2017

Conservative Treatment following ACL Rupture in an Older Individual

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CONSERVATIVE TREATMENT FOLLOWING ACL RUPTURE IN AN OLDER INDIVIDUAL

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A Scholarly Project Submitted to the Graduate Faculty of the

Department of Physical Therapy

School of Medicine

University of North Dakota

in partial fulfillment of the requirements for the degree of

Doctor of Physical Therapy

Grand Forks, North Dakota
May, 2017

This Scholarly Project, submitted by Wes Anderson in partial fulfillment of the requirements for the Degree of Doctor of Physical Therapy from the University of North Dakota, has been read by the Advisor and Chairperson of Physical Therapy under whom the work has been done and is hereby approved.

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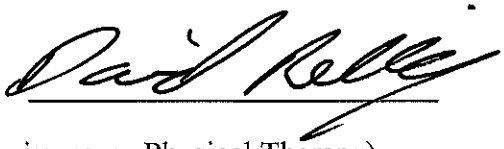

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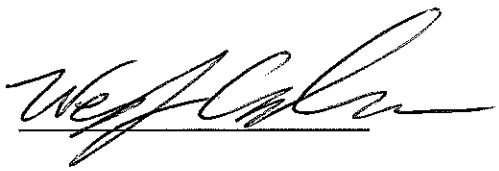
Signature 

Date 9/1/16

TABLE OF CONTENTS

LIST OF TABLES.....v

ABSTRACT.....vi

CHAPTER

I. BACKGROUND AND PURPOSE.....1

II. CASE DESCRIPTION.....4

Examination, Evaluation and Diagnosis.....5

Prognosis and Plan of Care.....9

III. INTERVENTIONS.....11

IV. OUTCOMES.....18

V. DISCUSSION.....20

Reflective Practice.....23

REFERENCES.....25

LIST OF TABLES

Table

1. Interventions Used in the Clinic for the First Two Weeks of Treatment.....15

2. Progression of Interventions Over the Second Two Weeks of Treatment.....16

3. Progression of Interventions Over the Final Four Weeks of Treatment.....17

4. Measurements Taken at Initial Evaluation Compared to Final Treatment Session.....19

ABSTRACT

Background and Purpose. The anterior cruciate ligament (ACL) is one of the most commonly injured ligaments in the knee. It is thought that reconstructive surgery of the ruptured ACL is the best way to return to functional activities, but not every patient wishes to have this surgery with the lengthy recovery. The purpose of this case report is to investigate the outcomes of conservative physical therapy treatment for an ACL rupture over the traditional reconstructive surgery.

Case Description. The patient fell off her bike on a gravel road and suffered a primary diagnosis of a ruptured ACL. She elected to use conservative treatment with Physical Therapy instead of reconstructive surgery for her ruptured ACL.

Intervention. The patient was given a home exercise program for strengthening of the dynamic stabilizers around the knee as well as strengthening of the hip abductor muscles. Interventions in the clinic included further strengthening of the knee stabilizers around the knee as well as involving proprioceptive training for balance and stability. Cryovasopneumatic treatment was also used to aide in the pain and swelling.

Outcomes. The results showed improved range of motion, stability, and functional mobility as well as decreased pain and edema in the joint space.

Discussion. In conclusion, after eight weeks spent with this patient in the clinic, she experienced a positive outcome while receiving conservative treatment for her ruptured ACL.

CHAPTER I

BACKGROUND AND PURPOSE

The anterior cruciate ligament (ACL) is one of the most commonly injured ligaments of the knee. It is estimated that more than 100 000 reconstructions are performed in the United States every year.[1] The ACL is most commonly injured in athletes who perform jumping, pivoting, and cutting movements that put a tremendous amount of stress on the ligament. Unfortunately, athletes aren't the only population injuring this body structure. Older individuals who are far less active can also have this problem. For younger athletes, surgical reconstruction is most commonly used because it allows them to return to their sport. For this group, surgery is most often a viable option for positive outcomes. What about those older populations that aren't as active and do not participate in sports? Is surgical reconstruction the best option for them? It is important to look at the long term outcomes of reconstructive and nonreconstructive treatment to determine what is appropriate for each patient.

