Research Article

Study of the Efficacy of Pressure Garment Therapy for Scar Management in Burn Patients

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Abstract|

Purpose: Our study aim is to investigate the effectiveness of pressure garment therapy (PGT) on burn scar treatment.

Methods/design: This is randomized clinical trial (RCT) was conducted at Burn unit and Plastic reconstructive surgery department and burn follow-up Mayo hospital, Lahore. We used prospective study design and enrolled 45 patients who were received pressure garment therapy (PGT). Patients on regular follow-up were to be examined for the status of their scars vascularity, pliability, color, pigmentation and regression. The subjects were wear pressure garments with normal compression randomized to their affected sites. We used Vancouver scar scale to assess scar.

Results: Improvement in the range of motion (ROM) and decrease scar pliability, vascularity, color and pigmentation and decrease rate of scar formation.

Conclusion: Pressure garment therapy is effective in scar management .This study shows the significance of pressure garments, achieving good results in preventing and treating scars, significant increase range of motion (ROM) and good esthetic results.

Received |06-12-2018: **Accepted**|27-09-2019

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Keywords | Pressure garment therapy (PGT), compressive therapy, burn, scar HS hypertrophic scar.

Introduction

Burn injuries to the skin are painful and if not healed properly leads to serious issues like abnormal scarring, limited range of motion, chronic non healed wounds[1] Most common causes of burn are heat, electricity, chemicals and rare are cold and radiations.[2] Burns are classified into first 1st or superficial, 2nd degree or superficial partial thickness burn, third 3rd degree or deep partial thickness burn and fourth 4th degree or full thickness burn depend upon the area of skin (epidermis and dermis).[3]

Burn injury leads to long lasting physical, aesthetic, functional and psychological consequences. Major consequence after burn is formation of scar. Scars are natural way of wound healing and replacement of damaged skin. These scars consists of excessive dense fibrous tissue growing in all directions and elevated above the level of skin.[4]

Spontaneous epithelization in wounds and application of delayed grafting of skin results in complication of scar deformities and developing contractures. Shoulder, elbow and hand have greater effect on activity of daily living (ADL) and restricts patient's functional freedom. Hands are susceptible portion of

human body. Therefore deformity are very commonly formed with hand burn.[5]

Most important task for rehabilitation is scar prevention and treatment. Limited studies are available related to the prevention and treatment of hypertrophic scar.[6] There is no ideal and all-purpose method available for of scar control.[7]

Treatment of hypertrophic scar including several options of pressure therapy which includes wearing of soft elastic fabrics.[8] To control and prevent scar mechanical loading by applying pressure of between 5-15mmHg is routinely used.[9] Although specific references to treat HS scar with pressure goes as far as back as early 1800s and even as early as the 16th century.[10]

PGT has been useful three decades and accepted to effect maturation and Appearance of burn scar.[11] The exact optimal pressure required for the effected treatment has never been scientifically established, some authors have never benefits with 5-15mmHg, but 15mm Hg is accepted as effective.[12-14]This pressure inhibits production and realignment the collagen bundles.[15,16] However, there is evidence that high pressure exceeding 30-40mmHg caused discomfort, maceration and paresthesia.[12,14,17,18]

If pressure garment is worn for 20-23hrs in a day then better results are observed, it will inhibits abnormal scar tissue. Although exact mechanism is unknown.[19] It is assumed that the pressure garment restrict blood flow to scar surface and reorganize the collagen fiber to resemble that of normal skin.[20,21]

Methods

For the prophylaxis and treatment of scar in burn we apply the non-invasive method compressive treatment. This method was accompanied by application of silicon sheets, hydrating creams and lotion.

We used keywords like “Pressure garment therapy”, “Compressive therapy”, “Burn scar” on database search of PubMed central, Medline, EMBASE and Scopus. For references we used paper published in English in last 8 years.

2.1. Patients

A total no of 45 patients with burn and fresh scar in period of healing were examined for period of one year (March 2016-March2017). The age of patients varied between 5 and 55 years. Inclusion criteria included ages (5-55) years and burns of both upper and lower extremities, face and neck, both male and females and with burn surface area 2-40%. Total 45 patients included in study and 3 patients were lost to follow-up.

