Rotator Cuff Injury: A Case Study

A Thesis Submitted to the

University Honors Program

In Partial Fulfillment of the

Requirements of the Baccalaureate Degree

With Upper Division Honors

Department Of Physical Therapy

By

Matthew Johnson

DeKalb, Illinois

May, 2012
University Honors Program

Capstone Approval Page

Capstone Title (print or type)

Rotator Cuff Injury: A Case Study

Student Name (print or type) Matthew Johnson

Faculty Supervisor (print or type) MJ Blaschak

Faculty Approval Signature

Department of (print or type) Physical Therapy

Date of Approval (print or type) 12/1/11
HONORS THESIS ABSTRACT

THESIS SUBMISSION FORM

AUTHOR: Matthew Johnson

THESIS TITLE: Rotator Cuff Injury: A Case Study

ADVISOR: MJ Blaschak

ADVISOR’S DEPARTMENT: Physical Therapy

DISCIPLINE: Health and Human Science W/ emphasis of Physical Therapy YEAR: 2011

PAGE LENGTH: 18 pages

BIBLIOGRAPHY:

ILLUSTRATED:

PUBLISHED (YES OR NO): No

LIST PUBLICATION:

COPIES AVAILABLE (HARD COPY, MICROFILM, DISKETTE): 1

ABSTRACT (100-200 WORDS):
Rotator cuff injuries are the third most common injuries behind neck and back. By informing patients about the anatomical structure and the purpose of these four muscles, we can help prevent or at least postpone the injury. In any case of an injury, an informative case study would provide knowledge of what to expect from a physical therapist. This project provides a brief overview of the rotator cuff muscles and their function. It also goes into detail about different types of rotator cuff injuries. The major purpose of this project is to describe the steps a physical therapist would take in diagnosing and treating a rotator cuff injury. This project gives exercises one would use in the case of a rotator cuff injury and it also gives mobility tests to compare normal mobility with injured mobility. Due to rotator cuff injuries being the third most common injury, it is important to inform and prepare the public for one such injury.
Description

There are four rotator cuff muscles: supraspinatus, infraspinatus, teres minor, and subscapularis. These muscles originate on the scapula and insert onto the head of the humerus. The head of the humerus sits in the glenoid fossa and is stabilized by these four muscles; along with other ligaments. The glenoid fossa creates a ball-and-socket joint with the head of the humerus. This makes this articulation multiaxial, meaning you can adduct, abduct, flex, extend, and medially rotate and laterally rotate the humerus, i.e. your shoulder.

![Figure 1: ball-and-socket joint (humerus-glenoid fossa)](image)

Supraspinatus

This muscle originates from the supraspinous fossa of the scapula across the top of the shoulder joint to insert onto the greater tubercle of the humerus. The action of this muscle is to elevate the arm and abduct the arm. Supraspinatus is innervated by the suprascapular nerve.

![Figure 2: Supraspinatus (posterior view)](image)
Infraspinatus

This muscle originates from the infraspinous fossa of the scapula across the back of the shoulder joint to attach to the greater tubercle of the humerus. The action of this muscle is to laterally rotate the arm. Infraspinatus is innervated by the suprascapular nerve.

Teres Minor

This muscle arises from the dorsal surface of the scapula running superior to teres major. It runs across the back of the shoulder joint and attaches to the greater tubercle of the humerus. This muscle laterally rotates the arm but only when it is adducted. Teres minor is innervated by the axillary nerve.

