

A Prospective Study on Assessment of Nanofat Injection for Facial Scarring After Burn and Traumatic Injuries

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Abstract:

Background: Facial scarring caused by burns and traumatic injuries can have profound physical and psychological effects. Nanofat injection, a regenerative technique rich in adipose-derived stem cells and growth factors, shows promise in improving scar quality and texture. Unlike traditional fat grafting, nanofat focuses on enhancing skin quality rather than volume restoration, making it particularly relevant for facial scarring.

Methods: This prospective observational study included 60 patients with facial scars (Group A: postburn scars; Group B: post-traumatic scars), aged 16 to 38 years. Patients were evaluated using the Patient Observer Scar Assessment Scale (POSAS) and photographic analysis. Nanofat was harvested and injected into scar tissue, with follow-up assessments at 3 weeks and 3 months.

Results: Both groups demonstrated significant improvements in vascularity, pigmentation, thickness, relief, and pliability. Patients reported marked enhancements in pain, itching, color, stiffness, thickness, and irregularity, especially for scars less than 10 years old. For postburn scars, 60% achieved fair and 40% good results; post-traumatic scars had 70% fair and 30% good results. No poor outcomes were observed, and complications were minimal, primarily temporary discomfort at the fat harvesting site.

Conclusion: Nanofat injection appears to be a safe and effective treatment for enhancing the appearance and quality of facial scars. It led to significant improvements in scar characteristics and patient-reported outcomes, particularly in scars of recent onset. No major complications were noted, underscoring its safety.

Recommendations: Further research with larger sample sizes and longer-term follow-up is warranted to confirm and expand upon these promising results. Nanofat injection should be considered as a potential therapeutic option for facial scar management.

Keywords: Facial Scars, Nanofat Injection, Regenerative Medicine, Scar Assessment.

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Introduction

Facial scarring resulting from burns and traumatic injuries can have profound physical and psychological impacts on individuals. The quest for effective treatments to mitigate these scars has led to the exploration of innovative approaches in regenerative medicine and dermatology. Among these, the use of nanofat injection has emerged as a promising technique [1, 2]. Nanofat, a refined form of autologous fat, is characterized by its rich content of adipose-derived stem cells and growth factors, which are believed to play a crucial role in tissue regeneration and healing [3].

The concept of nanofat injection revolves around harnessing the regenerative potential of adipose

tissue. Unlike traditional fat grafting, which primarily aims at volume restoration, nanofat focuses on improving skin quality, texture, and elasticity [4, 5]. This is particularly relevant in the context of facial scarring, where the primary goal is often to enhance the appearance and functionality of the scarred tissue, rather than to simply add volume.

The study aimed to assess the impact of nanofat grafting on postburn and post-traumatic facial scars, using the Patient and Observer Scar Assessment Scale (POSAS) and photographic analysis for evaluation.

Methodology

Study Design: This was a prospective observational study.

Study Setting: The study was conducted at the Patna Medical College and Hospital, Patna, Bihar, India, from June 2017 to June 2022.

Participants: The study involved 60 patients with facial scars resulting from burns and traumatic injuries.

Inclusion and Exclusion Criteria: Participants were divided into two groups: Group A (30 patients with postburn facial scars) and Group B (30 patients with post-traumatic facial scars), aged between 16 to 38 years. Exclusion criteria included patients with unstable scars, diabetes mellitus, hypertension, pregnancy, blood disorders, and keloid.

Bias: Efforts to minimize bias included the use of a standardized assessment scale and photographic documentation for objective evaluation.

Variables: The variable was the improvement in scar appearance and texture, as measured by the POSAS.

Data Collection: Data were collected through preoperative and postoperative POSAS evaluations and photographic documentation.

Surgical Techniques: Nanofat harvesting involved extracting microfat from the abdomen or lateral thigh using a standardized solution and a 2 mm×20 cm cannula. The harvested microfat was mechanically emulsified to create 'Nanofat'.

Nanofat Injections: Post sterilization with Povidone-iodine, Nanofat was injected into the scar tissue or dermis using 25- or 27-G needles. The endpoint of injection was the appearance of yellowish discoloration in the skin.

Follow-Up: Patients were followed up at 3 weeks and 3 months post-injection, with evaluations including POSAS scoring and photographic analysis.

Statistical Analysis: The assessment of treatment efficacy was primarily based on changes in POSAS scores and visual improvements in scars as documented in photographs.

Ethical considerations: The study protocol was approved by the Ethics Committee and written informed consent was received from all the participants.