Vancouver burn scar assessment scale was used.[22] For purpose of data analysis, follow-ups was divided into six blocks of end of month after application of PG and follow-up period up to 6 months.

2.2. Garments:

PGT was started within 2 weeks of re-epithelization. A custom-fit pressure garment (fig 1) was fabricated and designed such that to apply pressure up to 15mmHg. Patients were instructed to wear garments for at least 20-22 hours in a day and removing only for bathing.

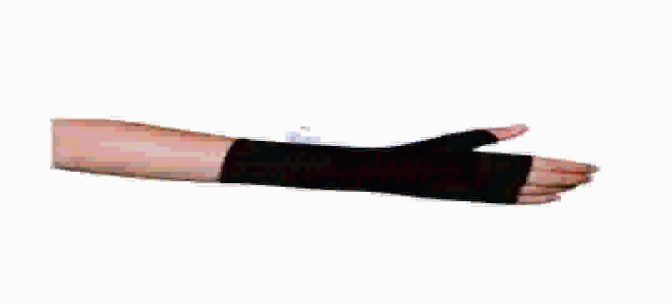


Figure 1- *An Example of the Garment*

2.3. Pressure:

In literature it is reported that there is effect of pressure garment in scar management.[23] In the literature it is stated that there is effect of low pressure tubular support in burn scar management.[24] These garments exerts pressure to healing scar with pressure between 15-20mmHg.[12,23] Researchers reported that 15mmHg pressure is necessary and above 40mmHg cause complications.

2.4. Vancouver Scar Scale

Vancouver scar scale used for checking pigmentation, pliability, vascularity and height of scar (Table 1). These assessment calculated by visual and manual analysis of scar.

Table 1: *Parameters and Scale for Vancouver Burn Scar Assessment*

Pigmentation(M)	
0	Normal-color that closely resembles the color over the rest of one's body
1	Hypopigmentation
2	Hyperpigmentation
Pliability(P)	
0	Normal
1	Supple-Flexible resistance
2	Yielding-giving way to pressure
3	Firm-inflexible, not easily moved; resistance to normal pressure
4	Banding-rope like tissue that blanches with extension of scar
5	Contracture-permanent shortening of scar, producing deformity or distortion
Vascularity(V)	
0	normal-color that closely resembles the color over the rest of one's body
1	pink
2	red
3	purple
Height(H)	
0	normal-flat
1	<2 mm
2	<5 mm
3	>5 mm

Results:

The patients were examined in an out-patient department. The assessment of the results of treatment was documented. The demographic characteristics of the study patients are included in table 2. The mean age was 9 years, 60% was male, 40% were female, and 71.1% cause of burn was flame. The results of Rehabilitation potential shoes that pressure garment therapy is effective in scar prevention after burn.

