OUTPATIENT PHYSICAL THERAPY FOR A PATIENT FOLLOWING SURGICAL REPAIR OF A FULL THICKNESS TEAR OF THE ROTATOR CUFF

A Doctoral Project
A Comprehensive Case Analysis

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DOCTOR OF PHYSICAL THERAPY

by

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A Project

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Abstract

of

OUTPATIENT PHYSICAL THERAPY FOR A PATIENT FOLLOWING SURGICAL REPAIR OF A FULL THICKNESS TEAR OF THE ROTATOR CUFF

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Adio K. Mangrum

A patient post arthroscopic rotator cuff repair of the left shoulder was seen for physical therapy treatment for 16 treatments over an eight week period at an outpatient physical therapy clinic. Interventions were performed by a student physical therapist under the supervision of a licensed physical therapist. The patient was evaluated at the initial encounter with goniometry, manual muscle testing, and the Shoulder Pain and Disability Index, and a plan of care was established. Main goals for the patient were to decrease pain, increase range of motion and strength, and return to weight lifting and running. Main interventions used were modalities for pain, manual therapy for range

of motion, and therapeutic exercise for strength. The patient achieved the following goals: increased strength, range of motion and function, and decreased pain. The patient was discharged to her home with a home exercise program.

_____, Committee Chair
Michael McKeough, PT, EdD

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Date

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Chapter 1

General Background

The shoulder joint is the third most common site of musculoskeletal pain in people under the age of 65 years.[1] The bones of the shoulder joint consist of the scapula, clavicle and humerus. The rotator cuff is made up of the supraspinatus, infraspinatus, teres minor and subscapularis muscles. The muscles of the rotator cuff are involved in various movements of the upper extremity (UE). The force applied by these muscles provide stability to the shoulder joint by holding the humeral head in the glenoid fossa of the scapula.[2] While many rotator cuff tears are symptomatic, they are a common cause of pain and disability.[3]

The incidence of rotator cuff tears is between 5% and 39%[3,4] and increases with age. People under the age of 60 years have an incidence of 6% while those over 60 years have an incidence of 30%. The incidence of partial thickness tears is 13% and full thickness tears is 7%.[3,5] Risk factors for a rotator cuff tear include increased age with incidence being higher among those over the age of 60,[4,6] history of trauma to the shoulder[4] and smoking.[7,8] Genetics have also been cited as a risk factor.[6,9] Yamaguchi et al. reported having an immediate family member, parent or sibling, with a rotator cuff tear increased the risk of developing one also.[9] In addition, elevated blood glucose,[10] metabolic syndrome[3] and elevated cholesterol and triglycerides[11] have been associated with a higher incidence as well.

The tendon of the supraspinatus muscle passes under the anterior portion of the acromion process of the scapula where it is at risk of impingement. Neer reported that 95% of rotator cuff tears result from impingment.[4] Some of the common traumatic causes of tears include fall on an out-stretched arm, a force applied to an abducted shoulder in external rotation, and dislocation of the glenohumeral joint.[12] There is no evidence that the rotator cuff tendons heal spontaneously once torn.[6] When untreated it is common for rotator cuff tears to increase in size. This increase is associated with increase in pain and loss of function. Asymptomatic shoulders with rotator cuff tears develop symptoms within 3 years, on average, and half of those who develop symptoms demonstrate an increase in tear size.[13]

Surgical repair using arthroscopy is a widely accepted treatment of rotator cuff tears.[14] Arthroscopic surgery has low risk and provides patients with good clinical outcomes.[14,15] Patients have maintained improvements in pain and function for as many as 15 years post-operatively.[15] Post-operative rehabilitation of the repaired rotator cuff has traditionally consisted of a period of immobilization of four to six weeks followed by passive range of motion (PROM) exercises. Some evidence suggests that introducing PROM exercises early in the rehabilitation process may lead to earlier gains in range of motion (ROM).[16]

Chapter 2

Case Background Data

Examination - History

The patient in this case was a 52 year old woman status post-surgical repair of a full thickness tear of the left supraspinatus tendon. The patient was referred to physical therapy (PT) by her orthopedic surgeon to reduce pain and increase ROM in her right shoulder. The patient also sought to return to her recreational activities which included weight lifting and running. She worked in an office doing clerical work and had recently returned to work full-time on regular duty. The surgeon provided the restriction of only passive motion of the LUE and instructed her to wear a sling during waking hours for four weeks following surgery.