Subscapularis

This muscle originates from the subscapular fossa on the anterior side of the scapula. It runs across the front of the shoulder joint and inserts onto the lesser tubercle of the humerus. Subscapularis medially rotates the arm and is innervated by the upper and lower subscapular nerves.
**Symptoms**

Rotator cuff injuries are the third most common injury behind neck and back.\(^1\) This is due to the fact that most rotator cuff injuries are inevitable in that they happen due to overuse of a muscle. There are some signs and symptoms that may help in recognizing a rotator cuff injury. If you have pain in your shoulder, especially when you reach over your head or behind your back, lifting, pulling, or sleeping on the affected side are all symptoms of a chronic rotator cuff injury.\(^5\) Also, if you feel any weakness in your shoulder or if you have loss in the range of motion of your shoulder. The most common sign is pain. This could include pain when you are brushing your teeth or reach for a glass in your cupboard. An acute rotator cuff injury can occur when there is a sudden tear sensation followed by severe shooting pain down your arm.\(^9\) A large tear may eliminate the ability to abduct your arm. Rotator cuff tendinitis usually shows signs of a deep ache in the affected area and can lead to a serious tear. If you experience muscle weakness in your arm, any pain, or pain lasting longer than a week you should go see a physician.

**Causes**

There are three major causes of a rotator cuff injury; tendinitis, bursitis, and strain or tear.\(^5\) Tendinitis occurs when your muscles become inflamed and irritated from overuse of the muscles. This is particularly common in athletes, especially in sports that involve an overhead motion such as tennis. Bursitis is due to an inflamed, fluid-filled sac (bursa) that lies between your joints and your tendons. A strain or a tear is caused by untreated tendinitis.

More typical causes of a rotator cuff injury include normal wear and tear, falling, lifting or pulling, repetitive stress, and poor posture.\(^9\) Normal wear and tear usually occurs at an age of 40 or beyond. This is when the muscle fibers begin to break down due to use over the years. Using your arm to break a fall can seriously damage your rotator cuff. It could bruise or even tear a rotator cuff muscle. Lifting or pulling an object that is overweight can be detrimental to your rotator cuff especially if this action is done overhead. Repetitive stress is due to overuse of the rotator cuff muscles. This can lead to tendinitis. Slouching your neck and shoulders forward is a result of poor posture. By doing this, you are shrinking the amount of space between your bones when your rotator cuff muscles reside.
Rotator Cuff Strain/impingement vs. Tear

A rotator cuff strain usually occurs when you overuse the muscles. A strain is much easier to fix then a tear. One of the main reasons they are easier is because no surgery is need to heal a strain. However, a strain usually leads to inflamed muscles which can impinge, or pinch, the rotator cuff. An impingement occurs when lifting your arm above 90°. This is due to the position of the inflamed muscle relative to your acromion. Your acromion is a bone that sits above your rotator cuff muscles right above the shoulder joint. Due to the nature of a rotator cuff strain, it usually takes 4-6 weeks to recover. A rotator cuff tear usually takes 12-16 weeks to recover because there is more damage to the muscle with a tear.

A rotator cuff tear can sometimes require surgery depending on the thickness of the tear. There are two types of tears: chronic and acute. An acute tear happens from a sudden, powerful movement. A chronic tear progressively gets worse with age.

Physical Evaluation

Range of Motion (ROM) Tests

These tests should be done passively (assistance from the PT) and actively (no assistance from PT). These should be recorded as two separate categories. It is done this way because the patient may feel pain and stop the motion as soon as it is felt. With PROM, the PT can assist the patient and possibly move the muscle further. Also, tests should be done on both sides of the body. In this case, the affected shoulder should be ROM tested along with the unaffected shoulder. This will give a benchmark for the normal ROM for the specific patient.

Lateral Rotation

The patient is sitting upright with his elbow flexed at 90 degrees. While keeping the elbow at the side, the physical therapist (PT) will laterally rotate the arm. This test will measure the mobility of the infraspinatus and teres minor.
**Internal Rotation**

The patient is sitting upright with their elbow at their side. The patient raises their hand up their spine as far as it can go. A normal patient can reach to T7 (thoracic vertebrae number 7). This test will show the mobility of subscapularis.

![Figure 7: Internal Rotation (ROM Test)](image)

**Forward Flexion**

The patient is sitting upright and lifts their arm as high as it can go. 0 degrees is considered to be at the patient’s side and 180 degrees is considered to be straight up. A normal patient will be around 180 degrees. This ROM test will show the mobility of supraspinatus.