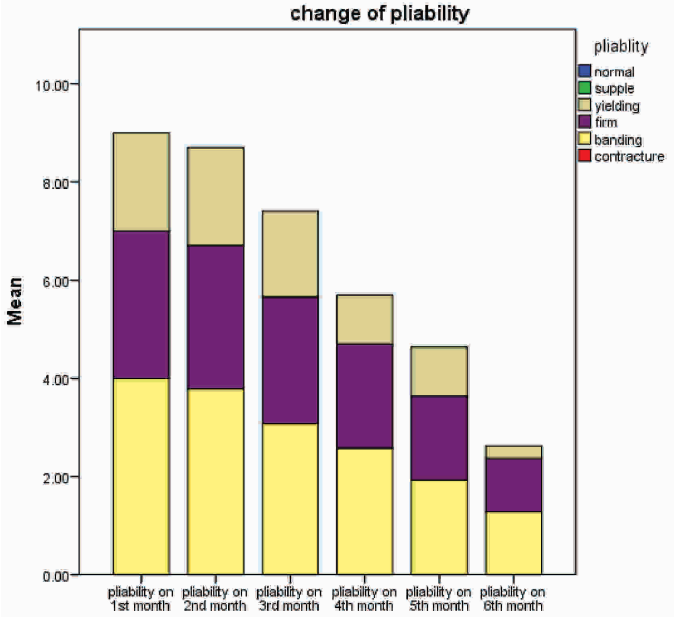
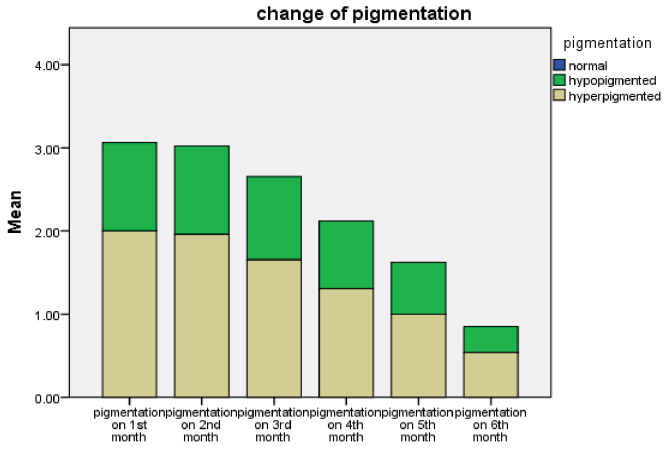
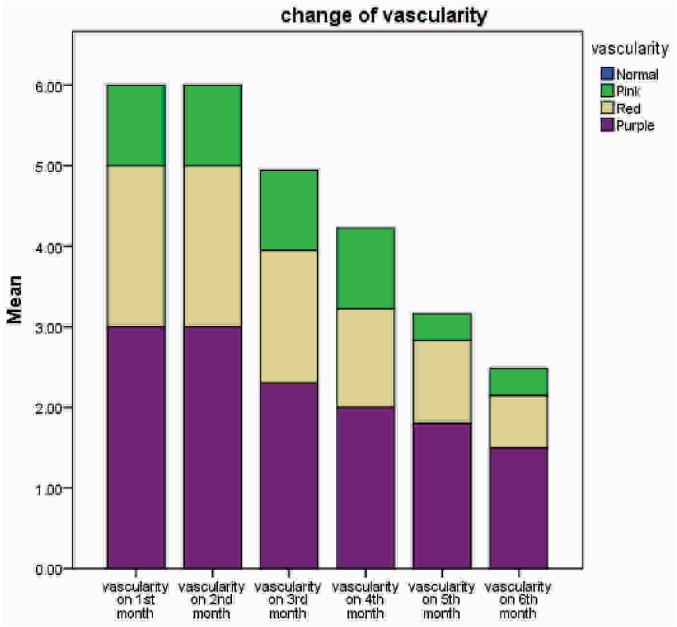
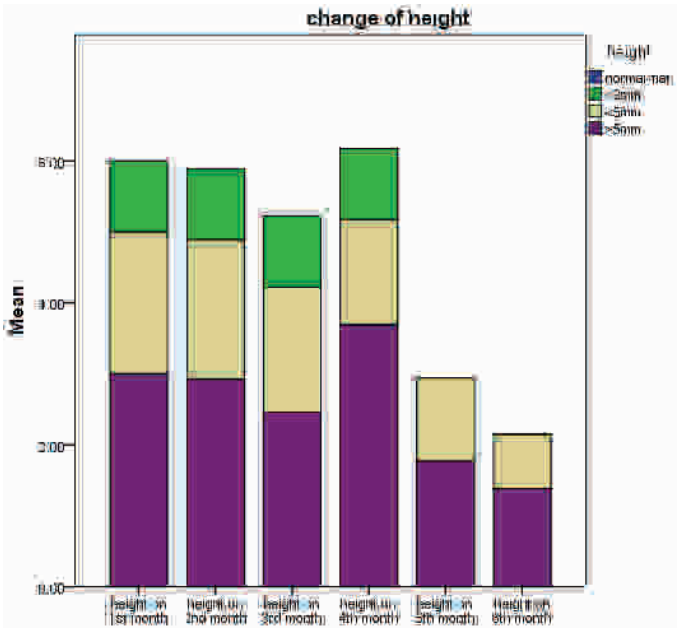


