Clinical Case Report Competition

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First Place Winner

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Massage therapy for post-mastectomy scarring
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Abstract

Following a modified radical mastectomy, the subject presented with painful and restricted glenohumeral range of motion (ROM) in abduction and little fascial mobility of the superficial and deep chest structures. It was hypothesized that Swedish and myofascial techniques used on and around the scar area would increase the mobility of fascial layers and therefore decrease glenohumeral dysfunction and improve ROM. Twelve treatments were performed, each consisting of assessment, heat application, Swedish massage, fascial techniques, clearing, cold hydrotherapy, and finally reassessment. Over the course of treatments, ROM improved from a maximum of 120 degrees with corresponding pain to a full ROM of 180 degrees without pain. This ROM improvement was maintained over a month after the conclusion of the study treatments.

Keywords: mastectomy, scarring, glenohumeral dysfunction, myofascial release, massage
Background

Breast cancer is the second-most common cancer among Canadian women (following non-melanoma skin cancer) and it is the top killer among cancers in that demographic, according to the Canadian Cancer Society (2012). In 2011, an estimated 23,400 women were diagnosed with breast cancer and an estimated 5,100 will die of it. This calculates to 64 Canadian women diagnosed with and 14 dying of breast cancer every day. Breast cancer diagnoses rose steadily from 1980 to the early 1990s, likely because of the increased use of mammography screening. As a result of increased use of screening, breast cancer death rates have declined in every age group since at least the mid-1980s. Taking these statistics into account, there is an increasing amount of individuals dealing with the effects of post breast cancer treatments.

Invasive ductal carcinoma (IDC) is the most common type of breast cancer at about 80% of cases (American Cancer Society 2006). When IDC is diagnosed, cancer cells have infiltrated the ductal wall and invaded surrounding breast tissues; they have the ability to metastasize. Treatment of IDC tumors typically involves surgery: a lumpectomy or mastectomy, the choice being dependent on the staging of the cancer.

A modified radical mastectomy, the surgery type involved in this case study, involves removal of the entire mammary gland including the nipple-areolar complex, the pectoralis fascia, and some of the lymph nodes in the armpit which may be involved due to the metastases of a tumor. The muscle under the breast is not removed. The boundaries marked for this surgery are the clavicle superiorly, the sternum medially, the inframammary fold inferiorly, and the latissimus dorsi muscle along the pectoralis major fascia laterally (King & Borgen 2005). It is common for reconstructive surgery to occur at the same time as the breast is removed or at a later date.

Introduction of the Medical Condition - Etiology and Pathology

A balance of all layers of soft tissue, including skin, superficial fascia, underlying musculature and deep investing fascia, is needed to facilitate normal function of surrounding osseous structures, tendons and ligaments. A modified radical mastectomy, like all surgeries, can often cause profound range of motion (ROM) and fascial dysfunction. Much of the issue stems from the scar tissue that develops during healing, collagen-based tissue that is weaker and less mobile than the tissue it replaces. (Rattray, 2010) Willem Fourie remarks that with surgeries “there is the risk of damage and adhesion between tissue movement planes resulting in dysfunction in the form of restricted tissue glide, muscle imbalances, weakness or loss of flexibility even at a distance from the original scar.” (2010) This damage can lead to greater systemic symptoms and these may not even be immediately evident, according to Lash and Silliman (2000): “upper body dysfunction may arise shortly after therapy and may resolve, arise, and persist [...] or arise at some time distant from therapy.”
The studies of Karki et al. (2005) become more specific with issues post-mastectomy, listing “upper limb oedema, decreased shoulder mobility, neural tissue injuries causing sensory and motor dysfunction and pain” as well as noting sleeping disturbances in a significant proportion of patients. It’s important to note that these symptoms are not universally experienced post-surgery, with Fourie (2008) concluding that “the presence of impaired shoulder ROM shows a lot of variability, ranging from an incidence of 1.5% to as high as 50%.”

With all these potential issues affecting patients completing treatment for breast cancer, there is clearly a strong requirement for therapy to treat these issues. Karki et al. (2005) assert that “there is an urgent need for developing systematic rehabilitation protocols for breast cancer patients to support their functioning and to prevent permanent, limiting disabilities that would affect the health condition.”

