



ORIGINAL ARTICLE

Outcomes of partial thickness skin graft donor site scar in patients treated with standard therapy versus massage therapy.

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ABSTRACT... Objective: To compare the donor site scar outcomes of partial thickness skin graft in patients treated with standard therapy versus massage therapy. **Study Design:** Randomized Controlled study. **Setting:** Burns and plastic surgery center, Peshawar. **Period:** 15th January 2025 15 July 2025. **Methods:** A randomized controlled study was conducted on 60 patients in Burns and plastic surgery center, Peshawar over a period of 6 months. They were divided into two groups with 30 patients in each; Group A patients were treated with petroleum jelly only and Group B patients received massage therapy that is friction therapy for 30 minutes. Scar outcome was assessed using Vancouver Scar Scale (VSS) at 12 weeks post operative time. **Results:** Both groups showed improvement in scar parameter. Group B showed significantly better VSS scores (1.9 ± 1.06) than Group A (4.3 ± 1.12), $p < 0.001$. Pliability of scar improved more in Group B followed by height of scar. Vascularity is improved moderately and Pigmentation differences were minimal between groups. **Conclusion:** Massage therapy improves partial thickness skin graft donor site scar outcomes in terms of scar pliability and height and it can be helpful adjunct in postoperative period. Patient education about treatment, their compliance largely affects the treatment outcome.

Key words: Donor Site, Massage Therapy, Partial Thickness Skin Graft, Petroleum Jelly Alone, Scar Outcome, Vancouver Scar Scale.

INTRODUCTION

Skin grafting is the most frequently performed procedure in plastic and reconstructive surgery. It is mostly used for management of wide range of defects including burns, traumatic wounds, chronic wounds or ulcer and for surgical tumor excision defects. Skin grafts are classified into two main types: full thickness skin graft and partial thickness skin graft. Among these types, the partial thickness skin grafts are preferred for many cases due to their ease of harvest, greater availability of donor sites, minimal donor site morbidity and short operative time.¹ Despite these advantages of the donor site from which skin graft is harvested is vulnerable to develop significant post operative challenges.

Common complications of the donor site of partial thickness skin graft include postoperative pain, delayed wound healing, infections, scarring

and contracture specifically over joints.¹ These complications have a significant impact on the overall treatment outcome. It may not only be cosmetically challenging but it also impairs function, cause discomfort, itching and reduce patient satisfaction.² Visible donor site scarring can also lead to significant psychological distress in patients.² Several studies have documented the psychological distress over visible donor site scars emphasizing the need for preventive scar management protocols.³

Hypertrophic scarring remains a significant concern as it is affecting the aesthetic outcome and patient satisfaction and is also causing functional deformity. Scar management has therefore become an essential component of postoperative care. Standard approach for prevention of donor site scar includes occlusive dressings, silicone sheets, pressure garments,

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topical antimicrobial, and emollients such as petroleum jelly. They are all aimed to promote re-epithelialization and minimize the risk of scar formation.⁵ Despite these measures, studies have shown that hypertrophic and pigmented scars persist in up to 30% of patients, particularly among those with darker skin types and younger individuals.^{5,6}

Recently, massage therapy has emerged as a potential noninvasive intervention that aims to enhance collagen remodeling, fibroblast activity, reduce fibrosis and improving blood flow suggesting its efficacy in increasing vascularity and scar pliability and decreasing pigmentation and scar thickness, thus improving the overall appearance of scars^{4,5,6}. The application of massage therapy in the treatment of post-traumatic scar and surgical scar has already shown promising results in many studies. Cho et al⁴ and Lubczyńska et al⁶ have demonstrated significant improvements in burn and surgical scars through massage therapy following structured massage therapy.

A systematic review by Ault et al. found that scar thickness, vascularity, pliability, itching and discomfort were improved by massage therapy among hypertrophic burn scars.⁷ Their meta-analysis concluded that more than 80% patients experienced clinically significant improvement, although methodological diversity among studies was noted. Similarly, Lin et al. in their 2022 meta-analysis confirmed that massage significantly improved scar thickness and pain.⁸ Another study by Shin & Bordeaux highlighted consistent improvements in scar aesthetic and tactile qualities among surgical and traumatic scars that are treated with massage therapy.⁹ Nedelec et al. Conducted randomized control trial on adult post burn scars and found that massage improved short term improvements in scar pliability, skin elasticity although long term benefits were less consistent.¹⁰ These findings support the effect of mechanical force in enhancing scar maturation.

