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Efficacy of Kinesio Tape and Myofascial Release on Scar Post Skin Graft

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ABSTRACT

Background: Scar post skin graft is common and affects psychosocial and overall quality of life (QOL) of individuals. The development of hypertrophic scars (HTS) following burns continues to be a significant concern for individuals who have been burned. Kinesio taping (KT) as well as myofascial release (MFR) demonstrated efficacy in enhancing the appearance in addition pliability of the scar but no studies were found to evaluate their effects on improving scar characteristics post skin graft.

Objective: To evaluate the therapeutic effects of kinesio tape, myofascial release and combined effect of them on scars post skin graft

Methods: Forty-five patients who had scars from skin grafts were chosen from El-Qasr Al Ainy hospital then divided into three groups of equal size using random allocation.

They were between the ages of 20 and 45. Group A (KT group) got KT in addition to traditional physiotherapy (Deep friction massage as well as stretching exercises) for six weeks. Group B (MFR group) got MFR in addition to traditional physiotherapy (Deep friction massage and stretching exercises) for six weeks. Group C (KT and MFR group) received KT and MFR in addition to traditional physiotherapy (Deep friction massage and stretching exercise) for six weeks.

Outcome measures: They were assessed with Modified Vancouver burn Scar assessment Scale (MVSS), A Schiotz tonometer device for scar characteristics and pliability, prior to and following six weeks of treatment.

Results: Post-treatment, all three groups showed a substantial improvement in MVSS as well as scar pliability compared to their pre-treatment condition ($p < 0.001$). The percent of change in (MVSS) in group A, B and C was 16.76, 31.02 and 58.72% respectively. The percent of change in scar pliability in group A, B and C was 18.32, 43.34 and 57.83% respectively. Group C demonstrated a substantial improvement in MVSS as well as scar pliability compared to both group A ($p < 0.001$) and group B ($p < 0.05$).

Conclusion: Using combined effect of kinesio tape and myofascial release is better in improving scar characteristics post skin graft

Keywords: Myofascial release, Kinesio tape, Modified Vancouver Scar Scale, Schiotz tonometer, scar and skin graft.

Introduction

A skin graft is a piece of skin that is completely detached from any vascular and nerve connections in order to survive¹. When more conventional, non-invasive approaches fail, skin grafting has traditionally been the treatment of choice for wound closure².

The process of wound healing ultimately leads to the formation of scars, which has developed to repair injuries³. Scars are the replacement of fibroblasts for normal skin tissue and are healed by resolution rather than regeneration⁴. Scarring can cause psychiatric and emotional disturbances⁵. Patients must receive proper scar management in order to cope with these outcomes⁶.

Kinesio tape (KT), with the aim of improving skin mobility, provide afferent feedback and show evidence of scar remodeling⁷. KT has physical properties that improve the skin's self-healing ability, thus it may help avoid the need for HTS surgery. It makes use of the particular application techniques and physical qualities of the elastic therapeutic tape⁸. KT is an elastic adhesive tape in a variety of colors and patterns that is applied directly to the skin and designed to simulate skin elasticity⁹.

Myofascial release (MFR) is a kind of manual therapy that aims to restore the fascia to its optimal length, alleviate pain, and enhance its functionality through the application of a low load long duration stretch¹⁰.

There are no studies that investigate the therapeutic effects of (KT), (MFR) and combined effect of them in patients with scar post skin graft based on researchers' knowledge. So, this study investigated the therapeutic effects of KT as well as MFR Regarding the scar after a skin graft procedure.

SUBJECT AND METHODS

Study design

Type of design: Randomized controlled study.

Period of study: This study was performed at Qasr Al Ainy hospital from June 2023 to Mar 2024.

Sample size and randomization

In order to prevent type II error, the sample size was calculated via G*POWER statistical software (version 3.1.9.2; Franz Faul, Universitat Kiel, Germany). The results showed that N=45 was the needed sample size for this investigation, since there was expected to be a considerable difference between the three groups. A power of 95%, an effect size of 0.4, and $\alpha=0.05$ were used in the calculation.

