



Adipose Tissue Grafting Improves Contour Deformities Related Hyperpigmentation of Face

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Abstract: Contour deformities of face are commonly associated with overlying skin hyperpigmentation. Such hyperpigmentation causes aesthetic problems as well as makes contour deformities more prominent. Conventional surgical and cosmetic approaches to treat hyperpigmentation have limitations and therefore it is imperative to use other innovative techniques to simultaneously heal the contour deformity and also to remove hyperpigmentation. The current study aims to evaluate the effect of autologous adipose tissue in improving contour deformities related hyperpigmentation of face. One hundred patients with contour deformities related hyper-pigmentation of overlying skin were enrolled from February 2017 to January 2018. Adipose tissue was harvested from each patient and processed under sterilized conditions. Purified fat collected in a 10cc Luer-Lok syringe was transferred to 1cc syringes and injected into affected areas of face. The patients were followed for 12 months after adipose tissue injections. Both subjective and objective assessment was performed before treatment and 12 months after adipose tissue injections. Results indicated that after adipose tissue grafting, there was a statistically significant improvement in hyperpigmentation of skin. Most of the patients were highly satisfied after use of adipose tissue injections. Image J scanning also showed significant changes in hyperpigmentation of face after adipose tissue use. In all parameters, the patient exhibited statistically significant improvement. In conclusion, autologous fat grafting is a promising and effective therapeutic approach for hyperpigmentation associated with contour deformities of face.

Key Words: Contour deformities, hyperpigmentation, liposuction, rejuvenation

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Contour deformities of the face requiring soft tissue augmentation are usually associated with hyperpigmentation of overlying skin. These deformities often result from a variety of conditions like trauma, infection and certain acquired diseases.^{1,2} Contour deformities and related hyperpigmentation of face cause both functional as well as aesthetic problems for the patients.³ It is pertinent to note that hyperpigmentation of overlying skin makes contour deformities more prominent.⁴ Conventionally, such contour problems are treated by using allogenic fillers, major flap surgery, lasers and other cosmetic options but with certain limitations. Flap surgery results in donor site morbidity and also does not address pigmentary changes in skin.⁵ Allogenic fillers are expensive and also do not improve hyperpigmentation of overlying skin.⁶ Lasers and cosmetic creams prescribed for pigmentary issues produce minimal results and their use is limited due to high recurrence rates and skin discoloration. No satisfactory measures are available so far rather they may become problematic by causing exogenous ochronosis. Moreover, these modalities also do not treat contour deformity.^{7,8} Therefore, other innovative strategies are required that can simultaneously heal contour deformities and also permanently resolve the issue of skin hyperpigmentation.

Fat is an ideal source of autologous tissue for regenerative medicine applications in plastic surgery and has gained robust attention of plastic surgeons for tissue augmentation. Fat is abundant, easily available and its procurement does not produce significant side effects. Initially adipose tissue grafting was used for lipofilling, however, its role to improve skin texture is also obvious from recent findings of several studies.^{9–11} Fat grafting is recognized as a promising and novel technique for volume restoration and skin rejuvenation due to its regenerative properties. Previously, fat grafting has been successfully used to heal contour deformities¹⁰ or postburn scars¹² of face, however, its role to improve related hyperpigmentation of underlying skin is elusive. Therefore, in the current study we aim to evaluate the effect of autologous fat grafting for contour deformities related hyperpigmentation.

MATERIALS AND METHODS

It is a prospective study conducted in the Departments of Plastic and Reconstructive Surgery, King Edward Medical University/Mayo Hospital, Lahore from February 2017 to January 2018. Hundred patients of either sex of age between 13 and 51 years having contour deformities on face with hyperpigmentation of overlying skin were enrolled from outpatient department of Mayo Hospital, Lahore.

Patients with contour deformities having skin adherent to facial skeleton and absence of lower abdomen fat (as donor site) determined by skin pinch test, were excluded from the study. Any depigmentary treatment taken by the patients during last 12 months was also considered to exclude the patients from the study. All participants were enrolled after informed, written consent. Basic details were collected, limitations, advantages and likely

complications of procedure were explained to all participants in a language understandable for them.

