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Clinical Application of Autologous Fat Graft and Dermis-Fat Graft in Patients with Cleft Lip and Palate Deformities: A Case Series

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ABSTRACT

Cleft lip and palate patients require multiple surgeries from childhood to adulthood to improve both function and aesthetics. Primary surgery may not completely resolve a cleft, residual scarring, asymmetry, nose deformity, or palatal fistula, can sometimes remain, leading to insecurity and social withdrawal. This study reports five cases of patients aged 7-13 years old with prior cleft lip and palate surgeries, treated with autologous materials for lip, nasal, or palatal repair, based on individual needs at Bali Mandara General Hospital, Denpasar, Bali, Indonesia. The first two patients had functional lips but were dissatisfied with scars and poor lip contour. Treatments included dermis-fat grafts, fat transfer injections, and/or scar revision. The third and fourth patients had Pittsburgh Type V palatal fistulas with nasal leakage and hypernasal speech, managed with dermis-fat grafts to close the fistulas. The fifth patient had a nasal deformity due to absent of primary correction and underwent nasal dorsal augmentation with a dermis-fat graft. All patients expressed improved appearance, function, and confidence postoperatively, with no complications during follow-up. Autologous materials such as autologous fat grafting and dermis-fat are reliable, versatile approach, and cost effective for improving lip contour, closing oronasal fistulas, and correcting nasal deformity.

KEYWORDS: cleft lip palate, dermis-fat graft, autologous fat-graft, fistula, nasal deformity

ARTICLE DETAILS

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INTRODUCTION

Cleft lip and palate are the most prevalent congenital craniofacial abnormalities. These malformations occur during a crucial window of embryonic development, specifically between the 4th and 7th weeks of gestation. Cleft lip results from the failure of fusion between the medial nasal process and the maxillary prominence, whereas cleft palate develops due to the incomplete union of the palatal shelves.[1] The global prevalence of orofacial clefts is estimated to range between 1 in 1,000 and 1,500 live births, with significant variations reported across different populations and studies.[2] These variations highlight the influence of genetic and environmental factors on the incidence of the condition, as reported by the World Health Organization. The incidence of cleft lip and palate in Indonesia is 7,500 cases each year.[3] While national health insurance covers functional reconstructive surgeries, it does not include procedures solely for aesthetic purposes.

Cleft lip and palate patients require multiple surgeries from childhood to adulthood to improve both function and aesthetics. Despite primary cleft lip and palate repair, many issues such as scarring and poor lip volume, nasal deformity, and palatal fistula leading to insecurity and social withdrawal. Cleft palate repair closes abnormal oral-nasal communication and improves speech and hearing, but fistulas, with rates between 0% and 58%, remain a challenge. Cleft lip nasal deformities further complicate facial aesthetics, presenting difficulties in rhinoplasty.[1,4] There are many techniques available to correct the secondary cleft lip palate deformity, one of them being autologous materials, both autologous fat-graft (AFG) and/or dermis-fat graft (DFG).

CASE PRESENTATION

The patients, ranging in age from 7 to 13 years, included three male and two female with prior cleft lip and

palate surgeries, treated with autologous materials (Autologous Fat Graft and Dermis-fat Graft) for lip, nasal, or palatal repair, based on individual needs. Prior to surgery, assessments were conducted for upper lip symmetry, volume irregularities, nasal deformities, palatal fistulas, and photographs were taken for documentation. Routine pre-operative procedures such as blood tests and chest X-rays were performed, all showing normal results. All surgical procedures were done under general anesthesia.

Case A

A 13-year-old female patient, who had previously undergone surgery for a complete cleft lip and alveolar repair on the left side, was brought to the plastic surgery outpatient clinic by her parents for a scheduled alveolar bone graft. The parents were concerned that their daughter had become socially withdrawn due to her appearance and condition. On examination, she had a whistle deformity, a visible scar on the philtrum, a flattened philtrum column, a disrupted white skin roll, and slight upper lip under-projection. The surgical plan included performing an alveolar bone graft to address a minor defect on the left side, along with lip reconstruction. Bone graft was harvested from the iliac crest, while fat was obtained from the umbilical area. The procedures involved using multiple Z-plasty techniques, performing a rigotomy on the philtrum, and transferring fat to the vermilion and philtrum to rebuild the philtrum column and the white skin roll.