In a study by Streich and Zimmermann,[1] the long term outcomes were measured and compared for patients with reconstructive and nonreconstructive treatments for a ruptured ACL. In this study, 80 patients were divided into 40 matched pair groups with an arthroscopically proven ACL insufficiency and were followed for 15 years. One half of the participants were reconstructed using an autologous bone-tendon-bone (BTB)

patellar graft and the other half were treated with a conservative physiotherapeutic-based rehabilitation program. The results showed no significant evidence that ACL reconstruction improves the long-term symptomatic outcome or that it reduces the rate of osteoarthritis development in patients age 18 to 39. A systematic review was performed by Monk et al[2] on surgical versus conservative interventions for treating adults with ACL injuries. In this review, data was collected from the Cochrane Bone, Joint and Muscle Trauma Group Specialized Register (18 January 2016), the Cochrane Central Register of Controlled Trials (2016, Issue 1), MEDLINE (1946 to January Week 1 2016), MEDLINE In-Process & Other Non-Indexed Citations (18 January 2016), EMBASE (1974 to January 2016), trial registers (February 2016), and reference lists. The review concluded that for adults with ACL injuries, there is low-quality evidence that there is no difference between surgical reconstruction and conservative treatment in patient reported outcomes of knee function at two and five years after injury. In other words, this low quality evidence suggests there is perhaps a difference between the treatment groups, so more high quality research needs to be done. It was also stated that many of these patients remained symptomatic following conservative rehabilitation and later decided to have their ACL surgically repaired.[2]

Although conservative treatment may sound more appealing to some patients, there are some negative residual effects that may not be desirable based on their activity level. Due to the lack of a functioning ACL, instability might be an issue indefinitely, especially for those patients that tend to be more active. They may get the feeling that their knee is going to give way and may cause them to be fearful when performing simple

activities like walking or using the stairs. This may be truer for people that like to walk in the grass or other uneven surfaces that may cause their knee to feel less stable. This lack of stability may also produce unwanted pain due to the knee having movement of the femur on the tibia it wouldn't normally produce.

The purpose of this case report is to demonstrate the outcome of a patient with a conservatively treated ACL rupture over the traditional reconstructive surgery.

CHAPTER II

CASE DESCRIPTION

The patient was a 66-year-old Caucasian female with a past medical history of asthma, depression, neuromuscular disorder, hyperlipidemia, osteopenia, fibromyalgia, rheumatoid arthritis, and basal cell carcinoma. She is 5 ft 3 in tall, weighs 136 lb, and has a BMI of 27.46 kg/m^2. She is a retired hair dresser and enjoys going on walks with her husband as well as taking care of her grandchildren. In the fall, she was riding her bicycle when she lost control on some loose gravel and fell off into some trees. She is unsure if there was any twisting motion involved as she made contact with the ground. She says she felt "a little bit of a pop" or discomfort in her right knee, accompanied with excessive swelling. She had immediate pain with weight bearing afterwards and had difficulty moving the knee. At the time of the examination, she said she felt a little unstable if she did not have a knee immobilizer on. She had been using crutches and a knee immobilizer before seeing the doctor 5 days after her fall. She felt pain medially, laterally, anteriorly and posteriorly with palpation, as well as a general achiness. The pain did not wake her at night and as long as she had the immobilizer on, her knee felt "okay". She had been using ice and elevation to try to bring down the swelling, which had effused down into her lower leg, ankle, and foot. She did not have any associated numbness or tingling. She had the most discomfort with walking and using the stairs due to pain and the fear of her knee

giving out on her. She lives in a two-story home with her husband. Her husband is also retired and will be at home with her to aid her if needed. Her main goal for treatment is to reduce the pain with walking and using the stairs. She would also like to be able to pick up and take care of her grandchildren without the fear of her knee giving way on her. She is not as active as she used to be and she indicated she "doesn't need to get to 100%." I urged her to not sell herself short and that I would help her get her knee as close to 100% as possible so she could continue to live her life without pain and apprehension.

