

Evaluation the effect of Lipofilling in Burn Scar: A cross-sectional study

Sajad Hatami¹, Samaneh Tahmasebi Ghorabi^{2,3}, Pardis Ahmadi⁴, Zahrasadat Razavi⁵, Arian Karimi Rouzbahani^{6,3,*}

1. Department of Surgery, School of Medicine, Emam Khomeini Hospital, Ilam University of Medical sciences, Ilam, Iran.

2. Clinical Research Development Unit, Emam Khomeini Hospital, Ilam University of Medical Sciences, Ilam, Iran.

3. USERN Office, Lorestan University of Medical Sciences, Khorramabad, Iran.

4. General practitioner, Ilam University of Medical Sciences, Ilam, Iran.

5. School of Medicine, Tehran Medical Sciences Islamic Azad University, Tehran, Iran.

6. Student Research Committee, Lorestan University of Medical Sciences, Khorramabad, Iran.



ABSTRACT

Background: Recently, a fat injection procedure called lipofilling has been widely used for many skin pathologies. So far, limited studies have examined the use of fat injections to treat burn scars. Given the importance of burn wounds and their psychological, social and economic burden, in this study, we compared the effect of Lipofilling on the healing of burn scars. **Patients and methods:** In this study, people who underwent burn scar lipofilling in the plastic surgery clinic between April 2020 and April 2021 were included in the study. The primary information of the patients was collected. Then, visits were made on days 30, 90, and 180, and the size, color, and symptoms of the scar were recorded in each visit. **Results:** The results showed that 65% of the patients were satisfied with the treatment. In 75% of the subjects, a high effect of lipofilling was observed and in 20%, a moderate effect was observed in the healing of burn wound color. The mean overall resizing of the burn scar was 8.65 mm. The average size of a burn scar after one month was 2.98 mm. The average size change after the third month compared to the first month was 3.65 mm and in the sixth month compared to the third month it was 2.1 mm. **Conclusion:** The results showed that the lipofilling method of fat injection had a high effect in reducing the size and improving the color of burn scars. It is suggested to conduct studies with a higher sample size and multicenter.

Keywords: Lipofilling Scar Burn injury Wound.

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*Correspondence to: Arian Karimi Rouzbahani, Student Research Committee, Lorestan University of Medical Sciences, Khorramabad, Iran.

Email: ariankarimi1998@gmail.com

ORCID ID: 0000-0002-0239-503X

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INTRODUCTION

In the last few decades, progress has been observed in the treatment of acute burns, including the reduction of mortality in cases of extensive burns, but no significant progress has been observed in the long-term consequences of burns, which include functional and aesthetic problems of these patients (1). Any kind of damage to the dermis leads to scarring. Dermal scars differ in terms of appearance, shape and consistency based on the type of injury and the characteristics of the wound healing process (2). Although scar tissue is necessary for the final healing of the wound, it can lead to complications. Scars can lead to cosmetic problems and may also lead to emotional, social and behavioral problems (3). More depression and anxiety have been reported in patients with facial trauma (4).

Scarring can also lead to chronic pain, which may be followed

by acute pain, which is a sign of normal wound healing. Another scar symptom is itching, which causes discomfort, and scratching it interferes with the wound healing process (5). In addition, hypertrophic or keloid scars, contractures and adhesions can lead to functional impairment of people (6). For the treatment of scars, doctors and researchers have proposed different protocols, but there is limited information about the effectiveness of these methods. No gold standard has been introduced for the treatment of scar tissue. The introduced treatments are based on the individual experiences of doctors and their success rate is different (7,8). A new therapeutic option for the treatment of scar tissue is the use of autologous fat injection, which was first introduced by Neuber in 1893 (9). Autologous fat injection has volume-enhancing effects and also appears to lead to the synthesis of collagen fibers, thereby increasing the thickness of the dermis and improving scar characteristics (10). Mesenchymal cells present in injected fat led to



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analgesic effects with changes in cell secretion (11). The most important advantage of using autologous fat injection is in reducing sensitivity or reaction to foreign bodies (12). According to ASAPS, fat injection is the ninth most used facial procedure. Fat injection is done in different ways such as conventional, Sharp-Needle Intra-dermal Fat (SNIF), Nanofat, Emulsion, SNIE, FAMI and SEEFI. The conventional method has been used since the past years, and recently the mentioned new methods have also been used and investigated. This progress in new methods for fat processing has made possible the use of small volumes that can be injected using fine needles, which can be effective in improving skin lines and improving tissue quality and remodeling (13).

Due to the presence of adipose mesenchymal stem cells (ASCs), injected fat has angiogenic and anti-apoptotic effects and improves tissue repair (14,15). Studies have shown that fat injection, in addition to filling defect areas, can lead to the repair and remodeling of surrounding tissues (16). Limited studies have investigated the effects of fat injection on scars and have reported mixed results. This study was conducted to investigate the effect of Lipofilling on the healing of burn scars.