Fig. 1. Pre-surgical appearance **(a,b)**, post-operative result **(c,d)**

Fig. 2. Rigotomy scar **(a)**, Fat-transfer process **(b,c)**

Fig. 3. Day 1 **(a,b)**, Day 8 **(c,d)**, Day 39 **(e,f)** Follow-up

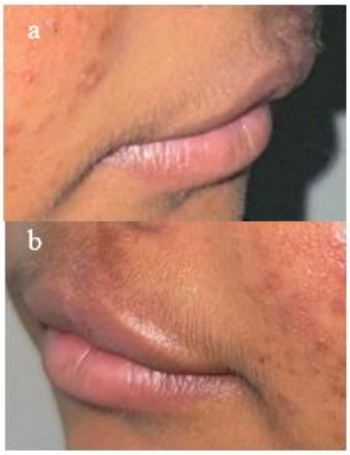

Fig. 4. Oblique View Day 39 Follow-up **(a,b)**

Fig. 5. 2.5 months Follow-up **(a,b,c)**

Case B

An 8-year-old male patient, who had previously undergone surgery for a complete cleft lip, palate, and alveolar repair, was brought to the plastic surgery outpatient clinic by his parents for a planned alveolar bone graft surgery. The parents reported that the patient had been socially withdrawn due to concerns about his appearance and condition. During the local examination, a whistle deformity and a lack of volume and projection in the upper lip were observed. The surgical plan included an alveolar bone graft to address a small defect on the left side, along with lip reconstruction. The bone was harvested from the iliac crest, and a dermis-fat graft was also taken from the same area. Lip reconstruction was performed using Z-plasty, and the dermis-fat graft was used to close the defect in the orbicularis oris muscle and enhance the vermilion. The patient was closely monitored in follow-up appointments, showing gradual improvement. His parents noted that he started interacting more with his peers as his condition improved.

