Case Study

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Effect of Cytoskeletal Manual Therapy, a Novel Soft Tissue Mobilization Technique, on Axillary Web Syndrome after Axillary Lymph Node Dissection: A Case Report

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Objective: Axillary web syndrome (AWS) is a condition comprising fibrous band-like cords that appear in the axilla of patients after axillary lymph node dissection (ALND) during breast cancer surgery and result in pain and reduced mobility. The cords appearing with AWS are hardened veins or lymphatic vessels. Manual therapy and stretching are recommended for pain control and mobility improvement. Therefore, this study investigated the effect of cytoskeletal manual therapy (CMT), which is a new soft tissue mobilization technique.

Design: A case report

Methods: A 41-year-old woman with AWS after breast cancer surgery and ALND visited a physical therapy clinic because of shoulder pain, decreased function, and decreased mobility. The cords were palpable and pain occurred 2 weeks after surgery. CMT was performed three times per week for a total of 6 weeks. Her pain intensity, range of motion (ROM), and shoulder function were measured.

Results: Measurements were performed after 2 weeks and 6 weeks of CMT and evaluated using the numeric pain rating scale (NPRS). Her pain intensity largely decreased after 2 weeks (4-point score reduction) and after 6 weeks (5-point score reduction) of CMT. After CMT, her full ROM was restored and her shoulder function was improved (7-point score reduction).

Conclusions: CMT is effective for pain control, mobility improvement, and functional improvement of patients with AWS.

Key Words: breast neoplasms, lymph node excision, postoperative care, musculoskeletal manipulations

Introduction

Axillary web syndrome (AWS) involves the development of cords or fibrotic bands in the axilla after axillary lymph node dissection (ALND) [1]. In one study, AWS was observed in 44 of 750 patients who underwent ALND [2]. Additionally, during a randomized controlled trial, AWS was observed in 57% of patients at 6 weeks after ALND [3]. ALND is performed for metastatic breast cancer. It has been reported that AWS observed in breast cancer patients who did not undergo ALND disappeared within three months [2].

The cords observed with AWS are hardened veins or lymphatic vessels that have transformed into fibrotic bands after ALND [4]. It is possible that AWS originates from the lymphatic system, and the cords associated with AWS cause decreased shoulder mobility and increased pain [5]. Natural recovery during the management of AWS can occur through revascularization or progressive collagen resorption [6].

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However, soft tissue mobilization, range of motion (ROM) exercises, joint mobilization, and stretching exercises are recommended for pain control and mobility improvement [5, 7, 8].

Therefore, in this study, the effect of cytoskeletal manual therapy (CMT), a novel soft tissue mobilization technique with active and dynamic mechanical characteristics focused on muscle elasticity recovery, on shoulder mobility and pain experienced by a woman with AWD after ALND investigated.

Methods

This case study was conducted after obtaining informed consent in accordance with the Declaration of Helsinki. The experimental procedure is illustrated in Figure 1.

Patient history and systems review

The patient was a 41-year-old female who was hospitalized to undergo chemotherapy for breast cancer. Her height her was 154 cm and her weight her was 46 kg. She had no other musculoskeletal disorders before breast cancer surgery. She experienced only mild swelling in her left leg during chemotherapy. After 10 rounds of chemotherapy, she underwent breast cancer surgery and ALND at the same time. At 2 weeks postoperatively, she reported palpable cords in her axilla, pain, and decreased shoulder mobility. This symptom was AWS, and it was judged that intensive manual therapy was necessary, so he was referred to a manual physical therapy clinic 3 times a week for 6 weeks as in the experimental design.

Examination

The pain intensity was measured using the Numeric Pain Rating Scale, with scores ranging from 0 (no pain) to 10 (worst pain) [9]. The minimal clinically important difference (MCID) in the Numeric Pain Rating Scale score ranges from 1.1 to 2.2 points [9, 10].

Shoulder mobility was measured using a goniometer to determine forward flexion, scaption flexion, and abduction [11]. During the measurements, the patient actively moved while in a standing position according to the assessor's instructions. The ROM measurements obtained using a goniometer had high intra-observer reliability (intraclass correlation coefficient = 0.91–0.99) [12].

The simple shoulder test was performed to assess shoulder function. It consists of 12 items related to daily life with possible answers of "yes" or "no" the higher the score, the worse the shoulder function [13]. Its reported MCID is 2 points [14].