The patient was taking hydrocodone for her pain as well as meloxicam to help decrease swelling. Hydrocodone is a common medication used for pain regulation with acute injuries but may have some unwanted side effects. The side effects include body aches or pain, depression, difficulty breathing, fear or nervousness, headache, unusual tiredness or weakness, and other effects not as pertinent to physical therapy intervention. As for meloxicam, some side effects include dizziness, arm, back, or jaw pain, stomach pain, chest tightness or heaviness, increased blood pressure, seizures, and trouble with breathing. As her student PT, I also need to be aware of these side effects. If she were to have any sort of distress, I need to know if it's from the PT interventions or if she is having a reaction to her medications. Fortunately, she did not mention having any sort of side effects from the medications.

Examination, Evaluation, and Diagnosis

Upon examination the patient rated her pain 4/10 at rest and 8/10 with activity using the visual analog scale (VAS). The VAS was given to her at in the waiting room before the examination began. A study by Flandry et al[3] compared the use of a VAS

versus other forms of pain evaluation including the Lysholm scale, the Noyes knee scale, and the Larson scale for knee injury. The VAS was shown to be valid and comparable to these other methods. Four questions were asked by the researchers after the subjects completed the forms: which form was easiest to complete, which form was more confusing, which form required more explanation to understand, and which form allowed you to best depict your symptoms? The VAS was found to be easier to complete than the other forms and was less confusing to the subjects in the study. The use of the VAS was also found to remove examiner bias when recording subjective data.

A magnetic resonance image (MRI) was taken a week after her accident. She was found to have sustained a ruptured anterior cruciate ligament, sprained medial and lateral collateral ligaments, and an oblique tear of the posterior horn of both the medial and lateral menisci. An MRI uses a magnetic field and radio pulses to create a picture of the structures inside of the body. A study by Razak et al[4] compared the results of diagnostic MRI testing and arthroscopic findings in patients with acute ACL injury. The subjects of the study underwent arthroscopic surgery following the MRI to confirm or deny the findings. The result of the study showed that using an MRI for diagnosing patients with ACL injury was nearly 100% sensitive and specific. MRI remains the gold standard for conservative diagnostic procedures for patients with acute ACL injury.[4]

In order to compare laxity and confirm MRI findings of her knees, I performed the Lachman test, anterior and posterior drawer tests, varus and valgus stress tests, and McMurray's test. She showed a positive sign for the Lachman, anterior drawer, varus, valgus, and McMurrary's special tests, while showing negative signs for the posterior

drawer test. Makhmalbaf et al[5] reported a sensitivity of 94.4% for the anterior drawer test and 93.5% for the Lachman test after SPSS 16 analysis of 653 patients suspected to have an ACL rupture. It can be concluded from this study that the diagnosis of ACL injury can be reliably made using the anterior drawer and the Lachman test. Another article by Katz and Fingeroth[6] compared the accuracy of the Lachman test, anterior drawer sign, and pivot shift test. They found all three tests were at least 95% specific but varied greatly in sensitivity. They found the Lachman test and pivot shift test to be 81.8% sensitive while the anterior drawer sign to be only 40.9% sensitive, concluding that even though the anterior drawer sign is widely used, it may be a poorer diagnostic indicator of ACL injuries. Rossi et al[7] wrote an article on examination of the knee which included the proper way to perform the varus and valgus stress tests along with how to interpret the results. They mentioned importance of the knee joint positioning when performing this test for an accurate interpretation. The angle the knee should be at is about 30° of flexion. This is to put all tendinous structures and posterior capsule on slack in order to isolate the MCL and LCL. They also stated that the positivity of the test should not be referred to pain, but rather the degree of joint opening. Pain can be subjective and depending on the grade of injury, the patient can have little to a lot of pain.

The range of motion in her right knee measured 70 degrees of flexion with full extension compared to the left with 153 degrees of flexion and full extension, with both measurements taken using a goniometer. Watkins et al[8] performed a study testing the inter/intratester reliability using a goniometer. The intertester (degree of agreement among multiple testers) reliability for measurements obtained with a goniometer was .90

for flexion and .86 for extension. The intratester (degree of agreement among repeated administrations of a diagnostic test performed by a single tester) reliability was .99 for flexion and .98 for extension. In conclusion, the study showed that goniometric measurements taken by the different physical therapists are not as reliable as measurements taken by the same clinician.

