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Case Report

Inverted flap lip plasty, Abbe's method, in the reconstruction of bilateral complete cleft lip sequelae: report of a case

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ABSTRACT

This study presents the case of a female patient treated between the ages of 19 and 24 years, with sequelae of complete bilateral cleft lip and palate. Sequelae treated include upper lip incompetence due to low lip volume and length, absence of premaxilla (due to unknown cause), conditioning a large naso alveolar and naso palatal fistula in the region of the primary and secondary palate junction (Pittsburgh V), and finally, dental malocclusion due to prognathism condition. Aforementioned sequelae were treated through upper labial plasty at the expense of translocation of pedicled lower labial flap in the lower labial artery, using Abbe's method; upper anterior removable partial anterior dental prosthesis, with sealing of the nasal cavity, and finally, Intraoral bilateral sagittal split osteotomies of mandibular ascending ramus, in order to reduce prognathism.

Keywords: Sequelae, Cleft lip, Palate

INTRODUCTION

Lip functions include competence in closing oral sphincter, swallowing, articulation of spoken language and in the expression of emotions.[1,4] Lip integrity can be affected by birth abnormalities such as cleft lip and palate, therapeutic mutilations due to oncologic pathology or hamartomas such as hemangiomas, traumatic mutilations because of urban violence or armed conflicts, a wide range of incidental situations, and so on.

Preserving lip functionality and aesthetics represents a major surgical challenge because lips are the functional and aesthetic axis of the lower third of the face.[7]

As lips have no bone or cartilaginous anchorage, they consist of a mobile and elastic structure composed of skin, mucosa, salivary glands and muscle.[1] Lip skin and mucosa are firmly attached to connective tissue overlying the orbicularis oris muscle of the mouth. The labial musculature inserts into both the skin and mucosa by means of elastic tendinous units consisting of concentrates of muscle fibers. When tendinous units are concentrated in small areas, pitting or dimpling occurs, but if these units are concentrated linearly, wrinkles appear in facial expression.[3]

Fibers on the orbicularis oris in the upper lip meet their midline termination at the philtrum in a densely undulating band of connective tissue originating in the nasal septum. However, deeper fibers of the orbicularis oris of the mouth pass freely from side to side.[3]

The red lip line is an anatomical reference that separates the moist lip mucosa from that of the dry lip.[15] Vermillion border forms the transition between the red lip and the skin. A unique feature of the human species is the vermilion lip.[3]

Vermilion is composed of a modified mucosa which lacks salivary glands, while its red color can be explained by the rich vascularity underlying the thin stratified epithelium

and the higher density of thin muscle fibers of the orbicularis oris muscle of the mouth arranged in that area.[3,15]

Parallel to the vermilion of the lip, the linea alba is a slightly elevated mucocutaneous white edge marking the transition between skin and mucosa.[1,3] This linea alba of the lip is an anatomical landmark pertaining to the marginal component of the orbicularis oris muscle of the mouth.

In the midline of the upper vermilion, the upper labial tubercle is found and from this structure there is a depression towards the nasal columella forming the philtrum flanked by two vertical columns on both sides.[3,15]

The facial artery supplies blood to the lips via both the superior and inferior labial arteries. Lip arteries arise at variable distances from the oral commissure. The course followed by lip arteries runs close to the free edge of the lip, deep to the orbicularis oris muscle of the mouth and closer to the mucosal surface of the lip. At the philtrum they anastomose with each other. These anastomoses reach the inferior portion of the nasal septum in the area of the anterior palatine foramen in the course of the nasopalatine artery and another anastomosis is established with the posterior septal artery coming from the sphenopalatine. Thus, a rich anastomosis is established between the posterior septal, anterior palatine and septal branches of the superior lip artery. Some collateral sources come from the ophthalmic artery and the infraorbital artery, coming from the internal maxilla.[3]

Motor innervation of lips depends on the facial nerve through its buccal and marginal mandibular branches. Sensory innervation of the lips is provided by the infraorbital and mental nerves.[3]

Objectives

Case report of a female patient between the age of 19 and 24 years old, with the following problems related to cleft lip and palate sequelae and their correction: upper lip insufficiency and incompetence, absence of premaxilla and dental malocclusion due to mandibular prognathism.

Detailed description of upper lip reconstruction using the Abbe method.

Discussion on correction of premaxilla absence sequelae by means of removable dental prosthesis and discussion on the reduction of mandibular prognathism by means of Intraoral bilateral sagittal split osteotomies of mandibular ascending ramus.