At a cellular level, scar formation involves complex interplay of cells, proteins and signaling pathways that are primarily driven by fibroblasts

and myofibroblasts. These cells lead to deposition of collagen types I and III under the influence of cytokines like TGF- β 1. Persistent activation of these pathways under conditions such as chronic inflammation or mechanical stress contributes to hypertrophic scar development.¹¹ Studies shows that modulation of TGF- β 1 signaling will result in myofibroblast apoptosis and in turn leads to ECM remodeling.¹²

Mechanical stimulation such as massage therapy activates the mechano transduction pathways that leads to fibroblasts alignment and collagen fibers organization. Studies show that by applying moderate mechanical force, the collagen fibers are arranged parallel instead of disorganized and there is decrease in scar elevation, that were the hallmarks of hypertrophic scars.¹³ Early deposition and alignment of collagen fibrils can cause fibroblast differentiation via mechanotransduction that may promote collagen remodeling and result in more elastic, less visible and flat scars.¹⁴

Other research study shows that mechanical pressure increases MMP-9 and MMP-12 expression and decreases collagen I expression in hypertrophic scar fibroblasts, a mechanism that also explains the beneficial effects of massage or pressure therapy in promoting ECM remodeling.¹⁵

Despite this strong body of evidence, there is very little data from Pakistan on how effective massage therapy is, massage for partial thickness skin graft donor sites. Certain challenges limit the implementation like lack of training, limited therapist availability, poor awareness and cultural hesitations. No large local trials have evaluated massage therapy specifically for partial thickness skin graft donor sites leaving a gap in evidence for local practice.

This study was designed to conduct a randomized control trial that compares standard donor site care that is petroleum jelly application to massage therapy using the Vancouver Scar Scale¹⁶, a validated tool for assessment of scar including height, vascularity, pliability, and pigmentation. the goal is to create robust local data that can improve postoperative care

protocols and enhance recovery outcomes after partial thickness skin graft in our population.

OBJECTIVE

The primary objective of this study was to compare the donor site scar outcomes of standard therapy versus massage therapy in patients undergoing partial thickness skin grafting by applying the Vancouver Scar Scale (VSS).¹⁶

METHODS

A randomized controlled trial was conducted at the Burns and Plastic Surgery Center Peshawar, over a time period of six months from Jan 2025 to July 2025. The study was approved by institutional ethics committee (No. 2189 Dated: 22-10-24). (Sixty patients aged 18–60 years, who underwent partial thickness skin grafting and met the inclusion criteria were enrolled and allocated to two groups via block randomization, the group A who received standard therapy that is application of petroleum jelly and group B who received massage therapy that is friction massage using fingertip pressure for 30 minutes daily.

Patients with commodities like diabetes, cardiovascular disease or any connective tissue disorders and those with scars older than two months were excluded from the study.

The primary outcome was assessed using the VSS evaluating scar vascularity, pigmentation, pliability, and height at 12 weeks post treatment. Data was analyzed using SPSS v16, with independent t-tests applied to compare group means, considering $p \leq 0.05$ as significant.

RESULTS

A total of 60 patients completed the study with 30 patients in each group, Group A received standard therapy and Group B received massage therapy. Both treatment groups showed improvements in scar characteristics over 12 weeks. However, those who received massage therapy showed significantly better VSS scores than the those who were only treated with petroleum jelly. The mean total VSS score in Group B was significantly lower i.e. 1.9 ± 1.06 compared to Group A 4.3 ± 1.12 statistically significant difference with a $p <$

0.001 which indicates better scar outcome with massage therapy as shown in Figure-1.

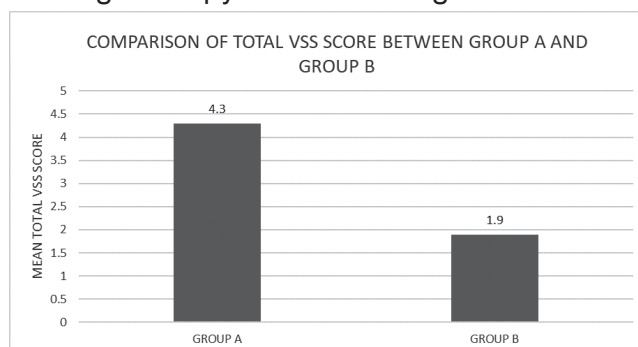


Figure-1. Graphical representation comparing mean VSS sub-scores between Group A and Group B, showing statistically significant improvements in pliability and height.