The randomization process was performed using a computer-generated randomized table utilizing the SPSS application "version 25 for windows; SPSS Inc., Chicago, Illinois, USA". Each participant was assigned a unique identification number, which was then used to divide them into three groups of similar size (n=45). The participants were assigned sequentially numbered index cards, which were placed inside opaque envelopes. The researcher unsealed the envelope and assigned the individuals to their respective groups.

The 45 patients, who ranged in age from 20 to 45 years, were divided into three equal groups at random (15 per group) A, B and C. Group A underwent KT. Group B underwent MFR. Group C (KT and MFR). All groups underwent traditional physiotherapy. Treatment lasted for six weeks, three sessions weekly.

Inclusive criteria included: The patient's age was varied from twenty to forty-five years, all patients exhibited no other pathological problems except scar post skin graft, patients were selected from both sexes (26 males and 19 females) and all patients had scars post

skin graft. The exclusion criteria for this study were individuals with open wounds at or near the treatment site, deep venous thrombosis, substantial health problems including diabetes or circulatory disorders, a previous diagnosis of skin cancer in the treated area, and uncooperative patients.

Fig.1 illustrates the flow chart of individuals recruitment through the study. Fifty-two subjects were examined for eligibility. seven were discarded (four participants didn't meet the inclusion criteria and three individuals declined to take part in the research). Forty-five people were randomly assigned to one of the three groups.