She had full strength in bilateral lower extremities but was painful in muscle testing the injured leg. Midpatellar circumferential measurements were taken to measure edema: 39 cm on the right compared to 35 cm on the left. The patient scored a 56/80 on the Lower Extremity Functional Scale (LEFS) indicating 30% functional impairment. Minimum level of detectable change with 90% confidence is nine scale points for this functional scale. This means that her score needs to change by nine points in order to be clinically significant. Binkley et al[9] performed a study to assess the reliability, validity and sensitivity to change of the LEFS. The test-retest reliability was excellent with an R=.94 and confidence interval (CI) of .89. When comparing to the Short Form (36) (SF-36) physical functional subscale, there was a higher correlation between the prognostic rating of change and the LEFS than between the prognostic rating of change and the SF-36 physical function score. The study concluded that the LEFS is reliable, and construct validity was supported by comparison with the SF-36. The LEFS was also superior to the SF-36 in regards to the sensitivity to change.

Upon evaluation of the clinical examination, the most significant problem for the patient was her pain level as well as instability. The pain and instability are what my clinical instructor and I concluded to be the cause of the loss of function (56/80 on

LEFS). We determined that her range of motion is limited due to the swelling in the joint capsule and should resolve within a few weeks. An injury like this, if left untreated, can cause other dysfunctions in the extremity, for example osteoarthritis.[1] That being said, she was in need of physical therapy intervention to improve the stability and decrease the pain in her knee. During the examination, she mentioned she was unable to ambulate comfortably in her current condition due to the pain and feeling of giving way in her knee. This created limitations in her social life as well as being able to take care of her grandchildren.

Prognosis and Plan of Care

The patient did not wish to have reconstructive surgery due to the fact that she had plans to take a vacation to Mexico with her family which would have to be delayed due to the surgery. Therefore, the plan for this patient was to use conservative treatment methods with physical therapy to decrease pain and edema as well as improve her range of motion, stability, and confidence in the injured extremity. Strengthening the muscles surrounding her knee as well as improving dynamic stability will hopefully help her meet her goals and return to functional activity. Her short-term goals for the first 2 to 4 weeks included increasing range of motion to 0 to 120 degrees of her injured right knee, decrease her pain to 0/10 at rest and 4/10 with activity, and decrease the edema to match the left extremity. Long-term goals for the following 4 to 8 weeks included increasing active range of motion to equal that of her non-injured extremity, decreasing pain to 1/10 or less with activity, and reporting no apprehension due to instability with walking and using stairs. We made a plan for her to come to the clinic for treatment two days a week

for 30 to 40 minute sessions. I would have liked to have her come in three times a week but unfortunately I was on a 4-day work week and it is important to have those rest days in between treatment sessions to let her recover. Two days a week should have been sufficient enough for her to improve and meet the goals listed above before she went on her vacation. Thomas and Burns[10] performed a randomized control study on the frequency of strength training in both men and woman. The two groups either performed strength training three times per week or just one time per week. Both groups showed improvement of strength in the areas tested after eight weeks of training, but with no significant difference of strength gains between them. The results suggest that high frequency training and low frequency training of equal set totals showed similar improvements in lean mass and strength, thus having my patient train two days a week instead of three was sufficient for rehab gains.

In order to be discharged, we wanted her to meet all of her long and short-term goals as well as reach a score that showed positive clinical significance in the Lower Extremity Functional Scale.

CHAPTER III

INTERVENTIONS

At the end of the initial physical therapy evaluation, the patient was instructed in and practiced a home exercise program designed to increase her range of motion and start strengthening her quadriceps and hip abductors. The home program consisted of heel slides, quad sets, straight leg raise, and clam shells using a Thera-Band®. She was given three different colors of Thera-Band® (yellow, green, and blue) of increasing resistance to take home. She was instructed to perform 3 sets of 10 repetitions, 3 to 4 times per week for each exercise.