CASE REPORT

A 19-year-old female patient with sequelae of bilateral complete cleft lip and palate consisting of upper lip insufficiency and incompetence due to extreme lack of volume of the orbicularis oris muscle (Figure 1) and absence of the premaxilla because of unknown cause (Figure 2). Added to these problems, the mandibular prognathism condition was extremely noticeable.

Figure 1: Upper lip is very short in its central portion. The use of dental prosthesis adds some volume to the upper lip. A missing premaxilla and the reduced volume of the orbicularis oris muscle of the mouth cause great depression in the middle third of the face and exacerbate prognathism condition.

Figure 2: Missing premaxilla.

The described sequelae cause severe air leakage through the nasal cavity resulting in unintelligible spoken language, hindering chewing, causing regurgitation of solids and liquids into the nasal cavity during feeding, increasing salivary containment problems due to lip incompetence, leading to an environment of low self-esteem and poor social skills. Additionally, the absence of premaxilla led to depression of the middle third of the face and exacerbated mandibular prognathism.

Speech output was very poor, but when obturating the oro-nasal communication, the explosive phonemes are emitted efficiently, which denotes that palatoplasty of approximately 16 years of evolution performs well at the palatine velum level. It appears that the technique used for palatoplasty was Wardill Kilner Veau and Sanvenero Roselli pharyngoplasty. Interestingly, in spite of the Pittsburgh I and III type fistulas of the soft palate, mobility of this structure is adequate, and the emission of spoken language is intelligible because the air leakage at the level of the absent premaxilla is kept blocked (Pittsburgh V type fistula) (Figure 3).[17]

Figure 3: Soft palate insufficiency and palatine fibromucosa discontinuity (Pittsburgh I and III type fistulas). Large anterior fistula (Pittsburgh V) caused by the absence of premaxilla.

Also, due to a missing premaxilla, dental and skeletal class III condition is exacerbated, and the incompetent upper lip is practically immobile because it is fixed to the nasal septum. The absence of premaxilla with 16 years of evolution caused upper lip tissue retraction creating tension and retraction on the nasal columella and the cartilaginous septum.

Cephalometric data show that the mandible has an excess vertical growth clockwise, thus causing a prognathism situation.

The first problem to be corrected was upper lip incompetence. The central portion of the upper lip was of very reduced height, width and volume. Thus, it was determined that the labial subunit corresponding to the labial philtrum should be considered as practically absent and susceptible to be reconstructed.

Lip plasty using the Millard method was considered for treating bilateral cleft lip. This option was discarded because of the absence of hard tissue support given the lack of the premaxilla. The best option was concluded to be an inverted lower lip flap plasty performed following Abbe's method. This option was chosen because of the following advantages: it ensures reconstruction of the philtrum labial subunit and its columns, in its full length, height and volume and symmetrically, and the possibility of releasing nasal columella tension.

When planning the plasty by Abbe's method (Figure 4), symmetrical reconstruction was considered, so it was decided to take the flap of the central portion of the lower lip with a W-shaped design intended to invert the flap and provide support to the columella, and when repairing the donor bed, the scar would be in the center of the labial sulcus with an inverted Y-shape. The recipient bed in the upper lip was approached in a Y-shape and repaired with the W-shaped flap, providing more tissue to reconstruct the nares floor. Flap vascular pedicle was the left inferior labial artery.

Figure 4: Y-shaped recipient bed design from the base of the columella to the vermilion free edge. Design of the donor bed in the lower lip in a W shape placed centrally and the vascular pedicle is placed laterally to the left.

The first surgical time of the case was performed when the patient was 19 years old. Abbe's method was used: the protocol of verification of safe surgery was strictly followed, antisepsis by means of oral cavity cleaning with dental brushing and 0.12% chlorhexidine rinse and washing of the facial skin and lips with surgical soap with 2% clohexidine. Sterile surgical drapes for maxillofacial surgery were placed. The procedure was performed under endovenous conscious sedation and local anesthesia with articaine 4% with epinephrine 1:100,000 in inferior dental nerves, infraorbital nerves and anterior and middle alveolar nerves.

The receiving bed is designed in the upper lip. A full-thickness Y-shaped approach is designed in the upper lip; with the oblique arms of the Y engaging the edge of the floor of each nostril at a width of 10 millimeters and at a 45-degree angle. The long arm of the Y is also incised in full thickness along the entire length of the lip. Hemostasis is performed by electrocoagulation (Figure 5).