Diagram of flow chart

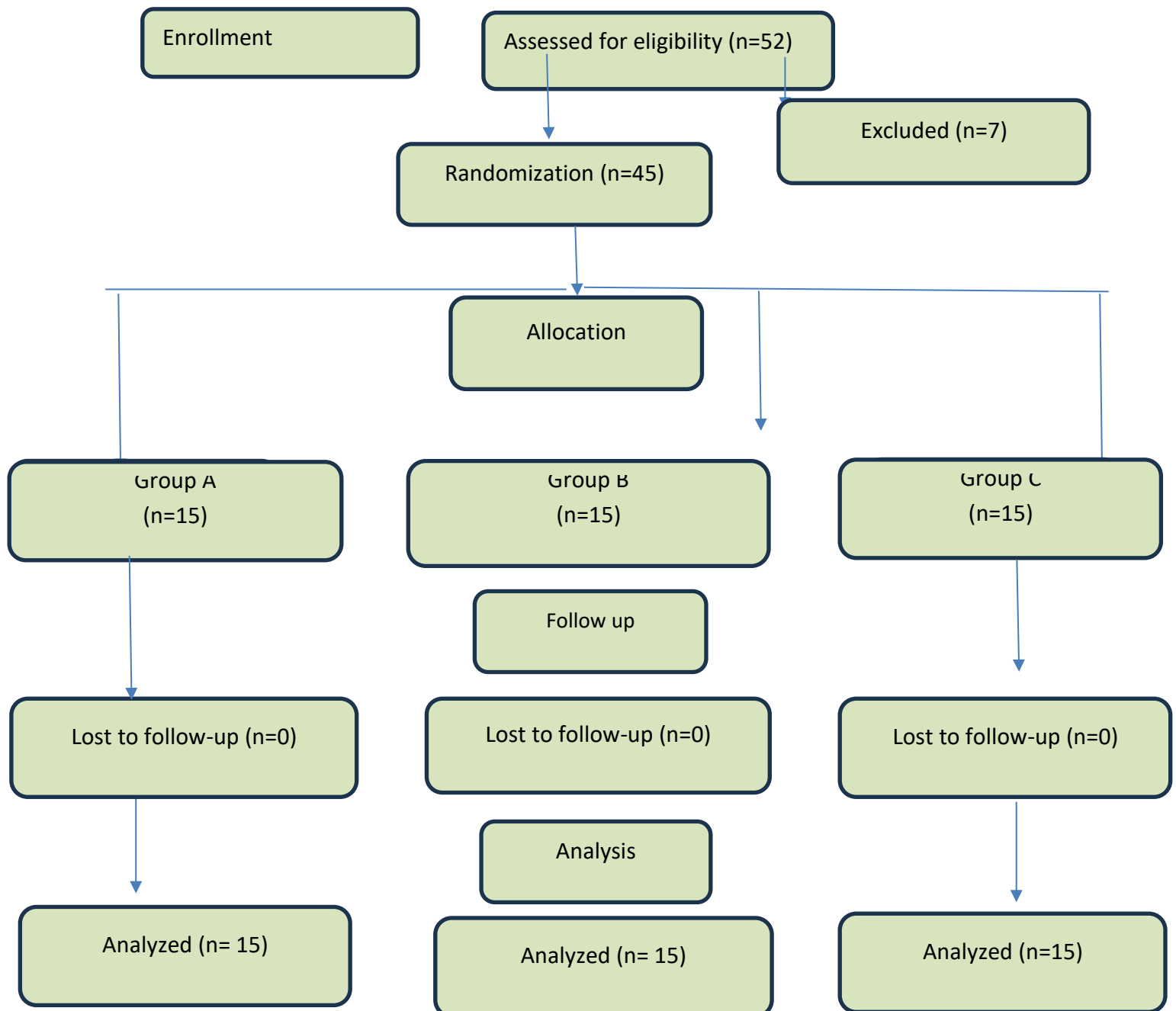


Fig.1 (consort flow chart of the study)

Outcome measures

Modified Vancouver Scar Scale (MVSS): assesses 4 characteristics of Scars; vascularity (1=Pink, 2=Red, 3=Purple), pigmentation (1=Hypopigmentation, 2=Mixed, 3=Hyperpigmentation), pliability (1=Supple, 2=Yielding, 3=Firm, 4=Ropes, 5=Contracture) and height (1=< 2 mm, 2= 2 to 5 mm, 3=> 5 mm). The larger the total score, the worse the Scar. Normal skin (zero score)^{11,12}. The researcher chose the best score for each subscale based on patient status, and then the score was summed to a total score¹³.

A Schiotz tonometer device: This device (Riester, Germany, 0124) was used as an objective tool to demonstrate strong connection with the pliability score of the VSS scale and high intra-observer reliability¹⁴. It has a floating plunger in the form of a rod-like with a weight of 5.5 grams fixed inside the barrel and other weights (7.5 or 10 grams) placed can be fixed on the plunger¹⁵.

The patient is placed in a comfortable and adaptable position. The Schiotz tonometer device is held upright at a measuring point on the scar (after the instrument has been calibrated), so that the plunger moves downwards due to gravity and indented the scar. The device features a horizontal scale ranging from 0 to 20, but it does not directly measure scar pressure. Instead, the readings from the device are converted into measurements in mmHg using the included conversion table for the Schiotz tonometer¹⁵.

Intervention

Kinesio tape (UNCUT) is used to reduce scar formation and is the new choice in the field physical therapy. it is made from 100% cotton fiber, heat sensitive acrylic adhesive and elastic polymer strands¹⁶. The patient was positioned comfortably, but the scar was permitted to undergo end stretching. The treated site was detected, cleaned and dehydrated. The patient is placed in a relaxed state of muscle and fascia in the scarred area. Kinesio tape is precisely tailored to match the dimensions of the scar in order to aid in reducing the formation of adhesions to the tissues beneath. The tape is applied along the scar (I shape) in the same direction as the scar line, fixed and then placed at 25 - 50% paper tension. KT is worn throughout the day and reapplied every three-four days¹⁷.



Fig.2 Showing kinesio Tape application on dorsum of the foot with scar post skin graft.