The purpose of the heel slides was to help increase her range of motion equal to that of her other knee. Heel slides are appropriate for this patient due to the lack of range of motion in her injured knee. Not only would the heel slides help prevent her knee from stiffening up, they would also help to decrease the edema in her joint capsule by helping the inflammation drain and resolve.

The quad sets were meant to strengthen the muscles around the knee. With her lack of stability after the injury, this exercise is important to help stabilize her knee joint to help prevent future injury. Other knee stabilization exercises were administered during treatment sessions in the clinic.

During the straight leg raise exercise, she was instructed to keep her quadriceps muscles tight while flexing her leg at the hip in supine. I wanted her to have a second exercise to work on her quadriceps while making it more challenging by added flexion at the hip. This will also help increase the strength of her hip flexors.

The purpose of the clam shells was to increase the strength of her hip abductor muscles. She did not necessarily have weakness in this area but it is important to strengthen all muscles in the chain. Hip strength is necessary for proper knee mechanics during functional activity. Having strong hip abductor muscles provides important control during stance and gait as well as protection against the dynamic valgus attitude of the knee, thus relieving pressure on the lateral aspect of the joint. Palmer et al[11] showed in her study that there was no statistical difference in knee kinematics between groups following an isolated hip abductor strength program or a functional motor control intervention. The change in magnitude of reduction of knee valgus was 10° and 5° for the functional motor control group and strengthening group respectively. The magnitude of reduction of internal rotation was 9° and 18° for the functional motor control group and strengthening group respectively. In conclusion, the study showed that there is a tendency for clinical significant improvement in both groups to help knee kinematics. There was also a clinically significant improvement in hip abductor strength for both groups, although not significantly different from one another.

A systematic review by Glass et al[12] examined studies regarding the effects of open versus closed chain exercises on patients with ACL deficient or reconstructed knees. They searched the data sources MEDLINE, ProQuest Medical Library, and

CINAHL. It included six randomized controlled trials comparing the use of open kinetic chain and closed kinetic chain exercises of 50 articles yielded from the search. The studies showed favorable results for utilization of both open and closed kinetic chain exercises for ACL deficient or reconstructed knees, but the authors mentioned further research need to be completed.

After practicing her home program, she put on a GameReady® machine for cryovasopneumatic treatment for 15 minutes to aide in decreasing edema. Cryovasopneumatic therapy is an intervention using ice along with compression. Waterman et al[13] performed a study comparing subjective and objective differences between cryovasopneumatic therapy and traditional ice pack therapy for patients following ACL reconstructive surgery. The study showed no significant difference of mid-patella circumferential measurements between groups after six weeks, but there was a significant difference in pain measurements using the VAS after six weeks. Although my patient did not undergo reconstructive surgery, the findings of the study can be applied for almost any injury that is accompanied with pain and swelling. She was very motivated, so compliance with the home program was anticipated.

The patient was seen in the clinic twice a week for 30 to 40 minutes each day. For the first two weeks, she performed therapeutic exercise which included a 6 to 8 minute warm up on the NuStep® machine. The NuStep's® low impact on the patient was the rationale for choosing it for the warm up. It also has the capability to use the upper extremities in order to get the whole body involved. The NuStep® was set at a low resistance for these first two weeks but was gradually increased as the patient's strength

improved. She then performed 3 sets of 10 repetitions with 50 lb of resistance on the bilateral leg press machine. This machine was used to strengthen the patient's quadriceps and hip extensors to begin working on the stability issues of her knee. The same can be said for the rationale behind the following exercise. The single-leg leg curl was performed 3 sets of 10 repetitions with the green Thera-Band®. The patient sat on a high enough bench so her feet did not touch the ground. I then wrapped the green Thera-Band® around her heel/ankle and put it on stretch to provide the resistance. Hamstring strength is crucial for patients with ACL injuries. The hamstrings are going to be very important muscles in her future as they will provide much stability, not allowing her tibia to translate forward under the femur. Lastly, she performed side stepping 6 times 20 ft to the right and to the left. A gait belt was used and she held on to a railing as she stepped due to the instability of her knee and her fear of falling. The side stepping is used for this patient for proprioceptive purposes. Cossich et al[14] evaluated the proprioceptive deficit in patients with unilateral tearing of the ACL after active evaluation of the sense of joint position. In other words, they wanted to evaluate the sensing of joint position on a patient with an injured ACL. They used 20 patients with unilateral ACL tears and tested them against the contralateral limb. The knee joints were put into positions of 20% and 50% of maximum joint range of motion and the proprioceptive performance was determined through the values of the absolute error, variable error, and constant error. Significant differences in absolute error were found at both of the positions and a constant error at 50% of the maximum joint range of motion. They concluded that the proprioceptive deficit continues to be present even when active evaluation of the sense of joint position