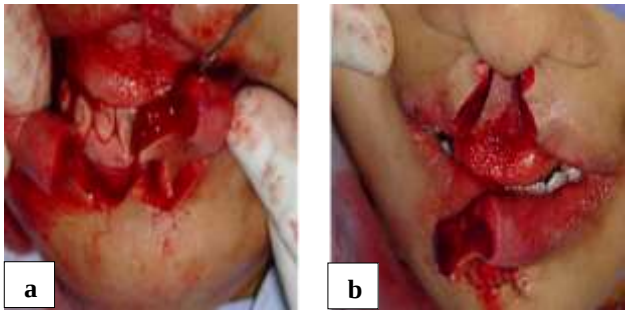

Figure 5: (a) The donor bed with the pedicled flap on the left inferior labial artery, and (b) the recipient bed of the upper lip ready to tie the flap.

A flap is designed in the center of the lower lip, in a W shape, 22 millimeters high and 10 millimeters wide, with the non-pedicled side on the right and the pedicled side on the left, in order to achieve the vascular pedicle in the left inferior labial artery. Flap dimensions correspond to the height to be reconstructed in the upper lip in a 10 mm

width of the central incompetence of the upper lip (Figure 6).

Figure 6: Insertion of the inverted flap in its recipient bed achieving the best possible match of the linea alba of the flap with the linea alba of the recipient bed.

The non-pedicled end of the flap was the right side. It was cut in a single full-thickness line using a number 11 scalpel blade. The inferior labial artery was identified closest to the labial mucosa, 4 millimeters from the free edge of the lip, underlying the glandular layer of the lip and 2 millimeters above the level of the linea alba of the lip. Hemostasis of the flap and the opposite edge of the wound was obtained with electrocoagulation and transfixion suture, respectively. The central convergent cuts of the design were also made in a single full-thickness line with the same scalpel blade. The flap cut on the pedicled side was performed taking as reference the location of the right inferior labial artery sectioned on the non-pedicled side, leaving a margin of 6 to 7 millimeters from the free edge of the lip, avoiding the section of the vascular pedicle and allowing a 180 degree turn of the flap without obstruction of the blood supply to the flap, with the possibility of correctly matching the linea alba of the flap on its pedicled side (the left) with that of the recipient bed on its right side. Hemostasis is verified and the donor bed is closed in three planes: labial mucosa, musculature and skin, in an inverted Y-shape.

The flap is inverted 180 degrees and is tied to the receptor bed, fixing it onto three planes —mucosa, musculature and skin—, taking special care in the correct matching of the linea alba of the flap with that of the receptor bed. Oral cavity is gently vacuumed and the procedure is completed (Figure 6).

Flap integration into the recipient site evolves smoothly and three weeks after surgery, in a second surgical time, with local anesthesia, it is released from its inferior base and its insertion into the recipient site is completed (Figure 7).

When comparing the condition prior to the lip plasty by the Abbe method, with the dental prosthesis used by the patient on a regular basis, and the 5-week postoperative period with the new prosthesis shows a significant and beneficial difference (Figure 8).

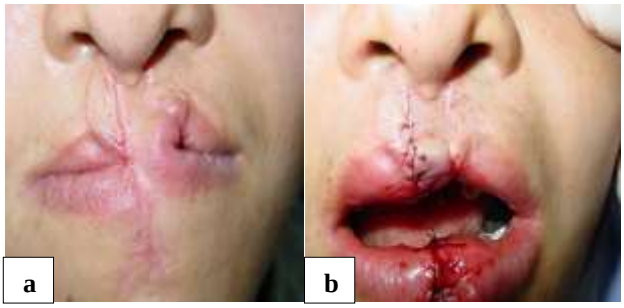

Figure 7: (a) Three weeks of postoperative evolution, and (b) release of the vascular pedicle of the flap.

Figure 8: Comparison (a) labial insufficiency and incompetence with the old prosthesis, and (b) adequate lip length 5-weeks post-surgery after the release of the vascular pedicle of the flap, with the new dental prosthesis. A small enhancement of the lower lip is seen to improve the condition of the lower lip.

The second sequela to be corrected was the absence of the premaxilla, the cause of which is unknown. Four weeks after the release of the lower labial flap, a removable dental prosthesis was made and placed in order to repair the absence of the upper anterior teeth, provide support to the upper lip and the nasal column, and provide sealing of the nasal cavity for correct phonation.

At the age of 24, the third problem was corrected: dental malocclusion due to prognathism. During the corresponding orthodontic preparation, there were difficulties for the correct alignment of the lateral maxillary segments due to the absence of the premaxilla, the crossbite of the left maxillary segment and the lack of attachment of the patient to attend her appointments with the orthodontist.