MFR is a very effective, gentle and safe hand on method of soft tissue mobilization to release fascial restrictions, breakdown adhesion, soften and lengthen

the fascia and restore tissue function¹⁸. The practitioner's contact (thumb) travels along the scar tissue from distal to proximal. This MFR was applied on scar for 15 minutes per session (three sets, 5 minutes each) with 1 min of rest interval, 3 times per week for 6 weeks¹⁹.



Fig.3 Showing Myofascial Release application on scar post skin graft.

Traditional physiotherapy: includes; deep friction massage, and stretching exercises.

The traditional physiotherapy was applied for 18 sessions through 6 weeks by three sessions per week. The physiotherapist applies deep friction massage by circular and perpendicular pressure to the scar tissue for 15 minutes at a time, moving both their fingers and the patient's skin at the same time, with pressure deep enough to whiten the scar²⁰. The post-burn muscles are stretched five times with a 30-second hold time and a 30-second break time in between each stretch²¹.

Statistical analysis:

An analysis of descriptive statistics as well as an ANOVA test were performed to compare the age distribution among different groups. A chi-squared test was used to compare the distribution of sexes between groups. A one way MANOVA test was used to compare the MVSS as well as scar pliability among the three groups. Post-hoc testing were conducted using the Tukey's test for conducting subsequent multiple comparisons. A paired t-test was performed to compare the MVSS and scar pliability before and after treatment in each group. The statistical tests were conducted with a predetermined level of significance of $p < 0.05$. The statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS) version 25 for Windows²².

Ethical Approval

The research pertaining to human use adhered to all pertinent national rules and institutional policies. The study received ethical approval from the Faculty of Physical Therapy at Cairo University (No: P.T.REC/012/004644). This study adhered to the ethical guidelines outlined in the World Medical Association Code of Ethics, namely the Declaration of Helsinki.

Informed consent

Every participant in this study gave their informed permission before it began.

Results

Subject characteristics

A total of forty-five individuals who had scars resulting from skin grafts took part in this study. The age range of the participants was between 20 and 45 years.

Table (1) shows subject characteristics of groups A, B & C. When comparing the groups according to age and sex, no statistically significant difference was found ($p > 0.05$).

Table 1. Basic characteristics of participants.

	Group A	Group B	Group C	p-value
	Mean \pm SD	Mean \pm SD	Mean \pm SD	
Age (years)	28.86 \pm 5.57	30.73 \pm 5.71	31.46 \pm 6.35	0.46
Sex, n(%)				
Females	5 (33.3%)	6 (40%)	8 (53.3%)	0.52
Males	10 (66.7%)	9 (60%)	7 (46.7%)	

SD, standard deviation; p-value, level of significance

Effect of treatment on MVSS and scar pliability:

Within-group differences

Compared to their pre-treatment levels, all three groups' MVSS as well as scar pliability improved significantly after therapy ($p < 0.001$). Changes in MVSS percentages for groups A, B, and C were 16.76%, 31.02%, and 58.72%, respectively. Scar pliability changed by 18.32% in group A, 43.34% in group B, and 578.83% in group C (Table 2).

Between-group differences

Both groups were statistically similar before treatment ($p > 0.05$). A post-treatment comparison of the groups demonstrated that group C exhibited a significantly improved MVSS as well as scar pliability in comparison to groups A ($p < 0.001$) as well as B ($p < 0.05$) (Table 2).

Table 2. Within and between-group differences in MVSS and scar pliability.

