

## Effect of Pressure Therapy on Severity of Post Burn Immature Scars Revisited: A Prospective Interventional Study

Saurabh Gupta, Ravi Kumar Chittoria\*, Abhinav Aggarwal, Chirra Likhitha Reddy, Padmalakshami Bharathi Mohan, Shijina K, Imran Pathan, Nishad K

Department of Plastic Surgery, Jawaharlal Institute of Postgraduate Education and Research (JIPMER), Puducherry, India.

Correspondence should be addressed to Ravi Kumar Chittoria, [drchittoria@yahoo.com](mailto:drchittoria@yahoo.com)

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### ABSTRACT

#### **BACKGROUND**

Immature scars is a major problem in post burn rehabilitation phase. Pressure therapy is claimed to be effective in treatment of these scars. We have conducted a clinical study to assess effect of pressure therapy on severity of these scars.

#### **METHOD**

This is a single institute prospective interventional study without a control arm. Post burn immature (vascular, raised, non-pliable or itchy) scars were included in the study. Outcome criteria was vancouver scar scale (VSS) score of scars. Intervention was pressure therapy in form of pressure garments and scar massage. Intervention period was 8 weeks. Paired t-test was applied for statistical analysis of the results.

#### **RESULT**

Total 41 scars in 14 male and 27 female subjects were included in the study. The mean age of patients was  $24.1 \pm 16.9$ . There was significant decrease in VSS score of scars after 8 weeks of pressure therapy. VSS score of scars decreased from  $7.4 \pm 1.8$  to  $7.1 \pm 2.0$ . Scar vascularity and pliability decreased significantly while decrease in scar height was not significant. Scar pigmentation remained unchanged.

#### **CONCLUSION**

Pressure therapy for post burn immature scar is effective in reducing severity of these scars. It reduces vascularity and height and improves pliability of these scars. It does not have any effect on scar pigmentation. Effect of pressure therapy on these scars becomes evident in 8 weeks of treatment, but it takes longer for scar height to decrease. It is important to ensure patient compliance with the pressure therapy.

#### **KEYWORDS**

Post burn immature scars; Pressure therapy; Vancouver scar scale

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## 1. INTRODUCTION

Burn is a major problem in low- and middle-income countries, with annual incidence of around 6-7 million per year in India [1]. During rehabilitation phase, a burn survivor has to deal with multiple post burn problems, scar being one of them. An immature scar is a red, sometimes itchy or painful and slightly elevated scar in the process of remodelling [2,3]. This is a major problem in the post burn patients. Post burn immature scars are reversible as well as preventable. Pressure therapy is the conventional treatment of post burn scars [2]. We have conducted a prospective interventional study to assess effect of pressure therapy on severity of post burn immature scars.

## 2. MATERIALS AND METHODS

This study was done in the Department of Plastic Surgery, at tertiary health centre in India. Sampling population was post burn patients coming to the plastic surgery outpatient department (OPD) of the institute. Subjects with post burn immature (vascular, raised, non-pliable or itchy) scars were included in the study. Exclusion criteria were subjects with acute burn wounds (<1month old), age >65 years, with diabetes/ radiation exposure, scars near eyes and subjects not willing to participate in the study. All subjects have not received any treatment for scars before this study.



**Figure 1:** Post burn immature scar before pressure therapy.

Outcome criteria was Vancouver scar scale (VSS) score of scars, which includes vascularity, pliability, height and pigmentation of the scar. Intervention was pressure

therapy in form of pressure garments for 23 hours and daily morning cleaning and scar massage.



**Figure 2:** Post burn immature scar after pressure therapy.

Scars characteristics were evaluated and VSS score recorded at the time of recruitment of subject in the study. Again, scars were evaluated after 8 weeks of intervention. (Figure 1 and Figure 2) Paired t-test was applied for statistical analysis of the results.

## 3. RESULTS

Total 41 scars were included in the study. The mean age of patients was  $24.1 \pm 16.9$  (range, 3-62 years). There were 14(34.1%) males and 27(65.9%) females, respectively. There was significant decrease in VSS score of scars after 8 weeks of pressure therapy. Scar vascularity and pliability decreased significantly while decrease in scar height was not significant. Scar pigmentation remained unchanged.

	Mean score	Std. Deviation		Pair difference	P value
Pigmentation (pre intervention)	2.122	0.78087	Pair 1	0	-
Pigmentation (post intervention)	2.122	0.78087			
Vascularity (pre intervention)	0.7805	0.82195	Pair 2	0.25929	0.012
Vascularity (post intervention)	0.6341	0.82934			
Pliability (pre intervention)	2.4878	0.67535	Pair 3	0.29097	0.007
Pliability (post intervention)	2.3171	0.81973			
Height (pre intervention)	2.0488	1.04765	Pair 4	0.07368	0.323
Height (post intervention)	2.0244	1.03653			
Vss score (pre intervention)	7.439	1.77551	Pair 5	0.57136	0.005
Vss score (post intervention)	7.0976	1.99756			

**Table 1:** Study findings and paired t test.

VSS score of scars decreased from  $7.4 \pm 1.8$  to  $7.1 \pm 2.0$ . The mean change in total VSS score of scars was 0.34 (P= 0.005). The mean change in scar vascularity score

was 0.14 ( $P = 0.012$ ). Mean change in scar pliability score was 0.17 ( $P = 0.007$ ). Mean change in scar height score was 0.024 ( $P = 0.323$ ).

