Research Article

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A Pilot Study of Making New Skin and Appendages for Post Burn Scars through a Unique Cocktail of Platelet Rich Plasma, Ablative Pixel Erbium: Yag Laser and Micro Needling Radiofrequency

Suruchi Garg*, Ami Badheka and Sachi Singhal

Department of Dermatology, Aesthetic Surgery and Intervention Dermatology, Aura Skin Institute, Chandigarh, India

***Corresponding author**
Dr. Suruchi Garg, MD, Department of Dermatology, Aesthetic Surgery and Intervention Dermatology, Aura Skin Institute, Chandigarh, India, Tel: 9914253530; E-mail: gargsuruchi01@gmail.com.

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Abstract

Burn scars are one of the most resistant and disfiguring scars to be treated by cosmetic and plastic surgery. The challenge remains not only with the damaged top layer but also with singeing and ablation of underlying appendages, vessels, nerves and glandular tissues depending upon the depth and degree of burns.

***Aim:** To improve structural and cosmetic outcome of a burn scar with a cocktail of platelet rich plasma therapy, ablative Pixel Erbium: YAG laser and micro needling.*

***Methods:** Five patients of post burn scars were selected for a cocktail treatment of pixel Erbium: YAG laser(Alma lasers, Harmony Platform; 1300mj/p, 5 passes), micro needling radiofrequency (De age: 3mm depth at 35w output, 3 passes) and platelet rich plasma therapy (Two Renew cell kits containing total 27 ml of whole blood). Micro needling radiofrequency was done first followed by instillation of platelet rich plasma (.05ml at a gap of 0.5 cm) each through insulin syringe and ablative laser was done last of all under local anesthesia cream. The sessions were repeated every three weeks for total 3 sessions.*

***Results:** There were 2 males and 3 females with post burns scars and all 5 patients completed the study. The scars were assessed using the POSAS (Patient and Observer Scar Assessment Scale). All patients were assessed for the improvement in pigmentation, vascularity, relief in terms of skin texture, thickness, pliability in a scale of 0-10 and also for the appearance of hair follicles (yes/no). Maximum improvement of 3.8 points was noted in mean values of pigmentation, while thickness and vascularity showed a difference of 1.4 points each in the mean value. The values obtained in Patient Scar Assessment Scale based on the questionnaire are maximum improvement of 4.2 points was seen in mean values of Colour, while mean values of Pain showed improvement of 1.2 points. There was appearance of new hair follicles in 4 out of 5 patients.*

***Conclusion:** Platelet rich plasma cocktail can help in creating new skin by resurfacing old scarred skin, rejuvenating dermis and sub cutis, activating dormant hair follicles and forming new vessels and nerves by repairing damaged appendages.*

Introduction

Burn scars are one of the most resistant and disfiguring scars to be treated by cosmetic and plastic surgery. The challenge remains not only with the damaged top layer but also with singeing and ablation of underlying appendages, vessels, nerves and glandular tissues depending upon the depth and degree of burns [1]. Skin grafts provide good help in mechanical restoration of all these structures but often it ends up giving a stuck on appearance. Various lasers and combination treatments have been tried with varying success in past [2,3].

Aim

To improve structural and cosmetic outcome of a burn scar with a cocktail of platelet rich plasma therapy, ablative Pixel Erbium: YAG laser and micro needling radiofrequency (MNRF).

Methods

Five patients of post burn scars were selected for a cocktail treatment of pixel Erbium: YAG Laser(Alma lasers, Harmony Platform; 1300mj/p, 5 passes), micro needling radiofrequency (De age: 3mm depth at 35mj output, 3 passes) and platelet rich plasma therapy {(Two Renew cell kits containing total 27 ml of whole blood with 3 cc of ACD-A as anticoagulant, centrifuged at 3200RPM and 1350 RCG in Remi cold centrifuge at 8-10 Degree temperature , harvesting 5-6 ml of PRP with platelet concentration of 5 to 7 times the baseline value (Avg count:10 lac)} to be repeated every three weeks for minimum 3 sessions. Topical anesthesia cream EMLA was applied for half an hour prior to procedure. Micro needling radiofrequency was done first followed by instillation of platelet rich plasma (0.05ml at a gap of 0.5 cm through insulin syringe) and ablative laser was done last of all. Kenacort (40mg/ml) was

injected in first session before start of therapy in patients with thick hypertrophied bands. Patients were advised to apply topical antibiotic ointment (mupirocin) twice a day for three days and frequent application of bland moisturizer was advised along with sunscreen application three times a day untill next session.