	Group A	Group B	Group C	p-value		
	mean \pm SD	mean \pm SD	mean \pm SD	A vs B	A vs C	B vs C
MVSS						
Pre treatment	9.13 \pm 1.18	9.67 \pm 1.11	9.86 \pm 0.83	0.35	0.15	0.86
Post treatment	7.60 \pm 1.24	6.67 \pm 0.82	4.07 \pm 0.88	0.03	0.001	0.001
MD	1.53	3	5.79			
% of change	16.76	31.02	58.72			
t- value	11.5	10.24	29			
	<i>p = 0.001</i>	<i>p = 0.001</i>	<i>p = 0.001</i>			
Scar pliability (mmHg)						
Pre treatment	13.70 \pm 4.53	15.32 \pm 4.52	14.37 \pm 3.39	0.54	0.89	0.81
Post treatment	11.19 \pm 2.78	8.68 \pm 2.67	6.06 \pm 2.33	0.03	0.001	0.02
MD	2.51	6.64	8.31			

% of change	18.32	43.34	57.83			
t- value	4.44	10.08	15.93			
	<i>p = 0.001</i>	<i>p = 0.001</i>	<i>p = 0.001</i>			

SD, Standard deviation; MD, Mean difference; p-value, Level of significance

Fig.4 (Mean MVSS pre and post treatment of group A, B and C)

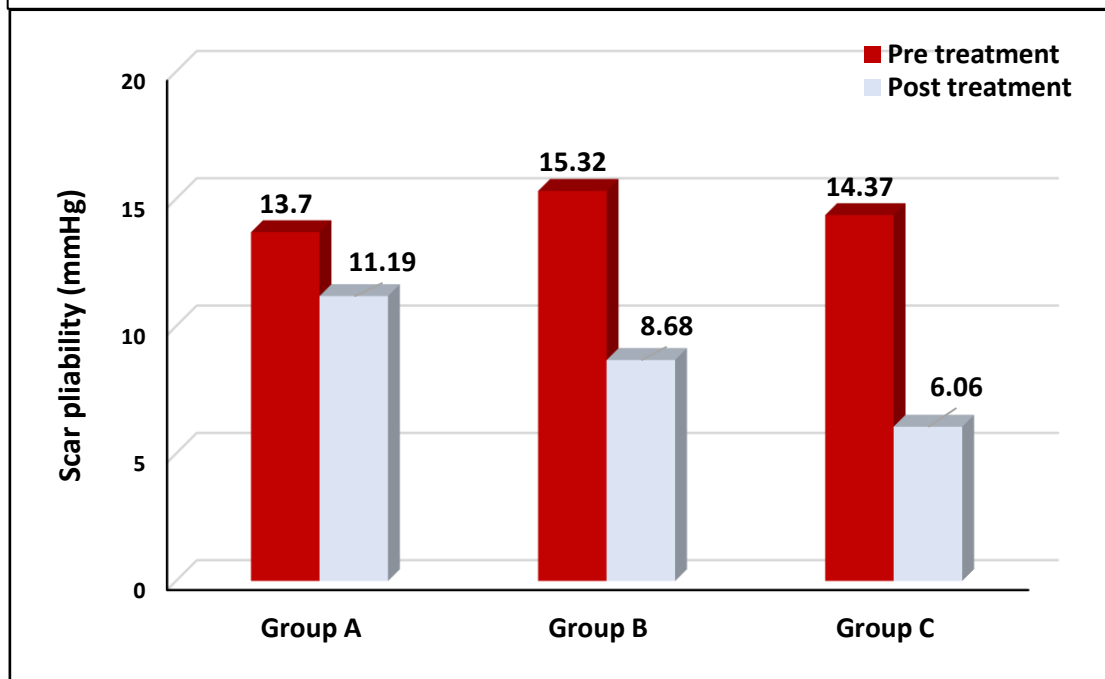
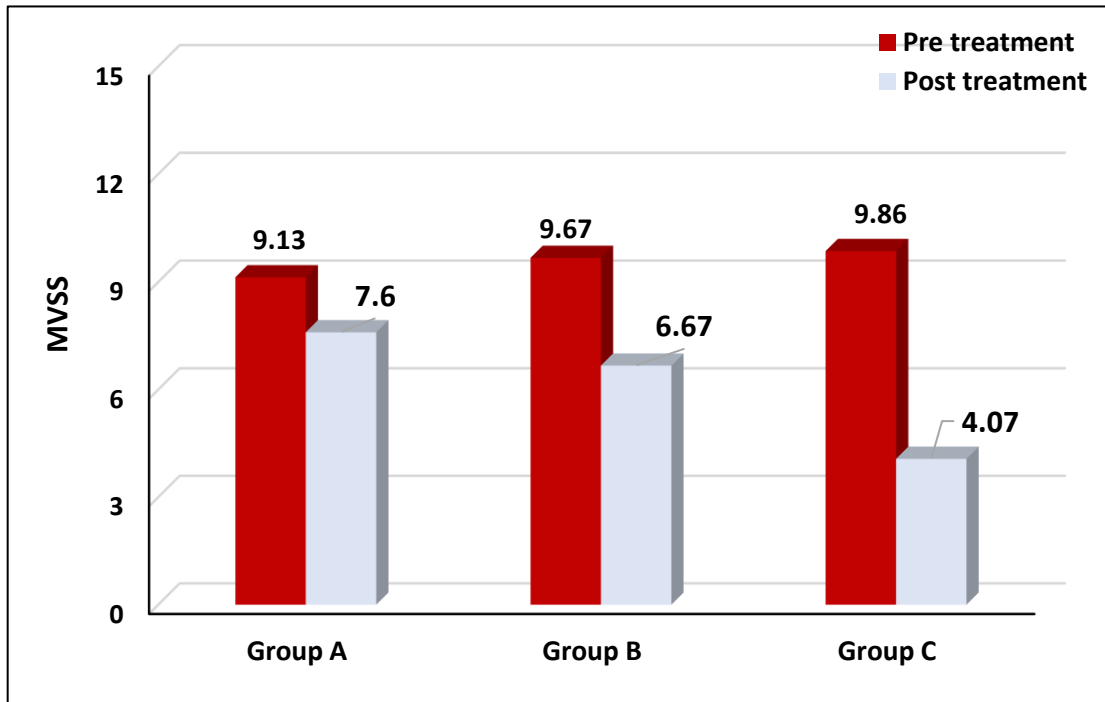


