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Original Article

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Comparison of soft tissue mobilization versus static stretching in post-burn contractures at elbow and wrist, A pilot study

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ABSTRACT

BACKGROUND & OBJECTIVE: Post-burn contracture is the tightening of the skin after a second or third-degree burn with the formation of contracture. Post-burn contractures result in the limitation of movement around a burn area. Burns contractures, if left untreated, may cause limitations in the range of motion and daily living tasks. The purpose of this study was to compare the effects of soft tissue mobilization versus static stretching in post-burn contractures at the elbow and wrist.
METHODOLOGY: A pilot study was conducted, and 36 patients were enrolled. Patients with post-burn contracture were divided randomly into two groups. Allocation of patients in both groups was done by computerized generated list. The treatment frequency was 3 times a week. Numeric pain rating scale (NPRS) and Katz index ADLS scale were used for scoring. Paired t-test was applied to evaluate the data.
RESULTS: The mean age in group A and B were 26.16±7.46 and 28.05±1.27, respectively. Mean score for pre-Katz Index of Group A and B (2.47±0.87, 2.16±0.98), post-Katz Index group A and B (3.29±1.68, 3.05±1.47) with a p-value 0.12 and 0.03 group A and B respectively. The mean score group A and B for pre-NPRS (7.61±1.37, 7.94±1.10), post-NPRS (2.27±1.01, 1.72±1.22) with a p-value<0.001 .
CONCLUSION: It was concluded that static stretching is more effective than soft tissue mobilization.
KEYWORDS: Burns, Static stretching, Contracture, Soft Tissue, Physical Therapy.

INTRODUCTION

Burn is an injury to soft tissue or skin of that part mainly caused due to heat, electricity, radiation, or other reasons. Burns are usually more than the sensation of burning. Burns are categorized by the skin damage and its severity. Non-blistered and red skin are first-degree burns, second-degree burns are with splotchy skin and are up to dermis depth while third-degree burns are also penetrated dermis (reticular region) forming a white and leathery, relatively painless appearance[1].

Elbow and wrist function is one of the most important goals of burn rehabilitation and is a consensually significant functional outcome[2]. A large incidence rate has been reported in underdeveloped countries or low-income countries, making up about 90% of the global burden of burns[3]. Most burn patients are often treated and admitted to the surgical wards of the hospitals. Type of burn are electrical burns which are caused by electricity strikes, flame burns, flash burns, contact burns and burn in depending on temperature and length of surface[4].

Contractures are caused by structural changes in non-bony tissues such as muscles, tendons, ligaments, joint capsules, and/or skin, resulting in a loss of full passive range of motion (ROM) of a joint. Burns cause damage to the epidermis and the underlying soft tissue, bone, and muscles, putting burn victims at risk for joint contractures and disability[5].

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Injury-related parameters such as the depth, extent, etiology, and site of the burn are likely to have a role in post-burn contracture formation. Genetic, race, skin color, age, sex, nutritional condition, adherence to medication, and factors related to treatment such as the timing of wound closure, type of wound closure, the wound bed, and the preventative tactics used are all factors that affect patients[6]. The incidence and severity of elbow and wrist contractures include humor-radioulnar joints, proximal and distal radio-ulnar joints, and carpal bone joints. The wrist joint is very often affected joint and wrist joint contractures include concomitant medical illnesses and total body surface area[7,8].

The foundations of burn rehabilitation in the domain of physical therapy are positioning, splinting, and exercise protocols. These exercise protocols for burn contracture care include airway clearance (if there is prolonged bed rest), positioning, stretching, and mobilization of the affected area[8].

Physical therapy enhances the restoration and bolster of muscles and regains range of motion[9]. Burn contractures can be managed with a range of conservative treatments, the most common of which are pressure therapy, silicone therapy, massage therapy, and moisturizing [10]. The use of a mix of therapies, such as surgical reconstruction, pressure treatment, silicone gels and sheeting, and disposable clothing, is the keystone of concurrent burn scar treatment [11].

Kneading massage is a type of soft tissue mobilization that puts the finger(s) or a hard tool transverse to the direction of the underlying collagen fibers directly over a tissue lesion[12]. Massage therapy is a non-invasive, conservative way of reducing the detrimental effects of a hypertrophic scar following a burn injury [13]. The majority of studies reported improvements in pain and range of motion ROM after soft tissue mobilization. Stretching exercises have a key role in the release of post-burn contractures[14, 15]. Manual stretching techniques have an effect on function retaining and general ROMs[2]. Soft tissue mobilization may reduce the thickness and pliability of burn contractures. Soft tissue mobilization of burn scarring decreases depression in burn patients by producing relaxation, reducing pain and stiffness, and improving mobility[16] .

The most common cause of death was flame burn. Adults (16-40 years) and the elderly (>65 years) received lethal doses of 76.5 percent and 41.8 percent TBSA, respectively, at which they had a 50 percent probability of survival. Flame and scald burns are common injuries that occur in the home and at work, and they can be avoided by awareness and safety precautions[17].

Previous studies focus on the modalities and ROM exercises and have limited comparison between the techniques, this study will find which technique was more effective along with ROM exercise in treating the burn contractures at the elbow and wrist.

The objective of the study was to find the effects of soft tissue mobilization versus static stretching in post-burn contractures at the elbow and wrist.

