Platelet Rich Plasma in the Treatment of Atrophic Acne Scars

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Abstract: Background: Autologous platelet rich plasma (PRP) is known to enhance wound healing and has applications in many fields of medicine including treatment of atrophic acne scars. **Objective:** To evaluate the efficacy of autologous platelet rich plasma in the treatment of atrophic acne scars. **Patients and Methods**: Twenty patients with atrophic post acne scars received intradermal PRP injection sessions. Each patient received 3 sessions at monthly intervals. The final clinical assessment took place 3 months after the last session. **Results**: PRP treated patients had some improvement of their atrophic acne scars. **Conclusion:** This study concluded that PRP can be a safe and easy method of treatment of mild atrophic acne scars.
[Elhawary Esraa E., Kato Abdullah M., Nassar Samia O., Hodeib Abeer A. and Shareef Mohamed M. **Platelet Rich Plasma in the Treatment of Atrophic Acne Scars.** *Nat Sci* 2019;17(10):43-46]. ISSN 1545-0740 (print); ISSN 2375-7167 (online). http://www.sciencepub.net/nature. 6. doi:10.7537/marsnsj171019.06.

Keywords: Platelet Rich Plasma; Treatment; Atrophic Acne Scar

1. Introduction

Acne is a common disorder affecting about 80% of adolescents and persists into adulthood in approximately 12-14% of these patients with cosmetic, psychological and social implications[1, 2]. All body areas with high concentrations of sebaceous glands are involved, especially the face, back and chest. Inflammatory acne lesions can result in permanent scars, the severity of which may depend on delay in treating acne patients. The scars are either hypertrophic scars, keloid scars or atrophic scars[3].

There are no standard treatment options for atrophic acne scars. Different modalities have been used such as topical retinoids, surgical techniques like punch graft, punch excision, subcision and autologous fat transfer, resurfacing techniques as chemical peels, dermabrasion and ablative laser treatment and collagen induction by microneedling and platelet rich plasma (PRP), dermal fillers and others[4, 5].

Platelet rich plasma is an autologous high concentration of human platelets contained in a small volume of plasma[6]. PRP contains various growth factors (GFs) and cytokines released by platelets that are found to play a critical role in all aspects of wound healing, angiogenesis and tissue remodeling[7].

Aim of the Work

The aim of this work was to evaluate the effects of autologous platelet rich plasma injection in the treatment of atrophic post acne scars.

2. Patients and Methods

➢ **Patients**

The present study was carried out on 20 patients with atrophic post acne scars who did not receive any treatment for acne scars for at least 6 months before starting the sessions and agreed to sign a written consent.

➢ **Methods:**

All patients were subjected to:

- Complete history taking
- Detailed general and dermatological examination
- Complete blood count
- Skin biopsies were taken by 2mm puchs to evaluate collagen formation before and one month after treatment using Mallory trichrome stain.

- **Platelet rich plasma preparation method:**

I. 9 ml of venous blood was collected from the anticubital vein under complete aseptic conditions into sterile tubes containing sodium citrate (10:1) as anticoagulant.

II. The citrated whole blood was subjected to two centrifugation steps in standard laboratory centrifuge. The initial centrifugation at 3000 rpm for 7 minutes to separate the plasma and platelets from the red and white cells.

III. The resulting plasma supernatant was harvested to a second centrifugation step at 4000 rpm for 5 minutes, leading to separation of plasma into two portions: platelet poor plasma and platelet rich plasma, typically the lower 1 cc of plasma (10% of initial volume of autologous blood) was yielded as platelet rich plasma.

IV. 10% of calcium chloride was added to PRP immediately before injection to produce platelet activation.

Platelet rich plasma injection method:

I. The site of injection was disinfected using ethyl alcohol 70% before starting the session.

II. While the patient in recumbent position, PRP was injected using 30 gauge syringe intradermally of 0.1 cc PRP with spacing of 1 cm apart.

3. Results

The study included 20 patients 8 (40%) males and 12 (60%) females with their age ranging between 20-30 years with a mean ± SD 24.60 ± 3.20. regarding their skin type, 4 patients (20%) had skin type III while 16 patients (80%) had skin type IV. The duration of post acne scars ranged between 6-14 years with a mean ± SD 7.90 ± 2.42.

All patients were photographed at baseline, before each session and 3 months after the last session. The photographs before and after the sessions were compared and evaluated using a quartile grading scale for assessment of clinical improvement of the scars (Table 1).

