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A Case Report: Outpatient Physical Therapy Treatment of a Patient with Unilateral Medial and Posterior Knee Pain and Osteoarthritis

by

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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

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This Scholarly Project, submitted by Joseph Griffin 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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(Chairperson, Physical Therapy)

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Title A Case Report: Outpatient Physical Therapy Treatment of a Patient with Unilateral Medial and Posterior Knee Pain and Osteoarthritis

Department Physical Therapy

Degree Doctor of Physical Therapy

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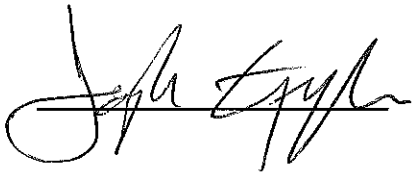
Signature 

Date 12.13.17

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Abstract

Background & purpose: Meniscus tears are commonly considered to be associated with a traumatic event, but the degenerative nature of osteoarthritis can also damage the cartilage. As meniscal tears are a common orthopedic pathology, choosing the correct treatment can be difficult and involve several factors. Current treatment options include partial or total meniscectomy, meniscal repair, or conservative management. There is growing research supporting the effectiveness in non-operative management of degenerative meniscal tears (DMT). The purpose of this case report was to investigate the non-operative management of a 47-year-old male with a unilateral DMT combined with osteoarthritis.

Case description: The subject was a 47-year-old male who presented to physical therapy with right-sided medial and posterior knee pain in combination with pre-existing osteoarthritis. The patient also presented with mild to moderate tenderness over the joint line, swelling around the knee, limited knee range of motion (ROM) and decreased strength.

Outcomes: Following a 6-week intervention program, the patient presented with improved strength and active knee ROM, improved posture, decreased pain, improved score on Lower Extremity Functional Scale (LEFS), and an improved activity tolerance during walking, squatting, and stair climbing.

Discussion and Conclusion: This case report shows the effectiveness of conservative physical therapy to improve physical function in middle-aged male patients with a degenerative meniscal tear and osteoarthritis.

Chapter I

Background and Purpose

Osteoarthritis (OA) of the knee is characterized by the degeneration of protective cartilage (the menisci) on the femur and tibia due to pathological compromise. Hypertrophy of bone at joint spaces and changes in the synovial membrane also occur.[14] People with knee OA usually suffer from knee pain, joint stiffness, decreased muscle strength, deficits in proprioception, decreased functional ability, and a profound reduction in quality-of-life. Muscle weakness, particularly of the quadriceps, is one of the earliest clinical signs of knee OA and has long been recognized as a hallmark of the disease.[32]

The primary function of the meniscus is to assist with distributing compressive forces during dynamic knee joint movements and static loading. In addition, the menisci also play important roles in knee joint lubrication and proprioception and serve as secondary joint stabilizers.[32] Meniscal injuries in the knee can compromise joint function and lead to increased contact pressures in the affected compartment. Meniscal injuries have also been associated with long-term dysfunction, degenerative joint changes, and osteoarthritis in the knee. More recent studies have shown that function of the knee was directly related to the amount of meniscal tissue that remained.[14] Increased knowledge of the long term consequences and altered biomechanics in the knee post meniscectomy has placed greater emphasis on meniscal preserving techniques. Patients with a meniscal

injury will commonly present with pain, joint stiffness, swelling, limited range of motion, knee instability, a feeling of “giving way”, and/or a locking or clicking sensation.[5,19]

Patients with OA and meniscal tears report knee buckling, pain, decrease gait speed and difficulty with stair climbing in combination with any of the signs/symptoms of each singular diagnosis.[11] In fact, in a study by Bhattacharyya et al,[1] 78% of the 2351 men and women age 36 to 94 years (median age of 63.5 years) reported buckling. The public health burden and long-term effects of meniscal injuries are substantial, particularly in physically active populations, because of the increased risk for early-onset osteoarthritis and long-term disability and the health care costs associated with degenerative joint disease.[1] A study by Lubar et al.[18] found OA of the knee affects approximately 5 million individuals in the U. S. with an economic burden of $3 billion to $6 billion due to decrease in work productivity, quality of life and increase in pain.

