Evaluating the impact of General Swedish Massage, Cross Fiber Frictions, Neuromuscular and Myofascial Techniques on Range of Motion, Skin sensation and Nerve pain in a Third-Fourth Degree Chronic Burned Victim. A Case Study.

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CONFLICT OF INTEREST

There was a conflict of interest prior to starting the treatments due to the client being the student therapist's partner. Informed consent was received on a form and the client was informed about the benefits, risks, assessment and the treatment to minimize conflict of interest. To minimize bias, the working relationship remained strictly therapeutic during treatments. Consent was received from the client for chest photos being taken and posted. For the purpose of this case study the client's name was left out.

ABSTRACT

OBJECTIVE: To determine if Myofascial release, Swedish massage, Neuromuscular therapy and frictions performed local to affected bilateral chest; combined with pain free stretch and strengthen exercises has an impact on the following: pain, itch, anxiety, range of motion, sensory of the skin, and nerve pain in a chronic burned victim. The goal is to decrease adhesions, hypertonicity, improve tissue elasticity in the client's bilateral chest area and restore range of motion to the bilateral glenohumeral joints.

CASE SELECTION: A Caucasian male, age thirty, with no history of illness nor currently taking any sort of therapy, who has a chronic third-fourth degree burn to his bilateral chest and the right side of his neck. The client has a full thickness graft in the form of an oval shape to the middle section of his throat and normal skin grafts to his bilateral chest and the right side of his neck

METHODS: Series of seven treatments in total, twice a week. 30mins of initial assessment prior to treatment consisted of charting the McGill pain questionnaire, state trait anxiety form and active/passive range of motion. Resisted muscle testing, pec contractor test, a two point discrimination test and a modified nerve pain test were done prior to the first treatment beginning and after the seventh treatment. 60mins of actual massage treatment consisted of Myofascial release, Neuromuscular therapy, Swedish massage and Cross Fiber frictions. Homecare

consisted of a stretch and strengthen exercise which will be incorporated with a moisturizer.

RESULTS: The client had a significant increase in nerve pain and skin sensation to his chest bilaterally. Upper/middle trapezius strength increased as well as range of motion of his bilateral glenohumeral joints. The client had a significant decrease in the McGill pain score with certain massage techniques, itch and a negative for the pec contracture test after the seventh treatment. The client showed no difference in the state trait anxiety form.

CONCLUSION: Massage has been beneficial in reducing itching and pain levels in this case. Massage therapy has increased overall range of motion, nerve pain and skin sensation in a third-fourth degree chronic burned victim.

KEY WORDS: Hypertrophic scar, keloid scar, burns, vitamin E cream and burns, massage therapy and burns.

INTRODUCTION

A burn is a type of wound caused when skin being exposed to chemicals (acids, bases, and toxins), electrical current or thermal extremes (flame, hot liquids, cold) to the skin or other tissues, causing severe damage to cells of the body internally or externally. [1] Approximately 55 percent of burns resulting from flame. [4]

Burns can be distinguished based on how much damage was caused, such as the depth, the amount of area burned, location and most importantly, the cause of the burn.[1] There is also the possibility of other influences that can determine what type of care and therapy is needed, such as: age of the person affected by the burn, previous illness and any injury prior to the burn.[1] A burn can be classified into three depths or degrees based on how deep the burn occurred and how many layers of skin are affected.

A first-degree or superficial burn affects only the epidermis or outer layer of the skin. The area of the burn is often painful to touch and usually presents with red coloring, and no visible blisters are present on the skin. This type of burn can be the result of skin exposed to low heat for a certain amount of time, or can be due to skin exposed to a high temperature heat source for a short period of time. For first degree burns, pain is usually minimal with little to no swelling in the

tissue burned and healing time is very quick, resulting in no long-term tissue damage or change in skin color. [1, 11]

A Second-degree or partial thickness burn affects the entire layer of the superficial dermis, thereby having the name superficial partial thickness burn, or the burn which extends into the deep dermal layer of skin and is called deep partial thickness burn. [1, 11] The burn area will have red coloring, pain may be present, lack of pain will be due to nerve damage associated with the burn, and sweat gland damage, edema or localized swelling will be present.