is made. Consequently, this sense involves activity of both intramuscular and tendon receptors.[14] This study shows the importance of proprioceptive training for patients with ACL injuries. With proprioceptive and neuromuscular training, these patients may have better sensing of joint position to help prevent future injury.

To increase the stability in her knee after her injury, she needed to reteach her dynamic stabilizers in order to prevent anterior translation of the tibia. Side stepping was useful to help her practice movements she may perform in her daily activities.

Table 1 below shows the condensed version of the interventions utilized over the first two weeks of treatment.

Table 1: Interventions Used in the Clinic for the First Two Weeks of Treatment

Intervention	**Time/Repetitions**	**Intensity**
NuStep®	6-8 min	Medium
Bilateral Leg Press	3x10	50 lb
Single-Leg Leg Curl	3x10	Green Thera-Band®
Side Stepping	6	20 ft
GameReady®	15 min	32°at full compression

Over the next two weeks, she was able to progress her exercise routine. She performed the same exercises above but was able to add more weight to the bilateral leg press and begin using the bilateral leg curl machine, of which she performed 3 sets of 10 repetitions at 25 lb of resistance. We decided it was an appropriate time to graduate to the leg curl machine because the resistance bands were getting too easy for her. With the leg curl machine, she was able to sit up-right with one pad just below her patellae and the other behind her heels. She found the leg curl machine to be more difficult and harder to control with the added resistance but as long as she performed the repetitions slowly she was able to control the weight. Resistance was also added to her side stepping using a 30-

foot-long silver Thera-Band® tubing that was wrapped around a pole and around her waist. This added resistance by putting her hip abductors under more stress in order to gain strength and stability. The side stepping also gave her knee a different feel compared to normal walking so it also added a proprioceptive component to her rehabilitation. She was also instructed to keep her knees and hips bent to about 45° every other set to engage her quadriceps.

Over these following two weeks (weeks 2 to 4), her knee stiffened up slightly, possibly due to apprehension and not letting her knee move into extension during ambulation – As a result, she lost 4° of extension. In order to regain her range of motion into extension, she performed 5 minutes of prone lying with her knees over the edge of the table and a 6-lb weight on her ankle. Five minutes on the recumbent bike at a resistance level of 5/20 was also added to the end of her treatment session to improve range of motion. Table 2 below shows the progression of interventions over the second two weeks of treatment.

Table 2: Progression of Interventions Over the Second Two Weeks of Treatment

Intervention	**Time/Repetitions**	**Intensity**
NuStep®	10 min	Medium-high
Bilateral Leg Press	3x10	65 lb
Bilateral Leg Curl	3x10	25 lb
Side Stepping	6	Silver Thera-Band® tubing
Prone Lying	5 min	6 lb
Recumbent Bike	5 min	level 5/20

The following 4 weeks (weeks 4 to 8) of therapeutic exercise again included adding resistance to the exercise routine she had been given. She had reached full extension in her knee therefore prone lying with 6-lb weight was discontinued. We stayed

with the recumbent bike in order to keep the range of motion gained. Walking forward and backward with the silver Thera-Band® tubing was also added to her program. Table 3 below shows the final weeks of treatment before the patient left for vacation.