![Figure 8: Forward Flexion (ROM Test)](image)
Strength Tests

External Rotator Cuff (RC) Strength

The patient is sitting upright with his elbows flexed at his sides. The PT will apply an internal force on the outside of the hand and the patient must resist the pressure as long as possible.⁶

Figure 9: External Rotator cuff Strength Test⁶

Internal RC Strength

The patient is sitting upright with his elbows flexed at his sides. The PT will apply an external force on the outside of the hand and the patient must resist the pressure as long as possible.⁶

Figure 10: Internal Rotator Cuff Strength Test⁶

Supraspinatus Strength

The patient is sitting with his arms straight out with his elbows locked. His arms should be angled at 30 degrees anterior to his scapula.⁶ The patient abducts his arms against the resistance from the PT.

Figure 11: Supraspinatus Strength Test⁶
Protocol: Rotator Cuff Tear

This is a protocol that describes a step-by-step rehabilitation plan for patients with a post-surgery rotator cuff tear. This particular protocol for this type of injury was found from AdvancedCEU.com.

I. Phase I - Immediate Post-Surgical Phase (Days 1-10)

Goals: Maintain Integrity of the Repair
Gradually Increase Passive Range of Motion
Diminish Pain and Inflammation
Prevent Muscular Inhibition

Days One to Six:

- Abduction pillow brace
- Pendulum Exercises
- Active Assisted ROM Exercise (L-Bar)
  - ER/IR in Scapular Plane at 45 degrees of abduction (pain-free ROM)
  - Passive ROM
  - Flexion to tolerance (painful ROM)
  - ER/IR in Scapular Plane at 45 degrees of abduction (pain-free ROM)
- Elbow/Hand Gripping & ROM Exercises
- Submaximal Painfree Isometrics (initiate days 4-5)
  - Flexion with elbow bent to 90 degrees
  - External Rotation
  - Internal Rotation
  - Elbow Flexors
- Cryotherapy for Pain and Inflammation
  - Ice 15-20 minutes every hour
- Sleeping
  - Sleep in pillow brace

Days Seven to Ten:

- Continue use of pillow brace
- Pendulum Exercises
- Progress Passive ROM to Tolerance
  - Flexion to at least 115 degrees
  - ER in Scapular Plane at 45 degrees abduction to 20-25 degrees
  - IR in Scapular Plane at 45 degrees abduction to 30-35 degrees
- Active Assisted ROM Exercises (L-bar)
  - ER/IR in Scapular Plane at 45 degrees abduction
  - Flexion to Tolerance*
    *Therapist Provides Assistance by Supporting Arm (esp. with arm lowering)
- Continue Elbow/Hand ROM & Gripping Exercises
- Continue Isometrics (submaximal and subpainful)
  - Flexion with Bent Elbow
  - Extension with Bent Elbow
  - Abduction with Bent Elbow
  - ER/IR with Arm in Scapular Plane
  - Elbow Flexion
- Initiate rhythmic stabilization ER/IR at 45 degrees abduction
- Continue Use of Ice for Pain Control
  - Use Ice at least 6-7 times daily
• Sleeping
  • Continue Sleeping in Brace until Physician Instructs

Precautions:

1. No Lifting of Objects
2. No Excessive Shoulder Extension
3. No Excessive Stretching or Sudden Movements
4. No Supporting of Body Weight by Hands
5. Keep Incision Clean & Dry

II. Phase II – Protection Phase (Day 15 – Week 6)

Goals: Allow Healing of Soft Tissue
Do Not Overstress Healing Tissue
Gradually Restore Full Passive ROM (Week 4-5) Re-
Establish Dynamic Shoulder Stability Decrease Pain
& Inflammation

Days 15 – 21:

• Continue Use of Sling or Brace (physician or therapist will determine when to discontinue)
• Passive Range of Motion to Tolerance
  • Flexion to 140-155 degrees
  • ER at 90 degrees abduction to at least 45 degrees
  • IR at 90 degrees abduction to at least 45 degrees
• Active Assisted ROM to Tolerance
  • Flexion (continue use of arm support)
  • ER/IR in Scapular Plane at 45 degrees abduction
  • ER/IR at 90 degrees Abduction
• Dynamic Stabilization Drills
  • Rhythmic Stabilization Drills
    • ER/IR in Scapular Plane
    • Flexion/Extension at 100 degrees Flexion and 125 degrees flexion
• Continue All Isometric Contractions
• Initiate scapular isometrics
• Continue Use of Cryotherapy as needed
• Continue All Precautions
  • No lifting
  • No excessive motion

Weeks 4 - 5:

• Patient should exhibit full passive range of motion by week 4
• Continue all exercises listed above
• Initiate ER/IR strengthening using exercise tubing at 0 degrees of abduction (use towel roll)
• Initiate Manual Resistance ER Supine in Scapular Plane (light resistance)
• Initiate Prone Rowing to Neutral arm Position
• Initiate prone shoulder extension
• Initiate ER strengthening exercises
• Initiate Isotonic Elbow Flexion
• Continue use of ice as needed
• May use heat prior to ROM exercises
• May use pool for light AROM exercises
• Rhythmic stabilization exercises (flexion 45, 90, 125 degrees) (ER/IR)

Weeks 5 – 6:
• May use heat prior to exercises
• Continue AAROM and Stretching exercises
  • Especially for movements that are not full
  • Shoulder flexion
  • ER at 90 degrees abduction
• Initiate Active ROM Exercises
  • Shoulder Flexion Scapular Plane
  • Shoulder Abduction
• Progress Isotonic Strengthening Exercise Program
  • ER Tubing
  • Sidelying IR
  • Prone Rowing
  • Prone Horizontal Abduction (bent elbow)
  • Biceps Curls (isotonics)

Precautions:

1. No Heavy Lifting of Objects
2. No excessive behind the back movements
3. No Supporting of Body Weight by Hands & Arms
4. No Sudden Jerking Motions

III. Phase III – Intermediate Phase (Weeks 7-14)

Goals: Full Active ROM (Week 8-10)
  - Maintain Full Passive ROM
  - Dynamic Shoulder Stability
  - Gradual Restoration of Shoulder Strength
  - Gradual Return to Functional Activities

Week 7:

• Continue Stretching & PROM (as needed to maintain full ROM)
• Continue Dynamic Stabilization Drills
• Progress Strengthening Program
  • ER/IR Tubing
  • ER Sidelying
  • Lateral Raises*
  • Full Can in Scapular Plane*
  • Prone Rowing
  • Prone Horizontal Abduction
  • Prone Extension
  • Elbow Flexion
  • Elbow Extension

*Patient must be able to elevate arm without shoulder or scapular hiking before initiating isotonics; if unable, continue glenohumeral joint exercises.

Week 8:

• Continue all exercise listed above
• If physician permits, may initiate Light functional activities

Week 10:

• Continue all exercise listed above
• Progress to Fundamental Shoulder Exercises
• Therapist may initiate isotonic resistance (1 lb wt.) during flexion and abduction*
  • *If non-painful normal motion is exhibited!
Weeks 11-14:

- Progress all exercises
  - Continue ROM and flexibility exercises
  - Progress strengthening program (increase 1 lb/10 days *non-painful)

IV. Phase IV – Advanced Strengthening Phase (Weeks 15 - 22)

Goals: Maintain Full Non-Painful ROM
- Enhance Functional Use of UE
- Improve Muscular Strengthen & Power
- Gradual Return to Functional Activities

Week 15:

- Continue ROM & Stretching to maintain full ROM
- Self Capsular Stretches
- Progress Shoulder Strengthening Exercises
  - Fundamental Shoulder Exercises
- Initiate Interval Golf Program (if appropriate)

Weeks 20-22:

- Continue all exercises listed above
- Progress Golf Program to playing golf (if appropriate)
- Initiate Interval Tennis Program (if appropriate)
- May Initiate Swimming

V. Phase V – Return to Activity Phase (Weeks 23 - 36)

Goals: Gradual Return to Strenuous Work Activities
- Gradual Return to Recreational Sport Activities