PATIENTS AND METHODS

A cross-sectional study was conducted in patients with burn scars referred to plastic surgery clinic in Ilam who underwent lipofilling. The sample size was calculated using the formula $n = z^2 p(1-p)/d^2$ of 20 people and the samples were selected randomly.

Inclusion criteria include burn scar sufferers with immature scars who underwent burn scar lipofilling in the plastic surgery clinic between April 2020 and April 2021, informed consent to participate in the study, and exclusion criteria: patients who cooperate Patients with burn scars other than immature type and patients who used other treatment methods for burn scars were not eligible to participate in the study. International Advisory Panel on Scar Management criterion was used to diagnose immature scar (17).

Basic information of patients (age, gender, previous treatments used) was collected. The follow-up period of the patients' treatment was 6 months. After lipofilling, visits were made on the 30th, 90th, and 180th days to follow up the treatment process, and the size, color, and symptoms of the scar were recorded in each visit. Then, by reviewing the collected information, we investigated the effect of using lipofilling in healing burn scars. The effect of the treatment on improving the color of the burn scar was defined as high, medium and low effect, in cases where the effect of lipofilling was high, the color of the scar changed to white, and in cases where it was moderate, the color changed to pink, in cases where the color remained red means it has no effect. In order to investigate the effect of lipofilling on the symptoms of burn wounds, Visual Analog Score (VAS) was used, which was calculated from 10 by the patient himself.

Also, the side effects of fat injection including swelling, bruising, infection, itching, pain, and bleeding from patients were investigated during the follow-up period.

In this study, patients responded to a researcher-made question-

naire about their satisfaction with the effect of fat injection on healing burn scars based on a three-level Likert scale of satisfaction (low, medium, high). Low satisfaction was given a score of 1, moderate satisfaction was given a score of 2, and high satisfaction was given a score of 3.

SPSS21 software was used to analyze the data. Mean index and standard deviation were used in quantitative variables and frequency and frequency percentage were used in qualitative variables. Independent T-test was used to compare the means.

RESULTS

In this study, a total of 20 people were included in the study, 7

Table 1. Frequency of demographic variables of study participants

Variable		Frequency (Percentage)
gender	male	7(35%)
	female	13(65%)
marital status	Single	12(60%)
	married	8(40%)
Level of Education	High school	0
	diploma	3(15%)
	Associate Degree	1(5%)
	Bachelor's degree	10(50%)
	Masters	5(25%)
	Doctorate	1(5%)

(35%) were men and 13 (65%) were women that the effect of lipofilling in the treatment of burn scars was investigated in these people. The average age of the participants in the study was 37.50 ± 5.48 years. The maximum age of the participants in the study was 50 years and the minimum was 30 years.

Table 1 shows the frequency of demographic information of the patients participating in the study separately.

In 15 people (75%) of the studied people, there was a change in skin color to white (high effect) and in 4 people (20%) there was a change in color to pink (moderate effect) and in 1 person (5%) of the study people There was no change in the color of the burn wound.

The results obtained from the researcher-made questionnaire about the patients' satisfaction with the effect of fat injection on burn scars showed that 10% (2 people) had low satisfaction, 25% (5 people) had moderate satisfaction, and 65% (13 people) had high satisfaction, which indicated that the method was highly effective. The treatment shows the burn scar.

The average change in the overall size of the burn scar was 8.65 mm. The average size change of the burn scar after one month was 2.98 mm, and the average size change after the third month was

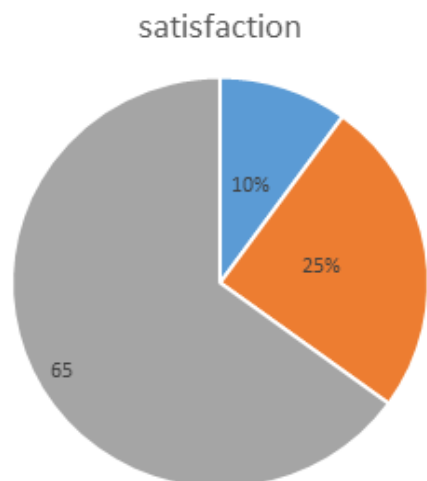


Figure 1. Percentage of patients' satisfaction with treatment

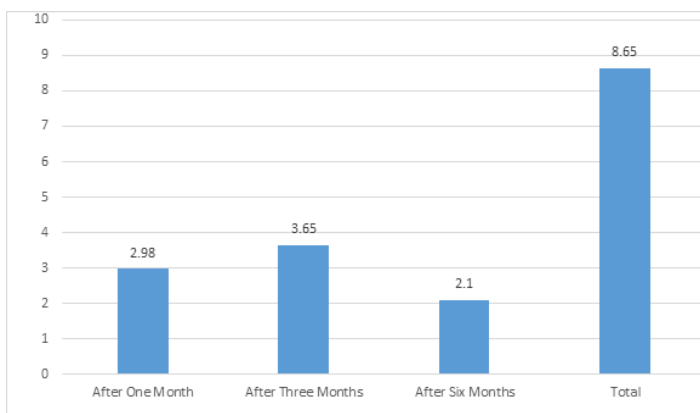


Figure 2. The effect of fat injection on improving the size of the burn scar

Table 2. Examining the relationship between patient satisfaction and gender variable

gender * satisfaction Crosstabulation						p-value	
		Satisfaction			Total		
		low	moderate	high			
gender	M	Count	1	1	5	7	
		% of Total	5.0%	5.0%	25.0%	35.0%	0.684
	F	Count	1	4	8	13	
		% of Total	5.0%	20.0%	40.0%	65.0%	
M; Male, F; Female							

3.65 mm compared to the first month, and in the sixth month it was 2.1 mm compared to the third month (Figure 2). After 6 months, the average scar size was smaller compared to the first and third month, which shows the effectiveness of the treatment method.