Lastly, a third-fourth degree or full thickness burn leads to destruction of the epidermis, penetrating deep to the dermis and into the subcutaneous tissue. The burn area may appear white, waxy, charred and black due to necrotic tissue forming around the damaged area and is typically painless due to loss of nerves. Due to the depth of a third-fourth degree burn, the most important structures affected in a third-fourth degree burn are: blood vessels and capillaries, nerves, sweat glands, and in worse cases muscle and bone. [1, 11]

First degree burns do not require any extremes of treatment; however, deep second and third-fourth degree burns during the acute phase will require treatment as soon as possible to give the affected area better tissue health. Manual Treatment methods include: elevation and correct postural position of the client's body and limbs to reduce edema that is present and prevent client immobility,

regular pain-free passive and active movements and stretching.[2] Without treatment range of motion loss and stiffness can occur, which commonly affect burn clients, whereby joints underlying a burn injury can become immobilised for periods of time, causing contracture of scar tissue. [2, 5]

One assisting medical procedure traditionally used in the treatment of burn victims is autographing, also known as 'Skin grafting'. It is the medical procedure when healthy skin tissue from another part of the body is used to augment the damaged tissue over time. This procedure is used only if the area shows no signs of healing and is often done as a last resort due to the outlined graph mark scar left behind after healing. [1]

Another assisting medical procedure is splinting, which is used to mechanically increase the overall length of the scar tissue. [2] It is recommended that splinting must start from the first day the damaged tissue is graphed and may continue over months and years, depending on the amount of tissue damage to prevent tissue contractures. [2] In certain clients, scars can become red, raised and rigid, and is usually associated with itching and pain, which might eventually lead to cosmetic, emotional and active daily living problems for these clients. [9, 8]Little can be done to stop the formation of hypertrophic and keloid scar tissues after a traumatic injury or postoperative procedure, however, multiple treatments are used to prevent the formation of scar tissue contracture and excessive scar growth.

[3] Without the presence of one or more of the above medical procedures which is often surgical release, contraction of the scar tissue will cause range of motion lost over time and prevent proper tissue alignment and healing,[2, 15] with many clients saying having treatment for burn related injuries is worse than getting burned. [7]

Massage therapy has been beneficial to burn clients by reducing itching and pain levels (not anxiety). For example, three studies conducted showed significant effects massage therapy has on decreasing itch, pain, and anxiety levels in burn clients, perhaps more importantly, massage therapy helped to increase soft tissue pliability and elasticity within hypertrophic scar [5] by decreasing the thickness of the scar. [6] Massage therapy studies on post burn rehabilitation used a combination of active exercise, Swedish massage, petrissage and frictions to treat chronic burn scars; however, it is not stated very clearly in the methods as to how many strokes, what direction and for how long certain techniques were applied or whether a high vitamin E cream or oil was used to apply the techniques. [6, 10, 7]

Burn scars usually have no moisture, so a moisturizer or oil to the skin is important to increase flexibility of the scar. [8] However, in a systematic review investigating the effects of generic moisturizer compared to vitamin E cream on outcomes such as graft size, hypertrophic scar, active range of motion, and cosmetic, showed no significant difference. [14]

The purpose of this study is to test further the effectiveness of massage therapy on burn rehabilitation. The methodology of Cho and colleagues[6] will be replicated to some degree due to not owning the same equipment which was used in their study. Reading within the research articles revealed very limited information on whether burn clients had an increase in range of motion that was once restricted by contractures within the damaged tissues, as well as whether the clients were able to regain any sensation due to the increased pliability of the scar tissue. So my research experiment will further examine these two areas.