As prevalence of knee OA has increased, multiple treatment interventions have been proposed including surgical, pharmacologic and conservative physical therapy approaches. There has been a recent increase in research showing the benefits of conservative physical therapy compared to arthroscopic surgery for the management of OA and degenerative meniscal tears.[6,9,13,23,31] Physical therapy may include modalities such as heat or cold, an individualized exercise program consisting of strengthening, range of motion, aerobic exercise, activity modifications, and joint protection, and manual therapy. Quadriceps strengthening has been associated with reduced joint pain and increase in function in patients with OA and meniscal tears.[31,33]

A meta-analysis of randomized, controlled trials concluded that muscle strengthening in weight-bearing and non-weight bearing positions were effective for pain relief.[33] The current research on physical function with conservative treatment of knee OA and degenerative meniscus tears is growing with most studies looking at post surgical physical therapy versus conservative therapy without surgery for treating OA and meniscus injury to improve physical function. More research is needed. The purpose of this case report is to document the effects of conservative physical therapy on functional outcomes in a patient with a degenerative meniscus tear and osteoarthritis. This review also explores the evidence for managing meniscal tears and when to consider each treatment option based on current available evidence.

Chapter II

Case Description

The patient is a 47-year-old male construction foreman who has noticed worsening medial/posterior pain, joint stiffness, weakness, and the feeling of instability in his right knee over the last 10 days beginning after playing in a soccer game. The patient has not seen a physician regarding the pain until 1 day ago and was referred to PT for examination and treatment for possible medial meniscal tear of the right lower extremity. He expresses that the worse pain (8/10) is felt during squatting motions, getting up from a chair, ambulating, and descending stairs. He presents with signs of inflammation in the joint line and moderate swelling in both the medial and lateral joint lines. The patient also claims a locking sensation during deeper flexion.

He does report that the pain increased and he felt unstable during his soccer game; there was no significant trauma. The patient's chief complaint is pain while squatting, descending stairs, decreased ROM, and decreased ability to perform manual labor at work. The patient also wants to return to playing soccer. The patient is currently treating the pain with ice, NSAIDs, and rest. With being on a construction site, the patient says his job includes climbing a lot of stairs, carrying heavy objects, twisting, squatting, and walking on a variety of even/uneven surfaces all day. The patient has PMH of mild atrial fibrillation, osteoarthritis in right knee, an arthroscopic rotator cuff repair 10 years ago, and Raynaud's syndrome. The patient report's his atrial fibrillation is stable and

being managed by his physician. His last cardiovascular appointment was three weeks prior. He reports his cardiovascular exercise consisting of playing soccer twice a week and he eats a moderately healthy diet. Following the completion of a comprehensive patient history, a patient examination was performed in accordance with guidelines provided by the Guide to Physical Therapist Practice.

Examination and Evaluation

The examination of this patient was based on Magee's Orthopedic evaluation of the knee.[21] The patient displayed a rounded shoulder posture and limp displaying partial weight bearing on his right lower extremity, limited knee flexion during swing phase, and the inability to reach full extension. The patient reported tenderness to palpation in the medial (5/10) joint line.[23] The patient states "my posture is a result of carrying objects in front of my body for years and when I am not observing the job-site, I am sitting at a desk" and "my knee pain is an 8/10 with activity and 2/10 at rest." Following placing the patient in correct posture, tight musculature was noted bilaterally in his pectoral muscles. Pain rating was taken at the beginning of each therapy session with the prompt "How would you rank your knee pain on a scale of 0-10, 0 being no pain and 10 being the worst pain you have ever felt?" The patient was also encouraged to report any increased pain during any particular intervention. Active range of motion was measured in supine. Hip and ankle ROM was all within normal limits but knee flexion and extension were limited. PROM was limited due to pain. The patient appeared very guarded during PROM. The results of goniometric measurements of the patient's hip, knee, and ankle ROM are listed in the Table 1 below; limitations outlined in red

Table 1. Initial Hip, Knee, and Ankle Range of Motion (in Degrees)