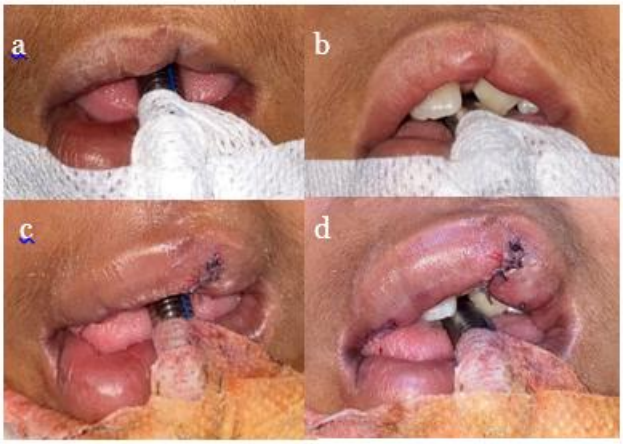

Fig. 6. Pre-surgical appearance **(a,b)** and post-operative result **(c,d)**

Fig. 7. Donor site **(a)**, Dermis-fat graft **(b)**

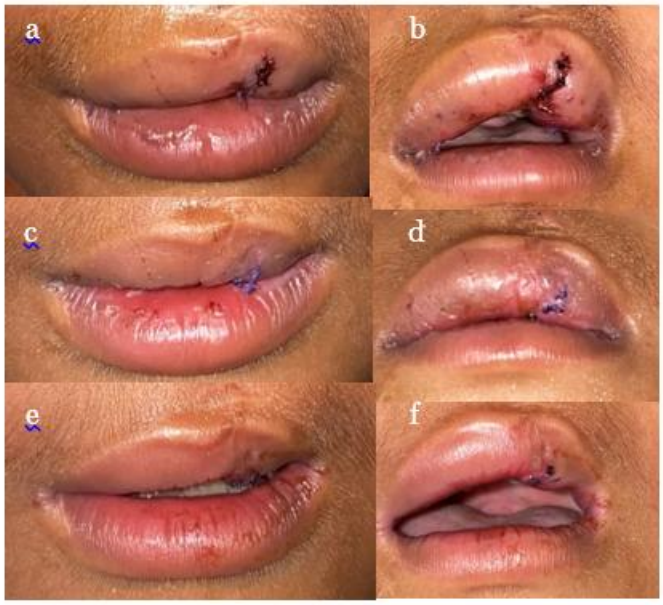

Fig. 8. Day 1 **(a ,b)** , Day 8 **(c,d)**, Day 15 **(e,f)** Follow-up

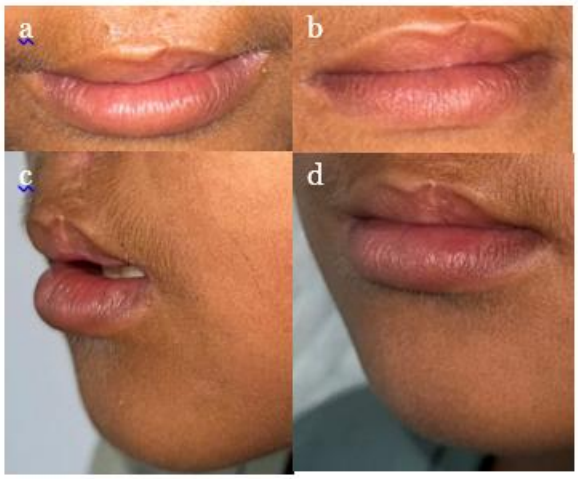

Fig. 9. 1.5 months **(a .c)**, 2.5 months Follow-up **(b, d)**

Case C

A 7-year-old male patient, with a prior history of bilateral complete cleft lip and palate repair and alveolar bone grafting, presented with complaints of hypernasal speech, nasal leakage of fluids and food, and delayed tooth eruption. Upon examination, an oronasal fistula was observed in the anterior palate, and a CT scan showed left oronasal defect. During surgery, cancellous bone was harvested from the iliac crest, along with a dermis-fat graft. A two-flap palatoplasty was performed on the anterior palate, with the nasal layer reconstructed using palatal mucosa. The nasal closure was

supported with a dermis-fat graft, which was secured by suturing it to both the gingival and palatal mucosa.

Fig. 10. Pre-surgical appearance

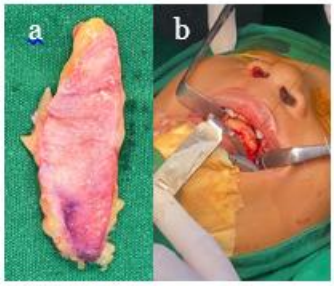

Fig. 11. Dermis-fat graft **(a)**, placement and fixation process **(b)**

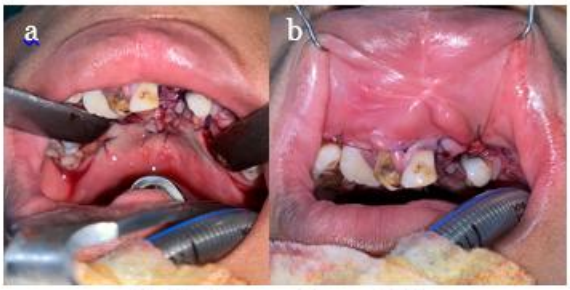

Fig. 12. Post-operative result **(a,b)**

Fig. 13. Day 3 **(a)**, Day 17**(b)**, 1-month **(c)**, 1.5-month **(d)** Follow-up

Case D

A 9-year-old male patient, with a history of bilateral complete cleft lip and palate repair, presented with complaints of hypernasal speech and nasal leakage of food and fluids. On examination, a wide anterior oronasal fistula was detected. A dermis-fat graft was harvested from the iliac crest. The nasal layer was reconstructed using a vomer flap and anterior palatoplasty, with the dermis-fat graft placed on the nasal side. The oral layer was closed with a transpositional labial mucosal flap that carried to the anterior palatal region.

In both patients **(case C and D)**, the fistula was closed without tension, and no complications such as hematoma, infection, wound dehiscence, or recurrence were observed during the follow-up period.

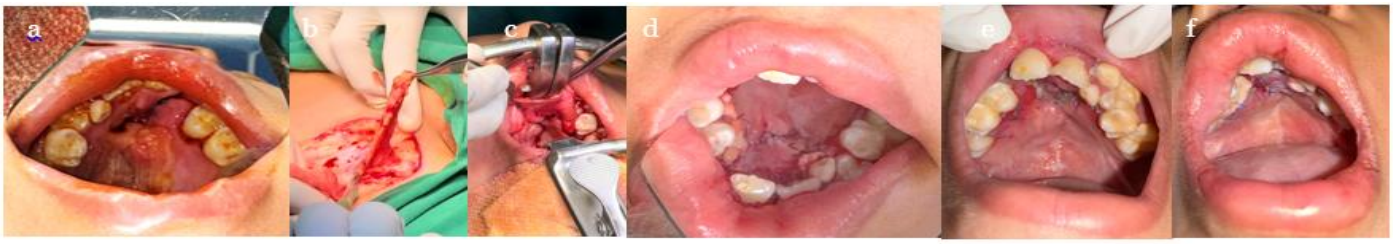

Fig. 14. Pre-surgical appearance **(a)**, Harvesting dermis-fat graft**(b)**, placement and fixation process**(c)**, Post-operative result **(d)**, Day 1**(e)**, 1-month**(f)** Follow-up