Table 2: *Demographic Characteristics of the Study*

Age(years)	
2-10	5
11-20	9
21-30	16
31-40	10
41-50	5
Gender	
Male	27(60%)
Female	18(40%)
Occupation	
Chef	2(4.4%)
House wife	8(17.8%)
No occupation	5(11.1%)
Student	5(11.1%)
Worker	25(55.6%)
Causes of burn	
Flame Burn	32(71.1%)
Electric Burn	9(20.0%)
Steam Burn	4(8.9%)
%age of Burn	
1-10%	18(40%)
11-20%	13(28.9%)
21-30%	10(22.2%)
31-40%	4(8.9%)
Degree of burn	
2nd degree	28(62.2%)
3rd degree	16(35.6%)
4th degree	1(2.2%)
Scar area	
Face and neck	12(26.7%)
Arm	6(13.3%)
Forearm	9(20%)
Wrist and hand	12(26.7%)
Leg	6(13.3%)
Hypertrophic scar	
Yes	28(62.2%)
No	17(37.8%)
Length of follow up(months)	
<6months	5(11.1%)
6-9months	18(40%)
12months	22(48.9%)
Rehabilitation potential results	
Excellent 80-90%	15(33.3%)
Good 60-80%	21(46.7%)
Poor 50-60%	9(20%)







The improvement in scar parameters during course of treatment were in our opinion satisfactory and we consider them a therapeutic success. Result analysis shows that parameters improved slowly during the course of treatment. Final results was non-pigmented, supple-flexible resistance, pink and <2 mm in height. If we use pressure therapy for more than 1 year then there will be more good results as compared to our research.

Discussion

The main purpose of this study was to see the effects of PGT on scar management in patients after burn injury.

Patients with Burn on thorax, abdomen and back area were not included in this study. Any disease associated with delayed healing, Allergy to garments, Medications cause delay wound healing and Other dermatological causes of scar formation also not included in this study. Consent form also taken from patients and included in this study.

Pre Vancouver scar scale value is 8.88±1.30 and post VSS value is 5.66±.1.05.Paired sample test shows significant values are:

Vancouver scar scale(parameters)	1st month value	6th month value
Pigmentation	1.642±.484	.452±.503
Pliability	3.238±.617	1.071±.676
Vascularity	2.159±.525	.818±.691
Height	2.250±.533	.909±.709

The results of study showed that pressure garments is more effective in scar management and prevention. The results of study showed that flame burns were the most common cause of burns. In literature 2002 concluded that pressure garments has effect on scar treatment.[25] Recent evidence tells that PGT is important for scar treatment.[26]

Scar is the common complication in burn patients that cause decrease functional movement and aesthetic impairments[27]. Scar appearance changes are slow so PGT requires patience[28]. There are various complications of pressure garments according to many studies such as pain, itching, blistering, increase transpiration ,ulceration ,emotional stress, shame and embarrassment to wear visible garments.[10]

To examine the effectiveness, risks and costs of PGT required additional research. It was first popularized at The Shiners Galveston Burn Hospital, PGT for hypertrophic scar was used.[26] PGT has been used for several decades for scar treatment and management. Its clinical effectiveness has never been scientifically proven and how pressure can be obtained for scar management remains a key concern in PGT. With pressure dressings the burned limb is hold in proper position and posture and also put direst pressure on wound, pressing the tissue in opposite way a contracture is likely to occur.[29]

It is important to inform the patients all about skin anatomy and burn injuries physiology. Also explain the details of garments, their properties, complications and effectiveness. 15mm Hg pressure is effective in compression garments in scar healing and

prevention.

Conclusion

It is concluded from the study that Pressure garment therapy in burn patients is a significant treatment outcome when measured by Vancouver scar scale to calculate the pre and post treatment and compare them. The results of study showed that flame burns were the most common cause of burns.

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