Table (1): Physician's evaluation of improvement

Physician's evaluation of improvement	(n = 20)	
	No.	%
Poor improvement (0-25%)	4	20
Fair improvement (26 – 50%)	10	50
Good improvement (51-75%)	6	30
Excellent improvement (>75%)	-	-

None of the patients showed excellent improvement, while 30% showed good improvement, 50% fair improvement (Figure 1) and 20% poor improvement.

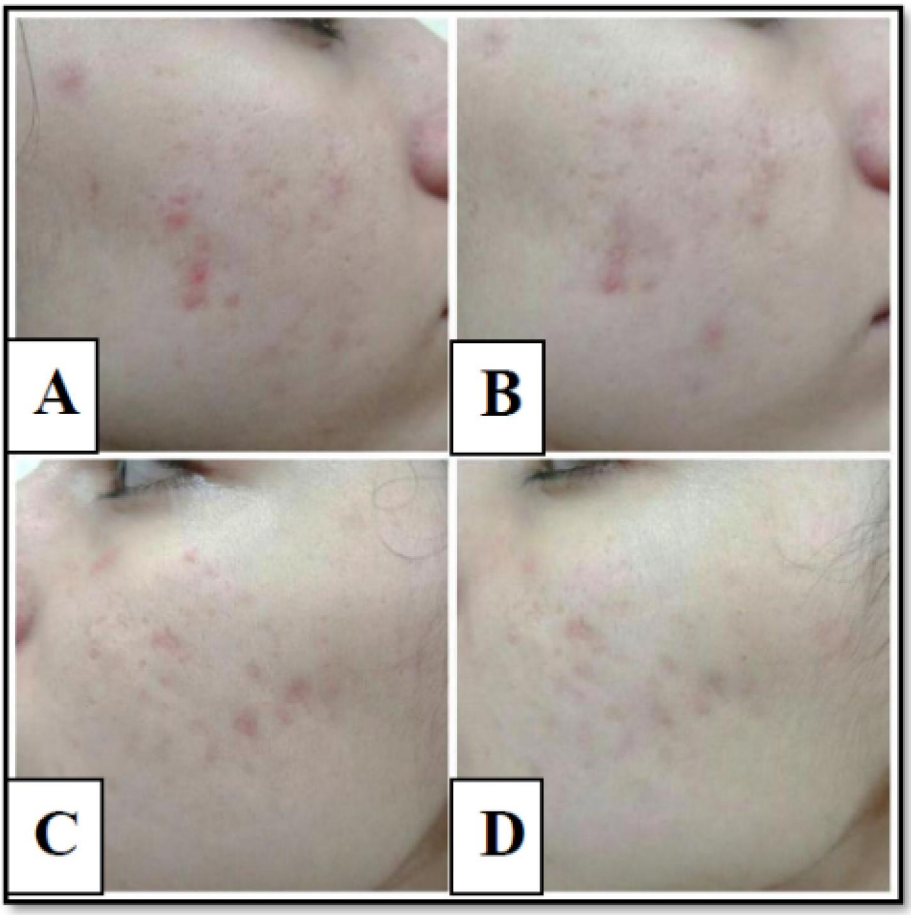

Fig. (1): A 23 years old female patient with moderate post acne scars in **group 1**
A: right side of the face before treatment
B: right side of the face after 6 months from starting sessions
C: left side of the face before treatment
D: left side of the face after 6 months from starting sessions with overall fair improvement

Regarding the side effects, patients were informed to report any side effects at each treatment session and during the follow up period. During the procedure, 12 patients (60%) experienced minimal pain and 8 patients (40%) experienced mild pain. While 4 patients (20%) had no erythema, 12 patients (60%) had trace erythema and 4 patients (20%) had mild erythema with mean ± SD 0.90 ± 0.57. Regarding facial oedema, 12 patients (60%) had no oedema while 8 patients (40%) had trace oedema with mean ± SD 0.50 ± 0.71. And none of the patients had crust formation.

Two skin biopsies were obtained from the treated sites in each patient, one before starting treatment and the other obtained one month after the last session. All analysis of the captured images of the different stained sections was carried out using the software Image J 1.47. (Table 3).

The mean epidermal thickness before PRP injection was 57.22 ± 4.51, while one month after the last session, it became 71.49 ± 5.68, with statistically significant increase in epidermal thickness (P. value <0.001*).

