OUTPATIENT REHABILITATION FOR A PATIENT WITH PATELLOFEMORAL PAIN SYNDROME

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A Comprehensive Case Analysis

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Abstract

of

OUTPATIENT REHABILITATION FOR A PATIENT WITH PATELLOFEMORAL PAIN SYNDROME

by

Rafael Montanez

A patient with right patellofemoral pain syndrome was seen for physical therapy treatment for 10 sessions over the course of two months at an outpatient physical therapy clinic. Treatment was provided by a student physical therapist under the supervision of a licensed physical therapist.

The patient was evaluated at the initial encounter with manual muscle test, active range of motion, functional tests, and special tests for knee pathology. Based on this evaluation, a plan of care was established. Main goals for the patient were to: increase walking distance; improve mobility; increase strength in lower extremity muscles which included the right hip and knee extensors, hip abductors, external rotators, and knee flexors; perform housework and basic home maintenance without pain; and regain functional independence. The main interventions included manual therapy, task-specific training, isometric/concentric/eccentric strengthening exercises, and functional training. The independent home exercise program (I-HEP) incorporated strength, stretching and walking program with progression to continue a path of becoming more physically active.

The patient had an overall improvement in pain inducing functional activities. By the end of the 5 weeks, she was able to ascend/descend more than 12 steps, perform a squat past 90°, and walk more than 4 miles all without pain. The patient also improved her score in the Lower Extremity Functional Scale from 56/80 to 71/80 surpassing the minimal clinically important difference score of 9. She was discharged to her home with an I-HEP after reaching all of her goals.

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General Background

Patellofemoral pain syndrome (PFPS) is a commonly used term to collectively describe anterior knee pain (AKP), arthralgia, malalignment of the patella, excessive lateral pressure syndrome, and extension subluxation.[1-4] An estimated 11-17% of knee pain referrals are due to PFPS and it is reported to equally affect both physically active and sedentary individuals.[5] Patients diagnosed with PFPS, according to literature, will commonly report a gradual onset of pain that is aggravated with increased frequency or duration in activities that load the patellofemoral joint, such as squatting, ascending/descending stairs, prolonged sitting, and prolonged standing.[2,6] Patients will often state that they have patellofemoral crepitus, knee stiffness, difficulties with activities of daily living, restricted mobility, and a poor quality of life.[2] This condition is seen in both men and women, but women are twice as likely to develop PFPS.[3,7] According to Schiavone-Panni et al. (2016)[8], the incidence of PFPS is estimated at 22 per 1000 persons per year. Risk factors that have been linked to the development of PFPS include a large q-angle, lower extremity muscle strength deficits, quadriceps tightness, knee joint and patella hypomobility, and hip abductor and external rotation weakness.[2-4] A systematic review that looked at anthropometric data such as height, weight, body mass index, body fat percentage, leg length discrepancy, and lower extremity (LE) circumference reported no significance in being predictive for PFPS.[9]

The proposed pathomechanics that lead to the development of PFPS involve changes in structural mechanics of proximal (hip, pelvis, and trunk), local

(patellofemoral joint), and distal (foot and ankle) tissues.[10,11] There are other pathologies that can present with similar symptoms as PFPS such as: iliotibial band syndrome, patellar stress fracture, or patellofemoral arthritis. All of these disorders can be differentiated from PFPS with a thorough hip and knee examination. There are still no specific tests that can be performed to diagnose PFPS, but there seems to be an agreement clinically that functional tests such as squatting, step up, or step down maneuvers are consistent in eliciting pain in patients with PFPS.[2,3,12] Crossley et al. states that 80% of individuals with PFPS who perform these functional tests experience pain.[2]

Patients diagnosed with PFPS respond well to conservative management. Although patients are expected to see the benefits from physical therapy within 6-12 weeks, there are some prognostic factors that lower expectations for patients' outcomes. Patients who have the following characteristics have a poorer prognosis following physical therapy treatments: those having PFPS longer than 6 months, have a high baseline of pain with functional activities, are greater than 50 years old, have LE muscle weakness, have altered kinetics during functional activities, and being a female.[2,7,13,14] Although some of the risk factors mentioned above are non-modifiable such as age, gender, and the onset of PFPS, there are a few that are modifiable. The modifiable risk factors include: decreased hip and knee muscle strength, high pain at baseline and altered kinetics during functional activities that increase the load at the patellofemoral joint.[14] These modifiable risk factors when corrected can improve the

prognosis for rehabilitation. Also, those who have had PFPS less than 6 months have good prognosis for physical therapy.

