

## Research Article

# Dermal Fat Graft Versus Bone Graft for Maxillary Augmentation in Cleft Rhinoplasty

Farkhandah Muhammad Iqbal,<sup>1</sup> Mirza Shehab Afzal Beg,<sup>2</sup> Iqra Khan<sup>3</sup>

<sup>1-2</sup>Plastic & Reconstructive Surgery Department, Liaquat National Hospital, Karachi

### Abstract |

**Background:** Secondary cleft lip Rhinoplasty is a difficult surgery to perform due to its abnormal anatomical features. There is an anomalous insertion of orbicularis oris in alar base on cleft side along with maxillary deficiency. The collapsed lateral crura and malar region needs structural support for better symmetry. The maxillary augmentation can be done via autogenous iliac bone graft, costal cartilage graft, dermal fat graft and alloplastic materials. The objective of the study is to compare the outcome of dermal fat graft with bone graft for maxillary augmentation.

**Methodology:** This was a retrospective study done at Liaquat national hospital, Karachi. All patients who presented to outpatient department for cleft rhinoplasty between July, 2015 to December, 2020 were included. Outcome was assessed using visual analog score by surgeon, patient and an independent assessor, after all patient had completed 6-month follow-up. Data analysis was done with SPSS version 21.

**Result:** 38 patients were included in the study. 20 had maxillary augmentation with dermal fat graft. 18 had bone graft. Mean Visual Analogue Score for iliac bone graft was 7.5 whereas for dermal fat graft it was 8.3.

**Conclusion:** Patients who had maxillary augmentation with dermal fat graft showed better results on visual analogue score as compared to patients who had augmentation with iliac bone graft.

**Received** | 19-04-2022: **Accepted** | 24-02-2023

**Corresponding Author** | Prof. Mirza Shehab Afzal Beg, (Professor and Consultant, Plastic and Reconstructive Surgery, Liaquat National Hospital, Karachi.) **E-mail I.D:** shehabbeg@hotmail.com

**Keywords** | Maxillary augmentation, Cleft rhinoplasty, Dermal fat graft, Bone graft

### Introduction

Surgery of the cleft nasal deformity is very challenging to perform even for skilled rhinoplasty surgeons due to its complex pathology and limitations in post-operative result.<sup>1,2</sup> Many techniques have been introduced since 1920 for the correction of cleft nasal deformity, which shows the difficult nature of cleft rhinoplasty.<sup>3</sup>

The degree of the labial cleft is directly proportional to the severity of nasal abnormality. Both unilateral and bilateral cleft nasal deformity share more or less same anatomical features which include abnormal insertion of orbicularis oris into the alar base and maxillary hypoplasia of the cleft side.<sup>4</sup> Maxillary hypoplasia leads to malocclusion and facial contour asymmetry. The collapsed lateral crura and malar region needs structural support

for better symmetry.<sup>5</sup> Pyriform aperture of the maxilla supports nasal platform, so it needs to be addressed while performing cleft rhinoplasty.<sup>6</sup>

Many studies have suggested different types of grafts that can be used for augmentation in cleft rhinoplasty. Autogenous iliac bone graft, costal cartilage graft (6th, 7th, 8th and even 10th rib) and dermal fat graft have all traditionally been used by different rhinoplasty surgeons.<sup>4,7,8,9,10</sup> There is paucity of data comparing these techniques to determine which has better outcomes. The rationale of this study is to compare outcomes of maxillary augmentation with bone graft versus dermal fat graft.

### Methodology

This retrospective study was done at Liaquat National

Hospital, from July 2015 to December 2020. The medical records of all patients aged 10 and above who underwent correction of cleft nasal deformity during this time period were extracted from Hospital Information System and reviewed. Patients who had nasal deformities other than those seen on cleft patients were excluded. All patients had been operated by a single surgeon after-baseline workup. All patients received routine post-operative care and instructions at discharge. They were followed up for 6 months. Details of any complications encountered and their management was also recorded.

