

# Autologous Fat Graft for Soft Tissue Camouflage in Craniofacial Microsomia

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## Abstract

**Introduction:** In India, a large majority of patients with craniofacial microsomia are unable to undergo complex reconstructions owing to unaffordability, lack of access to good craniofacial centers, or reluctance of parents to accept the surgical risk. There is also considerable social stigma attached to the resultant facial scars of surgery, especially in a girl child. Hence, we have explored autologous fat graft transfer as a “stand-alone” reconstructive option for soft tissue camouflage and aesthetic correction of facial deformity in unilateral craniofacial microsomia of Pruzansky–Kaban Grades I and II. **Materials and Methods:** Twelve patients who were seeking aesthetic correction of facial deformity in unilateral craniofacial microsomia of Pruzansky–Kaban Grades I and II, and who had adequate fat in the preferred donor sites of lower abdomen and antero-medial thighs, were selected. Patients with Grade III deformity, facial palsy, and previous skeletal surgeries were excluded. Autologous fat harvesting was done with the standardized Coleman’s technique and injected after decantation. Volumetric augmentation was assessed by clinical comparison with normal side for facial symmetry, skin pinch thickness at four reference points, and by two-dimensional analysis of pre- and postoperative standardized photographs at periodic intervals. **Results and Analysis:** Eleven of our patients were female and one was a male ( $N = 12$ ). In each session, 20–40 mL (mean  $28.75 \pm$  standard deviation [SD] 5.69) fat was aspirated and 12–35 mL (mean  $23.67 \pm$  SD 6.07) fat was injected. The average operating time was 35 min (mean  $32.91 \pm$  SD 4.05). Majority of our patients needed three sessions (mean  $2.8 \pm$  SD 1.03) of serial fat injections to achieve bilateral facial symmetry. Increase in skin pinch thickness was  $6.4167 \pm 1.31$  mm. The mean patient satisfaction score was  $8.83 \pm$  SD .717. **Conclusion:** Based on our results, we conclude that autologous fat transfer, when used for soft tissue camouflage, is a versatile, easy, effective, and inexpensive method for obtaining consistent long-term aesthetic goals in mild to moderate cases of craniofacial microsomia.

**Keywords:** Autologous fat graft, craniofacial microsomia, craniofacial reconstruction, fat injection

## INTRODUCTION

Craniofacial microsomia presents with a wide phenotypic spectrum of cranial and extracranial anomalies.<sup>[1,2]</sup> Because of the variable presentation, planning individualized reconstruction is based on the severity of the defect, availability of treatment options, and patient needs.<sup>[3]</sup> Mandibular and maxillary skeletal corrections with distractions, osteotomies, cartilage or bone grafting, and vascularized soft tissue transfers are all technically complex, expensive surgeries associated with high surgical risk and unaesthetic scars. Multiple and prolonged

hospitalizations are also needed. Fat grafts have been traditionally used to supplement the other reconstructions.

In India, a large majority of patients with craniofacial microsomia are unable to undergo complex reconstructions due to inaccessibility to good craniofacial centers, unaffordability, or reluctance of parents to accept the surgical risk. There is considerable social stigma attached

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to the resultant facial scars of surgery, especially in a girl child. Hence, we have explored the feasibility of autologous fat graft transfer alone as reconstructive option for soft tissue correction in craniofacial microsomia. The aim of our study was to assess the feasibility of autologous fat grafting as a “stand alone” reconstructive option for soft tissue camouflage and aesthetic correction of facial deformity in unilateral craniofacial microsomia of Pruzansky–Kaban Grades I and II.<sup>[3,4]</sup>

## MATERIALS AND METHODS

The outcome analysis in 12 patients with unilateral craniofacial microsomia of Pruzansky–Kaban Grades I and IIA and B<sup>[4-6]</sup> was performed. Patients with unilateral facial deformity and who were seeking aesthetic correction were selected. Patients with Grade III deformity, facial palsy, and previous skeletal surgeries were excluded. Three patients had undergone reconstruction for unilateral microtia at an earlier stage. Patients who had adequate fat in the preferred donor sites of lower abdomen and antero-medial thighs were chosen. All procedures were done under local anesthesia with Tumescent infiltration at the donor site and nerve blocks in the recipient sites.

