Original Research Article

DOI: http://dx.doi.org/10.18203/2349-2902.isj20194050

Outcome of fat injection in treatment of retracted scars

Fobin Varghese, Ajayakumar Kochunarayanan*, Aneesh Joseph, Kalesh Sadasivan

Department of Plastic and Reconstructive Surgery, Government Medical College Thiruvananthapuram, Kerala, India

Received: 21 May 2019 Revised: 06 August 2019 Accepted: 07 August 2019

*Correspondence:

Dr. Ajayakumar Kochunarayanan, E-mail: drakmchtvm@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Fat grafting was developed in recent years with refinement mainly based on Coleman technique. The method consists of taking fat removed by liposuction under low pressure, fat processing and then placement of fat on the treated area.

Methods: Patients who presented with depressed or retracted scars were considered. 12 patients were selected for the study as one year. Patients were given fat injection by Coleman's technique and were evaluated at 1, 3 and 6 months. Patient and observer scar assessment score (POSAS) was used for evaluation.

Results: The present study infers that there is a significant decrease in POSAS score on both the patient and observer side after fat injection for retracted scars. The overall patient score decreased from 5.75 (± 0.866 SD) pre-operatively to 3.17 (± 1.115 SD) post-operatively with a p value of less than 0.005. The difference between the scores is 2.58 which are comparable to other studies. The overall observer score decreased from 4.25 (± 1.422 SD) pre-operatively to 2.58 (± 0.996) post-operatively with a p value of less than 0.005. The difference between the scores is 1.67 which is comparable to other studies.

Conclusions: Autologous fat grafting seems to be a promising and effective therapeutic approach for scars with different origins such as trauma, burns, post-surgery. In general, we can affirm that treated areas regain characteristics similar to normal skin, which are clinically perceptible, leading not only to aesthetic but also functional results.

Keywords: Lipotransferance, Fat injection, Fat grafting, Autologous fat grafting, Coleman technique

INTRODUCTION

When the healing process begins the lesion can progress to contraction-retraction, which is considered the basic process where the edges are brought to the center by their tension lines, or it may contract generating a scar against cosmetics or functional objectives. The healing process is inherent to each individual, but there are various circumstances such as traumatic injuries, closures by second intention and burn scar that can contribute to the development of a scar retraction. In the case of a burn scar the tissue is subjected to a state of chronic hypoxia. Now-a-day's some of the possible treatments include: laser therapy external silicone patches, injectable

glucocorticoids, superficial radiotherapy, drug treatments such as interferon and colchicine (the still mostly under review), and a surgical treatment conventionally referred as z or w plasty, used to change the vertical axis of the scar and distribute better and without anarchy the basic tensions generated by the scar.^{1,2} The lipotransference was developed in recent years.³ The method consists of taking fat removed by liposuction under low pressure and places it on the treated area. Lipotransference is used in aesthetic lipofilling, for the treatment of chronic ulcers and also as a relaxation treatment of scars or retracted areas post cicatrisation. This method has been published as effective in several health international centers.⁴

Objectives

The objectives of this study is to find out the reduction of POSAS score value in retracted scars after fat injection among patients in a tertiary care hospital and to assess patient satisfaction by fat grafting in scars.

METHODS

This study was a prospective observational study conducted at department of plastic and reconstructive surgery, Government Medical College Trivandrum for one year from April 2017 to April 2018.

Study population

All patients under plastic surgery department coming with depressed scars in Government Medical College Thiruvananthapuram.

Inclusion criteria

Inclusion criteria include all the patients with depressed scars, burn scars, post-surgery scars and who gives informed written consent.

Exclusion criteria

Ppatients with wound infection, immune compromised status like AIDS/HIV Infections, malignancy were excluded, patients with connective tissue disorders, with conditions affecting proper wound healing like smoking, scurvy, and collagen vascular diseases and those patients who has scars of duration less than 6 months.