Week 23:

- Continue Fundamental Shoulder Exercise Program (at least 4 times weekly)
- Continue Stretching, if motion is tight
- Continue Progression to Sport Participation
Mock Case Study

Description: Patient X is 34 year old male who lives in Chicago, Illinois. He is business man whose hobbies include a wide range of sports. Patient X landed on his shoulder while playing a football game with his buddies. He had severe pain when lifting his arm. X-rays show a medium-size tear in his supraspinatus that will require surgery. Patient X has just received surgery in order to repair his supraspinatus tear. His goal is to be able to play sports with his buddies again.

Week #1

Patient X has a flexion of 90° before he feels any pain and stiffness. Patient X is using a pillow brace to provide support and cushion for the shoulder. The PT creates some active assistive range of motion (ROM) and passive ROM exercises using the L-Bar. Patient X does external rotation and internal rotation (ER and IR) using the L-Bar pain free (this is usually around 15-20°). This means that the moment patient X feels pain during the rotation, he stops the exercise. After these exercises, the PT has patient X to pain free isometrics. These exercises involve patient X pushing against a wall while in different stances. Ice is then applied for 15-20 minutes to reduce any swelling.

Week #2

Patient X is now doing passive range of motion with slight tolerance. Patient X is now doing flexion of 115° with slight discomfort. ER and IR is improving to 25-35°. The PT adds grip strength exercises. Isometric exercises help measure ROM for flexion, extension, and abduction with the elbow bent. Increase the use of an ice pack to 6-7 times a day.

Week #3

Patient X switch from a pillow brace to a sling when not doing the exercises. The passive range of motion for flexion is around 140° for Patient X. ER and IR is around 45°. Continue the active assistive ROM exercises along with the isometric exercises. Use ice whenever needed throughout the day.

Week #4

Patient X should have all passive ROM by this week. All previous exercises should be continued. This includes some new exercises such as Prone Rowing in neutral position, ER strengthening exercise, and Manual Resistance ER supine.

Week #5-6
Patient X is now using heat before his treatment in order to warm up the muscle. Active assistive ROM and active ROM exercises should be continued. Isotonic exercises are starting to take place now. Patient X is starting to use weights for some of his exercises.10

Week #7

Strengthening and stretching exercises are taking place this week for patient X. Some exercises include Prone Rowing, Prone Abduction, Elbow Flexion, Elbow Extension, and Lateral Raises.10

Week #8-9

Patient X continues all exercises listed above and if the physician has permitted it, patient X may experience light functional activities with the shoulder.10

Week #10

Patient X must continue with all of her exercises and progress to Fundamental Shoulder Exercises. Also, the PT is starting to use a 1 lb resistance during isotonic exercises.10

Week #11-14

Patient X is progressing through all of his exercises. Isotonic weight exercises should be increasing the weight a pound a day until he reaches 10 lbs.10

Week #15-22

A continuation of all the exercise programs are still in effect for patient X. Stretches have been added to his program by the PT. The PT begins a program specific for patient X’s goal. Patient X may initiate swimming, or practice pitching a baseball, or shooting a basketball.10

Week #23

Patient X should continue the Fundamental Exercise Program at least 4 times a week on his own time. At the point, PT is no longer needed and Patient X is on his own. He must do his stretches and exercises on his own.10
Range of Motion Exercises - Patient X’s exercises

Figure 12: L-Bar Flexion (Above)¹⁰

Figure 13: L-Bar External Rotation, Scapular plane (Above)¹⁰

Figure 14: L-Bar Internal Rotation, Scapular Plane (Above)¹⁰
Strengthening Exercises

Figure 15: Tubing, External Rotation (Above)

Figure 16: Tubing, Internal Rotation (Above)

Figure 17: Lateral Raises to 90° (Above)

Figure 18: “Full Can” (Above)
Figure 19: Side-Lying External Rotation (Above)

Figure 20: Prone Horizontal Abduction (Above)

Figure 21: Prone Rowing (Above)
References


