

*Research Article***Evaluation of the effect of Plasma on Post Burn Scars****Abdou M. Darwish, Khaled M. Hassan and Ebtihal A. Shawky Zahran**

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**Abstract**

**Introduction:** The skin is the largest organ of the body that serves multiple functions essential to the survival of the body, which may be compromised by the presence of burn, including thermal regulation, prevention of fluid loss by evaporation, hermetic barrier against infection and Sensory receptors that provide information about the environment. **Aim of the work:** The aim of this prospective study was to evaluate the effect of platelet rich plasma application on different types post burn scars. The hypothesis of the study is the previous options of the treatment of burn scars are satisfactory, if we can prove that platelet rich plasma, with using micro needling treatment therapy add an advantage in this field, it will be addition to the previous treatments. This study was conducted to answer the following questions: If PRP effective in treatment of post burn scars?, Can PRP applied to all types of post burn scars?, Is there are any complications?. **Patients and Methods:** This prospective clinical study was performed at the Plastic surgery department, Minia University Hospital in the period from February 2016 to July 2017, patients were counseled and signed informed consents, skin punch biopsies and photographs were obtained from all participants in this study. Results: 1. Demographic Data of the Patients: Twenty patients were enrolled in this study, the twenty patients completed the whole treatment and follow up protocol. Twenty patients, including eighteen females (90%) and two males (10%). Their ages ranged between 5 and 35 years (mean  $16.7 \pm 10.8$ ). All patients skin photo types were II-IV. **Discussion:** Burn scars represent a major challenge. In addition to significant morbidity to the scars themselves, side effects and lengthy courses of many therapeutic modalities represents an additional burden to the patients (Brusselaers et al., 2010). Recommendations: Further controlled studies with larger number of patients regarding the number of sessions and interval between sessions are recommended to estbestablish efficacy of platelet rich plasma therapy for the treatment of post burn scars.

**Keywords:** Plasma, Burn Scars, thermal regulation**Introduction**

The skin is the largest organ of the body that serves multiple functions essential to the survival of the body, may be compromised by the presence of burn, including thermal regulation, prevention of fluid loss by evaporation, hermetic barrier against infection and sensory receptors that provide information about the environment (Church et al., 2006).

Burns are one of the most feared and misunderstood destructive form of injury severely endangering the life and health of human tissue caused by a thermal agent such as the sun, fire, heat, hot liquid, electricity, lightning, radiation or a chemical agent. Major burns are devastating and complex injuries from which it often takes years to recover. Advances in burn care have greatly increased survival rates; however, burn survivors are left scarred

after recovery and their appearance and often their physical functioning do not return to 'normal' and alter a person's appearance in many ways (JW, 2012).

Post burn scars are supposed to be a dermal fibrotic disorder where red, raised, pruritic lesions distort the skin burn scar are cosmetically disfiguring and force the scarred person to deal with an alteration in the body appearance, resulting in delayed return to work and reintegration into the society (Adil and Edward, 2009).

Despite advancements in burn care, scarring remains a significant clinical problem in burn injury.

Understanding the pathophysiology of post burn scarring and systemic responses to thermal injury has revealed new targets for further

therapeutic strategies such as Silicone gel therapy, pulsed dye laser and fractional CO<sub>2</sub> ablative laser (Edward et al., 2014).

Platelet-rich plasma (PRP) is a portion of the plasma fraction of autologous blood, having a platelet concentration above baseline values. PRP is made by centrifugation of whole blood (drawn from a peripheral vein and stored in sodium citrate anticoagulant), which separates the various components of blood by their specific weight and increases the concentration of platelets (Sommeling et al., 2013).

Platelet-rich plasma contains and releases through degranulation several different growth factors and other cytokines that stimulate healing process, used to accelerate recovery from injury. The basic rationale is to mimic the natural ways of healing, bringing to the injury site a set of molecules that will accelerate the functional recovery of the tissue and repair of damaged areas (Anitua et al., 2006).

Through continued advancements in burn surgery and scar treatments to improve patient outcomes after burn injury this study will evaluate the effect of PRP on post burn scarring.

### **Aim of work**

The aim of this prospective study was to evaluate the effect of platelet rich plasma application on different types post burn scars.

The hypothesis of the study is the previous of the treatment of burn scars are satisfactory, if was can prove that platelet rich plasma, with using microneedling treatment therapy add an advantage in this field, it will be an addition to the previous treatments.

This study was conducted to answer the following questions:

If PRP effective in treatment of post burn scars?

Can PRP applied to all types of post burn scars?

Is there are any complications?

### **Patients and Methods**

This prospective clinical study was performed at the plastic surgery department, Minia University Hospital in the period from February 2016 to July 2017, patients were counseled and signed informed consents, skin punch biopsies and photographs were obtained from all participants in this study.

The study included 20 patients with post-burn scars recruited from the Outpatient Clinic, plastic surgery department, Minia University.

#### **Inclusion criteria:**

Both males and females were enrolled.

Participants between 5 and 50 years of age with post burn scars.

The scars must have occurred at least 6 months prior to the date of enrollment

No previous interventions (as laser or intra-lesional steroids) and sustained scarring from deep second or third degree burns.