Sample size

Sample size was calculated based on the formula

$$n = \frac{\left(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta}\right)^2}{\Delta^2} + \frac{\left(Z_{1-\frac{\alpha}{2}}\right)^2}{2}$$

$$\Delta = \frac{\mu_2 - \mu_1}{2}$$

$$\sigma = \frac{\sigma_1 + \sigma_2}{2}$$

where μ_1 is mean of preoperative total score =3.6, μ_2 is post-operative total score=2.9, standard deviation of preoperative score=0.9, standard deviation of post-operative score=0.7, significance level=5% and power of the study=80%. The sample size was calculated as 12 based on a previous study done by Jaspers et al.⁵

Data collection process

Fat grafting is a modality of treatment in the management of scars which is already being practiced in the Department of Plastic Surgery in Government Medical Thiruvananthapuram. observational study was done to patients coming to Plastic Surgery Out Patient Department. The entire procedure was under the Plastic Surgery Department using the Lipotransference/Lipofilling technique which has been standardised by Sydney Coleman: harvesting, refinement, and placement. The aim was to minimise trauma to adipocytes during the process which is achieved by harvesting intact parcels of fat small enough to inject but large enough to preserve tissue architecture. 12 patients were selected for the study from April 2017 to April 2018. Only patients of scars of more than 6 month duration were included. Informed written consent was taken. Patients were given fat injection and were evaluated at 1 month, 3 months and 6 months. POSAS (patient and observer scar assessment score) was used for evaluation preoperatively and 6 months after fat injection. Pre operatively patient were informed of the tenuous nature of fat grafting and the possible need for multiple procedures for desired cosmetic result.

Fat harvest

An atraumatic harvesting, handling, and transplantation correlates with higher long-term volume maintenance. Manual harvest (Coleman technique) results in higher percentage of viable adipocytes compared with conventional liposuction. Graft viability increases with the use of large bore harvest cannulas and low pressure.

Coleman technique: harvest

Small incision (5 mm) placed strategically for broad access to donor site. Infiltration of donor site with 1:1 wetting solution-under local anaesthesia, 0.5% lidocaine with 1: 200,000 epinephrines. Harvesting cannula: 3 mm diameter, 17-gauge lumen, 15 or 23 cm length, blunt tip; connected to a 10 cc Luer-Lok syringe. Cannula is introduced through the same incision made for infiltration. Gentle back-pressure on the 10 cc syringe plunger creates a light negative pressure. Cannula is advanced and retracted in long, even radial strokes through subcutaneous tissue. After syringe is filled with subcutaneous tissue, cannula is removed from syringe, and a Luer-Lok plug is placed to prevent leakage.

Fat processing

Refinement of the harvested subcutaneous tissue into pure fat is crucial for predictable fat grafting. There are three methods for fat processing: centrifugation, washing, or sedimentation. All three techniques have shown equivalent results.

Centrifugation

Ideal centrifugation is approximately 1500-3000 rpm for 2-3 minutes. An electrically operated centrifuge can be

used. After 2-3 minutes no further separation occurs, and fat cell destruction takes place.

Coleman technique: refinement

The plunger is removed from capped 10 cc syringe, and syringe is placed in central-rotor centrifuge. Syringe is centrifuged at approximately 3000 rpm for 3 minutes. The harvested material is now separated into three layers viz., upper layer (oil from ruptured fat cells) middle layer (parcels of adipose tissue, most viable adipose cells are consistently found at bottom of the fat layer) and lower layer (blood, water, lidocaine).

The upper (oil) layer is decanted using a cotton pledget. The lower (aqueous) layer is drained through bottom of the syringe. Exposure to air is minimized to prevent desiccation and fat cell lysis.

Fat injection

Cannula selection

7 or 9 cm injection cannula, 17-gauge lumen, 1 cc or 3 cc Luer-Lok syringe.

Structural fat placement

Transfer refined fat tissue from the 10 cc harvest syringes into 1 cc (face) or 3 cc (body) syringe by injection into open barrel of injection syringe. Place incisions for wide access to recipient site. Advance cannula and inject on withdrawal. Deposit in 0.1 cc aliquots to maximize surface area of contact with surrounding tissue. Place fat in cross-hatched pattern using long radial passes from multiple directions. Use digital manipulation to flatten clumps and minor irregularities.