The mean area percentage of collagen fibers in Mallory Trichromestained sections before treatment was 30.09 ± 3.94 and after treatment, it became 35.21 ± 6.25, with statistically significant increase (P. value 0.002*) after treatment. (Figure 2)

Side effect	Pain		Erythema		Oedema	
	No.	**%**	**No.**	**%**	**No.**	**%**
None	--	--	4	20	12	60
Trace	12	60	12	60	8	40
Mild	8	40	2	20	--	--
Moderate	--	--	--	--	--	--
severe	--	--	--	--	--	--
Duration						
Min. – Max.	--		0-2		0 – 2	
Mean ± SD	--		0.90 ± 0.57		0.5 ± 0.71	
Median			1		0.5	

Table (3): Comparison of the pathological results before and after treatment

Results pathology	**Before**	**After**	**t**	**P. value**
Epidermal thickness (um)				
Min. – Max.	52.16 – 67.08	61.42 – 78.76	5.883*	<0.001*
Mean ± SD	57.22 ± 4.51	71.49 ± 5.68		
Median	57.57	72.43		
Area of percentage of collagen fibers (%)				
Min. – Max.	25.07 – 36.74	28.34 – 46.39	4.245*	0.002*
Mean ± SD	30.09 ± 3.94	35.21 ± 6.25		
Median	29.83	34.31		

t: **Paired t-test** P: P. value for comparing between before and after
*: Statistically significant at P. value ≤ 0.05

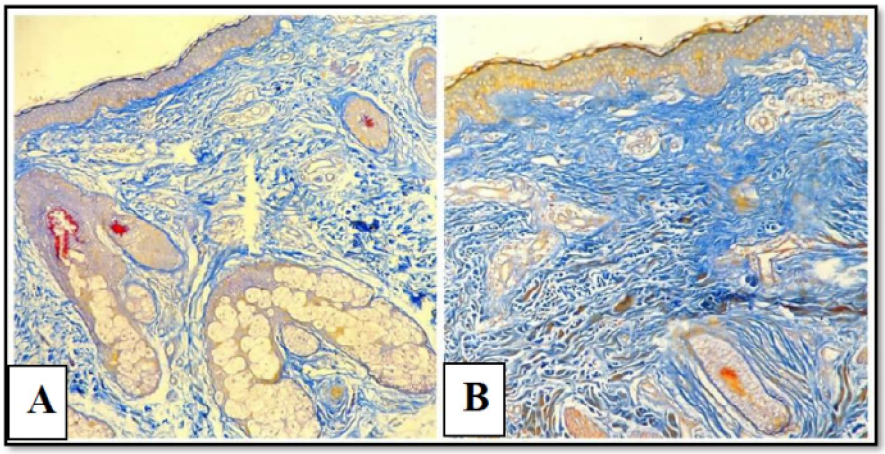

Fig. (2): Evaluation of dermal collagen
A: Before treatment showing disorganized widely separated collagen fibers
B: After treatment showing improvement of collagen fibers arrangement (Mallory Trichrome stain x100)

4. Discussion

Acne scars are common complications of acne lesions. Treatment options of atrophic acne scars include surgical excision, subcision, chemical peels, autologous fat transfer, dermal fillers, dermabrasion, microneedling, laser treatment, PRP and others[8].

Platelet rich plasma is an autologous concentrate of human platelets in a small volume of plasma, containing biologically active factors with high concentration of GFs and cytokines, responsible for haemostasis, synthesis of new connective tissue and revascularization[9]. It has been used as adjuvant therapy to CO2 laser, fractional Erbium laser and miconeedlig in treatment of atrophic acne scars[4, 10].

In the current study where patients were treated with intradermal PRP injection, 50% of patients showed fair improvement, 30% showed good improvement while only 20% showed poor improvement.

Platelet rich plasma may actively correct atrophic scarring through several mechanisms. The most important mechanism would be the release of GFs from platelets α granules, including PDGF, TGF, VEGF, IGF, FGF, ECGF and keratinocyte growth factor, as well as many cytokines, chemokines and resulting metabolites[11]. Because PRP is by definition platelet rich, it contains correspondingly high levels of these autologous GFs, which could serve in re-building the lost collagen and elastic fibers with improving the atrophic scars[12].

In addition to the numerous GFs in PRP, there are other reasons why PRP works to improve the skin. In a study by **Kakudo et al., 2008**[13] a dose-response relationship has been identified in vitro between platelet concentration and human adult mesenchymal stem cell proliferation, fibroblast proliferation and type I collagen production. That study found greater proliferation of stem cells when the skin was treated with PRP or PPP activated with calcium and thrombin than with non-activated PRP or PPP. In the current study, calcium chloride was used to activate PRP.

Conclusions

Platelet rich plasma is a safe and cheap method of treatment of post acne scars with minimal side effects and no downtime. It is suitable for patients with darker skin types and those who cannot have long recovery time as with other procedures. However, further studies on larger number of patients are recommended to evaluate the role of platelet rich plasma in the treatment of atrophic post acne scars.

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