Case E

A 9-year-old female patient with a history of left unilateral complete cleft lip and palate repair presented with a nasal deformity due to absent primary correction. She underwent nasal reconstruction to correct these deformities, which involved dorsal augmentation with a dermis-fat graft obtained from the groin area, Tajima reverse-u incision, and Mulliken's technique to reposition cartilage. Postoperative evaluations revealed improved nasal symmetry. The patient utilized a nasal stenting device to ensure patency and a nasal splint to protect and maintain the shape following the procedure. No complications were reported during the follow-up.

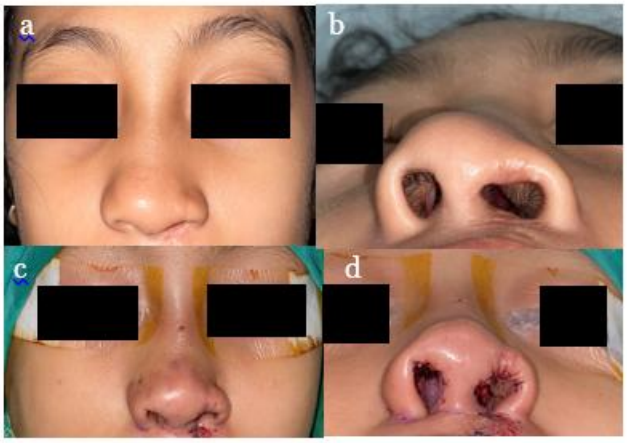

Fig. 18. Pre-surgical appearance **(a , b)** and post-operative result **(c ,d)**

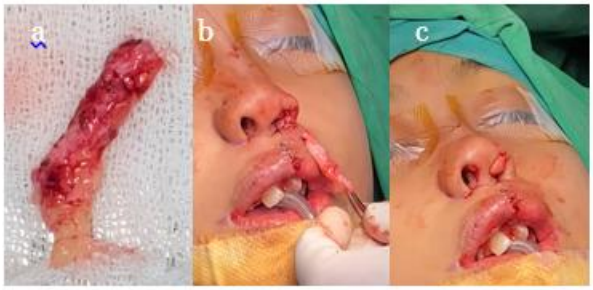

Fig. 19. Dermis-fat graft **(a)**, fixation process **(b,c)**

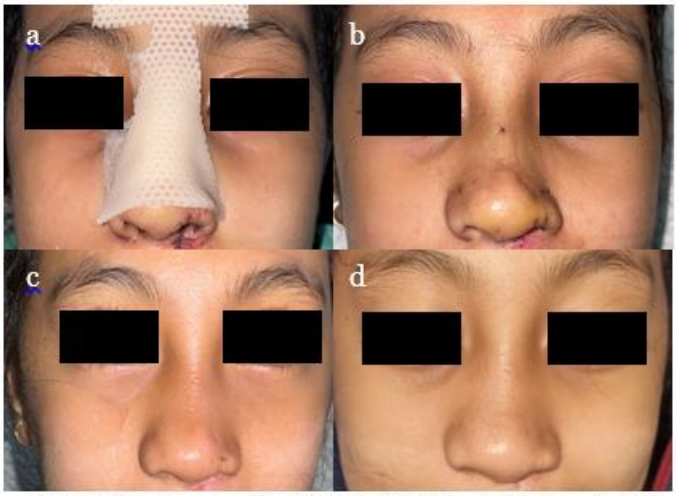

Fig. 20. Anterior view, Day 1 **(a),** Day 8 **(b),** Day 41 **(c),** 3-months **(d) Follow-up**

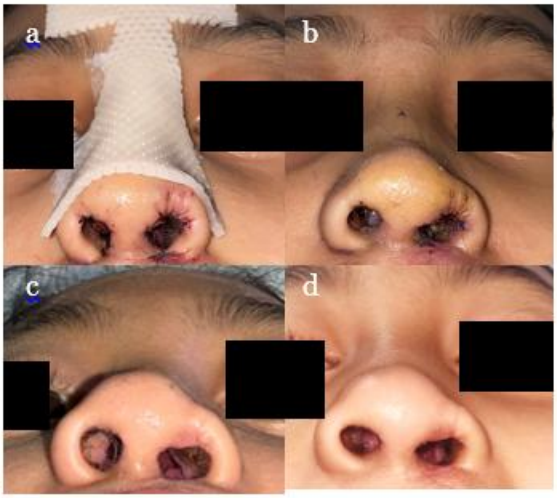

Fig. 21. Worm's eye view, Day 1 **(a),** Day 8 **(b),** Day 41 **(c),** 3-months **(d) Follow-up**