Literature has shown little evidence for use of scar massage to improve purely aesthetic outcome (Shin & Bordeaux, 2011), but the use of myofascial techniques in scar treatment for other purposes are not well studied. MacDonald (2004) found that connective tissue techniques, along with hydrotherapy, “can increase tissue mobility [and] mobilize the tissue layers” post-mastectomy, and Day et al. (2009) found that the application of fascial manipulation and technique may be effective in reducing pain in chronic shoulder dysfunctions. Fourie (2008) concluded in a study involving 18 post-treatment breast cancer patients that “adding mobilization of all tissue gliding restrictions resulted in improved upper limb function, reduced pain and increased exercise tolerance.” These results suggest the effectiveness of such treatment and requirement for more investigation into their effects. It is with this in mind that we approach the case study.

**Common Interventions**

Massage as a general treatment has a number of established beneficial effects. It controls pain, improves circulation, relaxes muscles, improves the immune system, reduces stress and anxiety, and gives the client a feeling of well-being (Rattray 2000).

Rattray (2000) provides many suggestions for scar treatment by massage therapists. The use of pre-treatment hydrotherapy application of heat (e.g. moist heating pad – thermophore) is recommended. Fascial techniques such as skin rolling, connective tissue frictions, s-bowing, c-bowing, cross-fibre frictions such as j-stroke fascial technique and fascial shearing are all recommended to promote fascial torsion in the specific area of the restricted tissue with the goal of a mobile, functional scar. A slow, passive stretch should follow to encourage collagen fibre alignment during the healing process, promoting the production of loose or areolar scar tissue rather than dense connective-tissue scar. Post-treatment application of cold hydrotherapy is appropriate to decrease hyperemia and heat production. Finally, prolonged passive self-stretching is recommended as areolar scar tissue responds well to this form of exercise.
General Anatomy

Rattray (2000) defines fascia in this way:

Connective tissue or fascia surrounds all muscles, muscle groups, bones and organs, holding them in place. Although it has various names depending on its anatomical location, fascia is, in fact, a continuous sheet of supporting tissue that envelops the entire body. It is strong yet mobile.

Willem Fourie, in an article about post-mastectomy shoulder treatment and rehabilitation, adds that “fascia does not move bones or initiate movement it merely controls the quality of the movement taking place while keeping the bony levers and spacers within a specific functional configuration.” (2010)

Fascia surrounds and protects muscular tissue, decreases friction in areas of movement, and provides a pathway for nerves, blood vessels and lymphatic vessels to enter and exit muscles. Fascia is part of body structures from superficial to deep. Superficial fascia, formed from collagenuous and elastic fibres, helps protect the body from external stresses, stores adipose tissue, provides a pathway for vascular and nerve structures, and gives an anchoring point for the subcutaneous layer of the skin. Deep fascia is “denser, tougher, and tighter. It compartmentalizes the body and surrounds the muscles and viscera, contributing to the body’s contours and function.” (Rattray 2000). It contains no fat, but also provides vascular and nerve pathways. The deep fascia that surrounds individual muscles is also referred to as epimysial fascia. Fourie (2010) remarks that “the deep fascia of the trunk also fuses with the epimysial fascia”, emphasizing the connections between the layers.

When there is injury to any body tissues, including fascia, fibroblasts aggregate to produce collagen and other matrix materials to form scar tissue in the process of fibrosis. This fibrotic tissue does not have the same specialization of the original tissue, so the original function is impaired. (Tortola & Derrickson 2009).