Results

There were 2 males and 3 females with post burns scars and all 5 patients completed the study. The scars were assessed using the POSAS (Patient and Observer Scar Assessment Scale). All patients were assessed for the improvement in pigmentation, vascularity, relief in skin texture, thickness, pliability in a scale of 0-10 and also for the appearance of hair follicles (yes/no). Subjective assessment was done in terms of pain, pruritus, thickness, colour, and relief. Each patient was evaluated before start of the treatment and 1 month after completion of 3 sessions of combination treatment of pixel Erbium YAG laser, micro needling radiofrequency with PRP therapy. Evaluation was done objectively as well as subjectively through a questionnaire.

The values obtained in Observer Scar Assessment Scale before and after procedures are as shown in (Table 1). The mean pre procedure and post procedure value of each parameter for 5 patients was calculated and plotted on a line chart as shown in chart 1.

Table 1: Observer Scar Assessment Scale

Parameters assessed		Vascularity	Pigmentation	Thickness	Pliability	Surface area	Relief	Total
Subject 1	Pre procedure	5	9	5	7	9	6	41
	Post procedure	3	3	4	4	7	3	24
Subject 2	Pre procedure	4	8	5	6	7	8	38
	Post procedure	3	4	3	4	5	4	23
Subject 3	Pre procedure	2	5	6	4	8	5	30
	Post procedure	1	3	5	2	6	4	21
Subject 4	Pre procedure	3	8	4	6	8	6	35
	Post procedure	1	3	2	3	4	3	16
Subject 5	Pre procedure	2	5	3	4	6	4	24
	Post procedure	1	3	2	2	3	2	13
Mean	Pre procedure	3.2	7	4.6	5.4	7.6	5.8	33.6
	Pre procedure	1.8	3.2	3.2	3	5	3.2	19.4

Table 2: Patient Scar Assessment Scale

Parameters assessed		Pain	Pruritus	Thickness	Stiffness	Colour	Relief	Total
Subject 1	Pre procedure	4	6	5	7	9	7	38
	Post procedure	2	3	3	3	3	4	18
Subject 2	Pre procedure	3	5	5	6	8	5	32
	Post procedure	2	3	2	4	3	4	18
Subject 3	Pre procedure	7	7	6	7	6	5	38
	Post procedure	4	3	4	3	4	3	21
Subject 4	Pre procedure	4	4	5	6	8	7	34
	Post procedure	2	2	2	3	3	4	16
Subject 5	Pre procedure	2	5	3	4	5	4	23
	Post procedure	1	3	1	2	2	2	11
Mean	Pre procedure	4	5.4	4.8	6	7.2	5.6	33
	Post procedure	2.2	2.8	2.4	3	3	3.4	16.8

As depicted by the data, maximum improvement of 3.8 points was noted in mean values of pigmentation, while thickness and vascularity showed a difference of 1.4 points each in the mean value.

The values obtained in Patient Scar Assessment Scale based on the questionnaire are shown in Table 2. Mean pre procedure and post procedure values of each parameter were calculated for 5 patients and plotted on a line chart as shown in chart 2.

Chart 1: Mean pre procedure and post procedure values of Observer Scar Assessment Scale represented by a line chart.

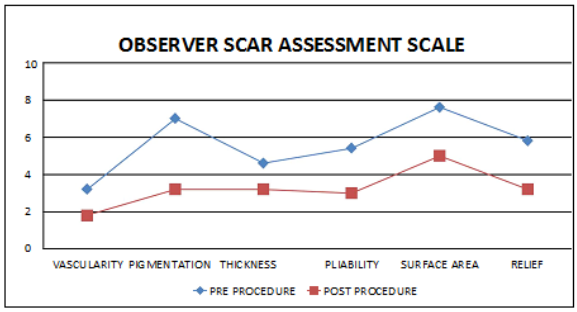
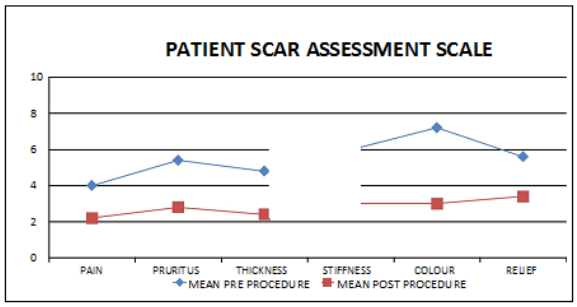


Chart 2: Mean pre procedure and post procedure values of Patient Scar Assessment Scale represented by a line chart.