CLIENT HISTORY

The client is a thirty year old male who works eight hour days as a finisher. The client is involved in multiple artistic activities which involve lots of overhead and heavy lifting. The client's current condition consists of a chronic third-fourth degree burn to his bilateral chest and the right side of his neck, which happened at five years of age and is equal to eighteen percent of total surface area burned.[1] During this time the client received a full thickness graft in the form of

an oval shape to the middle section of his throat and normal skin grafts to his bilateral chest and the right side of his neck which were extracted from the anterior portions of the client's bilateral thighs. Client received a total of five surgeries between the age of five and thirteen for surgical contracture release. Use of pressures garments on his bilateral chest helped with tissue healing and splints under the right arm and over the bilateral neck helped to maintain tissue length. During the early healing time the client received assisted bilateral pectoralis stretches and iodine for open wounds which was done by his parents with no extra therapy. The client presents with loss of sensation in the chest and right side of the neck due to the degree of burn and limited range of motion of the bilateral glenohumeral joints in flexion, abduction, internal rotation and external rotation. The client has reported no problems with active daily living, has no other medical conditions and is in great health.

ASSESSMENT

The McGill pain scale was given to the client to fill out prior to and after every treatment. The McGill pain scale is used to determine the client's perception of pain; the scale features 11 questions relating to sensory descriptions of pain and 4 effects of pain.[12]

The State trait anxiety form was given to the client to fill out prior to and after the every treatment. The form consists of twenty questions relating to how

the client feels at the given moment, with answer choices of 4=almost never, 3=often, 2=sometimes and 1=almost never.[13]

Resisted manual muscle tests (RMMT) performed included bilateral pectoralis major and minor, upper and middle traps and sternocleidomastoid prior to the first treatment beginning and at the end of the seventh treatment to determine muscle strength. Grading is as follows: 0=no contractility, 1=slight contractility, 2=movement but not against gravity, 3=movement against gravity but not against resistance, 4=can maintain against gravity and against minimal resistance, 5=can maintain against gravity and against full resistance applied.

Special tests included the pectoralis major and minor contracture tests. These were done prior to the first treatment beginning and after the seventh treatment only.

A two point discrimination test was performed on the client's bilateral chest prior to the first treatment beginning and at the end of the seventh treatment, to determine skin sensation. In order to get an accurate representation of the client's sensation impairment, the client's scar tissue was grafted into one inch squares with one square as a reference point (Figure 1 and Figure 2). The tip of a protractor was used with the two points spaced at 3mm to represent two points, and one point to represent one point. One or two points were randomly placed by the therapist into each one inch square and based on if the client could feel one or

two points or nothing at all the (findings) were recorded but on a scaled down version of the clients bilateral chest and neck.

Figure 1 Imaging illustrating the inch sized grid used for measuring nerve sensation and circulatory response. This figure shows the Right lateral most view of this grid pattern including axilla.

Figure 2 Imaging illustrating the inch sized grid used for measuring nerve sensation and circulatory response. This figure shows the anterior view of this grid pattern demonstrating the burn range irregularity and size across the bilateral chest.

A modified nerve test was performed on the client's chest prior to the first treatment beginning and at the end of the seventh treatment, to determine the

client's pain flow. In order to get an accurate representation of the client's pain, information was recorded on the scaled down version of the client's graphed chest. One point on a protractor was used and placed by the therapist into each one inch graphed square. This time the client had to report on any pain they felt. A pain scale of one being light pain (shown in green) and five being extreme pain (shown in red) was drawn on the scaled down graph with the numbers one through five coloured coded and represented within the scaled down graph (Figure 4.A).

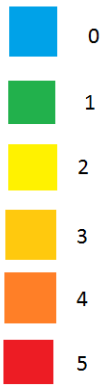


Figure 4.A Imaging illustrating a pain scale of one being light pain in green and five being extreme pain in red is shown.

TREATMENT PLAN

The client received seven one hour treatments in total twice a week; all included a strength and stretch homecare with lotion applied before completing.

The initial assessment was 30 minutes long included a postural, a pre and post active/passive range of motion (AROM/PROM) with use of a goniometer for the bilateral glenohumeral joint. A state trait anxiety short form and a McGill pain questionnaire, both were given at the beginning and end of each treatment as well. Before the treatment started, the client was supine and instructed on deep diaphragmatic breathing (DDB), while a hot thermophore was applied to the client's bilateral chest and neck for five minutes. A Visual Analog Scale of Pain and Itch was given during myofascial, Swedish, neuromuscular and friction techniques. The treatment goals for the client were developed based on assessment, resisted muscle manual tests (RMMT) and special tests.