A modified radical mastectomy affects the majority of the pectoralis muscles, the fibres of which are described by Simons and Travell (1999) as attaching medially as four separate sections. The fibres attach to the medial portion of the clavicle, the longitudinal border of the sternum, the costal cartilages of ribs 2 through 6 or 7, and finally to the abdomen via the superficial aponeuroses (fascia) of the external obliquus abdominis muscle. Fourie (2010) notes that “the fasciae of the pectoralis muscle, deltoid and latissimus dorsi muscles adhere firmly to the respective muscles due to intramuscular septa branching off its internal surface between groups of muscle fascicles.” Similarly, according to Muscolino (2010), “the lowest four to five slips of the costal attachments of serratus anterior interdigititate with the external abdominal oblique.” It is then imperative, when treating any issues involving the fascia of the chest area, that all of these muscles (pectoralis major, deltoids, latissimus dorsi, external obliquus, and serratus anterior) are addressed.
Hypothesis

Limited studies have demonstrated the effectiveness of massage in increasing tissue mobility in the general population as well as in improving upper limb function after breast cancer treatments. Based on the findings of these studies, a treatment program of Swedish and myofascial techniques will be used on and around the scar area of a post-mastectomy breast cancer patient to increase the mobility of fascial layers around the scar tissue and therefore decrease glenohumeral dysfunction and improve ROM.

Introduction to Case Study (Patient History)

The patient is a working 54-year-old woman smoker with no relevant injury prior to her diagnosis. She was diagnosed with breast cancer in December 2010. The patient underwent chemotherapy, a modified radical mastectomy, and radiation therapy.

Chemotherapy was the initial treatment, running from January 2011 until June 2011. A bilateral modified radical mastectomy was performed July 2011 – the right breast was cancerous and the left breast was removed under suspicion of malignancy. Thirteen lymph nodes were removed from the right chest and axilla and no lymph nodes were removed from the left chest and axilla.

Complications with healing – infection and poor healing of the surgery site – led to 3 additional surgeries. The 2nd surgery was in mid-August – implants were removed and tissue expanders (a synthetic material placed to stretch the surrounding structures to enable breast augmentation at a later date) were installed. In the 3rd week of August a flap revision was performed to remove scar tissue and the right tissue expander was removed to encourage healing. After these surgeries it was discovered that she was allergic to the “Steri Strips” which were used to hold the incisions together to heal – this, coupled with a decreased immunity due to lymph node removal on the right side, left her prone to infections and led to ineffective healing. In early September a 4th surgery was performed to clean out infection in the incision site on right and another flap revision on the left side, leaving the left tissue expander in place. Antibiotics were administered four times over the July-September surgery schedule in attempt to control infection.

Radiation was performed from November to Mid-December 2011. It was five times per week for five weeks and was performed from anterior and posterior chest region. It was performed only to the right chest, the location of breast cancer. The patient recalled that her skin felt considerably tightened in the right chest region during this time.

Patient was instructed to apply cream daily to the chest; originally this was Glaxal Base, and later during her case study treatments was Jergens body lotion. She was also on Exemestane, an anti-estrogen therapy. She was taken off this in March 2012; her doctor advised that it could possibly be aggravating her neuropathy pain, but MedlinePlus (2010) does not list any neuropathy-related side-effects for this drug.
It is possible that the patient’s use of cigarettes may have had some effect on healing and scar tissue formation. Smoking limits the oxygen carrying capacity of hemoglobin. Elevated carboxyhemoglobin levels have been associated with changes to the epithelium and increased platelet stickiness. Nicotine affects macrophage activity and reduces epithelialization (British Columbia Cancer Agency 2011).

**Patient Anatomy with signs and symptoms**

The surgical scar on the right side was approximately 9 inches in length and sat between ribs 5 and 6. The scar was slightly curved, making it somewhat difficult to measure accurately. Areolar tissue and nipple had been removed bilaterally.

The patient presents with painful restricted range of motion and little fascial mobility of the superficial and deep chest structures. Additionally, the patient experienced decreased hours of sleep (to approximately 3 hours per night), awakening with pain, skin pulling, and the feeling of need to “move her arm”. On frequent occasions she moved to the couch to maintain a different sleeping position that did not impinge the limbs.

When requested to show where she feels “skin pull”, she indicated the sternum and to the lateral ribs. She indicated that her range of motion was affected in both abduction and flexion of the glenohumeral joint on the right side, but not on the left. Various activities of daily living were also impacted; for example, opening a right handed fridge caused a shooting pain from axilla to sternum. Her golf swing was particularly affected, causing pain with swing force and decreased ROM with swing. She was unable to reach for items above shoulder height due to pulling of skin and pain. All of the above restrictions focus strictly to the right upper limb. The patient indicates there is no restriction, pulling or pain on the left upper limb or chest.