Pliability of scar showed more pronounced difference in those patients who received massage therapy, the scar height and its vascularity were also improved more in Group B patients, whereas pigmentation scores were almost similar in both groups having minimal clinical difference.

On comparing the sub scores of VSS between the groups as shown in Table-I Most prominent improvement was seen in pliability. Group A patients scored 2.37 ± 0.89 whereas Group B scoring 0.67 ± 0.76 . This reflects a marked reduction in scar stiffness with massage therapy. Similar findings were reported by studies of Shin & Bordeaux and Nedelec et al. where massage significantly improved pliability and elasticity of post burn scars.^{9,10}

	Group A (Mean $\pm$ SD)	Group B (Mean $\pm$ SD)
Vascularity	0.4 ± 0.50	0.27 ± 0.45
Pigmentation	0.67 ± 0.76	0.63 ± 0.67
Plaibility	2.37 ± 0.89	0.67 ± 0.76
Height	0.87 ± 0.78	0.33 ± 0.71

Table-I presents the mean $\pm$ SD of total and sub-parameter VSS scores for both groups. Clearly demonstrates superiority of massage therapy across most parameters.

Scar height was also lower in Group B that is 0.33 ± 0.71 compared to Group A showing 0.87 ± 0.78 shows flattening of scar in patients who received massage therapy. These findings

are consistent with clinical trials done by Cho et al. (2014), which showed reduced scar thickness following consistent massage therapy.⁴

Patients in the Group B showed slightly lower vascularity scores i.e. 0.27 ± 0.45 than the Group A i.e. 0.40 ± 0.50 which was not statistically significant. This shows a mild decrease in redness and visible capillaries. Similar findings were observed in studies by Cho et al. and Ault et al where vascularity improved mildly with massage therapy.^{4,7}

There was no significant difference in scar pigmentation between both groups.

Group A: 0.67 ± 0.76

Group B: 0.63 ± 0.67

This suggests that massage therapy may have minimal effect on pigmentation this finding aligns with cho et al study who also reported variable outcomes in pigment improvement across different populations.⁴

These individual parameter comparisons reinforce the overall observation that massage therapy improves donor site scar characteristics, specifically in terms of pliability and scar height, moderate benefits in vascularity while having less impact on scar pigmentation.

Two patients one in each treatment group were found to be non-compliant with post operative care. Both patients demonstrated significantly elevated VSS scores compared to the group. Despite being in different treatment groups both patients showed poor scar outcomes having scores above the group means. These cases suggest that noncompliance leads to poor scar outcomes, regardless of the treatment type. They also highlight that the benefits of both massage therapy and standard therapy rely heavily on patient consistency. Even simple interventions like petroleum jelly require consistent application for optimal scar healing. This finding highlights the importance of patient education and adherence to post operative care protocols, regardless of the treatment option.

DISCUSSION

The findings of this study showed that patients treated with massage therapy had significant improvement in donor site scar outcome compared to those treated with standard therapy that is only application of petroleum jelly. This supports the hypothesis that massage therapy provides better donor site scar outcomes compared to standard petroleum jelly application alone. On assessment at 12 weeks using the Vancouver Scar Scale Group B showed lower mean scores in all parameters including vascularity, pigmentation, pliability, and height that indicated an improved cosmetic and functional result.

These findings of our study are in concordance with studies done by Cho et al. (2014), which showed that massage therapy had significantly decreased scar thickness and improved vascularity in burn patients.⁴ Our study also supports the hypothesis that mechanical stimulation through massage may positively affect scar remodeling and studies of scar tissue confirm that mechanical forces can enhance collagen orientation.¹³

Ault et al.'s study also aligns with our findings and shows that scar characteristics improves in over 80% of patients undergoing manual scar therapy.⁷ Similarly, Lin et al. in their study confirmed the effectiveness of massage in reducing scar height and pain scores.⁸ Our study adds to the limited literature on massage therapy particularly in STSG donor sites.