Five years prior to surgery, the patient experienced an onset of pain which gradually increased. She reported no trauma to the right shoulder. Her symptoms included pain and loss of function. Pain worsened gradually over a period of a few years. She began to rely heavily on her right arm when performing activities of daily living (ADLs). She began the use of non-steroidal anti-inflammatory drugs (NSAIDs) to ease her pain. She sought medical treatment five years after the onset of her initial symptoms. Her primary care physician ordered imaging studies and based on the results of magnetic resonance imaging (MRI) the patient was diagnosed with a full thickness tear of the supraspinatus tendon. She was referred to an orthopedic surgeon who suggested she undergo arthroscopic surgery to repair her torn rotator cuff.

Surgery was performed two weeks prior to her initial PT visit. At the time of her initial evaluation she had recently returned to work in an office doing clerical work. No modifications were made to her working conditions. She was instructed by her surgeon to wear a sling during waking hours for four weeks following surgery. The other restriction giving by the surgeon was PROM exercise only for the left UE during the first four weeks.

Following surgery the patient's chief complaint was pain in her left shoulder, upper trapezius muscle and proximal brachium. She described all pain as constant aches that ranged in intensity between 3 and 6 on a 10 point numeric pain rating scale (NPRS). Her pain was aggravated by movement of reaching, lifting and carrying with her left upper extremity (LUE). Her pain was eased in approximately 20 to 30 minutes by prescription pain medication, Norco. She was unable to lie on her left side and reported using only the right upper extremity (RUE) when performing ADLs. She had some difficulty dressing but did not require assistance. She awoke two to three times each night due to pain in her left shoulder, but was able to return to sleep within ten minutes.

The patient was diagnosed with breast cancer in May 2009. She underwent a mastectomy of the left breast in February 2010 and had been cancer free since that time. She reported that her general health was good. She lived in a one story house with her husband and adult son. No modifications had been made to her home. She had exercise equipment in her garage including free weights and machines for

resistance and cardiovascular exercise that she had used two to three times per week prior to surgery.

The patient's goals included reducing pain and increasing ROM. She expressed a fear of acquiring adhesive capsulitis. She wanted to return to her recreational activities including running and weight lifting.

Systems Review

Systems affected by the patient's condition included the musculoskeletal system. It was suspected that the cardiovascular system may have been affected due to the patient's reduction in physical activity.

- Cardiovascular/Pulmonary – Not tested (NT)
- Integumentary – Surgical wounds were closed and dry.
- Musculoskeletal
    - Gross ROM: Impaired LUE
    - Gross Strength: Impaired LUE
    - Height: 5' 3"
    - Weight: 130 lbs
- Neuromuscular
    - Gross Balance: Walking and sitting balance unimpaired per observation
    - Gross Gait: No gait deviations per observation.
    - Gross Locomotion: Not impaired per observation

  - Gross Transfers: Stand to sit and sit to stand transfers unimpaired per observation
  - Gross Transitions: Not impaired per observation
  - Motor function: Limited ROM LUE, no other impairments observed
- Urogenital: Not impaired per patient report
- Gastrointestinal: Not impaired per patient report
- Communication, Affect, Cognition, Learning
  - Age appropriate communication: WNL
  - Orientation x 4: WNL
  - Emotional/behavior responses: WNL

Examination – Medications

The patient was prescribed Norco® and tramadol for pain relief. She reported taking a 50 mg tablet of tramadol in the morning and in the afternoon. She took one 10-325 mg tablet of Norco® at night before bed.

Table 1

Medication

MEDICATION[17]	DOSAGE	REASON	PT SIDE EFFECTS
Norco®	**10-325mg once a day at night**	**Pain**	**Lightheadedness, anxiety, slowed irregular breathing, chest tightness, drowsiness**
Tramadol	**50mg twice a day**	**Pain**	**Dizziness, weakness, sleepiness, nervousness, muscle tightness, seizures, difficulty breathing**

Chapter 3

Examination – Tests and Measures

Tests and measures used in this case study included those for body structure and function impairments and activity limitations according to the International Classification of Functioning, Disability and Health (ICF). Goniometry, manual muscle testing (MMT) and the NPRS were used to measure body structure and functional outcomes. The Shoulder Pain and Disability Index (SPADI) was used to measure activity limitations.