Fig.5 (Mean scar pliability pre and post treatment of group A, B and C)

Discussion

This research was undertaken to explore the therapeutic benefits of KT as well as MFR in treatment of scar after skin transplant. In this research, the Schiotz tonometer

device (pliability) and MVSS; (pliability, height, vascularity and pigmentation) were utilized to assess the three groups (group A, B, & C) of the study for scar pliability and features .

The outcomes of this research demonstrated that there was considerable improvement following KT as well as MFR in tonometer and MVSS ratings. After therapy, however, the KT as well as MFR group showed far more improvement than the KT as well as MFR group. The % of change in (MVSS) in groups A, B & C was 16.76, 31.02 and 58.72% respectively. The % of change in scar pliability in groups A, B & C was 18.32, 43.34 and 57.83% respectively.

Hypertrophic scarring, which occurs after surgical operations, trauma, and particularly burns, is a significant concern for patients and a complex issue for clinicians. Hypertrophic scars can lead to a notable decline in both the functional as well as cosmetic aspects of one's quality of life ²³.

Regarding the effect of kinesio taping, findings of the present study aligned with **Szczegieliak et al²⁴** who investigated the effects of KT on post-operative scar in patients after cardiac surgery and found that edema, pain, and scar thickness were reduced after KT application.

In agreement with the current study, **Moortgat et al²⁵** investigated the effectiveness of kinesio tape to minimize scar tension. A total of twenty patients exhibited a substantial disparity in distensibility scores prior to (M=0.63, SD=0.23) as well as following (M=0.93, SD=0.25); $t(19) = -6.969$, $p = .000$) tape application. This results in a decrease of 47% in tension at the central area of the scar site. The researchers determined that the application of KT to the surface of the scar, which changes the mechanical forces exerted on the skin, is an innovative treatment for reducing tension on burn scars. Consequently, this treatment has the potential to diminish the occurrence of post-burn hypertrophic scars.