1. Decrease myofascial restrictions in bilateral pectoralis major/minor, right sternocleidomastoid and all right scalenes to increase tissue health.
2. Decrease adhesions in bilateral pectoralis major/minor, right sternocleidomastoid and all right scalenes to increase tissue mobility.
3. Decrease hypertonicity and increase length in bilateral pectoralis major/minor to decrease anterior pull of bilateral chest.
4. Decrease hypertonicity in right sternocleidomastoid and all right scalenes to decrease tension and pull on the neck.
5. Restore strength to posterior postural muscles (upper, middle) traps to increase postural stability.

The procedure is as follows:

Deep diaphragmatic breathing was used at the beginning of each treatment to increase parasympathetic stimulation and help the client to decrease pain levels. Next the therapist placed a thermophore to the client's bilateral chest for five minutes. A Broad cross hands myofascial spreading techniques was then performed by placing both hands crossed within the scar tissue borders, engaging the tissue to the level of the fascia, then both hands were moved apart taking up the slack. Three releases should be felt or holding for twenty to thirty seconds maximum. The therapist performed this technique for a total of three times. Next myofascial spreading was used to separate the right SCM from the right scalenes, held for three releases and repeating this technique three times. Next, place the thumb of one hand along the border of the scar tissue adjacent to the other fingers. The tissue was engaged by pulling outwards and each "cut" was held for ten seconds. Perform cutting along the entire border of the scar tissue two times. Then the client's skin outside the scar border was grasped and squeezed gently while lifting up and rolling the tissue towards the border of the scar tissue. Perform each skin roll twice along the border of the scar tissue. Next starting on the clients left side of the chest; the tissues were gently rolled, going from one border to the next. Perform the same treatment while continuing to move laterally until the entire scar tissue area is treated, then repeat horizontally. Perform one roll three times over the same area. The therapist then started on the client's left chest. Both hands grasped the client's left pectoralis major at the belly. The muscle was squeezed

and gently lifted. With the pressure maintain, roll the muscle belly between the index, middle and thumbs performing a money sign movement. Address both pectoralis majors and perform this two times. This technique was used on the client's right SCM. Perform this two times. Therapist braces both thumbs and frictions in a cross-hatch pattern to the client's bilateral pectoralis minor and right scalenes, repeated this four times. Next, lotion was applied within the borders of the client's scar by using a moderate long stroke. Perform this four times. Next, the therapist placed one hand on top of the other to act as a brace of support. Pressure is concentrated at the therapist's palmar surface. Perform using a broad downward circular pressure towards the client's heart. Progressively move towards the client's right side after each vertical line is complete, repeating five circles in one area. Therapist started on the client's left side, using the broad surface of their right forearm to stroke from the superior insertion of pectoralis major to the inferior origin. Perform five times over the same area for the bilateral pectoralis major muscles. Next, a scooping motion was performed to the client's bilateral pectoralis major muscles, focusing on the muscle belly of both pectoralis major muscles. Perform ten times over the same area for each muscle. Lotion was then applied to the client's right neck side. Next, a fingertip long stroke is used on the right SCM and scalenes, with broad light pressure towards the heart and performed for four times. Therapist held the client's neck with their left hand and slightly rotated the client's head towards the left. Pressure is then applied in

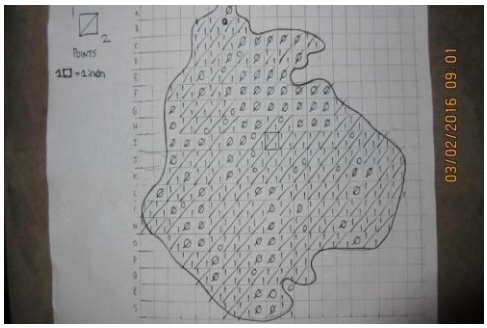
downward circular strokes towards the heart. Perform ten circles in one area. The therapist then performed a scooping motion with their right hand to the client's right SCM and scalene muscles. Perform ten times over the same area for the right side of the client's neck. Next, the client's left pectoralis major was put into a shortened position, by having the client raise their left arm to 90 degrees of flexion. Therapist then grasps the client's arm with their left hand so that the client can relax. Next, the therapist made a soft fist with their right hand compressing the pectoralis major muscle and maintained a hold. Slowly bring the client's arm from a 90 degree flexion out to the side. Perform this technique in frontal and sagittal plane and repeat twice. Hold each lever for thirty seconds. Do this for both bilateral pectoralis major muscles.