Hip	**Right**	**Left**
Flexion	121	118
Extension	12	10
Abduction	45	43
Internal Rotation	44	45
External Rotation	42	44
Knee		
Flexion (active)	108	136
Extension (active)	-12	0
Flexion (passive)	115	136
Extension (passive)	-7	0
Ankle		
Dorsiflexion	20	18
Plantarflexion	47	51
Inversion	35	35
Eversion	14	16

Hip and knee strength was tested using resisted isometrics with the patient in a supine position. Strength measurements were based on the 0 to 5 grading scale within the available range of motion. All motions resulted in 5/5 bilaterally except for right sided knee extension which was inconclusive due to pain. Seven degrees of flexion and five degrees of extension was able to be gained during passive movement of the knee joint.

Following ROM and strength testing, special tests were performed to test specific structures within the knee. The patient displayed positive results with the Apleys Compression and McMurray tests on the right side, which both are indicative of meniscal damage.[23,31] He was negative bilaterally for both Knee Varus and Knee Valgus tests which test both the medial and lateral collateral ligaments.[8,17,23] Lachmans test and Posterior Sag maneuvers were negative bilaterally exhibiting a strong ACL and PCL bilaterally.[17,25,26,28] The sensitivity and specificity of the tests are outlined in Table 2. The patient filled out The Lower Extremity Functional Scale (LEFS) which is a self-report questionnaire containing 20 questions about a person's ability to perform everyday tasks. The responses are based on a 5-point ordinal scale, 0 being extreme difficulty or unable to perform activity, and 4 being no difficulty. The lower the score, the greater the disability. It has been determined that the minimal detectable change is 9 scale points. The test has been determined to have high reliability and validity. The sensitivity and specificity are .81 and .70, respectively.[2] At initial evaluation, the patient scored 40/80 on the LEFS, indicating high disability with functional tasks, walking, squatting, hopping, running, and turning quickly.[2] The patients neurological testing was negative bilaterally.

Table 2. Summary of sensitivity and specificity of orthopedic special tests

	Sensitivity (95% CI)	Specificity (95% CI)	
McMurray's	61% (45% to 74%) 61%	84% (69% to 92%) 84%	Meserve[23] Smith[31]
Joint Line Tenderness	83% (73% to 90%)	83% (61% to 94%)	Meserve[23]
Valgus Stress 0°	0.91 (0.81 to 1.00) 0.96%	0.49 (0.39 to 0.59) 0.53%	Meserve[23] Garvin et al.[8]
Varus Stress 0°	0.00% to 0.17%	NA	Lange[17]
Lachman	78.6% 86%	100.0% 91%	Mulligan[25] Ostrowski[26]
Apley Compression	20% to 84%	79% to 84%	Smith[31]
Posterior Sag	79% 0.46% to 100.0%	100.0% 100.0%	Rubinstein[28] Lange[17]

Evaluation

Upon initial evaluation, the patient stated his strong will to receive PT services and not surgery for whatever diagnosis was determined. The patient stated that his wife had a recent negative experience receiving a lower extremity surgery. This bad experience combined with his positive experience with past physical therapy services helped outline his plan of care.

Following a thorough analysis of the patients' initial data and evaluation, the patient's signs, symptoms, LEFS score, and functional limitations pointed in the direction of a medial meniscal injury. In the attempt to obtain a clearer picture, the patient was referred for imaging of his right lower extremity. The patient returned to the clinic a few

days later with a diagnosis of a small horizontal cleavage (degenerative) medial meniscal tear on the posterior edge of the medial meniscus.

Following his return, the diagnosis and prognosis was discussed with patient. The patient had a fair to good prognosis with conservative management of a meniscal tear combined with OA. From the initial evaluation throughout the course of the 6-week treatment, the patient was very motivated and determined to return to his prior level of function and enjoyed sports, exercise, and playing with his children.