In line with previous research by **O'Reilly et al²⁶** who agreed with the advantages of KT for scar treatment. The results indicated that non-stretch tapes are efficient in lowering the height, color, and itching of linear surgical scars, therefore serving as a preventive measure. Paper tapes have demonstrated efficacy when used in wound remodeling or on fully developed scars. There is initial evidence suggesting that high-stretch, elasticized tapes may have advantages in managing scars during the phase of wound healing where remodeling occurs.

Goodridge et al²⁷ evaluated the effect of kinesio tape on scar resulting from three surgical procedures on the abdominal wall. The study shown that the pliability, blood supply, elevation of the scar, pigmentation, and alleviation of pain were enhanced with the application of kinesio tape. In addition, kinesio tape is easy to use, economical and effective for scar resolution.

Tawfik et al²⁸ assessed the effectiveness of kinesio taping compared to deep friction massage in treating hypertrophic scars resulting from burns. The treatment was administered three times per week for a duration of eight weeks. The findings demonstrated a substantial decrease in scar thickness as well as appearance ($p < 0.005$) for both groups following treatment. Furthermore, when comparing the two groups, there was a substantial enhancement in scar thickness as well as cosmetic appearance in kinesio taping group when compared with deep friction massage group.

This study's findings on the effects of myofascial release are in line with those of **Roh et al²⁹** showed that skin rehabilitation massage therapy improved scar pigmentation, pliability, vascularity and height compared to the surrounding skin as measured in vancouver scar scale and also reduced pruritus and depression in burn survivors.

Scott et al³⁰ review stated that Scar massage has the potential to provide benefits such as pain reduction, increased mobility, and improved scar features. This scoping review emphasizes the diverse characteristics of research on scar massage after surgery. A systematic review by **Ault et al**³¹ suggested that scar massage may be an effective method for managing hypertrophic burn scars due to its potential to reduce scar height, blood supply, pliability, pain, pruritus, as well as depression.

Cho et al³² investigated the effects of massage therapy for burn rehabilitation on post-burn hypertrophic scars. 146 burn patients were split into two groups for the study: an experimental group as well as a control group. Both groups were given conventional rehabilitation therapy, with the massage group receiving massage therapy. The findings demonstrated a substantial decline in VAS as well as itching scale ratings in both groups, showing a substantial difference within each group. Following therapy, the massage group exhibited a substantial reduction in scar thickness, distensibility, melanin, as well as erythema. The study determined that massage therapy is an excellent treatment for reducing pain, itching, and improving the appearance of hypertrophic scars following a burn injury.

Lubczynska et al³³ assessed the efficacy of manual scar therapy used together with complementary techniques for treating postoperative scars. The program consisted of two therapies, each lasting 30 minutes each week for a total of 8 weeks. The therapies comprised manual scar manipulation, massage, cupping, dry needling, as well as taping. The findings shown substantial beneficial impacts on pain, pigmentation, pliability, itching, surface area, thickness, uniformity, color, as well as scar rigidity.

Finally, the kinesio taping and myofascial release group had a more favorable difference regarding scar pliability as well as characteristics compared to the other two groups. The findings of this study confirm the hypothesis that the combination of KT and MFR is more effective in enhancing scar characteristics as well as pliability. Nevertheless, these techniques are regarded as a valuable therapeutic tool in the treatment of scars following a skin graft.

Limitations

This study was limited by Psychological status of the patients throughout the therapy time, individual variations in their reactions to therapy, patient's cooperation during the treatment. Insufficient follow-up, a brief treatment duration, and a small sample size. Further studies with large sample size, longer treatment duration and follow-up are recommended

Conclusion

There were significant improvements after treatment with both programs in all outcomes. However, kinesio taping and myofascial release group had higher improvement post-treatment, compared to kinesio taping group and myofascial release group.

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Disclosure statement

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Conflict of interest

The authors state no conflict of interest.

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