Neurologically the patient has no sensation on the scar or inferior and superior to the scar in the chest region except some hypersensitivity at the axillary border of the scar.

Patient had experienced previous issues with carpal-tunnel dating back to 1986; however, these only bothered her when she overexerts and she noted that she hadn’t had pain in over a year. Since her surgeries and treatments she finds the old “carpal-tunnel” pain noticeable in the evening and she wakes with tingling fingers with pain being at its worse at 3 out of 10 on a pain scale. She also indicated no numbness, tingling, or weakness increasing post-surgery but does occasionally feel a “toothache pain” at the medial epicondyle when over exerting.

Signs and symptoms and all assessment and treatment will be focused on the right upper limb and right chest region. The patient indicates no dysfunction or pain on the left upper limb or chest region. Due to the fact that her ROM and pain is only on the right glenohumeral joint, the treatments will be focusing on the right fascial restrictions and decreased ROM.
Forms of Assessment

The use of Adson’s, Halstead’s, and provocation test to assess the presence of Thoracic Outlet Syndrome were used and found negative.

Muscle testing was done in all ranges initially to test strength and noted slight weakness in flexion and abduction.

Her blood pressure was taken at the time of the original assessment with a reading of 118/75 and pulse of 88 BPM. At the last treatment, blood pressure was 115/75.

With the use of graphed paper, photos were taken with her arms in abduction – this was done because ROM in abduction presented the most problems for the patient. Landmarks of axillary fold and olecranon process, as well as a foot placement mat attached to the graph (see Figure 2), were used to ensure accuracy of measurement for reassessment.

Photographs (see Appendix B) and fascial mobility recordings (summaries in Appendix A) were taken at the initial and final sessions. The photographs and recordings were used to assess and observe tissue and tissue mobility changes pre- and post-completion of treatments. During the recordings, manual assessment was done medially/inferiorly, medially/superiorly, laterally/inferiorly, and laterally/superiorly to the right chest scar. She noted an increased sensitivity on the anterolateral border of the axilla with numbness medial to this area. All layers of tissues seemed firmly attached to deeper structures such as the ribs. After pressure was released from manual compression during assessment, an indentation was left which would take some time to rebound to its original position.

Peripheral joint exam with the use of “star chart” assessment forms (example in Appendix C) was performed to assess glenohumeral joint ROM. Abduction on the right side showed the greatest decrease of ROM, to approximately 110° before pain, with a corresponding fascial pull into the inferior axilla. Abduction could be pushed to 120° with pain and a pull starting at the medial sternum. During this exam, a folding and puckering of the skin at the medial and lateral borders of the scar, as well as fascial pulling and increased sensitivity at the anterolateral border of the surgical scar, were observed.

Treatment Protocol, Modalities, and Goals

A treatment protocol was prepared and followed each treatment. Some variations were made to this protocol (e.g. duration of each modality to achieve tissue response) as the tissue required on a treatment-to-treatment basis; these variations are noted in the treatment notes (Appendix A).

Each treatment was 90 minutes in duration. There were fourteen treatments, the initial two consisting strictly of assessment and protocol review. Each treatment incorporated both heat and cold hydrotherapy. The assessment was taken on February 6 and 9, 2012 and regular treatments started on
February 16, 2012, proceeding twice a week except when there was patient-therapist scheduling conflicts. Full reassessment was taken on April 2, 2012.

