EFFECTIVENESS OF PHYSIOTHERAPY IN SKIN GRAFTING

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ABSTRACT

Objectives

The aim of this study was to evaluate the potential of ultrasound technique and physical therapy in the improvement of skin grafted patients.

Methods

The subjects were recruited from ACS Medical College and Hospital. The study was performed using randomized control trials conducted on 7 patients. The study was performed using subjects with skin grafting flexors and extensor aspect of forearm anterior aspect of neck, foreleg and thigh. They were treated with ultrasound followed by a gentle massage and subsequently instructed them to use splints. Visual analogue scale and Goniometry were used as outcome measures for score pain and range of motion, respectively.

Results

The outcome of the study manifested improved range of motion, reduced scar and decreased pain in affected area, thereby emphasizing physiotherapeutic treatment was effective even in skin grafting conditions.

Conclusions

In conclusion, initial care through physical activity can prevent people from problems like developing deformities, etc and also helps maintain the skin integrity

KEYWORDS: Skin Grafting, Ultrasound, Massage, Visual Analog Scale, Goniometry

INTRODUCTION

Skin graft is a portion of skin removed from one area of the body and transplanted to another area through surgical procedure. Skin graft is performed when patients lose their skin due to various illness, injuries, burns, etc. The graft includes split thickness, which has varying amount of dermis and full dermis, called as full thickness. It requires both devascularization and revascularization from where it has been taken and grafted.

Split Skin Grafts: Since it consists of varying thickness of dermis, the graft is taken with the help of a large knife called dermatome and placed on the wound or scar. Usually these types of split grafts are excised from the lower leg.

Full Thickness Skin Grafts: Since the skin contains the entire dermis, it involves removing a small portion of skin and placing the prepared graft on the wound. Usually these types of grafts are taken from behind the ears, neck, arm for grafting to face or hand.
Since 1940’s, ultrasound therapy has been used effectively by physicists for treating various muscular and joint pain & abnormalities. Since while treating, it comes in direct contact with the patient skin, anti-friction gels are used to reduce friction and assist in efficient transmission of the ultrasound waves. The therapist uses in the range of 0.7 to 3.3 MHz in alternative compression and refraction motion. The ultrasound waves are easily absorbed by the connective tissues, tendons, ligaments and fascia. The intensity also decreases when penetrated deeper, since the waves were absorbed by soft tissues present between 3-5cms. Ultrasound therapy is used in various types of treatment, including sprains, inflammation, fasciitis, irritation, bursitis, osteoarthritis, scar tissue adhesion, etc.

Massage is physical activity acting on body with pressure using mechanical aids, vibration, tension, stationary, in a structured as well as unstructured manner. It can also be applied with forearms, fingers, hands, elbows, knees, etc. Massaging can create receptive activities, well being, relaxation, promotes concentration, peace; it can be arousal in nature. Many research and studies have proved massage reduces anxiety, depression, pain relief, and also helps in reducing blood pressure, heart rate. Massaging can help in activating parasympathetic nervous system, which eventually may stimulate the production of serotonin, endorphins and averting fibrosis, inducing lymphatic flow and improving sleep patterns as well.

Since skin grafting is a surgical procedure it has various risk factors, including bleeding, respiratory problems, infections, adverse reaction to medications, etc. Moreover adverse conditions of graft failure can lead to infection, swelling, poor blood flow to the injured area; the most commonly observed condition is the formation of hematoma. Any physical activity such as stretching or contracting the graft can lead to adverse effects. At least till 15 to 30 days, the graft should be taken care to avoid such things.

METHODOLOGY

Study Design

About 20 skin grafted patients were selected from ACS Medical College and Hospitals and were referred to the Physiotherapy department for improving their physical and functional ability. The study was performed using randomized control trial conducted on subject’s pre and post physical activity. The study required consent form, Ultrasound, lanolin oil, goniometry. The subjects were only included if they had normal and rigid surface over the grafted area and it should have been healed perfectly also. Likewise, the subjects who had graft failure, formation of hematoma were not included in the study.

Procedure

Since it is a non-blind cohort study, the skin grafted patients were asked to read and sign the consent form before starting the therapy. Immediately after giving appropriate information to the patients, they were assessed and scrutinized for taking the pre-treatment value of VAS scale for pain, and Goniometry for range of motion, prior to the treatment. Furthermore, the subjects were positioned on the couch according to the skin grafted site, and then the grafted area was exposed to ultrasound in varying pulse modes. The ultrasound was applied in the ratio of 1:4 and at an intensity of 0.8 w/cm² for 8 minutes in 1MHz. The therapy was carried out as 1 session per day for 35 days. The post-test scores were intervened at an interval of every 7 days.
Data Analysis

Visual analogue scale (VAS) and Goniometry were used as outcome measures to measure the pain and the range of motion (ROM), respectively. The means of the scores were taken for the interpretation of the study. The pre-test and post-test values were measured in order to compare the percentage of efficiency of the physiotherapy.