Chapter 2

Case Background Data

Examination – History

The patient was a 35-year-old female who came to the clinic with a medical diagnosis of right knee pain and stiffness. She reported a gradual insidious onset of pain that started two months prior to her evaluation. She had recently increased her walking distance after her car broke down requiring her to walk more to perform her daily activities. Prior to her car breaking down, her maximum walking distance was approximately 4 miles a week; after losing her transportation, she was walking approximately 20 miles a week. X-ray imaging revealed osseous structures to be intact and joint spaces were well preserved, no more information was available. There was no magnetic resonance imaging performed.

The patient presented to the clinic with a chief complaint of intermittent right knee pain with a maximum intensity of 8/10 depending on activity. The pain increased when activities were performed that increased forces on the patellofemoral joint. The activities that she was limited in due to pain included: walking ≥2 miles (7/10 pain intensity), squatting ≥ 90° (7/10 pain intensity), and ascending/descending ≥ 8 stairs (7/10 pain intensity). The patient stated that her pain was decreased by lying supine or sitting with legs extended > 90°. In these positions her pain decreased to 0/10 within a minute. She would only take Ibuprofen if her pain intensity was above 8/10 (Table 1). She also noted that driving for more than 30 minutes would elicit a pain intensity of 7/10. She reported difficulty getting in and out of the car once her pain was aggravated,

but her pain could be reduced to 1/10 after she would get out of the car and walk around for a minute. The patient's goals were to be able to perform housework and basic home maintenance pain free, and increase walking distance to ≥ 5 miles.

Systems Review

The patient's muscular system was impaired from PFPS with associated musculoskeletal impairments (Table 2). The cardiopulmonary system as measured in the clinic was impaired: resting heart rate was 95 beats per minute, blood pressure was 135/74 millimeter mercury, and arterial oxygen saturation (SpO2) was 99%. The integumentary system was unimpaired based on observation and patient report. The neuromuscular system was unimpaired based on observation and patient report. No impairments in her communication, cognition, or learning style were observed. The patients preferred language was Spanish.

Examination - Medications

Table 1

Medication table

MEDICATION	DOSAGE	REASON	SIDE EFFECTS
Ibuprofen	Three 200 milligrams tabs, 1 time daily, orally, as needed	Right Knee Pain	Constipation, diarrhea, gas or bloating, dizziness nervousness, ringing in the ears unexplained weight gain, shortness of breath or difficulty breathing swelling of the abdomen, feet, ankles, or lower legs, fever, blisters, rash, itching, hives, swelling of the eyes, face, throat, arms, or hands, difficulty breathing or swallowing, hoarseness, excessive tiredness

Chapter 3

Examination – Tests and Measures

The patient's deficits were categorized and measured using the International Classifications of Functioning, Disability and Health (ICF) Model.[15] Body structure and function impairments were measured by manual muscle testing (MMT), numerical pain rating scale (NPRS), goniometry, special tests, and functional tests[2] such as squatting, stair climbing or rising from sitting. Activity limitations were determined using the Lower Extremity Functional Scale (LEFS). The patient's participation restriction of being unable to perform housework and basic home maintenance after the examination was assessed using patient report.

Manual muscle testing is a common measurement tool used to determine muscle strength deficits. This test grades the muscle's ability to adapt to force provided by the clinician.[16] A weak muscle does not have the ability to adapt to a small increase in force provided by the clinician, and is unable to maintain a contraction.[16] Based on the muscle grading scale described by Kendall[17] for manual muscle testing, the muscle gets graded from a 0-5 scale. Grades 2-4 may have a + or – added to describe the muscle's strength more specifically. Strength grades range from 0 (meaning no contractions felt in the muscle) to 5 (meaning a normal muscle that is able to hold the test position against the pressure provided by the physical therapist).[17] Adequate to excellent interrater reliability has been determined for the LE muscles (ICC=.66-1.00).[18] Manual muscle testing has an excellent test-retest reliability (ICC=0.98).[19] According to

Cuthbert et al.[16] a true change in MMT is indicated when greater than a full grade improvement is achieved.[16]

The NPRS is an 11-point scale from 0-10 that is administered by the clinician. Patients self-report a numerical value that best describes the intensity of their pain. The pain scale ranges from 0 (no pain) to 10 (most intense pain). The NPRS has moderate to high test-retest reliability with an ICC ranging between 0.67-0.96.[20] The MDC_{95} that has been reported for LE is a change of 3 points.[21] The MCID is 1 point change for chronic musculoskeletal pain.[22] Since the MCID is less than the MDC, then the MDC value must be used as the MCID to ensure that a measureable change is detected that will also be clinically meaningful to the patient.