The goals of the patient were to reduce pain and instability, be able to work a full-day pain free, and return to recreational exercise. The rehabilitation goals discussed with the patient were mainly to return to prior level of function. The short term goals were to decrease pain, increase active knee extension to 0 degrees and active knee flexion to 115 degrees to allow for a normal gait pattern. The long term goals were to decrease instability in the knee, increase lower extremity strength, ambulate stairs pain-free, and be able to complete pre-injury work duties pain free.

Chapter III

Intervention

The patient was scheduled for physical therapy three times a week for six weeks. Each PT visit usually lasted forty-five minutes to an hour. The patient was very motivated and showed up for every appointment. Although determined to return to a post-injury activity and pain level, the patient was often less than compliant with the provided home exercise program (HEP) due to a busy family schedule.

Throughout the 6 week course of physical therapy, the interventions and plan of care (POC) focused primarily on manual therapy and exercise to reduce pain and instability and regain motion and strength.[3,4,11,27,29] Due to limited research on conservative treatment of degenerative meniscal tears in combination with osteoarthritis, a POC was developed that incorporated a combination of conservative treatment for meniscal tears and OA, as well as incorporating aspects of treatment for anterior cruciate ligament (ACL) tears.[3,4,9,13,14] The focus on reducing instability is why ACL strategies were used. Following the initial examination, the patient was educated about the diagnosis, prognosis, and plan of care. He was provided information about the treatment plan set forth by the rehabilitation team. The patient was given an explanation of the different interventions listed in the plan and how he would be progressed throughout the episode of care.

Week 1

The first week's treatment consisted of pain relieving modalities including continuous 1 megahertz ultrasound of the right medial joint line region. The patient received light stretching of the hamstrings and quadriceps and cryotherapy in the form of a cold pack to reduce inflammation at the end of the session for 15 minutes. Following ice, the patient's right knee was taped using Leukotape to assist in stabilization of the knee during time off the crutches.[10,11] During the visit, posture correction was initiated consisting of retracting the shoulders and head as well as neural gliding in supine of the femoral, and sciatic nerve distribution. A HEP was given at the end of visit two which consisted of stretching pectorals, hamstrings, gastrocsoleus, and quadricep muscles twice a day. The initial visit ended with gait training (PWB) with bilateral crutches on level ground and stairs. The patient was given a light compression sleeve to wear and was instructed on its use. The HEP also listed activities to avoid for the next few weeks. Following the first three visits, the patient reported a decreased level of pain in his knee to 6/10 with activity, decreased swelling, and an increase of 7 degrees of active knee flexion and 5 degrees of active knee extension.

Week 2

Week 2 of treatment continued with pain-relieving modalities of cryotherapy, posture correction, and stretching with the addition of joint mobilization, stationary cycling, core stabilization, and light strengthening (HEP adjusted accordingly). The patient warmed up for treatment by cycling on the stationary bike for 8 minutes.[15,22] The joint mobilization technique used for this case is based on Mulligan's theory of mobilization with movement utilized to increase force generation of the affected muscles

and decrease knee pain. The patient is supine with the knee flexed over an 8” foam roll, the distal femur is stabilized laterally by one hand and the proximal tibia is internally rotated with the other hand while the knee is actively and painlessly flexed/extended in a non-weight bearing position. This glide is held during 3 sets of 10 repetitions of pain-free knee flexion/extension.[10,11,27,29]

The initiation of early strengthening consisted of 1 set of 10 repetitions of quad sets, hip abduction and adduction, ham sets, SLR, isometric knee extension and flexion, hip flexion/extension, and ankle plantarflexion using light weight.[15] The treatment ended with the Leukotaping of the right knee.[10,11] The patient was able to work 2 hours consecutively pain-free, decrease joint tenderness, ambulate 20 ft. free of AD with no gait abnormality, and ascend/descend 5 normal height stairs pain-free. The patient was instructed to continue forward wearing his compression sleeve and begin walking with a single crutch to introduce greater load bearing. The patient was gait-trained accordingly.