#### Data analysis:

The outcome was assessed using Visual Analogue Score. The patient, surgeon, and a third observer (assessor) scored the following parameters on a scale of 1-10 with score 1 referring to extremely dissatisfied and score 10 indicating extremely satisfied. Parameters which were assessed included: Improvement in the natural contour of maxilla, improvement on frontal view, satisfaction with post-operative result, improvement in height of maxilla at conversational distance and improvement of symmetry of augmented side with the non-cleft side.

Data was analyzed in SPSS version 22.0, mean was calculated and reported. Average Visual Analogue Score for both bone graft and dermal fat graft groups was compared using independent t-test ( $p$ -value  $\leq 0.05$  taken as significant).

**Operative technique:** All surgical procedures were done under general anesthesia with the oral endotracheal tube pointed in a caudal direction.

**Dermal Fat Graft Harvest:** The dermal fat graft was harvested from the groin region in an elliptical fashion. The required graft was marked and 1% xylocaine with adrenaline local anesthetic solution was infiltrated. The area was de-epithelized in situ in a uniform fashion with surgical blade 10. The graft was taken with dermis and subcutaneous fat. The dermal fat graft was wrapped in wet gauze soaked with 0.9% normal saline. Hemostasis was secured and the donor site closed primarily.

**Iliac Bone Graft Harvest:** The iliac crest was marked along with anterior superior iliac spine. The incision was marked below the iliac crest (by lifting the skin upwards to hide the scar) and 2 cm posterior to anterior superior iliac spine. After infiltration with 1% xylocaine with adrenaline, the incision was given and deepened below the muscles. The cartilage cap was removed in a lid fashion with hammer and chisel. The desired size was marked on iliac bone and a unicortical graft harvest-

ted. Wound was closed in layers.

**Recipient Site:** An open approach was used by giving transcolumellar stepladder incision, along with an intra-nasal infra-cartilaginous incision, to expose the nasal framework. Limited pocket dissection was performed by dissecting soft tissue off the pyriform with freer dissector. The graft was inserted and placed over the hypoplastic maxilla. The mucosa was then closed with a 4-0 running vicryl suture.

#### Results:

The total number of patients who were operated on from July 2015 to December 2020 were 38. 20 patients had maxillary augmentation with dermal fat graft and 18 patients with iliac bone graft.

Patients age ranged between 10-40 years. The average score given on each assessed parameter by the surgeon, patient and assessor for augmentation with dermal fat graft is summarized in Table 1 and that for bone graft is summarized in Table 2.

Mean Visual Analogue Score (Combined Mean of all three, that is surgeon, patient and assessor) for augmen-

**Table 1:** Mean Vas Score For Augmentation With Dermal Fat Graft

|   | surgeon | patient | assessor |
|---|---------|---------|----------|
| Improvement in the natural contour of maxilla               | 7.8     | 8.7     | 8.0      |
| Improvement in frontal view                                 | 8.4     | 8.7     | 8.2      |
| Satisfaction with post-operative results                    | 8.4     | 8.8     | 8.7      |
| Improvement in height of maxilla at conversational distance | 8.5     | 8.6     | 8.6      |
| Improvement of asymmetry of augmented and non-cleft side    | 7.5     | 7.9     | 8.1      |
| Total score (Mean)  | 8.1     | 8.5     | 8.3      |

**Table 2:** Mean Vas Score For Augmentation With Bone Graft.

|   | surgeon | patient | assessor |
|---|---------|---------|----------|
| Improvement in the natural contour of maxilla               | 7.5     | 8.3     | 7.2      |
| Improvement in frontal view                                 | 8.0     | 7.7     | 7.5      |
| Satisfaction with post-operative results                    | 8.2     | 7.6     | 7.5      |
| Improvement in height of maxilla at conversational distance | 8.1     | 7.8     | 7.7      |
| Improvement of asymmetry of augmented and non-cleft side    | 7.1     | 7.0     | 7.0      |
| Total score (Mean)  | 7.7     | 7.6     | 7.3      |

tation with bone graft was 7.5 ( $\pm 0.4$ ) whereas for augmentation with dermal fat graft was 8.3 ( $\pm 0.4$ ), they were compared using independent t-test and found to

be statistically significant ( $p$ -value  $< 0.01$ ), shown in Table 3.