RESULTS

After the inclusion and exclusion criteria, only 7 subjects were selected for the cohort study from 20 subjects enrolled. Ultrasound therapy was used to heal soft tissue over the grafted site. In massage kneading technique was gradually reducing the stiffness. The data was collected three times from day 1 to 35 in between 7 days interval for each.

The results from pre and post study through VAS, elbow ROM, Hip ROM were given in Table1, 2, and 3, respectively. The Figures 1, 2 and 3 represent the difference between the pre and post therapy. The effectiveness of the therapy was measured in consecutive therapy sessions. The pre-test value of pain was found to be the same for all patients, pre-treatment value of pain 9 at the post-treatment value of 7th day was 8 and 14th day was 7, 21st day pain value was 6 and 28th day pain value was 5 and the last 35th day pain value was 4. The ROM of the considered joint was measured by Goniometry. The difference between post-test value and the pre-test value suggests gradual reduction of pain, and increase in ROM.

<table>
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<tr>
<th>Weeks</th>
<th>Mean Score</th>
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<tbody>
<tr>
<td>Pre test Score</td>
<td>9</td>
</tr>
<tr>
<td>7th Day Score</td>
<td>8</td>
</tr>
<tr>
<td>14th Day Score</td>
<td>7</td>
</tr>
<tr>
<td>21st Day Score</td>
<td>6</td>
</tr>
<tr>
<td>28th Day Score</td>
<td>5</td>
</tr>
<tr>
<td>35th Day Score</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 1: Pain Score Table for Elbow

Figure 1: Visual Analog Scale Scores
Table 2: Elbow Range of Motion

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</tr>
<tr>
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</tr>
<tr>
<td>14th Day</td>
<td>99</td>
</tr>
<tr>
<td>21st Day</td>
<td>120</td>
</tr>
<tr>
<td>28th Day</td>
<td>125</td>
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<tr>
<td>35th Day</td>
<td>125</td>
</tr>
</tbody>
</table>

Figure 2: Elbow Range of Motion

Table 3: Hip Range of Motion

<table>
<thead>
<tr>
<th>Range of Motion</th>
<th>Pre treatment value</th>
<th>7th Day Score</th>
<th>14th Day Score</th>
<th>21st Day Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexion</td>
<td>40</td>
<td>55</td>
<td>70</td>
<td>90</td>
</tr>
<tr>
<td>Extension</td>
<td>60</td>
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<td>12</td>
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</tr>
<tr>
<td>Abduction</td>
<td>10</td>
<td>17</td>
<td>25</td>
<td>30</td>
</tr>
</tbody>
</table>

Figure 3: Hip Range of Motion
DISCUSSIONS

Previous studies showed effectiveness of Ultrasound therapy on pathological and diseased conditions of the musculoskeletal systems, but only less study had studied the effectiveness of ultrasound therapy on skin. However, use of ultrasound (0.5 W/cm², applied for 5 minutes in alternate days, started from 14 th day to 21 st days) on skin injury healing process was not carried out until Dyson et al showed the effects on rabbit ears compared to the untreated rabbits. Furthermore, Dyson et al also manifested a significant reduction of pain on various ulcers of lower limbs using the ultrasound (0.8 MHz, 0.2 W/cm², applied for 5 minutes every day). Likewise, Roche and Ivanov reported the use of ultrasound, slightly different the parameters (3MHz, 1 W/cm²) and different portions of skin were found to be enhanced using ultrasound therapy. However, even with recent development in ultrasound therapy, application of ultrasound as a skin grafting therapy is not well evident.

This study has manifested the use of ultrasound on skin grafted subjects comparing with the results of previous studies. Certain limitations and difficulties incurred during the treatment were also represented below in order to avoid those difficulties in future. The thickness of the grafts- total thickness leads to infection and irritation compared to the partial one making ultrasound and physical activity an easier and simpler method. Application of ultrasound therapy showed significant improvement in irradiated graft compared to the control graft. Since skin is a large, complex organ and develops from both the epidermis and the dermis, it contains various glands, nerves, blood vessels as well as lymphatic tissues.
Massaging can break the collagen bundles present in the graft and form the scar. The random motional massage coupled with ultrasound therapy can soften and desensitize the skin, thereby decreasing purities and preventing adhesions, also the scarred tissues. A massage with firm pressure can make the skin blanch, followed by slow circular motion can flatten the damaged area. It should be continued until the scar matures, if stopped it can lead to contractures.

It is not necessary that the therapists have to visit the patients for the scar massage, as timely review of range of motion, splinting and functional therapy can be reviewed and taught to improve the massaging ability. For this reason, the patients are taught to how to start and complete the massage themselves in the absence of the therapists.

CONCLUSIONS

In conclusion, the physical therapy plays an important role in preventing complications and improving in functional ability of the patients. The ultrasound therapy on skin grafted patients was found to be significant on all the selected subjects. The study has manifested the effectiveness of ultrasound therapy, stimulating functional and morphological changes at cell level, leading to formation of new blood vessels, reunion of total thickness of the graft. Hence, physical therapy coupled with ultrasound massaging can improve patients suffering from developing deformities and thereby maintaining the skin integrity forever.

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