Measurement characteristics of the outcome measures used in this case study are as follows:

- Goniometry
  - Goniometry is the measurement of the ROM in joints of the human body using an instrument calibrated from 0-360^{o}. Its use has been shown to be reliable for measuring joint motion. Boone et al. report inter- and intratester reliability of goniometry for measuring the shoulder with intraclass correlation coefficients (ICC) of 0.97 and 0.96 respectively. The minimal detectable change (MDC) for goniometric measurements of the UE is 5^{o} and of the lower extremity is 6^{o}.[18]
- Manual Muscle Testing (MMT)
  - Manual muscle testing is a clinically useful method that physical therapists use to evaluate strength in a particular muscle. It assesses the

musculoskeletal and nervous systems. A specific protocol has been standardized for each muscle to be tested and consistency is required in order to obtain accurate results. The grading of MMT is based on the muscle's ability to contract and resist a manual force applied by the therapist. Grades range from 0, indicating no contraction, to 5, indicating a contraction against maximal resistance. MMT has been shown to have significant reliability with hand held dynamometers. The MDC for MMT is one full grade. [19]

- The Shoulder Pain and Disability Index (SPADI)
  - The SPADI is a questionnaire that assesses two dimensions, pain and functional disability. The self-administered questionnaire consists of five questions regarding pain and eight questions regarding disability. The pain questions are designed to assess severity while the functional activity questions are designed to assess a patient's difficulty in completing various tasks. Each question is scored on a scale of zero, signifying no pain, to ten, signifying worse pain imaginable. The scores of each dimension are totaled and expressed as percentages. The two scores are also totaled and expressed as a total percentage where 0 is best and 100 is the worst.[20]
  - In a systematic review, Roy et al found the SPADI to be valid, reliable, and responsive for rotator cuff repair. This study sought to investigate the quality and psychometric properties of 4 self-report questionnaires for the

shoulder. It included studies that reported on the psychometric properties of the SPADI and included patients with shoulder disorders, including rotator cuff injuries. They searched 3 databases and included 71 articles written in English and French. Each article was critiqued based on a quality assessment tool that evaluated the methods, statistics, and validity of conclusions. The tool included 11 items that were scored from a minimum of 0 to a maximum of 2. The results were then expressed as a percentage. Two studies scored over 90% and thirty-seven scored between 75% and 90%. Only six articles scored below 50%. I believed the quality of research was satisfactory enough to have confidence in the summary of author's conclusions.

- The ICCs range from 0.66 to 0.95. The MDC_{95} for the SPADI is 18% and the minimal clinically important difference (MCID) is 8%.[21] Because the MCID is less than the MDC, a change in score of 18% was used to determine a clinically meaningful change in the patient's condition. If the patient's score on the SPADI is reduced by 18% it will be interpreted as real change. Although the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire had better psychometric properties the SPADI was chosen because it was specific to the area of the body being tested and took less time to administer in the clinic. The SPADI was highly correlated with the DASH.[21] These two instruments have similar questions but the

questions regarding pain on the DASH does not ddiscriminate between the shoulder, arm, or hand.

Table 2

Examination Data

BODY FUNCTION OR STRUCTURE IMPAIRMENTS		
Measurement Category	**Test/Measure Used**	**Test/Measure Results**
Pain	**NPRS**	**Left shoulder = 3-6/10** **Left upper trapezius muscle = 3-6/10** **Left proximal brachium = 3-6/10**
Pain	**SPADI**	**Pain Sub Score = 54%**
Active Range of Motion (AROM)	**Goniometry**	**Cervical Spine: All motions within normal limits (WNL)** **RUE: All motions WNL** **LUE** • **Elbow, wrist, and hand WNL** • **Shoulder (p indicates pain with motion)** o **Flexion = 90° p** o **Extension = 40° p** o **Abduction = 35° p** o **Internal Rotation = 15° p** o **External Rotation = 15° p**
Passive Range of Motion (PROM) **All shoulder ROM for the LUE were empty.**	**Goniometry**	**Cervical Spine: All motions within normal limits (WNL)** **RUE: All motions WNL** **LUE** • **Elbow, wrist, and hand WNL** • **Shoulder** o **Flexion = 90° p** o **Extension = 45° p** o **Abduction = 45° p** o **Internal Rotation = 20° p** o **External Rotation = 20° p**
Strength	**MMT**	**RUE** • **Elbow and scapula 5/5 for all motions** • **Shoulder** o **Flexion = 5/5** o **Extension = 5/5** o **Abduction = 4+/5p** o **Adduction = 5/5** o **Internal Rotation = 5/5**