Adipose tissue was harvested from lower part of abdomen. Briefly, under light sedation, anesthetic solution (saline with 1% lignocaine and 1:500,000 epinephrine in a ratio of 1 ml of solution for 1 ml of tissue to be aspirated) was infiltrated by means of a 3 mm infiltration cannula as described previously.¹³ Fat was harvested with a 2-mm multi-hole, blunt cannula attached to a 10-ml Luer-Lok syringe under manually controlled negative pressure (not exceeding 2cc). In order to remove fluids, oils and debris and to concentrate the fat particles the aspirated fat was filtered with a common strainer under sterilized conditions. The fat tissue thus obtained was washed with 0.9% saline solution and collected using a sterile surgical spoon in a 10cc Luer-Lok syringe. From 10cc Luer-Lok syringe, it was transferred into 1cc syringes to be injected through a 2 mm blunt-tip cannula with a lateral opening. Purified fat was transferred to recipient site and its quantity was measured in milliliters. First photograph of the recipient area was taken immediately after fat grafting under standard settings and camera make so as to omit shadow effect on area with contour defect. The integrated density of marked area was determined by using ImageJ 1.4 software (US NIH, Bethesda, MD). Overlying skin was considered hyperpigmented if its integrated density of color (by ImageJ version 1.4) was less than the surrounding normal skin. Sterile strips were pasted on the recipient area and gentle crepe bandage applied. All patients were admitted, observed for any complication and discharged within 48 hours. Oral analgesic and antibiotics against gram positive bacteria (cephridine) were prescribed for 5 days along with sunblock of strength SP-30 from sunrise to sunset post operatively to be continued. Monthly follow up visits were planned and sessions of lipofilling were repeated if needed.¹⁴ Outcomes were measured both subjectively and objectively. Objective assessment was done by taking photographs under standard conditions of light, distance, views and camera make immediately after fat grafting and at one year post operatively once contour deformity got settled. Integrated density of color was determined and compared with integrated density immediately after lipofilling and one year post operatively once contour deformity got settled. Increase in integrated density towards the integrated density of surrounding normal skin was taken as improvement. Subjective assessment was done by the patients' satisfaction level as highly satisfied, satisfied and unsatisfied.

Information was recorded using a proforma. Quantitative variables like age, integrated density and pain score were projected in the form of mean (SD) while categorical variables including gender, satisfaction level and complications were shown as percentages and frequencies. All the data was analyzed by SPSS 21 (IBM, Armonk, NY) and *P* value <0.05 was taken as significant.

RESULTS

One hundred patients, 63% females and 37% males with mean age of 27.33 ± 7.25 years ranging from 13 to 51 years were included. Forehead was involved in 36% patients while cheeks in 21%, chin in 5% and nose in 9% patients. Combination of different areas of face was involved in 29% patients. The volume of injected fat was 4 ml to 17 ml (9.73 ± 5.21 ml) depending on the size of contour and hyperpigmented area. Most of the patients (43%) required 3 sessions repeated after an interval of 3 months while 37% required 2 sessions of fat grafting and in 20% patients single session was adequate to get satisfactory results. Distribution of patients in various characteristics is given in Supplemental Digital Content, Table 1, <http://links.lww.com/SCS/B276>.

At donor and recipient site edema was noted in all patients which settled within 72 hours by conservative management. Bruising of

skin was observed at donor area in 21% and at recipient area in 75% patients which also required reassurance and resolved by its own in 7 to 12 days. Two cases got infection at donor area and required intra venous antibiotics. Only one patient developed skin necrosis in an area of 2×2 cm which was managed by surgical excision and primary closure. These complications are shown in Supplemental Digital Content, Table 2, <http://links.lww.com/SCS/B276>. Improvement in pigmentation was observed clinically and was also found objectively by determining integrated color density using ImageJ 1.4. Integrated density recorded immediately after lipofilling was compared with the value at one year and paired *t* test was applied. There was significant improvement in pigmentation seen with *P* value 0.001. Thirty seven percent patients were highly satisfied while 52% were satisfied and 11% patients were unsatisfied with the improvement in pigmentation of the overlying skin.