Techniques were chosen to achieve the primary goals of improving the range of motion of her glenohumeral joint while also decreasing pain in the end range of abduction and the reduction of fascial pulling from her sternocostal region to her anterolateral axilla. Warm hydrotherapy and Swedish techniques were used to increase the circulation in the area and decrease tonicity of surrounding muscles, as described in Rattray (2010). Fascial techniques were applied in the management of scar adhesions and to encourage possible fascial reconstruction, based on the following concepts:

1) the appropriate level of fascia is reached by applying pressure to the tissue. The amount of pressure varies with the depth of the fascia;
2) a stretch is placed on the fascia to be treated, which takes the elastic slack out of the tissue;
3) the tissue is engaged by holding this stretch;
4) the stretch is held for a period of time sufficient to break some of the bonds between the individual fibres of the connective tissue. A burning sensation is perceived by the client. Several minutes may be required to achieve successful tissue release;
5) successful release is indicated by hyperemia, a palpable release of heat, decrease of pain or other symptoms and a softening or lengthening of the tissue. (Rattray, 2010)

Cold hydrotherapy would help to control inflammatory response post-treatment and assist in fascial alignment in conjunction with tension. Assessment of ROM and fascial mobility was done throughout treatments to monitor any changes.

Each session began with history taking, star chart peripheral joint exam, active range of motion (AROM) testing, resisted range of motion (RROM) testing, and palpation. Some further special tests were done periodically as signs and symptoms presented.

Treatments began with a 10 minute hydrotherapy application of heat with a thermostat-equipped thermophore to the complete chest just below the clavicle to the superior iliac crests anteriorly and bilaterally at a temperature of 136F. After the area was preheated, treatment began with Swedish, with light and deep stroking of upper trapezius muscles, pectoralis major, serratus anterior muscles, latissimus dorsi muscles, deltoid muscles bilaterally.

Following Swedish, fascial techniques began. First, shearing of the anterior chest caudally, just inferior to the clavicle. Second, shearing of pectoralis major muscles in an inferior/abdominal direction, between serratus anterior and external oblique muscles with stabilization of the lateral border of the scapula. Next, fascial release of the pectoralis muscle on the right with bowing – this technique was supplemented with active release in later treatments as she could tolerate a more aggressive approach.

Fascial skin rolling was performed initially superior and inferior to the surgical scar directed towards the scar and fascial restrictions. In later treatments, after skin and fascial movement had improved, skin rolling was done directly over the surgical scar on the right. Direct fascial treatments to the scar
MASTECTOMY SCAR MASSAGE

consisted of scar s-bowing, c-bowing and shearing of the scar both laterally to medially and superiorly to inferiorly. This progressed to j-strokes superior, inferior, and directly to the scar and palpable fascial adhesion. Each fascial technique was loaded into three planes and was held until a release was felt and slacking of tissue was taken up until tissue was loaded again.

The treatment was finished with light stroking in a clockwise direction starting inferomedially to clear the tissues. Positional cooling hydrotherapy (packed ice in a towel) was applied to the treated area. It was placed over the right chest area with her upper limb in abduction stretched for 10 minutes with the goal of promoting fascial tension alignment. Reassessment with the previous techniques was redone after each treatment.

Her homecare consisted of recording a daily journal to record differences in activities of daily living, how she felt before and after treatments, any changes in altered pain, sensations, and changes in fascial pulls and range of motion. She was also asked to record frequency, intensity and duration of assigned stretching homecare. She was given instructions and illustrations of a pectoralis major stretch she did two sets of these, bilaterally, twice a day.

Treatment Results and Prognosis

Changes were assessed before and after each treatment with longer initial and final assessments. The goals of increasing scar mobility, increasing range of motion and decreasing scar adhesions were achieved, indicated by the lack of pain with movement as well as achieving and maintaining full range of motion in all ranges.

Upon initial assessment the patient presented with restrictions in ROM, mainly abduction of the right glenohumeral joint which could be abducted a maximum of 110° before pain and a maximum of 120° with pain. By contrast, the patient was able to maintain full ROM with no pain in the later treatments (see Figure 1 – full measurements are detailed in Appendix A). The patient also noted decreased fascial pulling when placing the glenohumeral joint into abduction and indicated that the “skin felt good “ and “felt like it was more mobile”. Further treatments were recommended to further decrease the scar adhesions to underlying structures and to increase its mobility.
Figure 1- Range of Motion in Degrees, Pre- and Post-treatments

In addition to these measurable outcomes, there were notable subjective results. First and briefly, after completing the case study treatment series, the patient noted that there is no longer pain in her arm, it does not wake her and she “doesn’t worry about lying on that shoulder anymore”.