Table 3: Progression of Interventions Over the Final Four Weeks of Treatment

Intervention	**Time/Repetitions**	**Intensity**
NuStep®	12 min	High
Bilateral Leg Press	3x10	65-80 lb
Bilateral Leg Curl	3x10	25-40 lb
Side Stepping	6	Silver Thera-Band® tubing
Forward/Backward Stepping	6	Silver Thera-Band® tubing
Recumbent Bike	5 min	Level 5-10/20

The patient tried her best to follow the treatment schedule, but she had missed a couple days due other personal obligations. The actual duration of her physical therapy interventions lasted approximately eight weeks with those few days she had missed. Throughout her treatment, I communicated with her surgeon on the progress she was making in physical therapy so he would know exactly where she was in her recovery before she arrived for each appointment. As for re-examination and evaluation, at the beginning of every week I measured the range of motion in her knee and took her subjective opinion on her pain and overall comfort with walking and using stairs. If her range of motion did not improve or gotten worse, we made sure to focus on that aspect of her treatment in order to meet her goals.

CHAPTER IV

OUTCOMES

Over the eight weeks of therapy, the patient had decreased swelling, pain and apprehension as well as increased range of motion. After the first two weeks of therapy, she rated her pain a 0/10 at rest and a 6/10 with activity. Her range of motion was measured to be 4 to 118 degrees for the injured knee. She most likely lost some extension due to her favoring the affected leg with walking and not allowing it to fully extend due to apprehension with pain and with it giving out on her. Swelling in her injured leg decreased to 36 cm on the right compared to 35 on the left.

With continued therapy her range of motion increased to 3 to 125 after four weeks and 0 to 145 after eight weeks. She rated her pain 5/10 with activity after four weeks and 2/10 with activity after eight weeks. The swelling decreased to equal bilaterally after four weeks of treatment. After eight weeks, the patient continued to have apprehension with ambulation and using stairs. Over time, she should learn to trust her knee enough to not be afraid of it giving way on her. The patient also filled out the Lower Extremity Functional Scale a second time to compare to the initial evaluation. She scored a 70/80 indicating 12.5% functional impairment compared to the 30% functional impairment initially (Table 4). As stated earlier in the report, nine points of change in the functional scale is needed to determine clinical significance, so she had met this goal.

Table 4: Measurements Taken at Initial Evaluation Compared to Final Treatment Session		
Measurements Taken	**Initial Visit**	**Final Visit**
Range of Motion	0-70°	0-145°
Pain at Rest	4/10	0/10
Pain with Activity	8/10	2/10
Edema	39 cm	35 cm
LEFS	56/80	70/80

CHAPTER V

DISCUSSION

This report shows a patient with a ruptured ACL who was able to be treated conservatively and gain functional independence. Treating conservatively takes away the added stresses an older individual may have with surgery whether it involves complications with surgery or the lengthened recovery time. There are very active older individuals in society but they are probably not as active as younger people that still may be participating in athletics or recreational sports. That being said, they may not miss the stability the ACL provides for them and conservative treatment may be more appropriate. Grindem et al[15] reported the rate to return to pivoting sports after one year is not significantly different between patients that are treated with reconstruction or conservatively after an ACL injury. There is some degree of pivoting and shifting when turning with ambulation. If a patient in sports can return to a sport with much more pivoting stresses added to their knee, a patient who does not participate in those sports could have the same or better results. Grindem et al[15] did state that the nonoperative group had significantly higher knee joint laxity, but significantly better hop test limb symmetry indexes, Knee Outcome Survey Activities of Daily Living scores, and International Knee Documentation Committee Subjective Knee Form 2000 scores – None of the functional differences were larger than the smallest detectable difference.

One limitation to this study is the time frame with the patient. The patient will continue to receive therapy once she returns from her vacation and it would be important to receive follow up information at a later date to check on progression. It also would have been beneficial to be able to compare directly to another individual who had had reconstructive surgery for the same injury. Two of the articles referenced in this study used the pivot shift test to measure instability with pivoting motions. The patient being investigated in this study did not have the same measurements taken, although they would have been valuable from the start of the study to the end. To most accurately diagnose a possible rupture of the ACL, a systematic review was done by Ostrowski[16] comparing the lateral pivot shift test, Lachman test, and anterior drawer test. The reviewers searched MEDLINE and EMBASE and found 1090 eligible studies, in which 17 were selected. The results showed that during a physical examination, a positive result for the lateral pivot shift test is the best for ruling in an ACL rupture, whereas a negative result to the Lachman test is the best for ruling out an ACL rupture. Solely using sensitivity and specificity, the Lachman test is a better overall test for both ruling in and ruling out ACL ruptures. The anterior drawer test appeared to be inconclusive for drawing strong conclusions either way. Knowing this, the lateral pivot shift test would have been a valuable prognostic tool for my patient