As depicted by the above data, maximum improvement of 4.2 points was seen in mean values of Colour, while mean values of Pain showed improvement of 1.2 points. The results have been shown in (Figure1& 2).

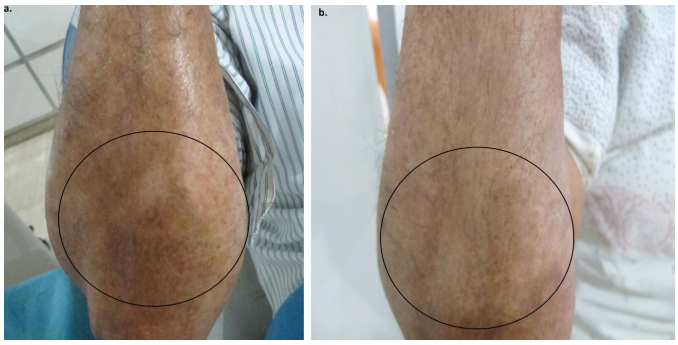


Figure1: Improvement in post burn scar (b) as compared to baseline(a)over dorsum of elbow after 3 sessions of PRP cocktail. Improvement in pigmentation, texture, vascularity and hair growth is appreciable in marked area.

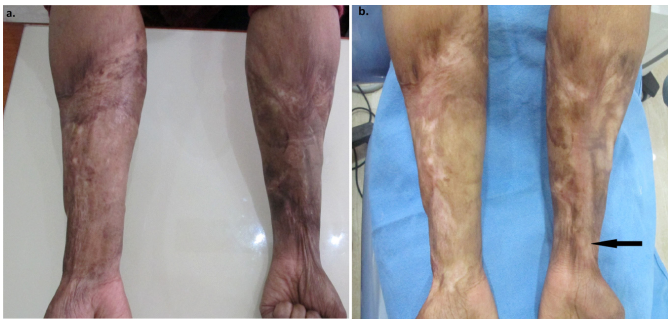


Figure 2: Improvement in forearms (b) compared with baseline (a) after 3 sessions of PRP cocktail. Improvement in contractures (black arrow), pigmentation, texture and vascularity is appreciable.

Four out of five patients (80%) noticed appearance of new hair follicles over treated area also established by histopathological image as shown in figure 3. Transient Post inflammatory hyper pigmentation was experienced by one patient after first session who improved completely in 3 weeks. She was found to be deficient in vitamin D and serum B12 levels which was corrected as per recommendations. No permanent side effects were noticed by any of these patients in 3 months follow up.

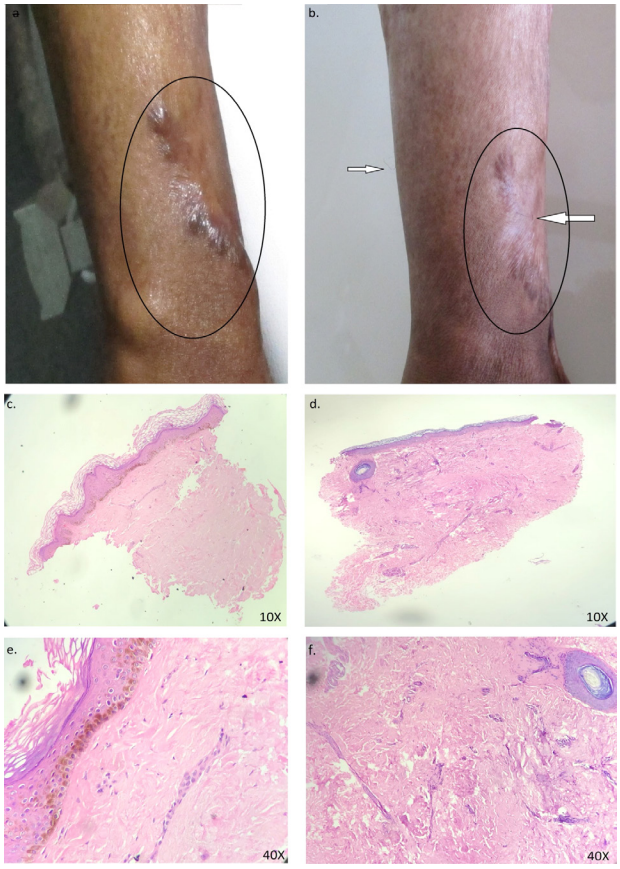


Figure 3: Improvement in keloid and hair growth (white arrow) in image (b) as compared to baseline (a). Histopathology images at (d-10x) and (f-40x) show appearance of hair follicle, increase in blood vessels and nerve twigs as compared to baseline images (c- 10x) and (e- 40 x) which look almost devoid of appendages. There is significant reduction in melanocytes at dermo-epidermal junction as compared to base line.