Secondly, the patient’s surgeon had ruled her out as a candidate for breast reconstruction surgery in early 2012, citing the lack of mobility of her scar tissue. In early May 2012, during a follow-up conversation with the patient, the patient indicated that the surgeon examined the patient, commented that the scar area was “deceptively supple” in light of the surgeries and radiation treatment. The surgeon indicated that it is unusual to be able to proceed with breast reconstruction after a mastectomy and radiation combination, but booked follow-up appointments to proceed with the reconstruction surgery based on the post-case-study state of the scar area.

Finally, the patient noted that the absorption of topical cream application increased between February and May. She commented that it originally “sat upon the skin for a long duration and in later treatments absorbed quickly” regardless of which cream was used (Glaxal Base or Jergens). This form of assessment was not taken into consideration but it is a notable change to the skins qualities. No relevant research was found on this topic.

Summary and Conclusion

In this case study, the use of Swedish and myofascial techniques on and around the scar area to increase the mobility of fascial layers around the scar tissue was successful. The treatments were also
measurably effective in decreasing glenohumeral dysfunction, enabling the patient to achieve and maintain full ROM in all directions without pain.

Unexpected but notable subjective results included increase of absorption of topical cream and enabling the patient to initiate breast reconstruction surgery when initially informed that it would not be possible.

These results suggest the effectiveness of Swedish and myofascial techniques for individuals post-mastectomy. More evidence-based studies, with a larger number of participants over a longer period of time, are strongly indicated.
Appendix A - Treatment Notes

These are notable points, both objective and subjective, for each treatment. They are rough notes intended as a treatment-by-treatment record of the patient’s progress.

- February 6 and 9th, 2012 were full assessment treatment times.
  - Treatment protocol and techniques were reviewed with the patient.
  - Initial assessment of scar and ROM was done. This included history-taking, fascial recording, photographs, and assessment of ROM using the star chart.
  - Found little to no movement of the scars on the right chest. When movement was initiated towards the scar in all locations, there was no scar movement and the tissues appeared to “fold into” the scar, especially puckering at medial and lateral points of the scar.
  - Patient says that opening right-handed fridge at work causes an 8/10 “short and shocking” pain going from the axilla to the sternum.
  - Patient feels “toothache pain” over the medial epicondyle of the humerus.
  - When lateral scapula border palpated, patient indicated tingling at olecranon.

- February 16, 2012:
  - Pre-treatment: Patient said she was experiencing a fascial pull from axilla to sternum and into medial posterior arm above elbow. During the ROM exam, this pulling occurred at approximately at 120° of abduction of the right arm with pain, which was the limit of abduction. Full flexion was achieved with a slightly bent elbow.
  - Post-treatment: Patient able to bring arm into 125° of abduction. She indicated a “slightly different” pull from axilla to sternum with no pull into arm.

- February 20, 2012:
  - Pre-treatment: Able to move into 120° of abduction with slight pain and a tight feeling along the axillary edge of pectoralis major muscle. Patient noted that after a shower on February 19 she was able to bring arm into full abduction with no pain, but she did encounter increased discomfort with the same motion that evening. She has experienced some right shoulder pain that has been intermittent.
  - Post-treatment: Able to do some skin rolling over scar this treatment as skin allowed movement superficially. Tissues still firmly attached to underlying tissues. Increased ROM with right abduction to approximately 125° with the only “pull” being of tissues at chest with no pain.

- February 23, 2012:
  - Pre-treatment: Able to move to 125° of abduction with slight pain. The patient notes that she had an increase of activity which has caused increased soreness with movements, and has noted a decreased ROM. During treatment, noted that fascia is starting to allow slight
movement inferior and medial to the surgical scar on the right side. Deeper structures with an increased response to palpation (rebounding quickly instead of remaining indented.)

- **Post-treatment:** Increase of ROM to 160° with no pain. Pull was felt only into the axilla and lateral edge of scar. There was a slight decrease in resisted range of motion in abduction.