		○ **External Rotation = 4+/5** **LUE** • **Elbow 5/5 for all motions** • **Scapula** ○ **Elevation = 5/5** ○ **Protraction = 3+/5** ○ **Retraction = 5/5** • **Shoulder** ○ **Flexion = 5/5** ○ **Extension = 3+/5** ○ **Abduction = 3+/5** ○ **Adduction = 5/5** ○ **Internal Rotation = 5/5** ○ **External Rotation = 4/5**
ACTIVITY LIMITATIONS		
Measurement Category	**Test/Measure Used**	**Test/Measure Results**
Function	**SPADI**	**Disability Sub Score = 59%**
PARTICIPATION RESTRICTIONS		
Measurement Category	**Test/Measure Used**	**Test/Measure Results**
Participation	**Subjective Exam**	**Unable to run**
Participation	**Subjective Exam**	**Unable to lift weights**

Chapter 4

Evaluation

Evaluation Summary

The patient in this case was a 52 year old woman who underwent arthroscopic surgery to repair a partial thickness tear of the rotator cuff in the left shoulder two weeks prior to the initial encounter. Upon initial examination the following body structure and function impairments were identified: pain in her left shoulder, upper trapezius muscle, and right upper brachium, measured by the numeric pain rating scale and the SPADI; decreased strength in the left upper extremity as measured by MMT; and decreased ROM in the left upper extremity as measured by goniometry. The patient described her pain as constant and variable, ranging from 3 to 6 out of 10 on the NPRS. Her pain was aggravated by movements of the LUE. Her pain was moderately irritable. The patient had the activity limitation as measured by the SPADI disability subscale.

This patient presented with body structure and function impairments and activity limitations consistent with post-surgical repair of the rotator cuff. Her goals included decreasing pain, increasing ROM and function, and return to her recreational activities of running and weight training.

Diagnostic Impression

The patient in this case experienced pain and loss of function secondary to pain and inflammation caused by soft tissue trauma experienced during arthroscopic surgery for the repair of her left rotator cuff tear.

Physical Therapy Guide Practice Pattern

The patient in this case presented with signs and symptoms consistent with Physical Therapy Practice Patterns 4-I: Impaired joint mobility, motor function, muscle performance, and range of motion associated with bony or soft tissue surgery and 4E: Impaired joint mobility, motor function, muscle performance, and range of motion associated with localized inflammation.

G-Codes

- Initial Evaluation: G8984CK G8985CJ
- Discharge: G8985CJ G8986CI

Chapter 5

PLAN OF CARE GOALS AND INTERINVENTIONS

Table 3

Evaluation and Plan of Care

PROBLEM	**PLAN OF CARE**		
	Short Term Goals (Anticipated Goals) (2 weeks)	**Long Term Goals (Expected Outcomes) (8 weeks)**	**Planned Interventions Interventions are Direct or Procedural unless they are marked: (C) = Coordination of care intervention (E) = Educational intervention**
BODY FUNCTION OR STRUCTURE IMPAIRMENTS			
Increased Pain o **Left Shoulder = 3-6/10** o **Left Upper Trapezius muscle = 3-6/10** o **Left Proximal Brachium = 3-6/10** o **SPADI Pain Scale = 54%**	**Decrease Pain** o **Left Shoulder = 2-4/10** o **Left Upper Trapezius muscle = 2-4/10** o **Left Proximal Brachium = 2-4/10** o **SPADI Pain Scale = Not tested (NT)**	**Decrease Pain** o **Left Shoulder = 1-2/10** o **Left Upper Trapezius muscle = 1-2/10** o **Left Proximal Brachium = 1-2/10** o **SPADI Pain Scale = 38%**	**Transcutaneous Electrical Nerve Stimulation (TENS)** **Cryotherapy** **Soft tissue mobilization (STM)** **PROM exercises**
Decreased AROM Left Shoulder o **Flexion = 90^{o}** o **Extension = 40^{o}** o **Abduction = 35^{o}** o **Internal**	**Increase AROM Left Shoulder** o **Flexion = 96^{o}** o **Extension = 45^{o}** o **Abduction = 41^{o}** o **Internal Rotation = 21^{o}** o **External**	**Increase AROM Left Shoulder** o **Flexion = 170^{o}** o **Extension = 60^{o}** o **Abduction = 170^{o}** o **Internal Rotation = 60^{o}** o **External**	**PROM exercises** **AROM exercises** **Neer I Shoulder Stretches (See HEP)** **Interventions to decrease pain also**