Result

Table 1: Summary of the study results

Parameter	Total
Total Patients	60
Age Range (years)	16-38
Average Age	25.60
Gender	
- Females	36 (60%)
- Males	24 (40%)
Scar Types	
- Normotrophic	36 (60%)
- Mixed Normotrophic and Atrophic	12 (20%)
- Atrophic	12 (20%)
Outcomes	
- Fair Results	60%
- Good Results	40%
- Poor Results	0%

This study encompassed 60 patients with facial scars, divided into two groups: 30 with postburn scars and 30 with post-traumatic scars. The age range of the participants was 16 to 38 years, with an average age of 25.60. The scars had been present for 1 to 30 years. The demographic breakdown included 36 females (60%) and 24 males (40%). The scar types were 36 normotrophic (60%), 12 mixed normotrophic and atrophic (20%), and 12 atrophic (20%).

Both groups underwent evaluation using the POSAS.

Group A (Postburn Scars): Observer evaluations in POSAS indicated significant improvements in all facial scars (N=30). Notable enhancements were observed in vascularity, pigmentation, thickness, relief, and pliability. Patient scores also showed marked improvements in pain, itching, color, stiffness, thickness, and irregularity, especially in scars less than 10 years old.

Group B (Post-Traumatic Scars): Observers noted considerable improvements in all facial scars (N=30) in terms of vascularity, pigmentation, thickness, relief, pliability, and surface area. Patient scores reflected improvements in color, stiffness,

thickness, and irregularity, but there were no significant changes in pain and itching, as most scars were mature.

Outcomes: In postburn scars, 18 patients (60%) showed fair results and 12 patients (40%) showed good results. For post-traumatic scars, 21 patients (70%) had fair results and 9 patients (30%) had good results. No poor results were reported in either group.

Complications: The procedure was well-tolerated with no significant complications, such as fat cysts, infections, foreign body reactions, permanent discolorations, or other adverse effects. Some patients experienced minor, temporary discomfort at the fat harvesting site.

Discussion

The study encompassed 60 patients with facial scars, divided into two groups: 30 with postburn scars and 30 with post-traumatic scars. Participants had an average age of 25.60 years, and their scars had been present for 1 to 30 years. The majority of scars were normotrophic, with 60% of patients being female. Both groups underwent evaluation using the POSAS, revealing significant improvements in various scar characteristics. Group A showed enhancements in vascularity, pigmentation, thickness, relief, and pliability, while Group B displayed improvements in vascularity, pigmentation, thickness, relief, pliability, and surface area. Positive outcomes were observed, with 60% of Group A and 70% of Group B patients achieving fair results, while 40% and 30%, respectively, achieved good results. Notably, no poor results were reported in either group, and the procedure was well-tolerated, with no significant complications observed, except for minor, temporary discomfort at the fat harvesting site, suggesting that the treatments were effective and safe in improving facial scar appearance and quality.

Several studies have explored the efficacy of nanofat grafting in treating facial scars, echoing the findings of the study involving 60 patients with postburn and post-traumatic scars. A study focusing on the appearance of facial and hand scars post-burn demonstrated the effectiveness of nano fat grafting in scar improvement [6]. Similarly, another research confirmed the benefits of autologous emulsified nanofat injection in enhancing scar characteristics and rejuvenation [7]. The combined use of lipoconcentrate fat grafting, nanofat transfer, platelet-rich plasma, microneedling, and CO₂ fractional laser has also shown promising results in skin rejuvenation and scar treatment [8]. Furthermore, the role of autologous fat grafting in facial scar remodeling, providing both aesthetic and functional improvements, has been highlighted [9]. Additionally, the use of condensed nanofat

combined with fat grafts has been found effective in treating atrophic facial scars [10].

Conclusion

In conclusion, this study of 60 patients with facial scars, divided into postburn and post-traumatic scar groups, yielded positive outcomes. Using the POSAS, significant scar improvements were observed in both groups. The majority of patients achieved fair to good results, with no poor outcomes reported. These findings suggest the effectiveness and safety of the interventions for scar enhancement, offering hope for scar patients. This research contributes valuable insights into scar management and highlights the potential of these interventions, calling for further research and larger-scale studies to validate these promising results.

Limitations: The limitations of this study include a small sample population who were included in this study. The findings of this study cannot be generalized for a larger sample population. Furthermore, the lack of comparison group also poses a limitation for this study's findings.

Recommendations: Further research with larger sample sizes and longer-term follow-up is warranted to confirm and expand upon these promising results. Nanofat injection should be considered as a potential therapeutic option for facial scar management.

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List of abbreviations:

POSAS - Patient and Observer Scar Assessment Scale.

CO₂ - carbon dioxide.

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