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# Immediate fat grafting in primary cleft lip repair



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## KEYWORDS

Cleft lip;  
Fat graft;  
Adipose-derived stem cells;  
Scar;  
Wound healing

**Summary** *Background:* Successful cleft lip repair creates symmetric nasolabial morphology with minimal scar. Fat grafting is used in cosmetic and reconstructive settings to provide contour, condition tissue and aid healing. This study employs immediate fat grafting concurrent with primary cleft nasolabial repair. We hypothesize that simultaneous fat transfer is safe and may optimize the result.

*Methods:* This retrospective analysis included a series of consecutive infants who underwent primary cleft lip repair with immediate fat grafting. Demographic and peri-operative details were recorded. Post-operative photographs were analyzed by three blinded reviewers (Al-Omari et al. and Asher-McDade et al.). Kappa statistics were employed to assess inter-rater reliability (Randolph and Watkins MW).

*Results:* 30 children, 37 sides (13 left, 10 right, 7 bilateral; 62% complete, 38% incomplete) who underwent cleft lip repair at Yale were included. 20 underwent nasolabial repair with simultaneous fat grafting. Mean age of repair was 3.5 mo (range 1.5–6.4). Fat was hand suctioned from the thighs (15 left; 2 right; 3 both) with mean yield of 2.1 cc (range 1–5 cc). An average of 1.4 cc (range 0.5–2.5 cc) was injected to the philtrum, vermilion, piriform and ala. No complications were experienced with lip repair, fat harvest or graft injection. Mean follow-up was 24.7 months (range 12.4–60.2 months). Postoperative photographic assessment revealed minimal residual cleft stigmata with inter-rater reliability. Each ordinal score was statistically significant compared fat grafted repairs to those without fat grafting ( $p < 0.05$ ).

*Conclusions:* Simultaneous fat grafting and cleft lip repair can be performed safely. The augmentation and modulation of scar formation may optimize results. Prospective comparison is necessary to further corroborate our findings.

*Level of evidence:* Therapeutic (Level IV).

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## Introduction

Cleft lip with or without cleft palate is the most common congenital craniofacial anomaly.<sup>5</sup> Embryologically, cleft lip results from a failed fusion of the maxillary and medial nasal processes. This defect results in a deformity of the nasolabial complex, with a complete cleft exhibiting the most significant structural displacement.<sup>6</sup> A myriad of repair techniques and presurgical cleft protocols have been described with conserved goals to align the lip and nose in an “anatomically correct” fashion.<sup>7–18</sup> While aligning lip landmarks is essential to performing a cleft lip nasolabial repair, the most natural result requires reestablishing the normal contours of the nasolabial region, blending the incision along subunits and minimizing scar caliber.

Intrinsic to the anomaly, clefted tissues are displaced and nasolabial structures are hypoplastic.<sup>19,20</sup> The described cleft lip repair techniques require tissue to be discarded and consequently do not convey nor supplement additional tissue to the nasolabial complex. Therefore, even in the best of repairs the contours of the reconstructed lip and nose may be blunted and not adequately supported. In addition to topographic differences, scar formation impacts the success of a repaired cleft lip. Scarring is a constant and unavoidable aspect of wound healing, and several factors likely contribute to scar caliber, including suture type, duration of suture placement, tissue tension and the child’s intrinsic healing capacity.<sup>21–24</sup> Undue scarring following cleft lip repair may cede secondary deformities of the lip and nose, including wide or pigmented scars, lip landmark distortion, vermilion irregularities as well as nasal deformities. Taken together, the repaired cleft lip stigmata result from insufficient nasolabial support, improper landmark alignment and excessive scar formation. Such asymmetries draw attention and therefore lessen the overall success of the cleft lip repair.

Fat transfer techniques have demonstrated utility in the correction of a host of deformities through soft tissue augmentation.<sup>25–31</sup> More recently, there is evidence that fat grafts harbor stem cells,<sup>32–34</sup> termed adipose-derived stem cells (ADSCs), and that these pluripotent cells produce factors beneficial for wound healing and regeneration.<sup>35–40</sup> This autogenous tissue may also improve scar caliber and minimize scar burden.<sup>36,40</sup> Research from our group has recently revealed that infant-derived ADSCs are more biologically robust than those obtained from adult tissue.<sup>37</sup>

The purpose of this study is to analyze immediate fat grafting in the primary cleft lip nasolabial repair. Given such favorable biophysical and biochemical properties, we postulate that the introduction of fat grafting will prove beneficial in the infant cleft lip population by recreating lip/nasal contours through tissue support and augmentation and that infant-derived ADSCs will assist the wound healing and regenerative process to minimize scar burden.

## Methods

A retrospective analysis was performed in accordance with the Yale University Human Investigation Committee

(#1209010767). A consecutive series of infants who underwent primary cleft lip repair with simultaneous fat grafting were included. A group who underwent primary repair without fat grafting were included as comparison. Demographic information, perioperative, and post-operative details were recorded. Continuous variables were summarized using mean and range, and categorical variables using frequencies and percentages. Three blinded reviewers analyzed photographs to assess the residual cleft-related facial stigmata (overall appearance of the full face, upper lip, nose and midface) using the following five-point ordinal scale: 1 = nonvisible stigmata (very good appearance); 2 = barely visible (good appearance); 3 = slightly visible (fair appearance); 4 = moderately visible (poor appearance); 5 = very visible (very poor appearance).<sup>1,2</sup> The percent of overall agreement (Po) and the free-marginal kappa (kappa),<sup>3</sup> a chance-adjusted measure of multi-rater agreement in which raters’ distributions of cases into categories are not restricted, were analyzed using the software package MacKappa.<sup>4</sup>

## Results

### Demographics

Children who underwent cleft lip repair at the Yale-New Haven Hospital. 30 infants, 37 sides, aged 1.5–6.4 months (mean 3.5 months), were included. 20 underwent repair with simultaneous primary fat grafting (Table 1). The cleft lip sidedness was 13 left, 10 right and 7 bilateral. 62% of the cleft lip anomalies were complete, while 38% were incomplete (Table 1).

### Surgical procedure

The cleft lip repair technique employed for unilateral cases was the modified inferior triangle technique or rotation advancement,<sup>10</sup> while bilateral lips were repaired using a variation of the standard repair.<sup>13</sup> In fat injection cases, fat was harvested from one or both thighs in all instances (15 left leg only; 2 right leg only; 3 both legs; operative time approximately 10 min) using manual suction as previously described (Table 2).<sup>38,39</sup> An average of 1–3 cc of 1% lidocaine (1:100,000 epinephrine) was injected at the donor site. No tumescent was used. Aspirated fat was strained on Telfa and transferred to a 1 cc syringe. Fat was white and of dense consistency without significant heme (Figure 1). The graft harvest yield was 2.1 cc (mean) (range 1–5 cc) and

**Table 1** Patient demographics.

	Subjects	Age at operation (months)	Gender	Diagnosis
+FG	N = 20	3.9	12F:8M	7L:8R:5B
–FG	N = 10	3.2	5F:5M	5L:2R:2B
	N = 30	3.5	17F:13M	13L:10R:7B

Gender: male (M) and female (F); Lip diagnosis: unilateral (U), bilateral (BL), complete (C) and incomplete (IN).

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