Goniometry is used by clinicians in order to quantify limitations in range of motion (ROM), determine appropriate interventions, and document the effectiveness of these interventions.[23] Goniometry has excellent intratester reliability with an (ICC=.91) and a moderate intertester reliability (ICC=.70) for the knee.[24] The MDC_{95} of 4 degrees was self-calculated using the average standard deviation and ICC coefficient provided in a manuscript from Gogia et al.[25]

The LEFS is a 20-item, region specific questionnaire that asks patients for their perceived limitations in their activities of daily living (ADL's).[26] The patient rates each item is on a 5-point scale with a total possible score of 80 points. A higher score indicates that the patient has a higher level of function. Adequate to excellent reliability has been demonstrated for orthopedic rehabilitation with an ICC value of 0.95[26,27]. The LEFS has a minimal detectable change MDC_{95} of 8 points. Thus, a change of 8 points

or greater in the LEFS score represents a change not due to chance, that you are 95% confident in, in those suffering from a PFPS.[27] A minimal clinically important difference (MCID) of 9 points in the LEFS score indicates a true clinical change considered important to the patient. Overall the LEFS has been reported to be a valid, reliable, and responsive measure for assessing LE impairments.[26,27] Since MCID is 9 points and MDC is 8 points, a score of 9 will not only provide a true change beyond measurement error, but also a change that is clinically meaningful to the patient.[26]

Table 2

Examination Table

BODY FUNCTION OR STRUCTURE		
Measurement Category	Test/Measure Used	Test/Measure Results
Strength	Manual Muscle Testing	Knee extension: 4/5 with pain 6/10 (R) Knee extension: 5/5 with no pain (L) Knee flexion: 4/5 with pain 4/10 (R) Knee flexion: 5/5 with no pain (L) Hip abduction: -4/5 with no pain (R) Hip abduction: 5/5 with no pain (L) Hip extension: -4/5 with no pain (R) Hip extension: 5/5 with no pain (L) Hip external rotation: -4/5 with no pain (R) Hip external rotation: 5/5 with no pain (L)
Pain	NPRS	Right knee 6/10 at baseline
AROM	Goniometer	Flexion: −5-0-120° with pain 7/10 (R) Flexion: −8-0-130° with no pain (L)
FUNCTIONAL ACTIVITY		
Measurement Category	Test/Measure Used	Test/Measure Results
Ascending/Descending stairs; associate pain	NPRS; observation	8/10; < 8 stairs
Squatting; associated pain	NPRS; observation	7/10; Unable to squat > 90°
Walking; associated pain	NPRS; observation	7/10; walking ≤ 2 miles
Mobility	LEFS	Initial Total Score: 56/80
PARTICIPATION RESTRICTIONS		
Measurement Category	Test/Measure Used	Test/Measure Results
Unable to perform housework and basic home maintenance; associated pain	Patient report; NPRS	Unable to perform housework and basic home maintenance due to pain intensity of 8/10 in the anterior knee and retropatellar regions. Requires termination of work.
R: right: L: left: NPRS: numerical pain rating scale		

Chapter 4

Evaluation

Evaluation Summary

The patient was a 35-year-old female presenting with insidious onset right knee pain that began two months prior to the evaluation. She had no previous injuries to either knee. Her right hip and knee extensors, hip abductors, external rotators, and knee flexors were significantly weaker when compared to her left LE muscle groups. There were significant limitations in AROM in both knee flexion and extension due to pain, tightness, or hypermobility. She showed poor motor control of the right LE during ascending/descending stairs, and poor body mechanics during a squat. During these functional tests she demonstrated increased knee valgus and slight hip drop when weight-bearing on the right LE, consistent with weakness seen in her hip abductors and external rotators. No ligamentous or meniscal pathologies were detected.

Diagnostic Impression

The patient demonstrated body structure and function impairments including: knee pain; limitations in AROM; weakness of hip extensors, abductors, external rotators; weakness of knee extensors and flexors; and poor motor control. These impairments resulted in activity limitations including: difficulty squatting $\geq 90°$; inability to ascend/descend ≥ 8 stairs; and inability to walk ≥ 2 miles. Activity limitations restricted the patient's participation in performing housework and basic home maintenance.

Prognostic Statement

Based on her subjective examination, the patient has a good prognosis for rehabilitation. The factors indicating good prognosis for rehabilitation include: symptoms present less than three months prior to the evaluation, mildly impaired functional mobility based on the LEFS score,[7] no osteoarthritis present in her lower extremity, and no psychological disorders.[28] The non-modifiable risk factors such as age greater than 50 and being a female plus having a high pain level at baseline during functional activities are indicators of a poor prognosis for rehabilitation.

