

Fat Grafting in Primary Cleft Lip Repair

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Summary: The goal of primary cleft lip repair is to unify the lip elements and achieve a nearly normal appearance. Many techniques can confer satisfactory results; however, scarring and contour irregularities may persist. Lipofilling can modulate scar formation and enable soft-tissue augmentation. The authors hypothesize that fat grafting during immediate cleft lip repair may be of benefit. Patients who underwent primary cleft lip repair with and without immediate fat grafting were compared. Postoperative photographs were analyzed by three blinded reviewers. Cronbach statistics and a two-tailed t-test were used. Scar analysis revealed statistically significant ($p < 0.05$) improvement in scar appearance and contour of the fat-grafted cleft lip repair. Immediate fat grafting may be a promising strategy to improve lip appearance, contour, and scarring during primary cleft lip repair. (*Plast. Reconstr. Surg.* 135: 1449, 2015.)

CLINICAL QUESTION/LEVEL OF EVIDENCE: Therapeutic, III.

Cleft lip is the most common craniofacial abnormality.¹ The goal of repair is a normally appearing lip and nose, with minimal visible stigmata of the previous cleft lip. However, all repairs leave a cutaneous scar, and unpredictable healing may occur despite the incision pattern and repair technique chosen.

Fat grafting provides augmentation, enhances contour and structure, and improves skin quality and scar appearance.² This improvement may be attributed to adipose-derived stem cell delivery, paracrine modulation, and vasculogenesis.^{3,4} Previous studies have shown that fat grafting improves radiated skin, skin softness, and the architecture of skin appendages, dermis, and epidermis.⁴

We describe the use of autologous fat grafting to improve the overlying cutaneous scarring and contours of the lip and midface.

PATIENTS AND METHODS

A retrospective analysis was performed. Thirty-five consecutive patients (44 sides) who underwent primary cleft lip repair by the senior author (D.M.S.) were included. Demographic information and perioperative details were recorded.

Unilateral cleft lip repair was performed using the modified inferior triangle technique.⁵ Bilateral clefts were repaired using a variation

of the standard repair. All skin incisions were closed in with interrupted 6-0 Monocryl and 7-0 Prolene sutures (Ethicon, New Brunswick, N.J.), sealed with skin glue, and covered by silicone sheets and Steri Strips (3M Company, Two Harbors, Minn.).

In the experimental group, 1 to 3 cc of 0.5% lidocaine with epinephrine 1:100,000 was injected, and fat was manually suctioned from the patient's medial thigh using a 10-cc syringe and Coleman cannulas. A total of 2 to 5 cc of fat was harvested and processed by Telfa rolling.⁶ The lipoaspirate was transferred to 1-cc syringes and 0.5 to 2 cc of lipoaspirate (average, 1.4 cc) was injected with a 19-gauge needle in 0.10-cm aliquots. The fat was deposited submucosally at the vermilion/mucosal junction, subcutaneously and intramuscularly along the scar/philtrum, and preperiosteally at the piriform.

The mean operative time was 2.1 hours (range, 1.4 to 3.4 hours). All patients were discharged 1 to 2 days postoperatively tolerating oral feeds. Scar care for both groups included Steri-Strips for 2 weeks, vitamin E for 2 weeks, and silicone gel and gentle massage for subsequent months.

Postoperative photographs were analyzed by three independent, blinded reviewers to assess residual cleft-related facial stigmata (appearance of the full face, upper lip, nose, and midface) using the following five-point ordinal scale: 1 = nonvisible stigmata; 2 = barely visible; 3 = slightly visible;

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4 = moderately visible; and 5 = very visible.⁷ Interrater reliability was shown with Cronbach alpha of 0.79.⁸ Results from each group were compared using the t-test ($p < 0.05$) (Microsoft Excel, Redmond, Wash.).

RESULTS

All patients were between 2 and 20 months of age at surgery (average, 4.9 months; SD, 3.8 months). Twenty-six clefts were unilateral and nine were bilateral, and 19 were incomplete and 17 were complete cleft lips. A total of 20 patients were in the fat grafting group (Table 1).

Statistically significant improvement was seen in the experimental group in all facial areas scored except around the nose (Table 2). When all bilateral lips were excluded, significant differences remained in the overall face and the lip (Fig. 1).

Patients scored at greater than 6 months showed that areas were improved in the fat-grafted cohort, and upper lip improvement reached statistical significance (Fig. 2).