Home care

The client had been asked to perform an upper and middle trapezius weighted contraction, which included twenty reps with seven pounds for each arm. This technique was to be performed three times a week. The client was also instructed to perform a pectoralis major and minor stretch against a wall or door. Each stretch was performed at thirty, ninety and a hundred and thirty degrees of arm abduction at the glenohumeral joint. Client was instructed to hold each stretch for thirty seconds to one minute, with two sets of stretches for each degree. This technique was to be performed five times a week.

RESULTS

Results from the two point discrimination test on the seventh post assessment (Figure 3.B) showed an overall increase in skin sensation to the client`s bilateral chest area compared to before the first treatment (Figure 3.A)



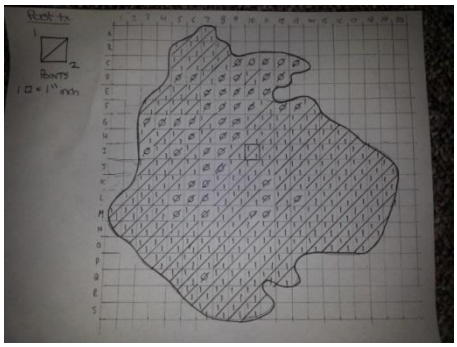
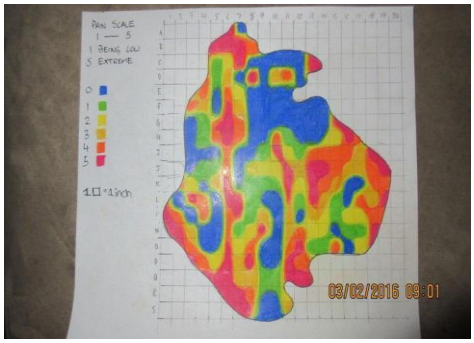


Figure 3.A **Figure 3.B** Imaging illustrating the two point discrimination tests on a scaled down version of the one inch grid. (Figure 3.B) showed an overall increase in skin sensation to the client`s bilateral chest area compared to before the first treatment (Figure 3.A)

Results of the modified nerve test on the seventh post assessment (Figure 4.C) showed an overall increase in pain and a few spots where sensation was lost compared to prior first treatment (Figure 4.B).



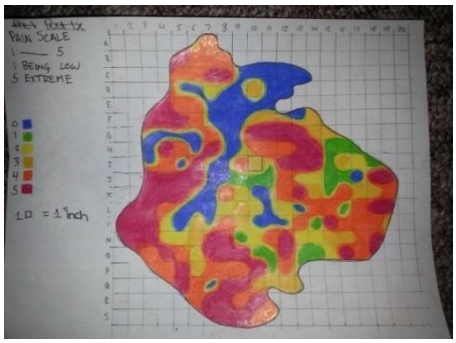


Figure 4.B **Figure 4.C** Imaging illustrating the scaled down version of the one inch grid used for measuring nerve pain. A pain scale of one being light pain in green and five being extreme pain in red is shown.

A visual inspection of the client`s skin after the modified nerve test on the seventh post assessment showed visible red spots where the protractor had been. This hyperemic response was not present in previous tests, leading the researcher to question the circulatory impact of the treatment to the affected area. (Figure 5).

Figure 5 Image illustrating the client`s skin after the modified nerve test on the seventh post assessment.

Resisted muscle testing for bilateral upper/middle trapezius was 4/5 shaky prior to the first treatment and after the seventh treatment 5/5 strong (Figure 6).