In the bone graft group, one (5.5%) patient complained about palpable bone graft post operatively, and six

**Table 3:** Comparison of Mean Visual Analogue Score for Dermal Fat Graft and Bone Graft

|   | Dermal Fat Graft<br>(Mean $\pm$ SD) | Bone Graft<br>(Mean $\pm$ SD) |
|---|-------------------------------------|-------------------------------|
| Mean Visual Analogue Score (Combined mean of surgeon, patient and assessor) | 8.3 $\pm$ 0.4                       | 7.5 $\pm$ 0.4                 |

(33.3%) patients had under correction at 6 months due to resorption of bone. Hence, a total of Seven (38.8%) patients out of 18 in bone graft group showed complications, whereas none of the patient (0%) whose augmentation was done with dermal fat graft reported any such complications.

Figure 1 shows a patient who underwent maxillary augmentation with dermal fat graft and Figure 2 depicts a patient who underwent augmentation with iliac bone graft.



**Fig.1:** A: Pre-operative picture (worm's eye view) B: Post-operative picture (worm's eye view) showing maxillary augmentation with dermal fat graft on right maxilla



**Fig.2:** A: Pre-operative picture (worm's eye view) B: Post-operative picture (worm's eye view) showing maxillary augmentation with bone graft on right maxilla

## Discussion

The pyriform aperture is an integral component to support the alar base and provide platform to the nose.<sup>6</sup> The complexity of the abnormalities varies with individual case of the cleft lip deformity and its progressive severity. Several causative factors are anatomical differences, scarring from previous surgeries and resultant restrictive growth of maxilla which leads to depressed alar base.<sup>5</sup>

The pyriform aperture is anatomically formed by the nasal bone superiorly and maxilla inferiorly and laterally.<sup>6</sup> It is a significant structure forming the nasal platform.<sup>11,12</sup> Zemann et al. and Fisher et al, have stated the anatomical differences in the maxilla of cleft patients.<sup>13,14</sup> The alar base is located posteriorly and laterally on cleft side as compared to the non-cleft side due to the abnormal attachment of orbicularis oris. The pyriform aperture augmentation with free dermal fat graft or on-lay iliac bone graft can elevate the depressed alar base and make it more symmetrical to the normal side.

Various materials can be used for augmentation of alar base. These include bone, cartilage, free dermal fat graft and synthetic materials which can be bio-integrable as well.<sup>4,10</sup> Our study has observed the differences in outcomes of alar base augmentation in two groups. We have demonstrated better results with dermal fat graft in comparison to on-lay iliac bone graft with statistically significant results.

The Dermal Fat Graft has two components, fat and dermis. In 1983, practice of using fat graft for facial soft tissue contour defects was initially testified. Since then, dermal fat grafts are commonly used for facial contour deformities with very good result, as shown by Davis et al.<sup>15</sup> Recently, its use for aesthetic purposes has also been well explained.<sup>16</sup> The groin has thinnest dermis, which makes it useful for aesthetic surgery with good skin laxity. An ample amount of graft can be harvested with inconspicuous scar with primary closure.

