

Correction of Depressed Scars with PRP Enriched Fat Graft

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ABSTRACT

Background: Many options for the improvement of depressed scars include scar revision with an elliptical excision, z-plasty, w-plasty, and geometric broken-line closure were found. Dermabrasion and laser treatment has been used to obtain a uniform skin surface. Hypertrophic scars can be treated with intralesional steroids and silicone pressure. Occasionally, scars may be adherent to the underlying structure. This depression along the length of the scar worsens the aesthetic deformity. Fat injection is an established method for treating depressions and contour deformities. Addition of PRP to fat grafts offers a better fat grafting survival.

Material and Methods: We report encouraging results with the injection of the PRP enriched fat into a pocket made with a sharp cannula in treating 20 patients with depressed and adherent scars.

Conclusion: This technique is a useful addition to the surgeon's resources when treating scars.

INTRODUCTION

Scars are areas of fibrous tissue that replace normal skin after injury. They result from the biological process of wound repair in the skin and other tissues of the body and constitute a natural part of the healing process. Scarring is considered abnormal when the amount of fibrosis is excessive or suboptimal, as in hypertrophic, atrophic, or keloidal scars; when it affects normal function; and when they are disfiguring [1].

Scars on different parts of the body may cause functional disability and cosmetic disfigurements. But when the location is on obvious areas as face or arms the scars need special attention [2].

The selection of autologous graft materials is accepted as one of the most fundamental media for use in most soft-tissue augmentation and reconstruction purposes. Fat grafting affords a medium that is soft, pliable, and readily available in abundant stores; can be harvested with minimal morbidity; has low antigenicity; and lacks risk of disease transmission [3].

Studies were focused on the effects of enhancing fat-graft survival by augmenting the biochemical healing potential of the graft material with the addition of platelet-rich plasma (PRP) [4].

Addition of PRP to fat grafts offers a better graft survival, a less bruising and inflammation reaction, and easier application due to liquefaction effect of PRP [5].

Fat grafts collected by liposuction can be re-injected subcutaneously for correction of depressed or irregular areas [6] which is revascularized within 48h. During this time, it is fed by diffused materials from plasma [7].

PRP maintains a high concentration of bioactive proteins and growth factors that are shown to augment tissue repair and regeneration. Results of researches have suggested that growth factors not only influence the viability of transferred cells but also may play a bioactive role in influencing the differentiation of precursor adipocytes within the graft into their mature form [8].

In addition to a volumizing effect, the injected fat has a neoangiogenic effect improving the cutaneous elasticity. This technique is thus also recommended for wound healing, scar reduction, radio-dermatitis treatment & correction of acne scars [9].

MATERIAL AND METHODS

The study was performed on 20 patients with depressed scars of various etiologies in the period between March 2015 and May 2017 at The Plastic and Reconstructive Surgery Department, Tanta University Hospitals.

Patients were treated by autologous fat grafting mixed with Platelet rich plasma (PRP) and 2 sessions of PRP prior to fat grafting with 2 weeks apart.

The procedure was done with local or general anesthesia, according to patient/physician preference. The abdomen or flanks were chosen as donor areas depending on patient/physician preference.

Infiltration was performed in the donor site according to the tumescent technique with a solution containing normal sterile saline containing 0.05% xylocaine with 1:1,000,000 of epinephrine, at a ratio of 1ml of solution per milliliter of aspi-

rated tissue. Manual harvesting using low pressure vacuum, created by slowly withdrawing the plunger of a 10ml Luer-lock syringe in a gradual manner. The fat harvesting was performed with a 3-mm-diameter blunt tip cannula attached to a 10ml Luer-lock syringe. The aspirate was collected in sterile tubes to be centrifuged before injection.

The Harvested fat was centrifuged 3 minutes at 3000 rpm. This method separates fat from substances that increase degradation, and concentrates adipocytes and stem cells per milliliter of transplanted fat.

During the procedure blood was withdrawn from the patient with citrate phosphate dextrose (CPD) at a volume ratio of 9 to 1 for anticoagulation. PRP was produced through centrifugal separation of whole blood.

After the first centrifugation (2500 rpm, 5 minutes), the blood was separated into plasma and red blood cells. The red blood cells were removed, and after a further centrifugation (3500 rpm, 5min) of the remaining plasma, the bottom layer, which is rich in platelets and constituted approximately 10% of the total withdrawn blood volume, was collected for use as PRP. At the time of grafting, the solution was mixed with 2% calcium chloride at a volume ratio of 7 to 1 to promote the release of growth factors from the platelets.

The purified fat by centrifugation was mixed through a 3-ways connector with PRP.

The fat/PRP mixture was transferred from 10ml Luer-Lock syringes to 1ml or 3ml Luer-Lock syringes via a 3-ways connector. It is important to use smaller syringe, because the fat placement is more precise. For fat placement, special blunt cannula (2mm) was connected to the 1 or 3ml

syringes. Fat was injected in small parcels and thin strips in several layers. Before injection, we created some tunnels in scars, to release fibrotic tissues. The fat graft is then placed by a withdrawing way.