#### **4. DISCUSSION**

Clinically accepted treatment protocol for post burn immature scar at present is pressure therapy. Pressure therapy has been used for treatment of post burn scars since nineteenth century and continuing till now in various forms [2]. Early clinical evidence was published by Silverstein and Larson in 1970s after which many clinical studies have shown benefit of pressure therapy on post burn immature scar [2]. Mechanism of pressure therapy is proposed to be blanching in the area where pressure is applied. Pressure causes decreased local blood flow and scar hypoxia which leads to decreased collagen production and establishes balance between collagen production and breakdown [4,5]. This balance makes the scar flatter and less vascular, pushing it towards maturity. The proposed mechanism of pressure therapy is based on clinical observation and yet to be proven by biological evidence.

Pressure therapy can be continuous or non-continuous. Continuous pressure therapy can be instituted through pressure garments, elastic bandages, inserts or conforming orthotics. Whereas scar massage and low stretch exercise are non-continuous modes of pressure therapy. To be clinically effective pressure garments are to be worn for 23 hours a day [2]. Scar massage can only be started once the scar is able to sustain shearing force without breakdown. In general pressure garments acts to reduce the scar height and make it less vascular, while scar massage and low stretch exercise make the scar more pliable and stretches it to avoid contracture development [2]. Scar massage also helps in reducing scar vascularity and itching in the scar [2]. Massage and exercise also help in joint mobilization.

Present study shows that with 8 weeks of pressure therapy there is a statistically significant decrease in VSS score of post burn immature scars. When looking at individual scar characteristics we found that pressure therapy leads to significant improvement in scar vascularity and pliability. The scar height does not reduce significantly, and scar pigmentation remains unchanged. Thus, present study shows that pressure garments and scar massage are effective in improving scar quality of post burn immature scars. Its effects are evident in 8 weeks of therapy. It makes scar less vascular and more pliable. But it does not have any effect of scar pigmentation. Also, the height of scar does not appear to improve with 8 weeks of conventional therapy. Present results are in accordance with other studies [2, 4-7]. Studies have shown that conventional scar therapy (pressure therapy) can prevent post burn immature scar from becoming more hypertrophic and rigid [2]. Previous clinical studies showed positive effect of pressure therapy on scar height also. Probably shorter duration of therapy is the reason for less improvement in scar height in Present study. At present, use of pressure therapy is the clinically accepted treatment protocol for post burn immature scars and it should be continued to use.

There are many problems associated with pressure therapy [8]. One major problem with pressure therapy (be it pressure garments, elastic bandages, inserts or orthotics) is the lack of adherence. Another problem is repeated scar breakdown, blistering and ulceration leading to discontinuation of the pressure therapy [2,8]. We also found problem of poor compliance with pressure therapy. Possible reason for it is discomfort in wearing pressure garments for long periods, especially for large scars. Some patient complained of excessive sweating and irritation in wearing garments for long time, but most of them found it comfortable. All subjects were able to perform their daily activities with pressure garments on. Customized pressure garments were more comfortable than ready-made ones. It is important to keep patients

motivated to wear the pressure garments through ongoing counselling on each follow up visit.

Present study showed that there is no effect of pressure therapy on scar pigmentation. We need to include treatment for hypo and hyper pigmentation in the post burn scar management. Superficial lasers targeting melanin in epidermis can be used for hyperpigmented scars. While Melanocyte transfer techniques can be used for hypopigmented scars.

Shortcomings of present study are that we did not consider categorization of scars based on location of scar, extent of original burn injury, previous operative wound management, and presence of skin graft over the scars. These may be confounding factors contributing to errors. Present study is a short-term study with 8 weeks of intervention period. Results may be different on long term follow up of the subjects.

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VSS is a validated tool for measurement of severity of post burn scars [9]. However, use of individual scar characteristics (vascularity, pliability, pigmentation and height) as outcome parameter has questionable validity. VSS is a clinical tool and its sensitivity is low for detecting subtle changes in scar.

## 5. CONCLUSION

Pressure therapy for post burn immature scar is effective in reducing VSS score of the scar. It reduces vascularity and height and improves pliability of these scars. It does not have any effect on scar pigmentation. Effect of pressure therapy on these scars becomes evident in 8 weeks of treatment, but it takes longer for scar height to decrease. It is important to ensure patient compliance with the pressure therapy.