o **Rotation = 15^{o}** o **External Rotation = 15^{o}**	**Rotation = 21^{o}**	**Rotation = 75^{o}**	**address this goal**
Decreased PROM Left Shoulder o **Flexion = 90^{o}** o **Extension = 45^{o}** o **Abduction = 45^{o}** o **Internal Rotation = 20^{o}** o **External Rotation = 20^{o}**	**Increase PROM Left Shoulder** o **Flexion = 100^{o}** o **Extension = 50^{o}** o **Abduction = 50^{o}** o **Internal Rotation = 26^{o}** o **External Rotation = 26^{o}**	**Increase PROM Left Shoulder** o **Flexion = 180^{o}** o **Extension = 65^{o}** o **Abduction = 170^{o}** o **Internal Rotation = 70^{o}** o **External Rotation = 80^{o}**	**PROM exercises** **Wand exercises** **Neer I Shoulder Stretches (See HEP)** **Interventions to decrease pain also address this goal**
Decreased Strength Left Shoulder o **Abduction = 4/5** o **External Rotation = 4+/5** **Left Scapula** o **Protraction = 3+/5**	**Increase Strength Left Shoulder** o **Abduction = 4/5** o **External Rotation = 4+/5** **Left Scapula** o **Protraction = 4/5**	**Increase Strength Left Shoulder** o **Abduction = 5/5** o **External Rotation = 5/5** **Left Scapula** o **Protraction = 4+/5**	**Isometric exercises for all joint motions** **Resistance exercises using tubing** **Scapular stabilization and strengthening exercises**
ACTIVITY LIMITATIONS			
Limited in ADLs	**No change expected at 2 weeks**	**Patient will be able to dress herself without difficulty**	**Interventions to decrease pain and increase ROM address this goal**
Loss of Function o **SPADI Disability Score = 59%**	**No change expected at 2 weeks**	**Increase Function SPADI Disability Score to 38%**	**Interventions to decrease pain and increase strength and ROM address this goal**
Unable to sleep through the night	**Only wakes once during the night due to pain**	**Does not wake at night due to pain**	**Interventions to decrease pain and increase strength and ROM address this goal**

Unable to run	**No change expected at 2 weeks**	**Able to run 10 minutes at a moderate pace**	**Interventions to decrease pain and increase strength and ROM address this goal**
PARTICIPATION RESTRICTIONS			
Unable to participate in recreational activities of running and weight training	**No change expected at 2 weeks**	**Patient will be able to weight train with moderate resistance and run at a moderate pace for 10 minutes.**	**Interventions to decrease pain and increase strength and ROM address this goal**
	Patient will be independent on a home exercise program	**Patient will understand the importance of continuing on a home exercise program**	**<u>Home Exercise Program</u> Neer I Shoulder Stretches** • **Pendulum** • **Passive Forward Flexion Supine** • **Passive External Rotation Supine** • **Passive Internal Rotation Standing** **Tubing strengthening exercises for the shoulder** **Self-stretches** • **Upper trapezius** • **Levator scapula**

Prognostic Considerations

Positive prognostic indicators included the patient's relatively young age,[22] the absence of diabetes mellitus and obesity, and her high level of physical activity prior to surgery.[23] Negative prognostic indicators included the patient's gender[23] and tear size which was full thickness, as larger tears have less incidence of complete tendon healing and longer periods of time to regain function.[22,23] The patient was highly motivated and had a good rehabilitation potential. She lived in a good environment with strong social support and exercise equipment in her garage. She was expected to be discharged to her normal living environment with a home exercise program.

Plan of Care- Interventions

See Table 3.

Overall Approach

Initially, the plan of care (POC) prioritized pain and ROM. Modalities such as high rate TENS and cryotherapy were utilized to address pain. There is some evidence to suggest that the use of TENS after arthroscopic shoulder surgery reduces pain and the use of analgesics.[24] The patient received TENS for 15 minutes with a cold pack applied over the shoulder simultaneously. The patient received STM for pain. Impairments in ROM were addressed using manual therapy. The vigor of all manual therapy was dependent on the patient's pain response.

The PROM exercises were administered by the student physical therapist (SPT) for all limited shoulder motions. The patient's arm was moved to the range where pain was first experienced and held for five seconds. This was repeated for a total of five repetitions and repeated for each shoulder motion. The patient was instructed on how to use an overhead reciprocal pulley system to progress exercises from PROM to AAROM and AROM. The ROM exercises were increased as tolerated by the patient. Manual therapy was progressed or regressed based on the irritability of the patient's symptoms.