Week 3

Week 3 of treatment continued with pain-relieving modalities of cryotherapy, posture correction, stretching with the addition of grade 2 and 3 anterior and posterior tibial glides to increase range of motion, unilateral strengthening, and proprioception training.[15] The patient warmed up for treatment by cycling on the stationary bike for 10 minutes followed by tibial glides and Mulligan mobilization in weight-bearing position.[10,11,27,29,33] The progression of strengthening consisted of 1 set of 10 repetitions of hamstring curls, partial weight mini squats (0-30°), front lunges, lateral step-ups, toe raises, prone knee bridges, standing hip abduction with band, and single leg-stance.

The treatment ended with the Leukotaping of the right knee.[10,11] The patient was able to work 3 hours consecutively pain-free, ambulate 100 ft. with no gait abnormality, ascend/descend 25 normal height stairs pain-free, and was able to achieve 120 degrees of knee flexion and -3 degrees of knee extension.

Weeks 4-6

Weeks 4 and 5 of treatment continued with pain-relieving modalities of cryotherapy, and stretching with the addition of joint mobilization taping and progression of strengthening and functional gait training exercises using a treadmill. The goals during these weeks were to continue to enhance muscular strength and endurance, maintain full ROM, return to functional activities, and normalize gait. During the course of the last 2 weeks of therapy, once the Mulligan glide was found that enabled the patient to squat pain-free, the glide was taped into place for the patient to wear until the subsequent session.[10,11,27,29,33] The progression of strengthening continued to emphasize closed kinetic chain exercises and dynamic stability. This was done by the consistent addition of weight to the exercises as tolerated, adding functional weights/shapes, varying the surfaces, eyes open/eyes closed, adding bilateral and unilateral stabilization/balance exercises, perturbation training on a balance board, and rotational core stability exercises with pulleys.[7,20,32,34]

The remaining weeks also consisted in advancing the level of intensity and length of time of treadmill walking. This patient was discharged from physical therapy after meeting all the preset goals and was instructed to continue with home strengthening program. At the time of discharge, the patient's knee extension tested 5/5 bilaterally, full

ROM was achieved, ascending/descending stairs was pain free, his LEFS score was 73, and he was able to work 6-8 hours pain-free.

Chapter IV

Outcomes

The patient was discharged following 6 weeks of therapy. The patient achieved all of the preset goals and his therapy plan was completed. The patient attended all PT sessions throughout the course of his treatment. This was a reflection of his determination throughout therapy and his motivation to return to his prior level of function.

The patient reported an overall decrease in the severity of knee pain, an ability to work 6-8 hours pain-free, and the ability to ambulate stairs without the development of any symptoms. The patient reported no feelings of knee instability or “giving way” during work and other functional activities, and no feeling of a locking sensation during squatting. The patients knee flexion range of motion increased from 108 to 135 degrees, and knee extension returned to 0 degrees. Muscle testing of right knee extension increased to 5/5, The patient reported an overall improvement in his functional abilities including a return to recreational swimming and biking, and the ability to work a full-shift.

Throughout the course of therapy, the patient displayed significant improvement if his gait pattern yet still possessed a very slight increase in stance phase time on the left leg. Upon discharge, the patient scored a 73/80 on his Lower Extremity Functional Scale.

Chapter V

Discussion

Musculoskeletal knee pain is a widespread and costly problem, in which meniscal tears and osteoarthritis make up a large percentage of these diagnoses. When experienced singularly, these conditions can be very painful. When experienced simultaneously, the condition can be debilitating and increasingly more complex to treat. OA in combination with a DMT can be difficult to treat due to the intricate relationship of the diagnoses.

Several studies have concluded that a meniscal tear can lead to knee OA.[13] On the flip side of that, knee OA can lead to a spontaneous meniscal tear through a gradual deterioration and breakdown of the meniscus.[13] Even with surgical resection to remove degenerative lesions, osteoarthritis may still progress. According to Van de Graaf et al,[36] "a meniscal tear can lead to OA and OA can lead to a meniscus tear." The two menisci, which are essentially the shock absorbers of the knee and help distribute loads across the surfaces of the joint, gradually thin and weaken as we age. If knee OA is present, this natural process can be sped-up resulting in tears.