DISCUSSION

Patients with cleft lip and palate, along with their parents, need to dedicate considerable time, effort, and financial resources towards treatment. Parental involvement is essential for a successful surgery, both preoperative preparation and postoperative care. Children with cleft lip frequently attract attention due to their appearance and may struggle with social interactions because of a negative self-image compared to peers without the condition, leading to feelings of shame and withdrawal. Research also indicates that girls dissatisfied with their appearance tend to have more negative psychosocial outcomes compared to boys. Children with cleft palate, tend to have lower academic performance, mainly due to speech problems like a persistent hypernasal voice, which affects verbal learning. They often fear speaking or smiling in public, and they may frequently face teasing or rejection from their peers.[5,6]

The shape of the mouth is a key factor in appearance, regardless of other existing beauty standards.[5] Lip aesthetic proportion plays an important role in the perception of facial symmetry, beauty and balance in the facial profile.[7,8] In women, well-defined, fuller lips with greater vermilion height relative to facial width are often seen as more attractive. Beauty ideals for lips are also influenced by principles like the golden ratio and balanced facial thirds, which emphasize harmony and proportion within the overall facial structure. The ideal lip proportions, when viewed from the front, showcase a harmonious ratio of 1:1.6, with the lower lip being subtly fuller than the upper. Vertically, the upper lip should be slightly shorter than the lower to maintain aesthetic balance. From a profile perspective, the upper lip typically extends around 3.5 mm beyond a straight line drawn between the subnasion and pogonion, while the lower lip projects approximately 2.2 mm forward.[8] The study conducted by Zhu et al. explained that patients with complete cleft lip at the age of 10 showed a lower lip protrusion index compared to normal individuals, due to progressive maxillary retrusion and a lack of support for the upper lip.[9]

In our experience, a lack of parental awareness about their child's condition is a significant factor contributing to the lack of follow-up care for cleft lip and palate patients after primary surgery. Financial constraints further hinder access to additional corrective treatments, leaving many patients without the care they need. As these children reach school age, they often experience feelings of insecurity and social withdrawal due to the visible differences between them and their peers.

Lip and nose correction treatment in this case was performed because the patient visited the plastic surgery clinic for follow-up regarding an alveolar bone graft procedure. However, during the consultation, the surgeon identified deformities in the lip and nose that required further corrective therapy. We do alveolar bone graft to close the small defect on patient A, B and C, alongside lip and nose reconstruction using dermis-fat graft, fat transfer injection, and scar revision using fat graft. It's our strategy to help cleft lip and palate patients improved their childhood development and social integration.

Lip projection and scar improvement can be achieved by using both dermis fat-grafts and autologous fat injection.[10] Frequently combined lip procedures such as scar revision and skin Z-plasty, V-Y advancement flap, mucosal tranposition flap were performed along with AFG.[11] Fat grafting is a versatile, low-cost surgical technique used in reconstructive and cosmetic procedures to correct contour deformities and enhance soft tissue. Rich in adipose-derived stem cells (ADSCs), it releases growth factors like VEGF, PDGF, and IGF-1, driving angiogenesis, promoting healing, reducing inflammation, and minimizing scarring by supporting collagen organization, epithelialization, and vascularization. Unlike surgical scar excision, AFG restores natural contours, reduces scar retraction, and effectively manages scar-related conditions.[10,12,13] The fat grafts administered to the patients in this case were filtered but not centrifuged. A study conducted by Botti demonstrated that there is no significant difference between fat grafting that is filtered and washed compared to fat that is centrifuged.[14]