Overall, the rehabilitation potential for the patient's episode of care was good to achieve her goals.

G-Codes

Mobility: Walking and Moving Around

Current with modifier: G8978CJ based on the LEFS

Goal with modifier: G8979CI based on the LEFS

Discharge Plan

The patient was to be discharged from physical therapy with an I-HEP after 10 weeks of outpatient rehabilitation.

Table 3.

Evaluation and Plan of Care

PROBLEM	PLAN OF CARE		
	Short Term Goals (4 weeks)	Long Term Goals (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			
Decreased Strength	**Improve patients right hip and quadriceps/hamstring strength measured by MMT** Knee flexors to 4+/5 Knee extensors to 4+/5 Hip abductors to 4+/5 Hip extensors to 4+/5 Hip external rotation to 4/5	Knee flexors to 5/5 Knee extensors to 5/5 Hip abductors to 5/5 Hip extensors to 5/5 Hip external rotation to 5/5	All strengthening exercises were performed avoiding patellofemoral pain and progressed when the patient was able to perform exercises with proper technique. Treatment was provided2x/week for 5 weeks in the clinic. The patient began with isometric hamstring sets in supine. The patient placed knee to 40° of knee flexion, 2 sets of 10, 10 second holds. (E) *This was added to her HEP that she completed with the same reps and sets.* (E) The patient required verbal cueing to perform exercises correctly and was given instructions to monitor pain. The isometric hamstring exercise in supine was progressed by adding one more set. The patient performed clam shells (Hip ER) in sidelying R/L 3 sets of 10 The patient performed prone leg extension R/L for 8 reps. (E) *The progression was added to her HEP plus the new exercises such as clam shells and prone leg extensions were added.* The clam shell difficulty was increased by adding resistance (yellow-red theraband), reps and sets. The patient progressed from supine isometric knee flexion to seated leg curls R/L 2 sets of 10 with yellow theraband. (E) *All strengthening exercises and progressions were included in the patients HEP.*

			The patient progressed from prone hip extension to standing hip extension R/L 2 sets of 10 The difficulty was increased by increasing resistance, sets, and/or reps. (E) The patient was instructed to perform the HEP at home twice a day 4-5 times a week using the same sets, reps and intensity.
Right Knee Pain	Decrease knee pain to 3/10 as measured by the NPRS	Decrease knee pain to 0/10 as measured by the NPRS	The same interventions used to increase ROM and strength were used to decrease pain.
AROM	Improve patients right knee ROM measured by a plastic goniometer. Extension: 0-4° Flexion: 0-130°	 Extension: 0-3° Flexion: 0-140°	The SPT provided inferior patellar glides, 2 bouts of 30 s. The SPT provided knee flexion mobilization with fulcrum (forearm), 2 bouts of 30 s. The patient performed R/L hamstring stretch in supine, 5 reps with 30 s holds. The patient used a towel to support leg. *This was added to her HEP. She will continue to perform at home on R/L leg, 5 reps, 30 s holds.* The patient performed standing calf stretched using a 2" step 4 bouts of 30s holds. The SPT provided medial patellar glides, 2 bouts, 30 s. *(E) The standing calf stretch was added to her HEP. She will continue to perform at home on R/L leg for 5 reps with 30s holds.* The SPT provided STM to the rectus femoris for 1 min The patient performed prone quad stretch to her R/L LE with 30s holds for 5 reps. *(E) The prone quad stretch was added to her HEP with same reps and holds.*
ACTIVITY LIMITATIONS			
Ascending/Descending stairs	Improve ascending/descending ≥ 12 stairs with 4/10 pain as	Improve ascending/descending ≥ 12 stairs with 0/10 pain as	The patient performed a step up/step down exercise from a 2" box, 15 reps. The difficulty of the exercise was modified by increasing step height, reps, sets. *(E) This was added to her HEP where she used a 2" at home.*