The patients were evaluated at admission and after 1 month, 3rd month and 6th month using a scientifically accepted scar evaluation scoring method – POSAS.

Study variables

Primary outcome is the change in POSAS score which is based on the colour of the scar, vascularity, pliability, relief and thickness of the scar.

Data collection tool

Data was collected from patients using a semi structured questionnaire.

Data analysis

Appropriate statistical software (SSPS trial version) was used for analysis of data. All quantitative variables were expressed as mean (SD) and all categorical variables as proportions. Paired t-test was used for determining

associations. A p value less than 0.05 will be considered as statistically significant.

Scar quality assessment was done using Patient and Observer Scar Assessment Scale (POSAS).

RESULTS

The study population is categorized in to different groups based on their age groups and analysed. Mean age of the study population was 26.50 with a standard deviation of 12.595. Minimum age was 17 and maximum age was 61 (Figure 1).

Categorisation of patients based on gender done. The present study has 67% females and 33% males (Figure 2).

Patients were asked about history of any comorbidities and tabulated for better analysis. Out of the 12 patients, 11 did not have any serious comorbidities. Only one patient had diabetes.

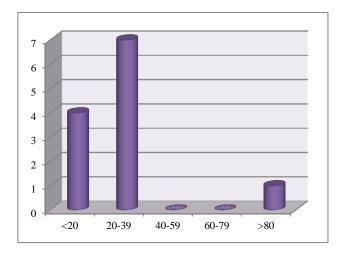


Figure 1: Age distribution in study population.

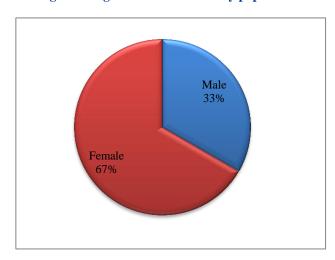


Figure 2: Gender wise distribution of study population.

Injury type

Type of initial injury was assessed. It helped in understanding the amount of contamination, foreign body reaction and possible fibrosis while healing of the wound. Scars due to different aetiologies were included in the study. Injuries due to Road traffic accidents accounted for 5 cases, burns scars cases were 4 and post-surgery scar cases were 3 (Figure 3).

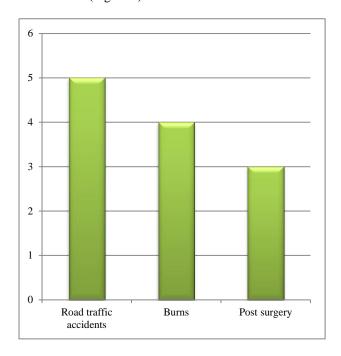


Figure 3: Classification based on injury type.

Site of injury

Out of the 12 cases, 9 were having the scars over face, 2 over neck and 1 over hand.

Comparision of patient overall POSAS scores

POSAS score for each individual patient were analysed and overall score was also calculated. The following scores were statistically analysed. Pre-operative overall patient POSAS score had a maximum score of 7 and minimum score of 4 with a mean of 5.75, standard deviation calculated as 0.866. Post-operative overall patient POSAS score had a maximum score of 6 and a minimum score of 2 with a mean of 3.17, standard deviation calculated as 1.115. Pre-operative overall observer POSAS Score had a maximum score of 8 and minimum score of with a mean of 4.25, standard deviation calculated as 1.422. Post-operative overall observer POSAS score had a maximum score of 5 and a minimum Score of 1 with a mean of 2.58, standard deviation calculated as 0.996. The present study shows there is a significant decrease in all variables of POSAS score as experienced by the patient. Similarly, the observer variables in the POSAS analysis shows a statistical reduction of scores with improvements in scar characteristics (Figure 4, 5).

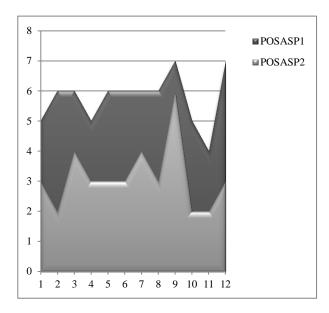


Figure 4: Changes in patient POSAS score before and after treatment.