Table 1. Patient Demographics

Demographics	Control Group	Fat Grafting Group
Total no. of patients	16	19
Unilateral cleft	10	16
Bilateral cleft	6	3
Complete cleft	8	9
Incomplete cleft	8	10
Right-side clefts	8	7
Left-side clefts	2	9
Female	9	13
Average age at surgery, days	134	161
Length of follow-up, days	267	265

Table 2. Statistical Results of Facial Analysis

Group*	Face	Upper Lip	Nose	Midface
A				
Control ($n = 22$)	2.85 (SD 0.66)	2.89 (SD 0.66)	2.80 (SD 0.96)	2.70 (SD 0.70)
Fat grafting ($n = 26$)	2.20 (SD 0.77)	2.11 (SD 0.72)	2.29 (SD 0.84)	2.18 (SD 0.69)
Difference	0.65	0.79	0.52	0.52
<i>t</i> Test	<0.01†	<0.01†	0.06	0.01†
B				
Control ($n = 12$)	2.50 (SD 0.50)	2.58 (SD 0.74)	2.39 (SD 0.68)	2.36 (SD 0.67)
Fat grafting ($n = 22$)	1.92 (SD 0.52)	1.91 (SD 0.55)	2.02 (SD 0.60)	2.00 (SD 0.56)
Difference	0.58	0.67	0.37	0.36
<i>t</i> Test	<0.01†	<0.01†	0.11	0.11
C				
Control ($n = 13$)	2.74 (SD 0.70)	2.74 (SD 0.77)	2.82 (SD 0.96)	2.62 (SD 0.79)
Fat grafting ($n = 16$)	2.29 (SD 0.87)	1.98 (SD 0.67)	2.43 (SD 0.95)	2.32 (SD 0.77)
Difference	0.45	0.76	0.39	0.29
<i>t</i> Test	0.14	<0.01*	0.28	0.33

*A: Overall results comparing experimental fat grafting group with all control group subjects. B: Results comparing only unilateral experimental fat grafting group with unilateral control group subjects. C: Results comparing long-term follow-up (>6 months) of experimental fat grafting group with long-term follow-up control group subjects.

† $p < 0.05$.

There was no donor-site morbidity, outside of mild ecchymosis, and no contour deformities were noted. The access incisions healed well without infection and remained hidden along the medial thigh crease. Donor-site concerns were not mentioned by families in the treatment group.

DISCUSSION

A successful cleft lip repair relies on understanding of anatomical segments and margins, requiring exacting tissue manipulation and closure. Even under the best of circumstances, an obvious scar, contour irregularities, and asymmetries may persist to suggest a history of a repaired cleft lip.

Fat grafting has numerous tissue benefits in plastic surgery. Contour augmentation and scar modulation are a few of the advantages, possibly due to transfer of adipose-derived stem cells. Adipose-derived stem cells promote angiogenesis, healing, and re-epithelialization. We recently published that infant fat produces more biologically robust adipose-derived stem cells than adult tissue does.⁹ Given these benefits, and the desire to improve upon the hypoplasia and standard cutaneous healing with cleft lip repair, we sought to investigate the influence of adipose grafting during primary cleft repair.

We saw improvement in all areas analyzed, although this did not reach significance in the nose. This may be related to the minimal nasal manipulation performed during the primary repair. Given the preponderance of bilateral clefts within the control group, we removed these



Fig. 1. Patient examples of cleft lip repairs using fat grafting. Note the varied sexes, ethnicities, and cleft widths.



Fig. 2. Photographs of immediately fat-grafted cleft lip repairs; note the improvement of the cutaneous scar, and the augmentation of the piriform from submental view.

patients from the analysis and still observed significant improvement in the face and lip areas.

With any pediatric intervention, long-term results are the goal of additional surgical intervention. A total 29 patients (13 control, 16 experimental) had photographic follow-up of greater than 6 months. Regardless of the time, the fat-grafted subjects had observed improvement along all lip areas, with statistical significance.

One criticism of some cleft lip repairs is the amount of abnormal tissue discarded, which can increase tension across the repair and lead to a more pronounced scar. Fat grafting offers a source of potential soft tissue and stem cells, which can improve scar appearance and overall lip contour. Injecting at the time of surgery offers a chance to optimize healing even as the scar evolves without an additional procedure. Importantly, fat grafting has the flexibility of being combined with any anatomic repair and can be performed during various treatment periods.

We also showed that the infant medial thigh contained enough fat in all cases for harvest and clinical use, without complication for cleft lip augmentation with minimal donor-site morbidity. Therefore, fat grafting in infants can be described as a safe option for cleft lip repair and other indications.

CONCLUSION

Immediate fat grafting may be a promising strategy to improve lip appearance, contour, and scarring during primary cleft lip repair.

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PATIENT CONSENT

Parents or guardians provided written consent for use of patients' images.

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