Discussion

Burn scars pose sufficient challenge to the treating surgeon and physician owing to the kind of damage it induces on the surface of skin and to a varying depth depending upon the depth of heat invasion [1]. The structural, functional and psychological impact of these burn scars can compromise the quality of life to a large extent [1].There are various treatments to improve the appearance of these scars through different modalities starting from split thickness skin grafts, radiotherapy treatments, ablative lasers (CO2 laser and Erbium YAG laser), non-ablative lasers(Erbium glass laser) and more recently micro needling and micro needling radiofrequency treatments with varying success rates [2-6]. Platelet rich plasma is gaining popularity in modern times for

different scar managements owing to instilling numerous growth factors and stimulating faster healing [7,8].

The concept of combining Pixel Erbium YAG laser and micro needling radiofrequency is to address the surface of scar and varying depths of scar simultaneously by providing surgically correct micro injuries which heal by skin resurfacing and collagen lay down, respectively. PRP therapy on the other hand is body's own healing elixir studded with millions of desired growth factors, leukotrienes and inflammatory mediators which help in combating these injuries faster and in more effective way, helping to restore normal skin and subcutis. The pathogenesis and wound healing in burn wound is different than normal wound in the sense that there is no haemorrhage and the blood vessels get singed and constricted [7]. The haemorrhage as it provides a skeletal framework for wound healing by attracting various cells like fibroblasts, monocytes, endothelial cells, leukocytes etc. is missing here and so is proper wound repair [7]. The platelet rich plasma helps in neovascularization and bringing in healing molecules and laying down collagen faster by more hydroxyproline recruitment. The key molecules which help in healing the scarred tissue are TGF1 (transforming growth factor1) and PDGF (platelet derived growth factor). These two growth factors work on collagen building, keratinocyte repair and rejuvenating the blood vessels. Interestingly PRP has practically growth factor for every cell and tissue present in skin and sub cutis. Besides PDGF, VEGF also helps in neovascularization, thus enhancing the overall nutrition and healing substances being carried to scar tissue. In our study we also created micro injuries in deep dermis and subcutis or fat layer through micro needling radiofrequency which helps in micro bleeds and recruiting more growth factors thus creating micro skeletal frameworks for wound repair.

Improvement in pigmentation is addressed by ablating the scarred and pigmented skin by pixel Erbium: YAG laser at relatively lower fluence. It helps in ablating and coagulating scarred tissue besides helping in repair and regeneration by photo enzymatic, photochemical and photodynamic stimulation [9]. On the other hand, pigmentation is also helped by normalizing keratinocyte – melanocyte milieu by presence of fibroblast growth factor or FGF in platelet rich plasma.

Platelet rich plasma also has nerve growth factors and neuroimmunophilin ligand which helps in nerve healing and regeneration and improving impaired sensations over previous scars [10]. This is also endorsed in our study by improvement in mean pain score by1.2 points. There is documentation of appearance of new follicles in burn scars which has not been reported earlier to the best of our knowledge. Platelet Rich Plasma is a store house of millions of growth factors, stem cell factors and leukotrienes, many of which work on hair follicle integrity and survival [11]. The damaged- dormant follicles in deficient vascular milieu following burn injury start getting regenerated with this cocktail treatment as is evident in figure 3.

Conclusion

In nutshell, it will not be an overstatement that platelet rich plasma cocktail can helps in creating new skin by resurfacing old scarred skin, rejuvenating deep dermis and sub cutis, activating dormant hair follicles and forming new vessels and nerves besides repairing damaged appendages. This treatment is based on the principle of regenerative medicine with planned laser and micro needling radiofrequency induced micro injuries and healed in right direction with the support of growth factors released by platelet rich plasma. Simultaneous protein based balanced diet and correction of underlying deficiencies help in faster healing of skin and subcutis [12].

The limitation of this study is that sample size is small and in future bigger comparative randomized controlled studies can be designed and executed.

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