According to the VAS criterion, the effect of fat injection on improving itching was 8.85 and its effect on burn scar pain was 9.3.

Based on chi-square test, the relationship between gender and satisfaction with treatment was measured. The results showed that 25% of men were highly satisfied with the treatment. Also, 40% of women showed high satisfaction with the effect of fat injection on burn scars, and this relationship was not statistically significant ($p=0.684$)

Side effects following lipofilling treatment including swelling, bruising, itching, bleeding and pain were observed in a limited number of patients. The most common side effect was bruising in 2 patients after lipofilling treatment, and no other side effects were observed.

DISCUSSION

Management of burn wounds is a challenging and complex issue for which there are various surgical and non-surgical options. Compression garments, splinting, silicone, laser therapy, massage and corticosteroid injection are non-surgical options (18). Recently, a minimally invasive procedure known as autologous fat transfer has been used as an alternative to surgery in scar management with promising results (19). It is said that this fat graft has the potential to regenerate the damaged tissue (20). Therefore, this study was conducted with the aim of investigating the effect of fat injection on the healing of burn scars in patients.

In the present study, the high effect of fat injection in improving the color and size of burn scars was shown by examining the subjects. Also, in this study, it was shown that the effect of this method in reducing the size of the burn scar in the third month is greater than in the first and sixth months. In a study by Bruno et al., who examined 93 burn scars and performed fat injection for half of the scars. By comparing and evaluating histological and immunohistochemical biopsy samples that were performed before treatment, 3 and 6 months after treatment, it showed that a significant improvement in scars was observed after 3 months and especially after 6 months. In addition, significant functional and aesthetic improvement was reported in the samples (21).

Recently, studies have shown the effective role of the combination of autologous fat injection and CO2 laser in improving facial scars (22). This shows that the combination of fat injection with various non-invasive techniques for scar improvement can have significant results.

More studies are needed to combine lipofilling and different skin techniques in scar improvement. These regenerative properties of fat grafts may also improve outcome when combined with standard surgical techniques (23). Even in cases where surgical treatment is necessary later, improving wound characteristics and scar quality may improve and increase the success rate of future surgeries. This improvement in skin texture may make it easier to manipulate the tissue in subsequent surgeries.

Therefore, integrating fat injection into the burn scar in the repair process for burn reconstruction may be an effective, simple, and long-term option. In the present study, it was shown that the effect of this method is effective in improving the pain symptoms and to a lesser degree the itching of the burn wound, And the side effects of using this method were observed in the form of bruising in only

two cases of patients. Various studies have investigated the effect of autologous fat injection in healing scar tissue. Another study showed that fat injection is effective not only in improving beauty, but also in improving function and reducing pain (24).

The present study examined people who underwent lipofilling of burn scars in terms of their satisfaction with the method used, and the results showed that a high percentage were satisfied with the treatment method. The study conducted by Challita and his colleagues examined people who underwent lipofilling of burn scars after one year in terms of satisfaction with the method used and showed that this method is a safe, simple, minimally invasive technique. Autologous for plastic surgeons to benefit from burn reconstruction prior to more invasive surgical procedures (25) that the results of this study are consistent with our study.

LIMITATIONS

The limitation of the study is the small sample size, and it is suggested that more complete and comprehensive studies be conducted to investigate the effect of fat injection on burn scars with a higher sample size, multicenter and also the factors affecting the effectiveness of this method. Also, studies with different treatment methods should be done in order to compare with this treatment method.

CONCLUSION

The results of the study showed that lipofilling had a great effect in reducing the size and improving the color of the burn scar and in reducing the symptoms of the burn scar. Also, in this study, its side effects are low, considering the use of autologous fat and a high percentage of patients were satisfied with the treatment method, it can be said that lipofilling is a suitable method for treating burn scars.

CONFLICT OF INTERESTS

There are no conflicts of interest in terms of the present manuscript.

ETHICAL CONSIDERATION

This study was conducted per and under the approval of the Ethics Committee of Ilam University of Medical Sciences, Ilam, Iran (Code: IR.MEDILAM.REC.1400.100). All participating patients were included in the study based on informed consent.

ABBREVIATIONS

ASCs= Adipose mesenchymal Stem Cells, SNIF = Sharp-Needle Intradermal Fat, VAS = Visual Analog Score.

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