Several studies have demonstrated the long-term effectiveness and safety of autologous fat grafting in managing secondary cleft lip deformities. Duskova et al. conducted a study on five cleft lip patients dissatisfied with their lip appearance, demonstrating that fat grafting to the upper lip and columella base resulted in satisfaction with the surgical outcomes.[15] Koonce et al. reported on 52 patients who underwent secondary lip revision with fat grafting. The study showed improvements in upper lip volume and symmetry for all patients, with both the patients and their families expressing satisfaction with the results.[16] Bae et al. demonstrated that fat grafting improved upper lip volume in 15 patients, confirming its effectiveness and reliability for treating secondary cleft lip deformities.[17] A study by Staebel et al. showed that among 8 patients who underwent dermis-fat grafting, only one experienced a complication of fat necrosis nodules and required additional surgery.[18] This present cases align with Staebel et al.'s observation that most patients did not develop new scars, as the dermis-fat graft harvesting was performed in the same iliac region used for bone graft harvesting. Wang et al. treated 35 minor cleft lip patients with dermis reconstruction and dermis-fat grafting, achieving high satisfaction over 6 to 20 months of follow-up.[19]

A dermis-fat graft is selected to enhance the deficient lip due to its low donor site morbidity, quick procedure time, and straightforward application.[20] As an autologous material, the dermis poses a minimal risk of infection and rejection, then also allows for enhanced flexibility and stability during placement, facilitating precise manipulation and secure immobilization at the recipient site. Studies have shown that buried dermis integrates effectively with surrounding tissues and, once integrated, remains stable without causing complications. Patel et al. reported on 10 patients who underwent dermis-fat grafting combined with other procedures, most commonly Z-plasty or V-Y plasty.[11,20] In this case series, dermis-fat graft was preferred over the Abbe flap because it can increase the volume of the upper lip without creating a new scar on the lower lip.[10]

The nose is the most prominent feature of the human face. Cleft lip nasal deformities cause significant anatomical distortions and present challenges in rhinoplasty.[21] The surgical correction of cleft nasal deformity is categorized into primary, intermediate, and definitive procedures. Primary rhinoplasty is defined as nasal surgery performed concurrently with primary cleft lip repair. Intermediate rhinoplasty is conducted between primary and definitive rhinoplasty, typically between the ages of 5 and 11 years. Definitive rhinoplasty is performed after the age of 14.[22] In this case, we performed an intermediate rhinoplasty using a dermis-fat graft to improve the nasal appearance and facilitate future corrections easier once facial growth is complete. This aligns with the explanation by Shih et al., who stated that intermediate rhinoplasty is performed to reduce deformities and improve outcomes during definitive rhinoplasty.

Timing of cleft palate repair differ between regions and surgeons, there are centers advocate one stage palatoplasty and the other two stage repair, and still debated which one the best.[23] At our center, we typically perform single-stage repairs, taking into account patient compliance and the cost of surgery. However, complications such as palatal fistulas may still occur. The incidence of fistulas following cleft palate repair varies

significantly across studies. While some patients may report symptoms, others remain asymptomatic.

Landheer et al. discovered that fistulas occurred more frequently in patients who underwent two-stage repairs than in those who had single-stage repairs. Cleft width plays a significant role in fistula development.[4,24] Other contributing factors include excessive tension, bleeding, and infection, all of which significantly increase the risk of fistula formation.[25]

Fistulas can significantly affect a child's quality of life by impacting speech, feeding, and social interactions. Repairing a fistula is more challenging than primary repair due to excessive scarring, fibrosis, and reduced vascularity, which ultimately limit palatal tissue mobility. [25,26] A study by Denadai et al. involving 44 patients with persistent symptomatic anterior oronasal fistulas reported reconstruction using local flaps with interpositional fascia or dermal fat grafting in 23 patients, and tongue flaps in 21 patients. The study showed successful outcomes in 93.2% of cases. However, three patients who underwent reconstruction with dermal fat grafting experienced recurrent fistula symptoms.[27]

In patients C and D in this case, dermis-fat grafting was preferred over tongue flap and conchal cartilage grafting. This decision considered the postoperative discomfort associated with tongue flap procedures, such as the need for mouth immobilization, difficulty eating and speaking for two weeks, and a higher risk of airway obstruction. Additionally, tongue flap procedures often require further surgical interventions, which were avoided with dermis-fat grafting. Furthermore, we aimed to minimize the creation of new donor sites that would be necessary if cartilage grafts were used.[25,27]

CONCLUSION AND LIMITATION

Autologous materials, such as AFG and DFG provide a reliable, versatile approach, that are also cost effective for improving lip contour, closing oronasal fistulas, and correcting nasal deformity in our case. Although no patients in this case series required additional fat grafting, this study are limited by the relatively short follow-up time of only 2-3 months.

ETHICS APPROVAL

Informed consent has been acquired from the guardian (mother/father). The patients' guardian provided written informed consent to be published as a case report.

COMPLETING INTERESTS

All the authors declare that there are no conflicts of interest

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