Because of these difficulties, treatment was delayed for more than two years. Finally, the patient underwent surgery for intraoral bilateral sagittal split osteotomies of mandibular ascending ramus. to reduce prognathism (Figure 9). Segment fixation and stability of mandibular osteotomies were achieved by means of rigid fixation with plates and bicortical screws, obtaining a harmonic relation in the dental occlusion of the posterior segments.

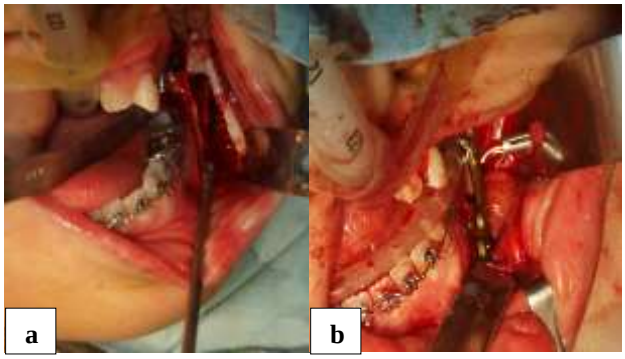

Figure 9: Intraoral sagittal osteotomy procedure of ascending mandibular branches (a) left branch osteotomy. The inferior dental vasculonervous bundle is seen attached to the distal segment, and (b) plate and screw fixation was chosen to provide greater stability to the osteotomies and the segments in their new positions.

Results

Repairing these sequelae leads mainly to functional improvements and, secondarily, to esthetic enhancement. Correction of the upper lip insufficiency resulted in improved phonation and physical appearance of the patient. Removable dental prosthesis offers a very efficient sealing of the nasal cavity thus avoiding solid and liquid food migration into the nasal cavity, as well as air leakage through the nose resulting in an excellent phonation and offering adequate support to the upper lip and the basis of the nasal columella, improving overall physical appearance. Reducing prognathism resulted in a much more harmonious and functional relationship of dental occlusion (Figure 10), thus allowing a more efficient chewing, and has secondarily improved physical appearance as well.

Figure 10: Enhanced dental occlusal stability improves conditions for functionality.

Due to reasons beyond our control, contact with the patient was lost and other problems have remained unresolved, specifically the presence of two palatal fistulas type Pittsburgh I and III and the large anterior palatal fistula type Pittsburgh V due to the absence of premaxilla.

DISCUSSION

Knowledge of both lip topography and anatomy leads to an understanding of the division of the lips into esthetic and functional units allowing a better understanding of defects to be reconstructed.

Lips are divided into subunits bounded by contour lines representing the different muscular tendinous insertions. Upper labial subunit is bounded above by the nose, laterally by the nasolabial groove, medially by the philtrum column and in the bottom by the vermilion and the white mucocutaneous line. Philtrum is bounded by the nasal columella and its lateral columns. Lower labial subunit is bounded at the bottom by the labial sulcus mento, laterally by the naso-genian sulcus and by the white mucocutaneous line.[1]

Regarding the skin side of the upper lip, it consists of two lateral subunits and one central unit, known as philtrum. In contrast, the lower lip consists of a single unit.[15]

Both the upper and lower vermilions are delimited by the linea alba muco cutanea, laterally by the commissures and by the vermilion's free edge.[1]

Dividing lips into subunits helps to design the reconstruction method. Other useful concepts are differentiating between vermilion defects on the one hand, and partial-thickness and full-thickness defects on the other.[2]

For lower lip, full-thickness defects are classified as those involving one-third of the lip, defects involving one-third to two-thirds of the lip width, and defects involving two-thirds to complete lip loss.[2,7] The amount and layout of vermilion, labial commissure, chin and intraoral vestibule likely to be used in a reconstruction procedure should also be taken into account.[7]

Deciding the method to be used for repairing lip defects is largely based on the horizontal extent of the defect. That is why the lips are divided into thirds to estimate the size of the defect.[15] Another parameter to be taken into consideration is how deep the defect is relative to the orbicularis oris muscle of the mouth.[9]

Lip reconstruction is intended to maintain or regain competent buccal closure, lip mobility and sensibility and to preserve esthetic conditions.[4] When lip reconstruction reduces oral stoma by 50% or less, patients become limited, especially when using dentures.[4] Reconstruction should be based on objectives to be achieved such as maintenance of lip function and esthetics, avoiding sequelae such as micro-stoma, effacement of the buccal commissure, replacement of wet lip by dry lip, lip adynamia, alterations in lip sensitivity and lip incompetence.[4,9]

Quoted by Jabaley, 1977, Karapandzic provides the following principles in choosing the technique for lip reconstruction.[12]