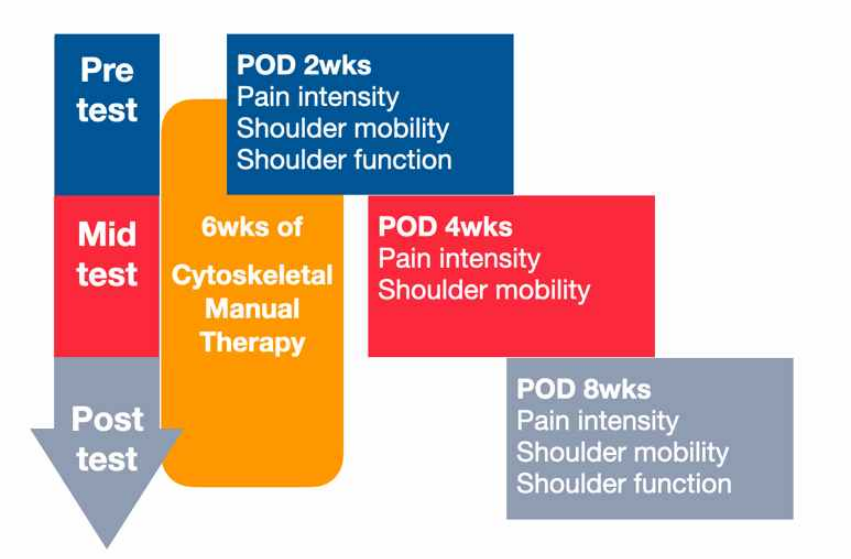


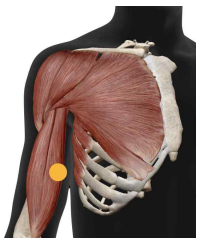
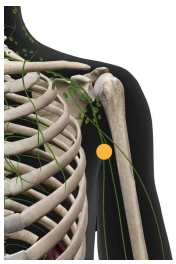
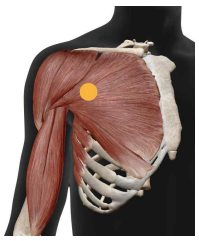
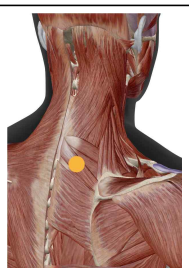
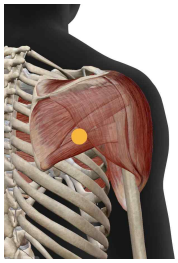
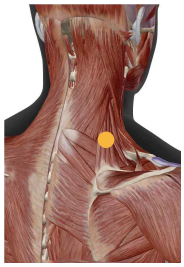
Figure 1. Sequence of outcome measurements. POD, postoperative day

Cytoskeletal manual therapy

Although various physical therapy techniques have been suggested, this study used CMT, which is a new manual therapy technique. CMT has some similarities to active techniques, including voluntary movement (Mobilization With Movement®, Angular Joint Mobilization®, Active Release Technique®) [14-16], neuroscientific insights, and cell biological evidence. CMT is a soft tissue mobilization method that involves activation or inhibition at the neuromusculoskeletal cell level [17], breathing patterns [18, 19], and pain education [20, 21]. Furthermore, it allows for the correction of the active movement of the patient [22]. Technically, the aim of CMT is to provide selective transverse stretching stimulation [23, 24] rather than compressed stimulation [25-27] of the tissue to enable pain control, functional improvement, and cellular recovery.

During this study, CMT was performed to treat the adhesions of surrounding tissues caused by breast cancer surgery and ALND and the limited motion caused by the cords associated with AWS. Three 30-minute sessions of CMT were performed each week for a total of 6 weeks. Table 1 describes techniques for each body part of CMT. The body application area was directed from the periphery to the center. The pressure applied to each tissue was intended to separate different tissues rather than pressure, and a comfortable method of applying pressure with weight rather than force of the provider was pursued. The joint motion was passive and dynamic, and when muscle tension gradually decreased, active movements were performed.

Table 1. Cytoskeletal manual therapy

Targeted soft tissue	Cytoskeletal manual therapy		Targeted soft tissue	Cytoskeletal manual therapy	
	Regions	Techniques		Regions	Techniques
Biceps brachii		▸ Transverse local mobilization ▸ Hold and move	Skin of the lymph vessel pathway		▸ Active and passive skin mobilization
Pectoralis muscles		▸ Segregated local mobilization ▸ Hold and move	Rhomboid minor		▸ Transverse local mobilization ▸ Hold and move
Infraspinatus and teres minor		▸ Segregated local mobilization ▸ Hold and move	Levator scapulae		▸ ransverse local mobilization ▸ old and move

Images were obtained from Muscles & Kinesiology (Muscle 8.0.76, Visible Body, USA).