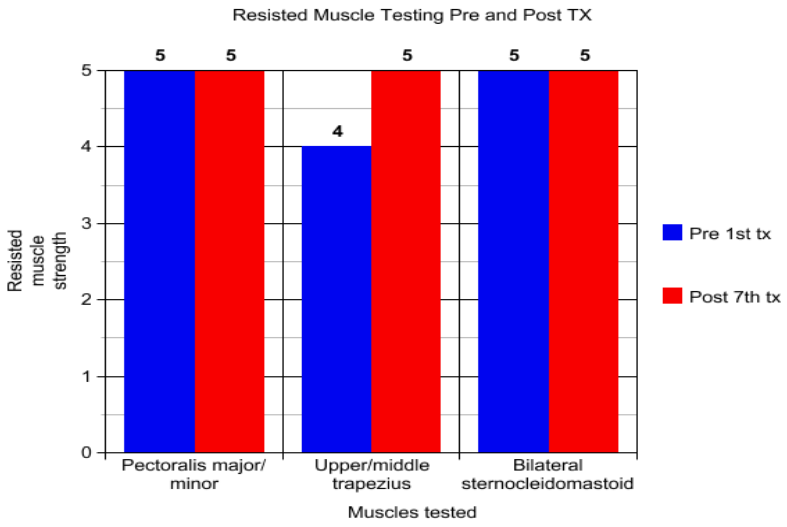


Figure 6 Imaging illustrating resisted muscle testing for bilateral pectoralis, trapezius and SCM.

Results show an overall decrease in pain level and pain sensation post first and seventh treatment associated with the McGill short form pain questionnaire (Figure 7). During pre-first treatment there was throbbing, shooting, hot burning, splitting and punishing-cruel pain. With post first treatment there was hot burning pain. With pre seventh treatment there was shooting, stabbing, sharp, gnawing and tender pain. For post seventh treatment there was only sharp and tender pain.

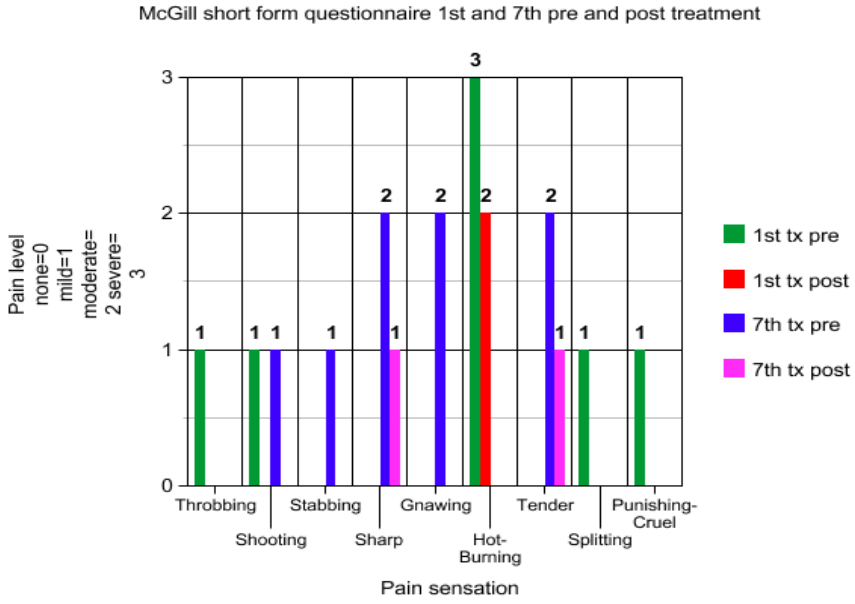


Figure 7 Imaging illustrating pain level and pain sensation associated with the McGill short form questionnaire. This graph compares first and seventh pre and post treatment.

Pain levels for each massage technique were considerably lower during the seventh treatment compared to the first treatment (Figure 8).