Strength was addressed using the progressive overload principle. The patient attended a follow up appointment with her surgeon four week following surgery. At that time she was allowed to perform AROM and resistance exercise. Strength exercises began during the third week of treatment, five weeks after surgery. Interventions began with isometrics and were progressed to resistance exercises using TheraBand® and tubing during the fifth week. Resistance exercise was progressed as the patient gained ROM and strength. Strengthening exercises began with tubing exercises with the patient's arm by her side and progressed to strengthening into 30^{o}, 60^{o}, and 90^{o} elevation as she gained ROM. The patient performed three sets of ten repetitions of strengthening exercises and resistance was increased as the patient's strength increased. Strengthening exercises were performed for all motions of the shoulder.

The NordicTrack® ski machine was used in place of an upper body ergometer to increase endurance of the shoulder girdle and to warm up target tissues prior to stretching. The NordicTrack® was used without the skis. The patient stood on the floor and used only the ropes. It was introduced in the fifth week of treatment for five minutes with the minimal resistance possible. The time was increased by one to two minutes each week up to ten minutes per session. The resistance was gradually increased each week based on the comfort of the patient. The use of Bodyblade® in shoulder rehabilitation has been found to increase ROM and decrease SPADI scores in patients with shoulder instability.[25] This long, flat device requires the patient to use the UEs to create oscillating movements. Bodyblades® were introduced during week six to increase ROM and function. The patient performed oscillating movements for 30 seconds initially in four directions while standing. The directions included the chest press with a single blade, with arms flexed to 90^{o} and oscillations occurring in the sagittal plane. Other oscillations occurring in the sagittal plane were performed with arms flexed to 90^{o} and straight down at the sides each with two blades. The final position with arms abducted to 90^{o} with oscillations occurring in the frontal plane was also performed with two blades. Time was increased to 45 seconds the following week and to 60 seconds for the remaining weeks of treatment. The same size blade was used for all treatment sessions.

Interventions to address pain and ROM were performed twice each week for eight weeks. Strengthening exercises began four weeks after surgery and were also

performed twice each week. All interventions were progressed based on the patient's tolerance. The patient performed a home exercise program three days each week. In order to maintain her cardiovascular endurance the patient was encouraged to participate in a home walking program to be performed three to five days per week for a minimum of 30 minutes per day. The walking program was intended to keep her active until she was able to return to her normal recreational activity of weight lifting and running.

PICO Question

For a 52 year old woman two weeks after arthroscopic rotator cuff repair (P), is early PROM exercise (I) more effective than immobilization (C) for increasing ROM and function?

Two articles were found that directly address this question. The first, a prospective randomized trial (Level 1b; PEDro Score 7/10)[26], revealed that introducing PROM exercise early in the rehabilitation process did not adversely affect the healing of the repaired tendon. All patients had undergone arthroscopic surgery. Patients in the early motion group started pendulum exercises immediately postop and PROM exercises were performed one week later. The immobilization group did not begin PROM until six weeks postop with the shoulder immobilized during that period with the use of a sling. The subjects who received early PROM showed significantly greater active range of motion (AROM) than the immobilization group at three months though there was no significant long term difference in ROM or functional outcomes between the two groups at six and twelve months. The authors concluded there was no advantage or disadvantage to using PROM early in the rehabilitation of rotator cuff repairs and the use of PROM did not cause any adverse events.

A strength of this study was the randomization of the subjects to the two groups. Also, the examiner who collected the outcome measures and the radiologist, who performed the test to assess tendon healing, were blinded to treament groups. Although investigators found no significant difference between groups, this may have

been due to the small sample size and a lack of statistical power. This study was relevant to the patient in this case study because it addressed one of her primary goals. She met the inclusion criteria for the study and the patients in the study were similar.

A second prospective randomized study (Level 1b; PEDro Score 5/10)[27] found that both immobilization and the early motion group had significant increases in ROM and function with no significant difference between the two groups. The "passive" group started pendulum and PROM exercises and began working with a continuous passive motion (CPM) machine immediately after surgery. The "immobilization" group was immobilized for six weeks, but were allowed to perform pendulum exercises. After six weeks all subjects received the rehabilitation protocol. The quality of tendon healing was assessed using arthrography, an X-ray of the shoulder joint after the injection of a contrast medium. The immobilization group showed slightly better tendon healing but the difference was not significant.