- **February 27, 2012:**
  - **Pre-treatment:** In AROM patient able to move into 120° of abduction until a pull is felt – there is no pain. Pull is no longer felt in arm and axilla but is now felt in the anterior chest over pectoralis major. The patient notes skin feeling “looser” and that after treatments she feels a “tightening” about 4-5 hours post treatment until continued movement loosens area again.
  - **Post-treatment:** First treatment that full abduction was achieved with no pain and only fascial pulling lateral to scar on right. Right arm remains slightly flexed at the elbow during flexion assessment.

- **March 1, 2012:**
  - **Pre-treatment:** In AROM patient able to move into 160° with no pain, and upon applying passive overpressure able to move into 165° with some pain. There was increased pain with the patient pointing directly to the glenohumeral joint which was possibly correlated with the increase of activity with the arm and patient increasing hours at work. Due to pain presentation the Speeds and Empty Can special tests were performed and found negative. Resisted ROM was tested which caused pain lateral to joint under middle deltoid and just below deltoid.
  - **Post-treatment:** In AROM patient able to move to full abduction (180°) with no pain and a slight pull into axilla. In retesting resisted ROM patient indicated no pain anymore but felt weak with movement.

- **March 5, 2012**
  - **Pre-treatment:** In AROM patient was able to do 170° of abduction with no pain. A slight elbow bend is still noted in full flexion. Patient notes pain in shoulder subsiding and skin “feeling good”. Rest of body overall is hurting indicating “extra work taking its toll”. Patient first notes increased absorption of topical cream application. Pre-case study, cream just seemed to sit on surface for a long duration, but it seems to absorb now. Right shoulder sore in the mornings but after shower and movement, pain subsides. Pain in shoulder has also subsided.
  - **Post-treatment:** Patient was able to do full abduction of the glenohumeral joint with no pain. Slight bend of elbow in full flexion still present.
March 8, 2012:

- **Pre-treatment:** Maximum abduction pre-treatment was 125°, with fascial pull at the lateral border of pectoralis major and lateral border of scapula. Today was first day she felt not as mobile with pulling that prevents abduction. An increased workload at her occupation could possibly be correlated.
- **Post treatment:** Patient was able to regain full ROM with abduction again with ease of movement.

March 12, 2012:

- **Pre-treatment:** Initially, tissue would give the appearance of “denting” and would take time to “rebound” from compression and bowing. Now, tissue around scar appears to rebound right away. Pain in glenohumeral joint has disappeared and full ROM was maintained.
- **Patient noted a change to skin not assessed on initial assessment in case study. She has been applying cream twice daily (at first Glaxal Base, then Jergens) as recommended by the Cancer Agency. Prior to treatments, the cream seemed to have little absorption but by this treatment now “absorbs and stays”.
- **Post-treatment:** Patient was able to clap hands above head after actively moving through full abduction with patient noting ease of movement during this action. Full flexion still showing a slight bend in elbow on right.

March 15, 2012:

- **Pre-treatment:** Patient in AROM was able to move into full abduction and flexion with the patient noting that it was the first time since surgeries that she felt that her arm was “part of her” and felt like it was “supposed to be there”. Patient said that shoulder was no longer affecting sleep.
- **Post-treatment:** Patient in AROM was still able to move into full abduction and flexion with ease. The patient noted increase ease of movement with GH flexion and abduction. There was a fascial pull inferolateral to scar which is slightly lower than usual area of pull. Hypersensitivity noted in the region of the lateral border of surgical scar. Because of this, j-stroke fascial technique was eliminated from the treatments of the lateral scar to ensure that treatment remains within patient’s pain tolerance.

March 26, 2012:

- **Pre-treatment:** Patient was able to maintain full abduction and flexion of the right glenohumeral joint with no pain or fascial pulling. Patient feels skin colour has lightened radiation treatments, which caused skin discoloration.
- **Post-treatment:** Patient now stretching in all three planes of fibres of pectoralis major. Patient is no longer on anti-hormone medications as of March 24 due to aching hands and neuropathy in her feet. Doctor feels medications may be causing this as a side-effect and
checking to see if removing medications decreases signs and symptoms. Patient indicated increased sensation on medial superior and inferior scar which initially presented as numb. She said she could feel movement of thumbs as well as fascial “sting”. When patient moves into full flexion of GH she automatically bends her elbow, but when this is brought to her attention she is able to straighten her elbow into full extension.