Autologous fat harvesting was done with the standardized Coleman’s technique<sup>[7]</sup> using 10cc Luer lock syringes and three-hole blunt lipo-aspiration cannula. The lipo-aspirate was prepared with 10min of decantation. Placement of the fat graft was done in multiple planes with 0.1–0.3cc aliquots injected through concealed access sites and without overcorrection. 1.0 and 1.5 lipo-injection cannulas with 3cc syringes were used to transfer the fat graft. The patients were discharged after 24h and placed on regular follow-up.

Serial fat injections were planned with a mean interval of 12–16 weeks between sessions. Volumetric augmentation was assessed by the following three methods: (1) Clinical comparison with contralateral normal side for facial symmetry was done. (2) Skin pinch thickness comparison at four reference points—lateral canthus, zygomatic

process, angle of mandible, and mental tubercle—was assessed with Vernier’s callipers. (3) Finally, two-dimensional analysis of pre- and postoperative standardized photographs [Figures 1–4] was done. Patient



**Figure 2:** Pre- and postoperative photographs—frontal view of Pruzansky–Kaban Grade IIA (mandible hypo-plastic, severe contour deformity). Bilaterally symmetric contour correction seen



**Figure 3:** Pre- and postoperative photographs—lateral view of patient in Figure 2 showing the facial symmetry attained. Microtia (right) was reconstructed with Nagata technique



**Figure 1:** Pre- and postoperative photographs in Pruzansky–Kaban Grade I (mandible normal configuration, mostly soft tissue hypoplasia) with autologous fat grafting



**Figure 4:** Pruzansky–Kaban Grade IIB (Severe maxillo-mandibular hypoplasia). Scarring by previous failed dermo-fat graft in the left cheek. Contour correction and camouflage attained by autologous fat grafting

satisfaction score at the end of the procedure was noted on a visual analogue scale with highly unsatisfactory result as 1 and highly satisfactory as 10. Patients were reviewed and photographed at 1 month, 3 months, and 6 months postoperatively. All patients had a minimum of 6 months' follow-up, and the longest follow-up was for 36 months.

## RESULTS AND ANALYSIS

Descriptive statistics of demographic and intraoperative variables ( $N = 12$ ) were charted and analyzed [Table 1]. Eleven of our patients were female, and one was male. In each session, 20–40 mL (mean  $28.75 \pm$  standard deviation [SD] 5.69) fat was aspirated and 12–35 mL (mean  $23.67 \pm$  SD 6.07) fat was injected. The average operating time was 35 min (mean  $32.91 \pm$  SD 4.05). All patients achieved bilateral facial symmetry with one to five sessions. Majority of our patients needed three sessions (mean  $2.8 \pm$  SD 1.03) of serial fat injections to achieve bilateral facial symmetry. The mean patient satisfaction score was  $8.83 \pm$  SD .717. There were no incidence of donor or recipient site complications, and the scars were inappreciable.

## DISCUSSION

Craniofacial microsomia is the second most common craniofacial anomaly in India.<sup>[2]</sup> There is virtually no “catch up” growth on the affected side and the facial deformity progressively worsens with age.<sup>[5]</sup> As the associated psychological problems also increase with the facial deformity, early intervention is necessary to correct the growth vectors. However, many of these young patients may not have access for treatment in higher craniofacial centers in India and are seen late with established deformities. When they present in the adolescent or young adult stages, their predominant concern is correction of aesthetic deformity with a minimally invasive procedure if possible.

General principles in the reconstructive algorithm of craniofacial microsomia involve complex bony reconstruction followed by soft tissue reconstruction. Most centers prefer to reconstruct the mandible first with the hope that repositioning of skeletal framework in the physiological position would unlock the growth potential

of the adjacent structures and minimize secondary deformity.<sup>[5]</sup> However, in mild to moderate cases of unilateral craniofacial microsomia, the reconstructive goal is to attain bilateral facial symmetry in relation to the soft tissue component. The patients in our series belonged to Pruzansky–Kaban Grades I, IIA and B, where there is more aesthetic concerns and minimal functional disability. All of them refused the options of skeletal distraction<sup>[8]</sup> and free flap reconstructions<sup>[9]</sup> because of the donor site morbidity and facial scars as well as the expenses involved. They also considered it too cumbersome to undergo multistage treatment at a remote craniofacial center. Hence serial fat injections were given to the patients with the aim of attaining bilateral facial symmetry.