The studies suggest there is no significant difference in long term outcomes when PROM is introduced early in the rehabilitation process when compared to immobilization, but that PROM introduced early in treatment can be beneficial for increasing ROM in the short term. This clinical outcome can be achieved without compromising the healing process. The patient in this case presented with ROM deficits. One of her goals was to increase ROM. She also expressed the fear of developing adhesive capsulitis. The use of PROM is an effective manual therapy technique that addressed the specific goals and fears of this patient.

I was confident that this patient would have a similar response to PROM exercise. I used this as evidence that early mobilization would be safe to implement without compromising the integrity of the repair. Increases in ROM at three months possibly helped reduce her fear of developing adhesive capsulitis. Earlier increases in shoulder ROM also may lead to earlier return of function and increased quality of life.

Chapter 6

Outcomes

Table 4

Outcomes

OUTCOMES				
BODY FUNCTION OR STRUCTURE IMPAIRMENTS				
Outcome	**Initial**	**8 week Follow-up**	**Change**	**Goal Met (Y/N)**
Pain				
Left Shoulder	**3-6/10**	**0/10**	**3-6/10**	**Y**
Left Upper Trap	**3-6/10**	**1/10**	**2-5/10**	**Y**
Left Proximal Brachium	**3-6/10**	**0/10**	**3-6/10**	**Y**
SPADI Pain Subscale	**54%**	**20%**	**34%**	**Y**
AROM Left Shoulder				
Flexion	**90º**	**180 º**	**90 º**	**Y**
Extension	**40 º**	**64 º**	**24 º**	**Y**
Abduction	**35 º**	**180 º**	**155 º**	**Y**
Internal Rotation	**15 º**	**52 º**	**35 º**	**N**
External Rotation	**15 º**	**90 º**	**75 º**	**Y**
PROM Left Shoulder				
Flexion	**90 º**	**180 º**	**90 º**	**Y**
Extension	**45 º**	**73 º**	**28 º**	**Y**
Abduction	**45 º**	**180 º**	**135 º**	**Y**
Internal Rotation	**20 º**	**57 º**	**37 º**	**N**
External Rotation	**20 º**	**93 º**	**73 º**	**Y**
Strength Left Shoulder				
Abduction	**4/5**	**5/5**	**1/5**	**Y**
External Rotation	**4+/5**	**5/5**	**<1/5**	**Y**
Strength Left Scapula				
Protraction	**3+/5**	**5/5**	**>1/5**	**Y**
ACTIVITY LIMITATIONS				
Outcome	**Initial**	**Follow-up**	**Change**	**Goal Met (Y/N)**
Function SPADI Disability Score	**59%**	**12.5%**	**46.5%**	**Y**
ADL	**Patient unable to dress without difficult**	**Patient able to dress herself without difficulty**		**Y**

Sleep through the night	**Wakes 2-3 times each night**	**Does not wake at night**		**Y**
Running	**Unable to run**	**Unable to run**	**none**	**N**
PARTICIPATION RESTRICTIONS				
Outcome	**Initial**	**Follow-up**	**Change**	**Goal Met (Y/N)**
Recreational Activities	**Unable to lift weights**	**Able to lift light weights**		**Y**

Discharge Statement

The patient in this case was seen in an outpatient clinic two visits per week for eight weeks for a total of sixteen visits. During that time she received modalities for pain, manual therapy to increase ROM, and therapeutic exercise to increase strength. The patient made significant increases in strength as assessed by MMT, exceeding the MDC of 1 grade in the left shoulder abduction and scapular protraction. She increased ROM in all shoulder motions that far exceeded the MDC of 5^{o} for goniometry. All ROM motion goals were met with the exception of IR. Although the IR goal was not met, IR ROM was markedly increased.

The patient achieved a significant decrease in pain and increase in function as measured by the SPADI. She decreased her score on the pain subscale from 54% to 20% and on the disability subscale from 59% to 12.5%, a change that far exceeds the MDC of 13 for the measure. The patient also exceeded the G Code goal. The goal was to go from CK to CJ. The patient achieved the level of CI. The patient had not yet returned to running but had begun lifting weights at the time of discharge. The patient was given the option to begin running at week six, but running was not a priority for her at that time. She was discharged to home with a home exercise program. The patient understands the importance of continuing her home exercise program.