➢ March 30, 2012:

- Pre-treatment: Patient is capable of maintaining full ROM with abduction and flexion. A slight elbow bend is still present with full flexion. She is also capable of clapping her hands together after achieving full abduction without pain and with ease. The patient indicated ROM very good and only pain is felt inferolateral to right scar where location was initially indicated to have hypersensitivity. She has been doing more stretching and noting improvement. During fascial assessment, noted increased movement deeper fascially near areas of medial scar that were initially noted as immobile and hardened. Patient indicates increased sensitivity on medial scar (initially numb).
- Post-treatment: Patient maintaining full ROM both with pre and post treatment. In order to fully fascially stress tissues with a stretch, changed patient position during cold hydrotherapy application. Patient is now in a side laying position to allow a long lever technique of stretching with hand placement between teres major and serratus anterior.

➢ April 2, 2012: (Final assessment)

- Pre-treatment: The patient is able to maintain full ROM with abduction and flexion. The slight elbow bend is still present, but when it is brought to the patient’s attention, she is able to correct and extend the elbow.
- After final treatment and full reassessment, patient notes that her only pain is on the hypersensitive area inferolateral to surgical scar.
- She notes she feels a pull when opening fridge at work but it doesn’t hurt anymore. Fascial pulling and pain no longer wakes her.
- There is no more “toothache pain” at the medial epicondyle of the humerus, and patient had “forgot” about that pain until asked.
- No tingling at olecranon with palpation of lateral scapula.
- Patient indicated that “my arm feels part of me again and the sides of my chest don’t feel separated anymore,” “I feel whole again,” and “I don’t feel like I’m dragging around this limb”.
- Patient feels a pull with the sternal head of pectoralis major during assessment but this does not hinder her ROM.
- During post-treatment recording of fascial assessment, the scar showed significant increase in mobility inferiorly and decreased “folding in” of tissues superior to the scar. There was still significant adhesion of tissues inferior to the scar that restricted its movement superiorly.
Appendix B - Photographs

Figure 2 - Foot mats to ensure accuracy for foot placement from pre and post treatments
Figure 3- Pre-treatment graph measurements – February 6, 2012

Figure 4- Post-treatment graph measurements – April 2, 2012
Figure 5 - Marked measurement graph (pre- and post-treatments)
Figure 6 - Pre-treatment – February 6, 2012

Figure 7 - Post-treatment – April 2, 2012
Figure 8 - Pre-treatment – February 6, 2012

Figure 9 - Post-treatment – April 2, 2012
Figure 10 - Pre-treatment – February 6, 2012

Figure 11 - Post-treatment – April 2, 2012
Figure 12 - Pre-treatment - February 6, 2012

Figure 13 - Post-treatment – April 2, 2012
### Peripheral Joint Exam

**Legend**
- $\$: Active ROM
- $\$: Passive ROM
- $\$: Hypermobility
- $\$: Pain in ROM

**Contra-indications or Precautions**

<table>
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<td>Hypermobility</td>
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**Additional Notes**

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### Appendix C - Assessment Chart

**Peripheral Joint Exam**

**Pre-treatment**

1. **Joint Examined:**
   - R __________
   - L __________

   ![Joint Exam Diagram]

2. **Abnormal End-feats**
   - **Movement**
   - **Quality**

3. **Restriction Pattern**
   - Capular
   - Non-capular

4. **Resisted ROM Testing**
   - **Direction**
   - **R. Grade. L. Pain (y/n)**

5. **Joint Play (C-L) Assessment**
6. **Special Tests**
   - 

**Post-treatment**

8. **Joint Examined:**
   - R __________
   - L __________

   ![Joint Exam Diagram]

**Differential Diagnosis**

6. **Joint Play (C-L) Assessment**

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**Clinic Instructor:**
- **Name:**
- **Date:**

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Bibliography