DISCUSSION

Autologous fat grafting is considered one of the popular methods for contour deformity correction.^{10,11,15} In our study, we used fat

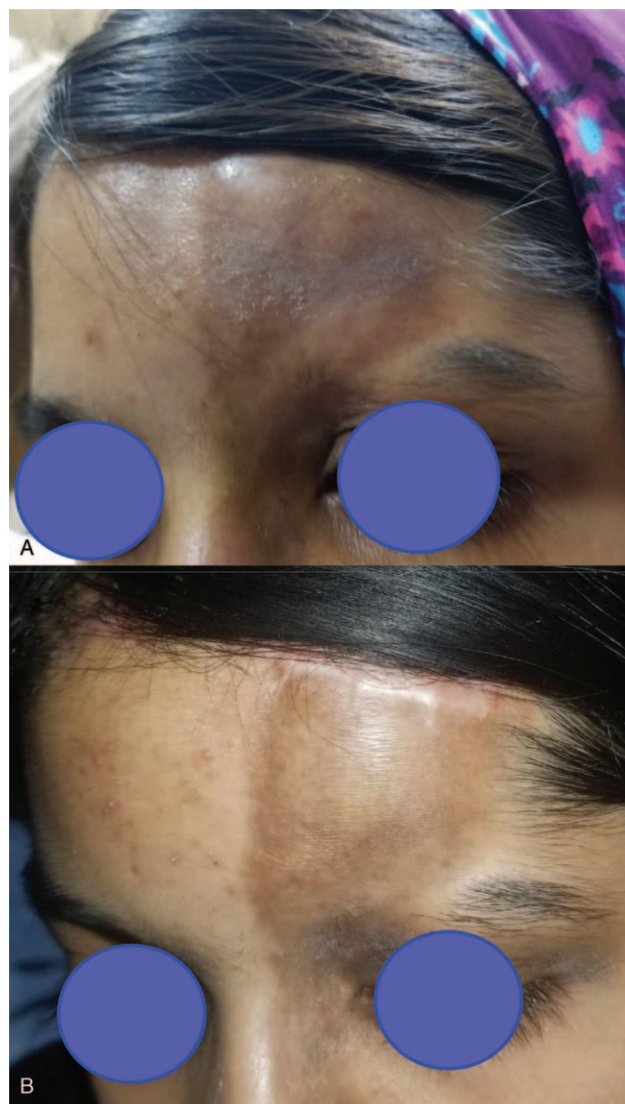


FIGURE 1. Contour defect with pigmentation on forehead. (A) before fat graft and (B) one year after transplantation of adipose tissue graft.



FIGURE 2. Contour defect with pigmentation on left cheek. (A) before and (B) one year after transplantation of adipose tissue graft.

from abdomen, buttocks, flanks or thighs depending upon volume of fat required, regional availability of fat or patients' preference.⁹ Most common site was lower abdomen due to abundance of adipose tissue available in this region. Slight overfilling was done considering resorption issues associated with conventional fat grafting.^{14,16,17}

Different types of fat grafting like macrofat, microfat, and nanofat grafting are currently in practice for various purposes. Each category has different set of harvesting and handling parameters, and their use depends on the type of disease or trauma. For contour deformities, macro and micro fat grafting is preferred as they add volume to the tissues.^{18–20} Nanofat on the other hand is employed for rejuvenation and aesthetic replenishing of the facial tissues and was not suitable for our study.^{18,21,12} We preferred micro fat grafting over macro fat grafting for its better survival and ability to fine tuning of the contour.²²

In the current study, Coleman harvesting strategy using syringe was employed and it results in more survival of harvested cells, and

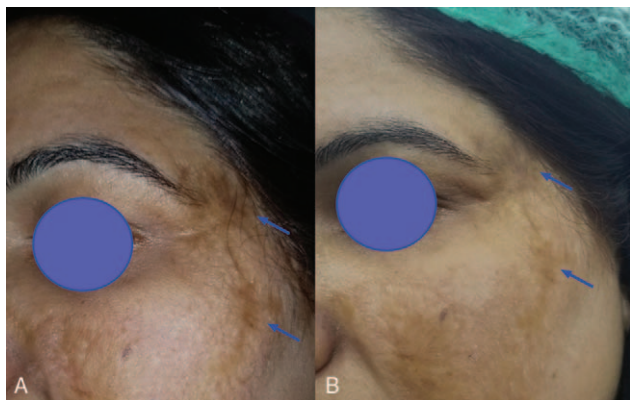


FIGURE 3. Contour defect with pigmentation on cheek. (A) before and (B) one year after transplantation of adipose tissue.