The cellular mechanism of massage therapy lies in its modulation of cellular activity. The pressure of massage therapy to the scarred tissue helps to promote collagen fibers reorganization, reduces signals like TGF- β 1 that is responsible for excessive scarring.¹² It also activates the enzymes like matrix metalloproteinases that degrade excessive extracellular matrix proteins.¹⁵ These mechanisms explain the consistent improvements that we have seen in scar pliability and height in our patient sample.

In our study scar vascularity scores also showed statistical differences in favor of massage therapy. This suggests that massage not only influences collagen deposition but may also have effects

capillary architecture within healing tissue.

An important finding of our study is that pigmentation scores remained similar between both groups which suggests that massage therapy may have limited impact on pigment alteration at least in this 12-week period. These findings are consistent with Cho et al. And Baryza & Baryza who has noted variable effects on pigmentation depending on individuals and skin types.^{4,16} These outcomes are relevant in populations with darker skin tones where pigment alteration is a common concern.

An interesting finding in our study was the presence of two non-compliant patients, one in each group, who had significantly elevated VSS scores. While Group B generally showed better scar outcomes, the non-compliant patient in this group had a VSS score comparable to poor outcomes seen in Group A. This finding reinforces the potential benefits of both treatments. The Group A patient's scar worsened without regular petroleum jelly application, while the Group B patient failed to benefit from massage therapy due to irregular sessions. Thus, both methods are clinically meaningful when applied consistently, a message which is also showed in literature by Cho et al. and Nedelec et al.^{4,10}

This outcome showed that treatment efficacy is closely related to consistency. This supports the idea that even evidence-based interventions can underperform if patients do not comply with post operative care. This observation emphasizes that patient commitment is importance in order to achieve optimal results from massage therapy. Similar conclusions are shown in study by Cho et al.⁴, where consistent participation in massage sessions directly correlated with improved VSS scores.

Non-compliance worsely affects the therapeutic outcome even when evidence-based treatments are used. Therefore, future protocols in these patients should include strong follow-up and patient counselling and education about compliance.

While our study showed the importance of

massage therapy there are few limitations that should be acknowledged. First our sample size was statistically powered but it was relatively small and included patients only from one center. Second our study outcome was dependent on patient compliance with the massage therapy although they were monitored closely but may have introduced variability in outcomes. Third the follow-up duration of 12 weeks was shorter and it may not have included long term changes in scar characteristics although it was sufficient for early scar maturation.

Future research should aim to validate these findings in large and multicentric trials and with a larger period of follow up to evaluate massage therapy benefits. Studies should be done that compares different massage techniques or combining massage therapy with other interventions like silicone therapy. Methods that assess tissue flexibility and firmness could provide a more objective measure of scar pliability. A study on patient satisfaction and quality of life outcomes would offer a more comprehensive understanding and importance of massage therapy.

In conclusion, our study supports massage therapy because it is simple, cost-effective and non-invasive method to improve donor site scar outcomes after STSG. Including massage therapy as an adjunct into routine postoperative care could significantly enhance aesthetic and functional recovery in patients undergoing skin grafting procedures. Due its simplicity, affordability and non-invasive nature, massage therapy can be considered an effective adjunct to standard donor site care in patients undergoing partial thickness skin grafting particularly in resource-limited settings.

LIMITATIONS

Small sample size.

Single center design

Short follow-up period (12 weeks) that does not include long-term scar maturation

Subjectivity of VSS scoring despite using a standardized scale

FUTURE DIRECTIONS

Larger multicenter studies with longer follow-up periods to assess long-term outcomes

Objective measurement tools such as noninvasive imaging and tissue flexibility assessment tools.

Comparative studies evaluating other physical modalities (e.g., silicone sheets, laser therapy) with massage

CONCLUSION

Massage therapy significantly improves donor site scar outcomes in partial thickness skin graft patients compared to standard care in terms of pliability, scar height and overall VSS. Pigmentation showed minimal change and vascularity is affected slightly. Including massage therapy into post-graft treatment protocols may enhance patient satisfaction and functional outcomes. Results support the effectiveness of massage as a noninvasive, low-cost therapy. Treatment success is very closely related to compliance of patient with treatment showing the importance of patient education and follow up.

Ethical Approval

This study was approved by the Ethical Review Board of Hayatabad Medical Complex, Peshawar with Article approval No. 2189.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

1	Urooj Shah: Data collection, manuscript writing.
2	Mansoor Khan: Design.
3	Mian Fazle Khuda: Analysis.
4	Waqas Hayat: Interpretation.