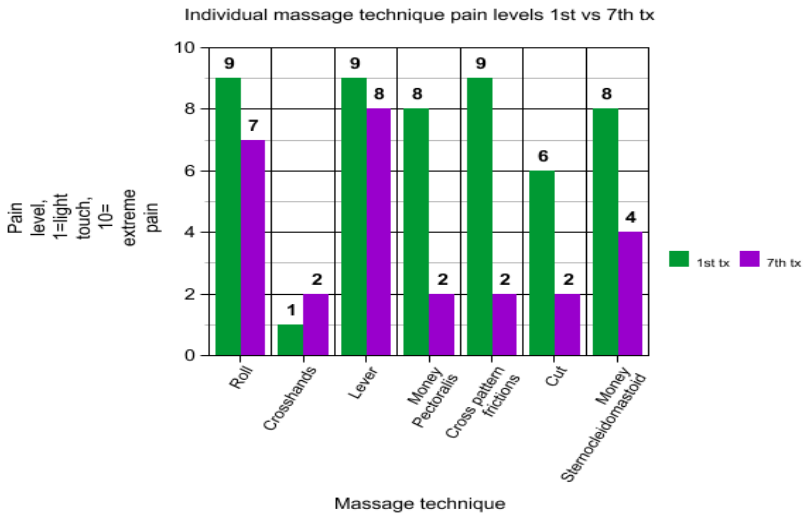


Figure 8 Imaging illustrating Pain levels for each massage technique.

There was a significant decrease in itch on the fourth treatment in the applicable massage techniques compared to the first treatment. During first treatment there was no itch with roll or cross hands. With third treatment there was no itch with the lever or cross hands. With fourth treatment there was only itch with roll. Fifth to seventh treatment the client had no itch (Figure 9).

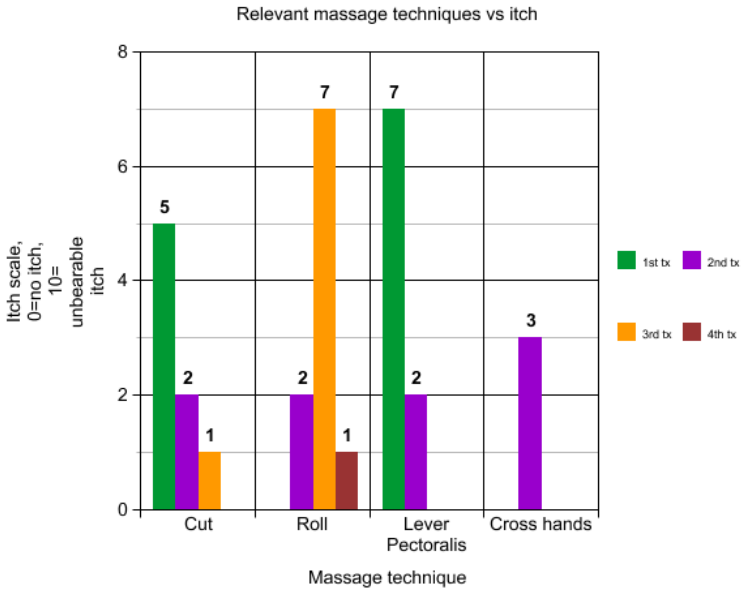


Figure 9 Imaging illustrating itch with applicable massage techniques.

The client had an overall range of motion increase in all bilateral glenohumeral movements after the first and seventh post treatment. (Figure 10.A, 10.B).

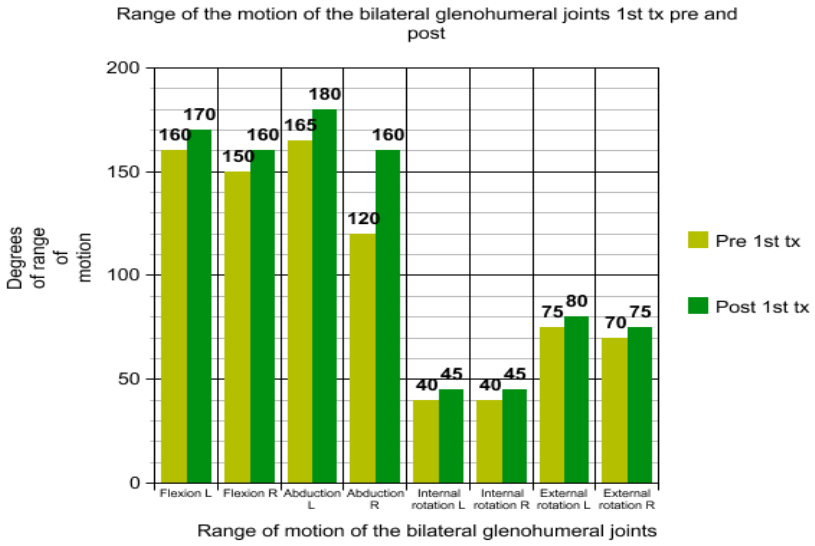


Figure 10.A. Imaging illustrating bilateral glenohumeral movements' pre and post first treatment.