Results

The pain intensity, ROM, and shoulder function of the patient who received CMT for 6 weeks were measured (Table 2).

Measurements were performed after 2 weeks of CMT and after 6 weeks of CMT. The pain intensity scores decreased by 4 points after 2 weeks of CMT and by 5 points after 6 weeks of CMT compared to the baseline score before CMT. Compared to the ROM before CMT, ROM after 2 weeks of CMT and after 6 weeks of CMT, respectively, improved as follows: forward flexion, 63° and 75°; scaption flexion, 68° and 68°; and abduction, 60° and 93°. Furthermore, the shoulder function score decreased from 8 points before CMT to 1 point after 6 weeks of CMT.

Discussion

Our patient experienced AWS after ALND for breast cancer. AWS, which is characterized by decreased shoulder mobility and increased pain caused by cords comprising fibrotic bands in the axilla, can be managed using manual therapy. During this study, the treatment progress with CMT, which is a novel manual therapy technique, was confirmed.

Pain intensity, ROM, and shoulder function were measured at 2 weeks and 6 weeks after CMT. The pain intensity score decreased by 4 points after 2 weeks of CMT and by 5 points after 6 weeks of CMT. This could be considered a clinically significant effect because the previously reported MCID is 1.1 to 2.2 [9, 10]. These results are similar to those reported by a meta-analysis of manual therapy after breast cancer surgery that found that manual therapy is effective for the controlling pain in the upper extremity (standardized mean difference = -0.62) [28]. Regarding ROM, an improvement of 60° to 90° was observed at 2 weeks and 6 weeks after CMT. These results showed a larger increase in ROM than that reported by a previous study of AWS management using manual therapy [5]. The shoulder function score decreased from 8 points before CMT to 1 point after 6 weeks of CMT. Because the reported MCID is 2 points [14], it can be confirmed that CMT has clinically positive benefits.

The clinical presentation of AWS includes pain and a pulling sensation caused by reduced cord mobility. Additionally, tissue adhesion after breast cancer surgery can exacerbate symptoms [29-31]. However, during this study, a significant improvement in mobility was observed at 2 weeks after CMT. Considering these results and the clinically significant changes reported previously, the effect of CMT seems quite positive.

CMT focuses on mechanical pain control based on biomechanical factors proposed by numerous manual therapy techniques. However, CMT is effective because it focuses on fibroblast and neuromuscular activation, and it aims to further restore the cell unit and improve function. The results of 2 weeks of CMT are similar to those of 2 weeks of physical therapy after ALND [32]. Furthermore, it has been reported

Table 2. Pain intensity, range of motion, and shoulder function of the right shoulder

Measurement	Before CMT	2 weeks after CMT	6 weeks after CMT
Pain intensity (points)			
Worst pain	6	2	1
Range of motion (degrees)			
Forward flexion	105	168	180
Scaption flexion	112	180	180
Abduction	87	147	180
Shoulder function (points)			
SST	8	–	1

SST: simple shoulder test.

that starting CMT at 5 to 7 days after surgery has a positive effect on wound healing [33, 34]. Therefore, CMT focuses on the physiological factors of stretching and the direction of pressure applied to the tissue to improve tissue strength and extensibility through the proper recovery of fibroblasts and homeostasis of the cytoskeleton [23, 24]. Postoperative adhesions cause anterior translation of the humeral head during forward shoulder flexion [35], and stimulation is transmitted to the long head of the biceps brachii [36]. This joint positioning fault can be explained by adhesion of the posterior capsule of the shoulder joint. Adhesion of the posterior capsule occurs secondary to the increased stiffness of the infraspinatus and teres minor [37] and the increased coupled force during forward flexion, which increase the compensatory action of the levator scapulae and rhomboid minor, thus causing tightness of the pectoralis muscles similar to that associated with upper cross syndrome [38]. Therefore, CMT was applied to the targeted soft tissues (Table 1), and the cords associated with AWS were relaxed along the myofascial pathway.

Conclusion

This is the first case report to describe CMT for patients with AWS after ALND during breast cancer surgery. CMT can lead to improvements in pain, mobility, and shoulder function caused by cords associated with AWS.

Conflicts of interest

The authors declare no conflict of interest.

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