Although treating conservatively is the appropriate option for many patients, there are those patients that do not have good outcomes and must elect to have their ruptured ACL reconstructed later in life. Harris et al[17] performed a study asking the question if early ACL reconstruction with rehabilitation would lead to better patient-reported

outcomes and lower incidence of osteoarthritis at 5 years post injury compared with delayed ACL reconstruction with rehabilitation. This was a randomized controlled trial with results that showed that early ACL reconstruction plus rehabilitation did not provide better results at 5 years compared with optional delayed ACL reconstruction plus rehabilitation. The authors also found no radiographic differences between patients with early ACL reconstruction, delayed ACL reconstruction, or no ACL reconstruction (rehabilitation alone). This study shows that patients opting for reconstruction later in life do not have any better outcomes in the long run than those wanting to solely treat conservatively, which is something those patients should think about when the option for reconstruction arises again.

It is important to also look at the other side. If the study[15] showed that there is no difference in outcomes, and most patients present osteoarthritis regardless, then why not have the surgery done earlier in life so you can have the stability in your knee and have the lengthy recovery of surgery over and done with.

Another study was done by Dhillon[18] asking the question what happens if a patient does not elect to have surgery and proceeds with the conservative route instead? In the group of patients treated conservatively, 51% needed a delayed ACL reconstruction. However, all of the outcome measurements were the same in the group treated conservatively and the group treated with ACL reconstruction. The author concluded that the results should encourage clinicians and patients to consider rehabilitation as the primary mode of treatment for an acute ACL tear. In other words, if

all patients with an ACL tear elect to have surgery, 50% of them would be having unnecessary surgery.

Reflective Practice

Conservative treatment for ACL injuries seems to be taking more ground as of late for older patients because they simply do not need to have an intact ACL to still be functional in life. Of course, that all depends on what kind of activities they participate in on a daily basis. This report has shown a patient with a ruptured ACL can still exercise and be clinically functional through the use of physical therapy. I would highly recommend discussing with future patients with similar diagnoses the option of conservative treatment instead of surgical processes which can take six months of recovery time. Although not fully recovered by the time this patient went on her vacation, she showed that her recovery time was much shorter with conservative treatment.

The examination of this patient was standard for any patient with a knee injury. Examining all structures is important, even after the patient has seen the physician. It is important for the physical therapist because we need to know all of the limitations the patient has so we can work towards their goals and improve their body as a whole. One special test that I would consider performing for future patients is the lateral pivot shift test. It is a good test to examine stability in the knee and can be used throughout treatment as a re-evaluation tool.

If I were to have another patient like this, I would incorporate more proprioceptive training in my interventions. We did include a little proprioceptive training with the side stepping and walking forward and backward with resistance. I

would have liked to include more balance activities like single leg stance on even and uneven surfaces or standing with perturbations. This would give the muscles around the knee a different input from the environment forcing them to react differently and gain more stability.

The total cost reimbursed over the 11 clinical visits was $795.00 and an out of pocket cost to the patient of $198.75 (25% of total cost). Medicare's multiple payment procedure reduction policy was applied for the cost of treatment. My patient seemed to be very financially stable so the out of pocket cost over 11 visits did not seem to have much of an impact on her and her husband financially. That being said, I believe the benefits of reducing pain and improving stability and strength for ambulation and home life very much outweigh the cost of her treatment.

Further research is needed to determine the best conservative interventions to be used for patients with ACL ruptures. There are many studies demonstrating rehabilitation protocols and intervention programs for patients who have had reconstructive surgery of their ACL, but there are few showing what interventions are best when treating conservatively.

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