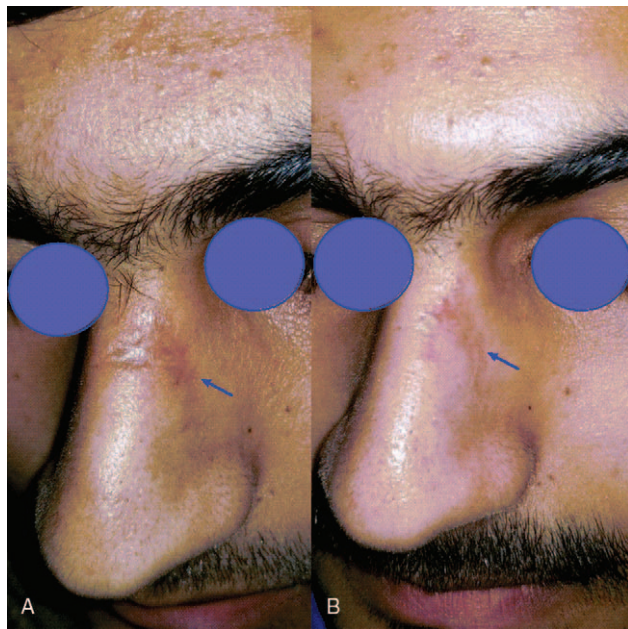


FIGURE 4. Pigmentation on nose. (A) at the time of fat graft and (B) after 1 year of adipose tissue graft.

is simple and inexpensive as compared to pump system.²³ Procedure was repeated, if needed, after three months follow up to achieve satisfactory contour correction.²⁴ There were few complications which were addressed without any permanent sequelae.

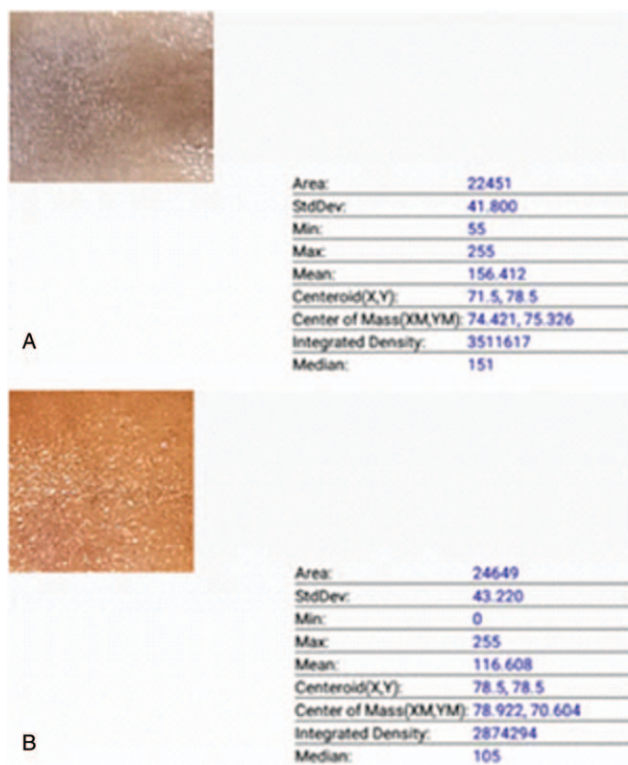


FIGURE 5. Scanning by ImageJ with increase in integrated color density showing a decrease in pigmentation with adipose tissue grafting. (A) showing before transplantation and (B) one year after fat grafting.

Patient pictures before and after transplantation of fat grafts are shown in Figs. 1–4.

Different skin types have different response to improvement in pigmentation after fat graft. To minimize bias we selected type III and type IV on Fitzpatrick scale in this study.⁷ Improvement in pigmentation of overlying skin after fat grafting was first reported by Maily et al.²⁵ We found marked improvement in skin pigmentation and recorded the outcome subjectively in the form of patient satisfaction and objectively by using ImageJ software to find out numerical change in integrated density of the color (Fig. 5).^{12,26}

CONCLUSION

Autologous fat grafting is preferred for correcting contour defects of face because of its abundance, easy availability, non-immunogenicity and rejuvenating overlying skin. It is helpful due to its promising effects in improving the hyper pigmentation of skin overlying contour defects of face.

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