The advantages of dermal fat graft are its biocompatibility, minimal donor site morbidity, durability, short operating time, resistance to infection, less hospital stay and easy postoperative management.<sup>17</sup> There are few tactics which can be used to avoid graft resorption. These include ensuring grafts are not thicker than two centimeters, gentle graft tissue handling, vascular bed, good hemostasis of the recipient site to avoid hematoma, graft immobilization and infection avoidance. The



dermal fat grafts can survive in radiated patients also. The explanation for graft survival has two main reasons which are dermal component and proangiogenic properties to enhance its vascularity at recipient site.<sup>18</sup>

Complications of dermal fat grafts are decrease in graft volume and cyst formation. The volume reduces evidently within 2 or 3 months post-operatively, but steadies afterwards.<sup>19</sup> In the literature the volume loss is reported to be from 1%–2% to 10%–20% in first year.<sup>20</sup>

For bone grafting iliac bone is a preferred donor site. It provides good amount and quality of bone with both cortical and cancellous components. It is easily approachable. It has no foreign body reaction, with low chances of infection.<sup>21</sup> However, some disadvantages include low contouring abilities, non-mouldability, donor site pain and resorption at recipient site.<sup>4,9,22,23</sup>

The limitation of our study included the lack of an objective scale to evaluate the augmentation by comparing pre and postoperative parameters. Secondly, we didn't conduct histology to identify the resorption in iliac bone graft and dermal fat graft. Our study is a single center, retrospective study with limited number of patients.

## Conclusion

Alar base augmentation efficiently re-establishes the alar base on the cleft side. Patients who had maxillary augmentation with dermal fat graft showed better results on visual analogue score as compared to patients who had augmentation with iliac bone graft.

## References:

1. Cuzalina, Angelo, and Calvin Jung. "Rhinoplasty for the cleft lip and palate patient." *Oral and Maxillofacial Surgery Clinics* 28, no. 2 (2016): 189-202.
2. Nolst Trenité, Gilbert J., Richard HL Paping, and Albert H. Trenning. "Rhinoplasty in the cleft lip patient." *The Cleft palate-craniofacial journal* 34, no. 1 (1997): 63-68.
3. Madorsky, Simon J., and Tom D. Wang. "Unilateral cleft rhinoplasty: a review." *Otolaryngologic Clinics of North America* 32, no. 4 (1999): 669-682.
4. Moore, Meredith L. Grogan, Thu-Hoai C. Nguyen, Kristopher M. Day, and Adam B. Weinfeld. "Pyriiform Costal Cartilage Graft Improves Cleft-Side Alar Asymmetry in Secondary Cleft Rhinoplasty." *The Cleft Palate-Craniofacial Journal* 57, no. 5 (2020): 537-542.
5. Talaat, Wael M., Mohamed M. Ghoneim, Yasser M. El-Shikh, Sherif I. Elkashty, Mohammed AG Ismail, and Tarek FA Keshk. "Anthropometric analysis of secondary cleft lip rhinoplasty using costal cartilage graft." *Journal of Craniofacial Surgery* 30, no. 8 (2019): 2464-2468.
6. Kim, Yong Bae, Seung Min Nam, Eun Soo Park, Chang Yong Choi, Moon Seok Kang, and Han Gyu Cha. "The Effects of Alar Base Augmentation in Secondary Unilateral Cleft Lip Nasal Deformity." *Journal of Craniofacial Surgery* 32, no. 2 (2021): 525-529.
7. Cunha, Giovanni, Audrey Foster Lefort Rocha, Valfrido Antônio Pereira Filho, Mario Francisco Real Gabrielli, and Marisa Aparecida Cabrini Gabrielli. "Atrophic maxilla reconstruction with autogenous iliac graft and guided dental implants." *Journal of Craniofacial Surgery* 29, no. 8 (2018): 2218-2219.
8. Kim, Jae Hoon, Jin Woo Song, Sung Wan Park, Won Suk Oh, and Joo Heon Lee. "10th rib cartilage: another option of the costal cartilage graft for rhinoplasty." *Archives of Aesthetic Plastic Surgery* 21, no. 2 (2015): 47-53.
9. Tetè, Stefano, Raffaele Vinci, Susi Zara, Vincenzo Zizzari, Alessandro De Carlo, Giorgio Falco, Domenico Tripodi, Amelia Cataldi, Carmen Mortellaro, and Enrico Gherlone. "Long-term evaluation of maxillary reconstruction by iliac bone graft." *Journal of Craniofacial Surgery* 22, no. 5 (2011): 1702-1707.
10. Erdogan, Bulent, Asuman Tuncel, Gokhan Adanali, Orgun Deren, and Meltem Ayhan. "Augmentation rhinoplasty with dermal graft and review of the literature." *Plastic and reconstructive surgery* 111, no. 6 (2003): 2060-2068.
11. Mommaerts, Maurice Y., Frank Lippens, Johan VS Abeloos, and Lucas F. Neyt. "Nasal profile changes after maxillary impaction and advancement surgery." *Journal of oral and maxillofacial surgery* 58, no. 5 (2000): 470-475.
12. Pessa, Joel E., Lisa D. Desvigne, and Vikram P. Zadoo. "The effect of skeletal remodeling on the nasal profile: considerations for rhinoplasty in the older patient." *Aesthetic plastic surgery* 23, no. 4 (1999): 239-242.
13. Zemann, W., G. Santler, and H. Kärcher. "Analysis of midface asymmetry in patients with cleft lip, alveolus and palate at the age of 3 months using 3D-COSMOS measuring system." *Journal of Cranio-Maxillofacial Surgery* 30, no. 3 (2002): 148-152.
14. Fisher, David M., Lun-Jou Lo, Yu-Ray Chen, and M. S. Noordhoff. "Three-dimensional computed tomographic analysis of the primary nasal deformity in 3-month-old infants with complete unilateral cleft lip and palate." *Plastic and reconstructive surgery* 103, no. 7(1999): 1826-1834.
15. Davis, Richard E., Robert A. Guida, and Ted A. Cook. "Autologous free dermal fat graft: reconstruction of facial contour defects." *Archives of Otolaryngology-Head & Neck Surgery* 121, no. 1 (1995): 95-100.
16. Little, J. William. "Applications of the classic dermal fat graft in primary and secondary facial rejuvenation." *Plastic and reconstructive surgery* 109, no. 2 (2002): 788-804.

