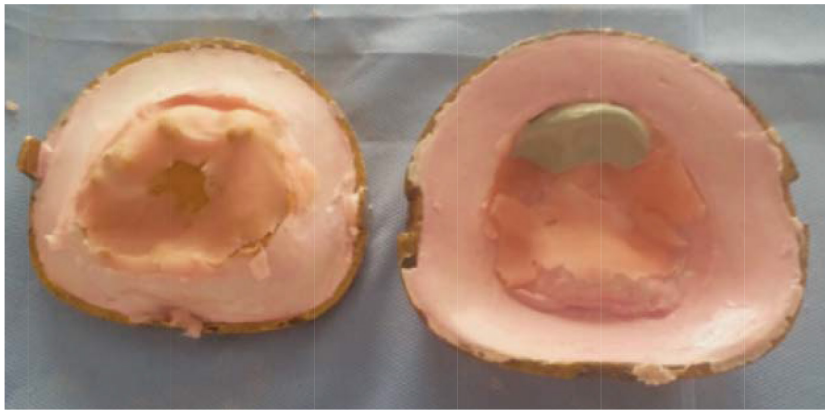

Fig 12: Trial closure with putty block

Fig 13: Hollow lightweightprosthesis

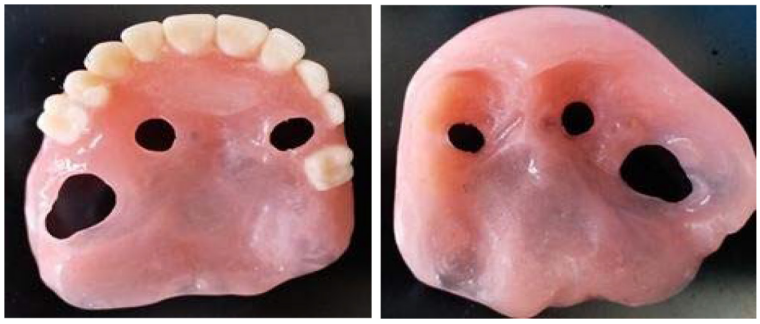

Fig 14 and 15 : Relieved Complete removableprosthesis

Fig 16 and 17 : Prosthesis insitu – frontal and profile view

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Discussion

Multi-disciplinary team approach in the management of cleft lip and palate is well recognised. The role of a prosthodontist in dental care is to restore appearance and function where surgery and orthodontics had failed to provide optimum results. This encompasses restoration of the health of remaining teeth, replacement of missing teeth, maintenance of arch form, obturation of naso palatal communication and improvement in speech.

One of the most challenging aspect of cleft lip and palate rehabilitation is the restoration of normal facial appearance in maxillary hypoplasia. The impaired growth in the maxillary anterior region, especially after multiple surgical protocols can result in anterior maxillary insufficiency. The tooth and bony defects in the cleft side include hypoplastic teeth, hypodontia, deficiency of alveolar bone and palatal or buccal fistulae. This often compromises the surgical and orthodontic treatment necessitating prosthetic intervention for achieving reasonable results. The scarring following surgery results in a practically inactive upper lip which fails to conceal any alveolar defects or irregularities in gingival contour. Same time it acts as a hindrance to the extension of labial flange into the sulcus. The lip is generally unsupported due to the underlying extensive dental and skeletal anomaly and often requires support with a prosthesis.

Fixed, removable and implant prosthesis may be employed as prosthodontic treatment options in cleft palate rehabilitation. Extensive fixed restorations were advocated earlier under the belief that it would stabilize the entire arch[11]. But currently conventional crown and bridge work is advocated when the edentulous span is small and the bridge work does not run across the cleft. Less extensive fixed restoration with one or two abutments on either side of the cleft[12] also may be attempted. Adhesive restorative techniques such as resin composites, porcelain laminate veneers, Andrews bridge and resin bonded fixed partial denture[13], may be used in younger adults for whom minimal tooth preparation is essential.

Dental implants may prove to be useful in edentulous patients to enhance retention. They also serve to replace missing congenital teeth but the major problem with this treatment modality is the difficulty in finding adequate bone of good quality. Zanolla et al evaluated the longevity of prosthetic rehabilitation treatment with implant-supported overdenture (IOD) and implant- supported fixed denture (IFD) in cleft lip and palate patients over a period of 22 years and concluded that the success rate was not compromised and resulted in satisfactory longevity. But the maintenance of the prosthesis was challenging due to wear of the teeth and recurrent fractures[14]. A retrospective study on implant borne prosthetic rehabilitation in cleft lip and palate patients have found that implants are a reliable prosthetic option for such patients[15].

A removable prosthesis such as a tooth supported overdenture can be successfully employed to enhance retention and improve speech and function[16]. But this treatment option requires the abutment teeth to be in excellent periodontal health and free of caries. Periodic follow up and meticulous oral hygiene practices are mandatory to maintain the periodontal health of the abutments.

The cleft palate patient discussed here presented with short clinical crowns, unfavourable location of teeth and a flat palate. Arch discrepancy in the form of Angle's class III occlusion, reverse overjet and buccal crossbite accompanied by an anterior open bite were also present. Moreover the presence of very few existing teeth with periodontally compromised condition precluded successful rehabilitation with a fixed dental prosthesis or an overdenture. The non availability of adequate quantity and quality of bone at the anterior region excluded rehabilitation with implants. Hence a removable prosthesis option was selected which served to obturate palatal defects, disguise arch

discrepancies and replace missing teeth.

The treatment plan should be customised based on each patient's necessities and aesthetic requirement concomitant with a multidisciplinary approach. Hollowing of obturator or complete denture prosthesis using various materials and techniques has been abundantly described in literature. Some of the commonly used materials include sugar[17], salt, gelatin[18], thermocol, polyurethane foam[19], wax or acrylic shim, silicone[20,21] etc. A hollowing technique using gelatin soap has been adapted here considering its ease of retrievability and ability to withstand the curing temperature of acrylic resin[22]. The added thickness of labial flange given in the current prosthesis serves to satisfy the esthetic requirement of the patient. The hollowing of the labial flange resulted in a lightweight prosthesis enhancing the comfort and ease of use. The unfavourable location of the few existing natural teeth in the maxillary arch prompted the need for a complete denture base with appropriate relief in the regions corresponding to the respective teeth. The prosthesis discussed here satisfies all the functional and esthetic requirements of the patient and provided acceptable prosthetic rehabilitation.

Conclusion

Effective teamwork between the prosthodontist, dental technician, speech and language therapist and patient's family is essential to assess the prognosis for each patient. Successful rehabilitation of a cleft lip and palate patient depends upon the extent of the defect, anatomic limitations and patient motivation. A dental prosthesis that is acceptable to the patient should be convenient to wear, maintain arch form, provide adequate function and evade social stigma.

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