Patients were dressed in compression garments that cover the areas that have been suctioned. Compression garments are generally encouraged 24 hours per day for 4 weeks. Patients were followed up for scar evaluation concerning texture, clinical improvement and complications.

RESULTS

Twenty patients with depressed scars were included. The epidemiological and clinical features are listed in Table (1). Patients consisted of 9 women (45%) and 11 men (55%). The average age was 24.25 (range 6-41). The most common recipient site was the cheek (40%). Other treatment areas were the forehead, chin, neck, leg and back area (in 3, 2, 2, 4 and 1 patients respectively). Fat tissue donor sites were the flanks and lower abdomen. The most common etiology was trauma (60%) while burn was in 6 patients and steroid injection in 2 patients. The scar was linear in 11 patients and wide in 9 patients. Patients received an average of 1.75 fat injections (range 1-3 sessions). Patients were evaluated clinically with serial photographs. Two blinded doctors performed clinical assessments using the following grading scale: 0 = (poor), 1 = (fair), 2 = (good), 3 = (excellent), and 4 = (complete). Clinical results are shown in Table (1). Three patients showed fair results (scale 1), 3 patients showed good results (scale 2), 12 patients showed excellent results (scale 3) and 2 patients showed complete resolution (scale 4). There were no poor results. Postoperative complications of minimal bruising, pain, edema, and erythema occurred but rarely persisted more than 72 hours.

Table (1): Patients data.

No.	Sex/Age	Scar site	Etiology	Scar shape	Number of injections	Result
1	M/10	Cheek	Traumatic	Linear	1	3
2	F/25	Forehead	Traumatic	Wide	1	3
3	F/31	Cheek	Burn	Wide	3	2
4	M/17	Chin	Traumatic	Linear	1	3
5	M/41	Forehead	Traumatic	Linear	2	3
6	F/6	Cheek	Steroid injection	Wide	2	4
7	M/22	Cheek	Traumatic	Linear	1	2
8	F/23	Chin	Traumatic	Linear	1	3
9	F/36	Neck	Burn	Wide	2	1
10	M/33	Forehead	Traumatic	Linear	1	3
11	F/19	Cheek	Traumatic	Linear	1	4
12	M/22	Leg	Burn	Wide	3	2
13	F/27	Neck	Burn	Wide	2	3
14	M/33	Cheek	Traumatic	Linear	2	3
15	F/34	Leg	Burn	Wide	3	1
16	M/27	Back	Steroid injection	Wide	2	3
17	F/20	Leg	Burn	Wide	3	3
18	M/15	Cheek	Traumatic	Linear	1	3
19	M/14	Cheek	Traumatic	Linear	1	1
20	M/30	Leg	Traumatic	Linear	2	3

Grading scale for improvement 0 = (Poor). 1 = (Fair). 2 = (Good). 3 = (Excellent). 4 = (Complete).



Fig. (1): (A) Pre and (B) Post operative views of a post surgical cheek scar.



Fig. (2): (A) Pre and (B) Post operative views of a post traumatic cheek scar.



Fig. (3): (A) Pre and (B) Post operative views of a traumatic scar of the leg.



Fig. (4): (A) Pre and (B) Post operative frontal views of a post steroid injection cheek scar.



Fig. (5): (A) Pre and (B) Post operative frontal views of a post steroid injection cheek scar.

DISCUSSION

The advent of fat grafting or lipofilling, first introduced by Neuer in 1893 [10] and popularized by Coleman [6], has changed the surgical strategy for soft tissue augmentation. The application of this technology in patients with scars is a novel surgical alternative and promises long-term effects [12]. They are usually implanted into the superficial layer just beneath the dermis to replace lost tissue volume and induce collagen production via stretching of dermal fibroblasts, thus improving skin texture and thickness [13]. However, the reported rates of fat cell survival are very variable, may be due to different techniques of harvesting, processing and reinjection of fat cells. Recently, the addition of PRP has been considered very effective to improve fat intake and survival [14], and several

studies have already demonstrated improvement of wound healing and fat grafting survival in both reconstructive and aesthetic cases by using fat grafting with PRP [15]. Platelet-rich plasma is used as an additive in various clinical indications [15-27] including fat grafting. The growth factors present in platelet-rich plasma stimulate wound healing [28,29] tissue remodeling, and revascularization [15] and improve fat graft take [30-32]. Clinical studies, however, report a large variation of results [33-35]. Our results confirmed that a combined approach should be the gold standard to maximize the outcome in the treatment of atrophic scars. Fat plus PRP subcutaneous injection can fill the scars and stimulate self-regeneration, as shown in all our patients.

Conclusion:

Scars that involve the cutaneous and subcutaneous tissues benefit from a combined approach of fat enriched with PRP that proved to significantly increase skin and subcutaneous tissue thickness. All patients, regardless of age, social class or educational level, are highly motivated to undergo the procedure because they have not yet found effective therapy or have not yet undergone treatment.

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