METHODOLOGY

A pilot study was conducted from September 2019 to February 2020 at the burn and plastic ward surgical tower mayo hospital Lahore the duration of the study was 4 weeks after the approval from the ethical committee with IRB 2209/RC/KEMU. Total 36 patients with unilateral 1st and 2nd degree elbow and wrist burn contracture were included on the purposive non-probability technique, which was randomly divided into two groups, 18 in each group. Group A patients were treated for elbow and wrist burn contractures with Conventional treatment (General ROM exercises, splinting, use of pressure garments, 3 sets of 10 repetitions with 30-60 seconds hold and 1-minute rest, 3 times in a week for 4 weeks treated with soft tissue mobilization).

Group B patients were treated with static stretching (30-60 seconds hold, kneading, friction massage, 3 sets of 10 repetitions, 3 times in a week for 4 weeks) for elbow and wrist burn contractures. Age between 15 to 35 years, elbow and wrist contractures occurrence for a minimum of 1 week and lesser than 3 months, both males and females patients were included in the study. Patients diagnosed with neuropathy, weight loss, fever, history of malignancy, inflammatory arthritis in the wrist joint, structural abnormality affecting the hand, patients with a history of nerve injury and fracture of elbow and wrist, and any formal history of nerve surgery were excluded from the study. The data normality distribution was checked by the Shapiro Wilk test. Paired t-test was applied to evaluate the data with a significant value of 0.05.

The disability and progress level before and after the treatment and burn contractures was measured by using Katz's index disability scale. This scale describes 6 scores which included bathing, clothing, toileting, transferring, continence and feeding. The Numeric pain rating scale (NPRS) is a reliable and valid instrument to assess pain[18].

RESULTS

Table-I: Descriptive statistics.

	Group-A (n=18)	Group-B (n=18)
Age Mean±SD	26.16±7.46	28.05± 1.27
Male n(%)	12 (66.7)	13 (72.2)
Female	6(33.3)	5(27.8)

The total participants in the study were 36 in numbers, equally divided into two groups. The mean age in group A and B were 26.16±7.46 and 28.05±1.27, respectively. Among them 12 (66.7%) were male, and 6(33.3%) were females in groups A, 13 (72.2%) were male and 5(27.8%) were females in groups-B. Mean score for pre-Katz Index of Group-A and B (2.47± 0.87, 2.16±0.98), post-Katz Index group A and B (3.29±1.68, 3.05±1.47) with a p-value 0.12 and 0.03 group A and B respectively. The mean score group

A and B for pre-NPRS (7.61±1.37, 7.94± 1.10), post-NPRS (2.27±1.01, 1.72± 1.22) with p-value<0.001 respectively. The p-value of Katz Index of group B and NPRS of both groups have p<0.05 which shows a significant difference.

Table-II: Pre and Post Katz Index, NPRS, and Elbow ROM.

	Group-A	Group-B	p-value
Categories	Mean ± SD		
Pre Katz Index	2.47±0.87	2.16±0.98	0.12
Post Katz Index	3.29± 1.68	3.05±1.47	0.03
Pre NPRS	7.61±1.37	7.94±1.10	<0.001
Post NPRS	2.27±1.01	1.72±1.22	<0.001
Pre ROM Elbow	84.4±4.2	82.2±5.0	0.20
Post ROM Elbow	81.9±7.0	87±6.0	<0.001

DISCUSSION

The purpose of the study is to evaluate the results of stretching and soft tissue mobilization in post burns elbow and wrist contractures. This study compared the results of the elbow and wrist joints as a range of motion (ROM) and the quality of functional recovery of the upper extremity. Previous descriptive cross-sectional research has revealed a positive link between therapeutic activities and the range of motion of the upper extremity joints and the health-related quality of life of burn sufferers [19].

In this study, the hold time of the stretching exercises received the most attention. The one-minute stretching hold period was chosen based on past research. Previous research has shown that sustained stretching for burn scars is useful, however, there has been debate over the hold time. Even though the majority of experts agree on 30-60 seconds, According to Godleski's study it should be more than 3 minutes, and further research is needed to decide what duration is best. Longer hold times were thought to be beneficial, although there was concern that therapist tiredness during a long stretch could alter the consistency of the intervention and lead to a lack of patient tolerance[20]. Another study found that early sustained stretching exercise increased the range of motion and functional recovery of the shoulder joint after a severe burn to the axilla [21].

According to our study, the stretching protocol enhanced group-A ROM much more than group B. During the intervention phase, the stretching routine consistently increased ROM in rehabilitation patients with burn injuries. In the treatment of burn patients, active range of motion combined with stretching exercises was more successful than the active range of motion alone in lowering pain intensity, functional activities, and range of motion of the affected limb[22]. Physical activity and exercises also play beneficial role in other diseases related to bone [23].

When compared to both groups A and B, elbow and wrist ROM improved dramatically as a result of the stretching technique used in our study. This stretching exercise regimen was found to have a positive effect on burn contracture, resulting in functional and cosmetic improvements for the patients. The study included a limited sample size of participants, which was a constraint.

CONCLUSION

The static stretching technique is more effective in improving ROM and reducing deformity as compared to soft tissue mobilization and conventional treatment in post-burn elbow and wrist contractures.

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Authors' Contribution:

Zainab Tehreem: Conception, design, and acquisition of data.
Yasir Kazmi: Statistical analysis and interpretation of data.
Muhammad Usman Khalid: Critical review of article and methodology.
Haroon Mansha: Data compilation and manuscript drafting.
Muhammad Hassan: Acquisition of data.
Rabia Majeed: Manuscript drafting and final approval of the version.

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