PR 1.1		The same of			
Table:	1:	Patient	character	ristics	comparison.

			Gender			Scar cause		
	No. of patients	Genuel		Mean	Dongo	RTA	Burns	Doct curgory
		Male	Female	Mean	Range	KIA	Duilis	Post-surgery
Present Study	12	4	8	28.17	17-61	5	4	3
Jasper et al	39	9	31	45	1-59	11	22	7
Maione et al	36	8	28	16.54	14-18	Pathological short limb deformity		deformity

Table 2: Paired samples test patient score.

		Paired differences			t	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean			
Pair 1	POSASP1 - POSASP2	2.583	0.900	0.260	9.940	11	0.000

Table 3: Paired samples test observer score.

Paired differences					t	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean			
Pair 1	POSASO1 - POSASO2	1.667	0.651	0.188	8.864	11	0.000

Table 4: Comparison of variables in POSAS patient scale in the present study.

POSAS item	Pre-operative (SD)	Post-operative-6months (SD)	Difference	p value
Pain	2.75 (1.35)	1.67 (0.98)	1.08	0.003
Itch	3.92 (0.90)	3.58 (0.79)	0.34	0.039
Colour	5.83 (0.38)	3.5 (0.46)	2.33	0.001
Stiffness	6.92 (0.35)	4.25 (0.25)	2.67	0.001
Thickness	5.33 (0.43)	3.25 (0.49)	2.08	0.001
Shape	4.67 (0.39)	3.08 (0.46)	1.59	0.001
Total score	5.75 (0.866)	3.17 (1.115)	2.58	0.001

Table 5: Comparison of variables in POSAS observer scale in the present study.

POSAS item	Pre-operative (SD)	Post-operative- 6 months (SD)	Difference	p value
Vasularity	2.58 (0.14)	1.75 (0.13)	0.83	0.001
Pigmentation	4.67 (0.25)	2.67 (0.22)	2	0.001
Thickness	5.17 (0.42)	2.92 (0.28)	2.25	0.001
Relief	4.75 (0.21)	3.5 (0.23)	1.25	0.001
Pliability	4.92 (0.33)	3.67 (0.31)	1.25	0.002
Surface area	2.08 (0.28)	1.33 (0.14)	0.75	0.005
Total score	4.25 (1.422)	2.58 (0.996)	1.67	0.001

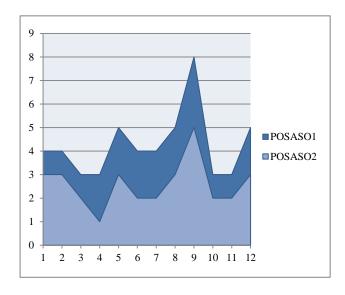


Figure 5: Comparision of observer POSAS score before and after treatment.

DISCUSSION

The present study was conducted in 12 cases of scars of different aetiology in department of Plastic, Reconstructive & Burns Surgery, Govt. Medical College, Thiruvananthapuram during April 2018 to April 2018. We investigated the effectiveness of autologous fat grafting on scar using POSAS Score.

Patient and scar characteristics

The present study was conducted in 12 patients without any loss of follow up among patients. The range of age group included was from 17 to 61 with the mean age group as 28.17. There were 8 females and 4 males included in the study. The aetiology included Road traffic accidents -41.7%, Burns -33.3% and post-surgery scars -25% (Table 1).

Scar outcome

After a single fat grafting procedure, total patient and observer scar assessment scale score (i.e., the average score of six items) for both the patient and observer decreased significantly, which corresponds to improved scar quality. The present study infers that there is a significant decrease in POSAS score on both the patient and observer side after fat injection for retracted scars. The overall patient score decreased from 5.75 (± 0.866 SD) pre-operatively to 3.17 (± 1.115 SD) post-operatively with a p value of less than 0.005. The difference between the scores is 2.58 which are comparable to study by Jaspers et al with a reduction in overall scores of 1.3. In the study by Maione et al the reduction in score is 3.2 (Table 2).^{5,6}