Chapter 7

Discussion

The patient in this case study was seen for 16 treatments of PT in an outpatient clinic, twice per week for eight weeks. She had arthroscopic surgery to repair the rotator cuff in her left shoulder two weeks prior to attending PT. Her goals included reducing pain, increasing ROM of her left shoulder, and return to her recreational activities of running and lifting weights. She received modalities for pain, therapeutic exercises for strength, and manual therapy for ROM. She achieved significant improvement in ROM, strength, pain, and function.

The patient responded well to treatment. She did not report any adverse effects to any treatments. I would feel comfortable using a similar approach in the future when treating a patient with a similar presentation. I was attentive to the patient's pain during manual therapy and took steps to ensure her comfort during treatment. I also provided the patient with appropriate and timely progression for her therapeutic exercises and home exercise program.

This patient tolerated treatment well and progressed quickly. When treating other patients with the same diagnosis I will not assume that I can use the same amount of vigor with manual therapy that was used on the patient in this case study. The treatment of older patients may also require less vigor than used on a woman in her fifties. This patient was physically active. A similar patient with a sedentary lifestyle may not tolerate the vigor and speed of progression of this course of care.

At the initial evaluation, the patient's AROM and strength for the LUE were measured to establish a baseline, however post-surgical protocol allowed PROM only until four weeks post-surgery (two weeks after initial evaluation). It would have been appropriate to wait until the patient was cleared by her surgeon for AROM and resisted ROM exercise before taking these measurements. Interventions to address AROM and strength impairments did not begin until the restrictions were removed by the surgeon. Initial strength measurements should be deferred until precautions are lifted and done immediately prior to implementing strengthening interventions. In the future I will take care to work within the protocol set forth by the surgeon. It is important that the physical therapist collaborate with all members of the health care team in the best interest of the patient. Based on the patient's excellent recovery no adverse effects were noted as a result of the strength and AROM testing performed during the initial exam.

The outcome measure used in this case study, the SPADI, is appropriate for patients with a number of different shoulder pathologies. If the patient has involvement of other parts of the upper extremity, the Disabilities of the Arm Shoulder and Hand (DASH) may be more appropriate. I was fortunate to find recent research on the use of PROM exercises in the treatment of patients following arthroscopic surgery to repair the rotator cuff. The literature found no long term benefit to introducing PROM exercise early in the rehabilitation process when compared to immobilization. However, there was evidence that patients who receive early PROM show gains in

ROM at three month follow-up that are significantly greater than patients who are immobilized.[16,26] This patient expressed the primary goal of increasing ROM and a fear of developing adhesive capsulitis. Because PROM could be used without jeopardizing the integrity of the repair it was chosen for the patient in this case. For a patient with pain reduction as a primary goal, immobilization may have been a more appropriate approach. The patient in this case achieved a significant increase in ROM and decrease in pain.

The patient in this case achieved all long term goals except full internal rotation and returning to running. I did not assess the joint play in the patient's left shoulder. It is possible that tightness of the posterior capsule may have contributed to her IR deficit. Anterior to posterior mobilization of the glenohumeral joint may have assisted in improving IR ROM. Stretching other tight structures around the shoulder joint, such as the pectoralis minor muscle, may have also helped to increase shoulder IR ROM.

A closer assessment of scapular motion and positioning may have highlighted some impairments that may have contributed to the patient's IR limitation. Assessing and treating scapular stability may have increased her gains in IR. Exercises to strengthen scapular muscles, such as the lower trapezius muscles and rhomboids could have been a part of the POC and incorporated into the HEP. Instructing the patient to perform her HEP on all days of the week might have provided greater gains in IR ROM.

Although the patient was encouraged to engage in a regular walking program she did not reach her goal of returning to running. I did not instruct the patient to try running nor did I put her on a treadmill and attempt running in the clinic. I left it to the patient's discretion to decide when she would like to return to running. This goal was not directly addressed during the course of treatment. In the future I would determine if the patient could tolerate running in the clinic before advising her to try it on her own. Because it was one of the patient's goals it should have been addressed directly.

I hypothesized that the main contributors to this patient's activities and participation limitations were largely affected by her body structure and function impairments, specifically pain and ROM, and that her function would increase as those impairments where addressed. While her pain may have been a primary contributor to her impairments, I must be careful to not allow body structure and function impairments overshadow activity and participation limitations when planning interventions. It is important to address function directly when treating patients.

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