Tanna *et al.*<sup>[10,11]</sup> have compared soft tissue reconstruction with serial fat grafting to complex microvascular free flaps and consider the former a safer alternative with better symmetry scores. Free tissue transfers offer the best soft tissue replacement in a single stage. But they leave unaesthetic donor site and facial scars, and are bulky and technically demanding. In more severe cases of hemifacial microsomia, presence of a sizable recipient facial artery will have to be ensured before flap planning.<sup>[12]</sup> We were able to obtain comparable results with good patient satisfaction scores by using serial fat grafting alone.

Benefits of fat injections over free flaps include technical simplicity, precision of delivery, minimal facial scarring or donor site morbidity and less sagging by retention of connecting ligaments of face. Furthermore, autologous fat is readily available, inexpensive, host compatible, and thus, an ideal filler that can be transferred repeatedly with minimum trauma.<sup>[13]</sup> We found that with successive fat injections, apart from the contour correction, the quality of the overlying skin also improves, probably by the neo-angiogenesis or the tissue remodeling action of the preadipocytes as postulated by Coleman *et al.*<sup>[7]</sup> One of our patients [Figure 4B] who had adherent cheek scar due to previous failed dermo-graft<sup>[14]</sup> placement also showed considerable improvement after three sessions of fat grafting with subscission. It was noted in follow-ups more than 24 months that as our patients gained body weight, the hypertrophy of fat in the operated side was more than

**Table 1: Descriptive statistics of demographic and intraoperative variables ( $N = 12$ )**

Variable	n	Minimum	Maximum	Mean	Standard deviation
Age (years)	12	12	32	17.5833	5.28219
Gender					
Male	1				
Female	11				
Surgical time (min)	12	30.00	45.00	32.9167	4.50168
Lipo-aspirate volume (mL)	12	20.00	40.00	28.7500	5.69090
Transplanted fat volume (mL)	12	12.00	35.00	23.6667	6.06530
Number of sessions per patient	12	1.00	5.00	2.8333	1.02986
Increase in skin pinch thickness	12	4.00	8.00	6.4167	1.31137
Satisfaction score	12	7.00	10.00	8.8333	.71774

on the normal side of face. This cautioned us against overcorrecting the affected side as the transferred fat will behave as abdominal fat and show increase in bulk that is out of proportion to the facial fat on the normal side.

Krastev Todor *et al.*<sup>[15]</sup> in a systematic review and meta-analysis of 52 studies found that autologous fat transfer was associated with a high patient and surgeon satisfaction rate, high volume retention, and low clinical complication rate. Lim *et al.*<sup>[16]</sup> also documented the UCLA experience regarding the durability of facial symmetry attained with fat grafts but also noted that more severe cases may need skeletal correction to achieve satisfactory contour and occlusion. In our study, consistent results were obtained with a single surgical team with uniform technique of harvesting, processing, and injection of fat. A limitation of our study was that the outcome analysis was done with two dimensional photographs and clinical examination alone. LASER scanners or 3 dimensional CT imaging with soft tissue imaging software would have provided more of an objective assessment, but these are expensive and not available for routine evaluation in most hospitals of developing countries. However, the goal of reconstruction to obtain facial symmetry and patient satisfaction was achieved in our series of mild to moderate cases of craniofacial microsomia with the minimally invasive technique of autologous fat grafting.

## CONCLUSION

Autologous fat transfer, when used for soft tissue camouflage, is a versatile, easy, effective, and inexpensive method for obtaining consistent long-term aesthetic goals in mild to moderate cases of craniofacial microsomia. It has tremendous application as a sole reconstructive option in India and other developing countries where there is a paucity of good craniofacial centers for complex craniofacial reconstructions.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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## Conflicts of interest

There are no conflicts of interest.

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