Arthroscopic surgery on this part of the knee is the most frequent surgical procedure performed by orthopaedic surgeons in the United States. According to Mayo Clinic,[13] there are more than 300,000 knee arthroscopies performed each year in the United States on patients who have a meniscal tear and osteoarthritis in the same knee

compartment. Yet while arthroscopy is considered effective for meniscal tears alone, its effectiveness for associated osteoarthritis is unclear.

There is current debate amongst medical professionals and conflicting research on the best treatment for OA and DMTs. Current treatment options include partial or total meniscectomy, meniscal repair, or conservative management. There is growing research supporting the effectiveness in non-operative management of degenerative meniscal tears.

Following the 6 weeks of physical therapy, the patient progressed faster than expected and was on track to achieve his goal returning to work and recreational activities pain-free. The patient made great gains throughout the course of rehabilitation and was very motivated to succeed. This case study was developed to explain the specific conservative treatment provided for a middle-aged male with a degenerative tear of the medial meniscus in conjunction with knee OA. The report has achieved this purpose and can be used as supplemental information for future patients with the same impairments. The success of this patient can be seen in the overall decrease in pain, subjective LEFS scores, and increase in functional abilities. The improvement in those areas can be related to the interventions provided.

The interventions and plan of care (POC) focused primarily on manual therapy, exercise, core stability, maintaining proper posture, and performing proper lifting techniques. Resistive exercise was implemented based on the evidence that neuromuscular strengthening of the hip abductors and quadriceps can improve pain and physical function in patients with knee OA.[32] Additional research has shown that interventions designed to improve muscle strength, especially quadriceps strength, and

neuromuscular function can provide functional improvements, pain relief, and possibly also a delay in the progression of osteoarthritis (OA) as muscle weakness and reduced functional performance may be risk factors for OA.[3,4,7,20,24,32,34,35]

The Mulligan Concept of manual therapy appeared to be the intervention that provided most immediate and long term relief. Mulligans unique concept of mobilization with movement (MWM) is defined as the application of a specific vector of force to a joint, which is sustained while the patient performs a previously impaired physical task. The key to successful use of MWM is the skillful and efficient application of this mobilization force so as to painlessly achieve immediate and long lasting relief of pain.[10,11,27,29,33] This technique was ideal for this patient because it required the patient to be an active participant while the therapist moved the specific targeted area into a pain-free position. This technique allowed the patient and therapist to see immediate results.

Many patients who have osteoarthritis of the knee and a torn meniscus can defer having the meniscus repaired and undergo physical therapy instead. But based on the best evidence, arthroscopic partial meniscectomy does not result in better pain relief and functional improvement than does physical therapy alone in patients who have a torn meniscus and knee osteoarthritis.[13]

Reflective Practice

The course of treatment and plan of care for this patient was shown to be effective in using conservative physical therapy to treat a degenerative meniscal tear in conjunction with ipsilateral knee osteoarthritis. This treatment success was partially due to excellent mentoring by my clinical instructor. Due to the complexity of this diagnosis and my inexperience, I was initially uncomfortable in handling this case.

As I reflect upon my overall treatment and interactions with this patient, it is challenging to be critical of myself and my physical therapy skills as this was just my first clinical affiliation. I believe much learning is gained through trial and error. Throughout the course of treatment, I would have liked to try a wider variety of interventions to gauge their results and use the Knee injury and Osteoarthritis Outcome Score (KOOS) assessment in combination with the LEFS. The KOOS, which a knee functional assessment, is more specific in knee OA, and has a sensitivity of 0.88 and a specificity of 0.72. An advantage of the KOOS is the inclusion of two different subscales of physical function relating to daily life, and sport and recreation. This enhances the instrument's validity for patients with a wide range of current and expected physical activity levels. I believe this combination would have given better direction in developing the plan of care.

Conclusion

Meniscal tears are a frequent orthopedic pathology, therefore choosing the correct treatment can be challenging and involve multiple factors. Current treatment options include partial or total meniscectomy, meniscal repair, or conservative management. There has been a continued growth of research supporting the effectiveness in non-operative management of degenerative meniscal tears (DMT). This case report shows the effectiveness of conservative physical therapy to improve physical function in middle-aged male patients with a DMT and knee OA.

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