The overall observer score decreased from 4.25 (± 1.422 SD) pre-operatively to 2.58 (± 0.996) post-operatively with a p value of less than 0.005. The difference between

the scores is 1.67 which is comparable to the study by Jaspers et al, with a reduction in overall scores of 0.7. In the study by Maione et al the reduction in score is 1.4 (Table 3).^{5,6}

The present study shows a significant reduction of patient variables of colour scores, 5.83 (± 0.38 SD) preoperatively to 3.5 (± 0.46) post-operatively. Reduction in stiffness scores from 6.92 (± 0.35 SD) pre-operatively to 4.25 (± 0.25) post-operatively. Reduction in thickness scores from 5.33 (± 0.43 SD) pre-operatively to 3.25 (± 0.49 SD) post-operatively (Table 4).

The present study shows a significant reduction in observer variables of thickness scores, 5.17 (\pm 0.42 SD) pre-operatively to 2.92 (\pm 0.28 SD) post-operatively. Reduction in relief scores from 4.75 (\pm 0.21 SD) pre-operatively to 3.5 (\pm 0.23 SD) post-operatively. Reduction in pliability scores from 4.92 (\pm 0.33 SD) pre-operatively to 3.67 (\pm 0.31 SD) post-operatively (Table 5).

CONCLUSION

While the scar is a definitive result, it is also the conclusion of the dynamic process of tissue repair and regeneration. Because this is regulated by cytokines, growth factors, chemicals and cellular elements, the influence on the various physiological activities alter the evolution of the wound. It is at this point; through the staging of the molecular basis of healing and the scar itself that fat grafting is presented as an alternative treatment. An improvement in the functionality of the areas involved, skin texture and increment in the elasticity of the tissues has been shown by the results. The spontaneous and generated pain during movements decreased dramatically and has even disappeared. This made the patients very receptive to future infiltrations. Now we are extending our present study to combine the regenerative effects of fat grafting with platelet rich plasma.

ACKNOWLEDGEMENTS

I am grateful to Almighty for the help showered upon me for this project. I express my sincere gratitude to my beloved teacher Dr. Ajayakumar K. Professor of Department of Plastic and Reconstructive Surgery for his kind guidance, inspiration and support throughout the

study. I am extremely thankful to Dr I. P. Yadev sir Associate professor Department of General Surgery for analysing the study and guiding the formatting. I am thankful to my beloved Head of the Department, Dr. Aniraj R. who inspired me to the core. I am thankful to all the Faculties, Post Graduates, and other staff of Department of Plastic and Reconstructive Surgery for the great assistance and help given, without which this study would not have materialized. Above all, I am indebted to all patients, and their caretakers and operation theatre staff who participated in this study with their kind cooperation. Also, a big help from my wife, Dr. Nimmy Andrews, was needed for completion of this project.

Funding: No funding sources Conflict of interest: None declared Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

- 1. Alster TS, Williams CM. Treatment of keloid sternotomy scars with 585 nm Flash lamp-pumped pulsed-dye laser. Lancet. 1995;345:1198-200.
- 2. Boyadjiev C, Popchristova E, Mazgalova J. Histomorphologic changes in keloids treated with Kenacort. J Trauma. 1995;38:299-302.
- 3. Illouz YG. Body contouring by lipolysis: a 5-year experience with over 3000 cases. Plast Reconstr Surg. 1983;72:591-7.
- 4. La Rusca I, Schonauer F, Molea G. Core fat graft transplantation for depressed scar. Plast Reconstr Surg. 2009;123:1394-5.
- Jaspers M, Brouwer K, van Trier A, Groot M, Middelkoop E, van Zuijlen P. Effectiveness of Autologous Fat Grafting in Adherent Scars. Plastic and Reconstructive Surgery. 2017;139(1):212-9.
- 6. Maione L, Memeo A, Pedretti L, Verdoni F, Lisa A, Bandi V, et al. Autologous fat graft as treatment of post short stature surgical correction scars. Injury. 2014;45:S126-32.

Cite this article as: Varghese F, Kochunarayanan A, Joseph A, Kalesh Sadasivan. Outcome of fat injection in treatment of retracted scars. Int Surg J 2019;6:3195-200.