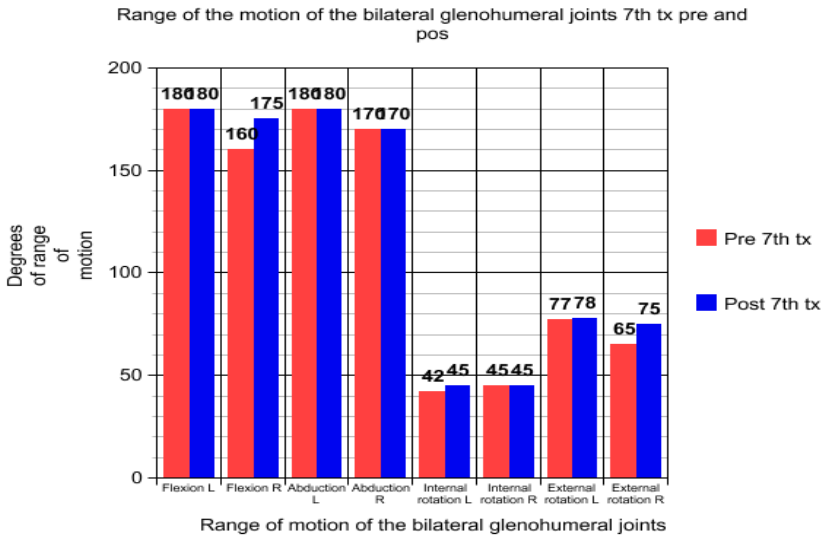


Figure 10.B. Imaging illustrating bilateral glenohumeral movements' pre and post seventh treatment.

Results on the seventh post assessment came back negative on the right side in the pec contracture test, from being positive prior to first treatment.

Results from the state trait anxiety form revealed no difference between pre and post treatment.

CONCLUSION

The purpose of this case study was to determine if massage has an effect on pain, itch, range of motion, sensory of the skin, and nerve pain in a chronic burned victim. Out of eight assessments, four assessments showed significant increases, two assessments showed significant decreases and two assessments stayed the same, at the end of the seventh treatment. These findings were possibly due to an increase in blood flow, strength, flexibly and a decrease in hypertonicity in the bilateral chest area, due to the client's body becoming accustomed to massage. The state trait anxiety form revealed no significant difference pre and post treatments. The client reported feeling less tight in his chest area and is still able to do all the activities he did prior to treatment starting. The client reported that he will still continue to do his homecare throughout the week so his flexibility and strength can be maintained. For future studies, the client should still receive two massages a week, however, an increase in the span of the massage treatments is recommended to see the true benefits massage has on a chronic third-fourth degree burn. Having equipment that measures any decrease in hypertrophic and

keloid scar tissue as well as skin elasticity as shown in the reading "The effect of burn rehabilitation massage therapy on hypertrophic scar after a burn "[6] would be beneficial. One point to note with all grid lines followed with the two point discrimination test, when two points of a protractor were placed on the client's bilateral chest area, it was extremely hard for the client to tell if there were two points or one point applied, this was tested on different body areas on multiple people and the same results came up, however, as results show, the client either felt one point or nothing at all; to obtain a more accurate result, the modified nerve test should be done at least once a week to make sure the client is not having an off day or fluctuations of nerve pain; a 2 inch square used to increase reliability of the 1 and 2 point test as 1 inch is the smallest range you could reasonably expect the 1 and 2 point discrimination to work at.

Massage was beneficial in reducing itching and pain levels in this study. Many studies show massage positively impacting anxiety; however in this study Massage Therapy did not reduce anxiety. Massage Therapy has shown to increase overall range of motion, nerve pain and skin sensation in a third-fourth degree chronic burned victim. Massage may have a positive impact on localized circulation for burn victims, but further and formalized assessment is needed. Additional larger-scale research is needed to determine statistical significance.

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