Resection and reconstruction should be performed in the same surgical procedure and preferably at the same time; the most suitable tissues for lip reconstruction are, in order of preference, remnants of resected lip, opposite lip, adjacent cheek and, ultimately, distant tissues; local flaps that provide mucosa, muscle and skin achieve the best results, and best results are accomplished when sensitivity and mobility of the new lip are preserved. As a corollary to these principles, Pepper, as quoted by Geelan Hansen, suggests that partial-thickness lip defects involving 1.5 to 3.0 centimeters in the labial vermilion should be converted to full-thickness defects for better reconstruction results when closed directly.[15] Thus, full-thickness defects up to one-third of the upper lip and up to one-half of the lower lip can be closed directly.

Abbe's and Estlander's methods were developed at different times and for different types of lip defects.[5,6] Abbe's method was designed for repairing upper or lower lip defects medial to the oral commissures. Estlander's method was designed to reconstruct upper or lower lip defects where oral commissure is involved. Common features of both methods are: flap displacement and inversion that will mend lip defect, and both methods are ideal for repairing upper or lower lip defects involving more than one-third and up to two-thirds of the affected lip.

Estlander's technique refers to an inverted lip flap, with an axial vascular pattern irrigated by the upper or lower labial artery, which can be used in both upper and lower lip reconstruction. Lip defects to be reconstructed may extend up to two thirds of the length of the affected lip and involve oral commissure.[10]

Ashish et al report on treating ten patients using Estlander and Abbe's methods for lip reconstruction and recommend the following parameters when planning: lower lip flaps were taken from the middle portion of the lip to reconstruct the upper lip.[14] Upper lip flaps were taken from lateral portions of the lip to repair lower lip defects. Vascular pedicle for the lower lip flaps was lateral and for the upper lip flaps the arterial pedicle was medial.

The flap width was chosen to be 50% of the length of the defect to be reconstructed aiming at distributing reconstruction of 100% of the defect between both lips.

Estlander's method was applied for cases of defects involving oral commissures.

Full-thickness incision on the non-pedicled side is intended to verify the position of lip artery in relation to the thickness of the orbicularis oris of the mouth and the mucocutaneous line of the lip. This maneuver guides the height of the cut on the pedicled side of the flap to avoid damaging the vascular pedicle of the flap.

Vascular pedicle was released two and a half to three weeks after the first surgical time without complications due to lack of irrigation. No flap necrosis was reported.

Estlander's method for reconstructing lip commissure has been the most widely used since its first description in 1872, and it may be used for both upper and lower lip defects.[9]

Estlander's flap design is typically an isosceles triangle with a base half the width of the defect, measured over the vermilion length on the opposite lip. Likewise, the flap height should equal the defect height.[10]

Chai et al described lower lip reconstruction in a patient with verrucous carcinoma using the Abbe's method by designing two symmetrical upper lip flaps to repair the lower lip defect and named this method as "Abbe double flap".[8]

They found that a symmetrical approach in obtaining the two Abbe flaps was the best way to maintain the lower lip shape. They observed that the double flap technique is suitable for reconstructing large lip defects, avoiding trauma and other post-operative complications of other methods involving large incisions made on the face.

While the use of a double Abbe flap is a very compelling option, Ferrer et al provide an extensive description of the Karapandzic technique for reconstruction of the entire lower lip, and McGregor proposes a modification of Gillies and Millard's method for reconstructing defects of the entire lower lip due to tumors.[11,13] The main difference between both methods is that Karapandzic's method aims at preserving the innervation of the tissues.

Both the Abbe and Estlander methods of lip reconstruction are suitable for full-thickness defects between 30% and 60% of lip width. Both methods transfer skin, muscle and mucosa, and fulfill the objective of maintaining lip competence.[15,16]

Geelan-Hansen et al indicate that Abbe's method can be extended for defects involving columella, perialar region of the lip or premaxilla region.[15] When using Estlander's method, lateral incision is designed to include the oral commissure in the flap and to lie in the naso-genial sulcus. The flap is rotated 180 degrees so that the new oral commissure resides at the inflection point of the flap. In both methods, the transported tissue is temporarily denervated with the recovery of motor and sensory innervation that may take up to a year.

CONCLUSION

Inverted flap plasty using the Abbe method is a very versatile resource for lip reconstruction due to cancer,

trauma or birth defects. Dental and maxillofacial prosthesis offers possibilities to replace jaw birth malformations and acquired defects. The different orthognathic surgery techniques offer the possibility of correcting many developmental and growth abnormalities of the jaws.

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