17. Issa, Sabah Abdul-Aziz, and Mustafa Emaduldeen Jameel. "Free Dermal Fat Graft for Reconstruction of Soft Tissue Defects in the Maxillofacial Region." *Craniofacial Trauma & Reconstruction* 13, no. 4 (2020): 260-266.
18. Nakakita, Nobuaki, Kouichirou Sezaki, Yasuharu Yamazaki, and Eiju Uchinuma. "Augmentation rhinoplasty using an L-shaped auricular cartilage framework combined with dermal fat graft for cleft lip nose." *Aesthetic plastic surgery* 23, no. 2 (1999): 107-112.
19. Fagrell, Dan, Sverker Eneström, Anders Berggren, and Barbara Kniola. "Fat cylinder transplantation: an experimental comparative study of three different kinds of fat transplants." *Plastic and reconstructive surgery* 98, no. 1 (1996): 90-6.
20. Choi, Min Hyub, Wei Jie He, Kyung Min Son, Woo Young Choi, and Ji Seon Cheon. "The efficacy of dermofat grafts from the groin for correction of acquired facial deformities." *Archives of Craniofacial Surgery* 21, no. 2 (2020): 92.
21. Kim, Gi-Jung, Young-Soo Jung, Hyung-Sik Park, and Eui-Wung Lee. "Long-term results of vertical height augmentation genioplasty using autogenous iliac bone graft." *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology* 100, no. 3 (2005): e51-e57.
22. Romano, James J., Nicholas T. Iliff, and Paul N. Manson. "Use of Medpor porous polyethylene implants in 140 patients with facial fractures." *The Journal of Craniofacial Surgery* 4, no. 3 (1993): 142-147.
23. Sabuncuoglu, Fidan, Altan Varol, Metin Şençimen, and Hüseyin Ölmez. "Onlay iliac bone grafting as an ancillary augmentation procedure for paranasal rejuvenation during bimaxillary surgery." *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology* 109, no. 2 (2010): e13-e19.