Able to understand provide written informed consent.

#### **Exclusion criteria:**

Keloid scars.

Areas of contractures.

Pregnant, intending to become pregnant during the course of the study.

Concurrent inflammatory skin conditions, active infection, or lesions suspicious for malignancy.

Having a bleeding disorder or taking anticoagulation medications, including heavy use of aspirin.

### **Results**

#### **I. Demographic data of the patients:**

Twenty patients were enrolled in this study; the twenty patients completed the whole treatment and follow up protocol. Twenty patients, including eighteen females (90%) and two males (10%). their ages ranged between 5 and 35 years (mean  $16.7 \pm 10.8$ ).

All patients skin photo types were II-IV (table).

**Table: demographic and clinical data of the patients.**

No.	Age (years)	Sex	Scar duration	Insult	site	Skin type	Previous interventions
1	27	f	1 year	flame	hand	III	-
2	35	F	10 years	scald	face	III	Topical therapies
3	10	F	4 years	scald	arm	III	-
4	30	F	8 months	scald	hand	IV	-
5	6	F	3 years	scald	face	III	Topical therapies
6	15	F	7 months	scald	hand	III	Topical therapies
7	32	M	20 years	scald	forearm	IV	-
8	25	F	12 years	flame	face	II	Topical therapies
9	12	F	8 years	scald	chest	II	-
10	9	F	2 years	scald	arm	II	Surgical release
11	6	F	3 years	scald	arm	III	-
12	23	F	15 years	scald	neck	II	-
13	5	F	2 years	scald	chest	II	Surgical release
14	10	F	4 years	scald	thigh	IV	Surgical release
15	7	F	3 years	flame	forearm	III	-
16	5	f	2 years	scald	forearm	III	Surgical release
17	6	M	3 years	scald	arm	IV	Surgical release
18	27	F	1 year	flame	hand	III	Surgical release
19	35	F	10 years	scald	forearm	III	-
20	9	F	2 years	scald	forearm	III	Surgical release

## Discussion

Burn scars represent a major challenge. In addition to significant morbidity to the scars themselves, side effects and lengthy courses of many therapeutic modalities represents an additional burden to the patients (brusselaers et al., 2010).

Patients with scarring after burn frequently help in improving the aesthetic appearance of their residual cicatricial deformity. Their scars are generally treated by tissue transfer, W- and Z-plasties, flaps, cortisone injections or ablative procedures that injure or destroy the epidermis and its basement membrane and subsequently lead to fibrosis of the papillary dermis. The ideal treatment would be to preserve the epidermis and promote normal collagen and elastin formation in the dermis (Aust et al., 2009).

Autologous platelet-rich plasma is plasma with a higher concentration of platelets than normally found, it can enhance wound healing, which has been demonstrated in controlled studies for soft and hard tissues (Carter et al., 2003). Platelet-rich plasma has been largely

used as a therapeutic option for the treatment of chronic wounds of different etiologies. The enhanced regeneration observed after the use of platelet-rich plasma has been systematically attributed to the growth factors that are present inside platelets' granule (Moroz and deffune, 2013).

The alpha-granules of the platelets release growth factors in response to platelet activation, and stimulate cell proliferation and cell differentiation for tissue regeneration. These growth factors have an important role in the regulation and proliferation of mesenchymal cells, including fibroblasts, and have been shown to induce synthesis of collagen and matrix components; thus, improvement of atrophic scars is expected (Rodriguez et al., 2005). So, this study aimed to evaluate the therapeutic efficacy and safety of autologous platelet-rich plasma, microneedling and combination of both procedures in the treatment of burn scars.

There are many studies that are performed a systematic search on PRP in the treatment of

burn wounds. A high variety exists in PRP products, procedures, and content. This makes interpretation and comparison of the evidence difficult.

Considerations on platelet-rich plasma in burns. Despite the paucity of the literature on PRP in burns, in theory, a deep dermal burn could benefit from PRP in several ways. First, hemostatic qualities of PRP could decrease perioperative blood loss, as well as improve the take rate of the skin grafts by decreasing continued bleeding, functioning as a fibrin glue, as well as providing a well-vascularized bed for the meshed skin graft. Furthermore, the positive effects of PRP on wound healing, as seen in reports on PRP in *in vitro* models, chronic, and acute wounds, could contribute to faster closure of mesh interstices, because PRP promotes vascular ingrowth and fibroblast proliferation, and possibly reepithelization (Carter et al., 2011).

### Recommendations

Further controlled studies with larger number of patients regarding the number of sessions and interval between sessions are recommended to establish the efficacy of platelet rich plasma therapy for the treatment of post burn scars. Studies investigating the density of different types of collagen following platelet rich plasma to be carried at 2 week, 2 months, and 6 months after treatment to monitor changes in different types of collagen with time.

Studies investigating the mechanism of action of platelet rich plasma on elastic fibers in burn scars.

Further histopathological and special stain studies to evaluate the effect of platelet-rich plasma on collagen growth are recommended.

Using another scar scales helps to overcome the patient and observer drawbacks of scars.

Further studies on comparison between the effect of platelet rich plasma and fractional CO<sub>2</sub> laser post burn scars were suggested.

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