	measured by the NPRS	measured by the NPRS	The patient performed step down R/L exercise from 2" step to improve eccentric control of the knee extensors, 15 reps. The exercise was progressed by increasing the step height and increasing reps/or sets. (E) The patient was instructed to progress number of steps, and increase steps as tolerated when she can ascend/descend stairs with < 4/10 pain on the NPRS
Squatting	Improve squatting ≥ 90° with 4/10 pain as measured by the NPRS	Improve squatting ≥ 90° with 0/10 pain as measured by the NPRS	The patient performed sit to stand exercises from a 30 inch plinth, 1 set, 10 reps. The exercise was progressed by increasing sets, resistance and lowering plinth to 17 inches to reach a deeper squat ≥ 90°. *(E) This was added to her HEP where she monitored and modified chair height based on her recommendation from SPT.* (E) The patient was provided with visual and verbal cues to keep toes pointing forward, pelvis neutral, and prevent knee valgus.
Walking	Increase walking ≥ 2 miles with 5/10 pain as measured by the NPRS	Increase walking ≥ 4 miles with 0/10 pain as measured by the NPRS	(E) *The patient was provided with a walking program for her HEP*. The patient was instructed to progress walking distance, intensity, and frequency as tolerated when she can run 1 mile with < 5/10 pain intensity on the NPRS
Mobility: Moving Around	Improve patient's right LE functional activity tolerance to 62/80 as measured by the LEFS	Improve patient's right LE functional activity tolerance to 70/80 as measured by the LEFS	The same interventions used to increase ROM and strength, and to decrease pain of the right knee during ascending/descending stairs, squatting, and walking, were used to improve functional activity tolerance as measured by the LEFS. The exercises/treatments performed to improve the areas in the body structure and function were used to improve the problems in activity.
PARTICIPATION RESTRICTIONS			
Unable to perform housework and basic home maintenance	Be able to perform housework and basic home maintenance with an improvement in pain 4/10 as measured by the NPRS	Be able to perform housework and basic home maintenance without pain	(E) The patient was instructed how to perform proper squats, lifting mechanics, shift weight to her right and how to increase frequency as tolerated when she can perform house work and basic home maintenance with < 2/10 pain on the NPRS Improvements in the activity limitations promoted the patient to reach her participation goals.
SPT: student physical therapist; R/L: right or left; LE: lower extremity; HEP: home exercise program; reps: repetitions ; s: seconds			

Plan of Care – Interventions

See Table 3.

Overall Approach

The guiding treatment philosophy utilized during this course of physical therapy was task-specific training with the overload principle. In this approach to rehabilitation, the focus was on improvement of performance in functional tasks through goal-directed practice, student physical therapist provided feedback, and repetition. With this focus, the plan of care aimed to restore normal body structure and function that contributed to activity limitations and participation restrictions. The patient was able to restore normal LE mechanics by increasing functional strength just beyond her previous state, decreasing pain, decreasing tightness, and improving motor control.

PICO question

For a 35-year-old sedentary female with PFPS (P), is posterolateral hip strengthening (I) more effective than quadriceps/hamstring strengthening alone (C) at reducing anterior knee pain and improving functional activity level (O)?

The purpose of this study was to determine if, in addition to quadriceps and hamstring strengthening exercises, adding posterolateral hip muscle strengthening exercises would be more effective in producing better long-term outcomes than conventional knee exercises alone in women with PFPS (level of evidence: 1b).[29] Fifty-four sedentary female participants with unilateral PFPS were randomly assigned to either a knee exercise group (KE) (n=26) or a knee and hip exercise group (KHE)

(n=28). Both groups received 12 treatment sessions over four weeks. The KE worked on strengthening and stretching of the hamstrings, quadriceps, and triceps surae. The KHE received the same treatment as the KE group plus strengthening and stretching exercises for the hip abductors, extensors, and external rotators. The resistance load for the strengthening exercises was standardized to 70% of the estimated 1 repetition maximum. Elastic band resistance was determined based on the patient being able to perform 10 repetitions of the exercise. The patients were reassessed each week and progressed as needed. Both the KE and KHE groups performed 3 sets of 10 repetitions for all of the exercises. Individuals in the KE group focused on strengthening and stretching the musculature of the knee while those in the KHE group performed the same protocol plus the addition of strengthening exercises that focused on hip abductors, external rotators, and hip extensors. All of the outcome measures were administered at initial evaluation, at 4 weeks, 3 months, 6 months, and 12 months. Individuals in the KHE group, when compared to the KE group, showed better function and had lower pain at 3, 6, and 12-month follow-up ($P<.05$). Based on these results, the authors concluded that a treatment approach that includes both conventional knee and posterolateral hip strengthening exercises is more effective in improving function and reducing pain in patients with PFPS over a 1-year period than knee strengthening exercises alone.

The patient profile of this case study matches the inclusion criteria required for the study, suggesting that the patient would benefit from the treatment utilizing principles incorporated in this study. According to the study, there is a 91% recurrence rate of

PFPS, providing a program that includes both hip and knee strengthening excises showed promising results in treating PFPS by significantly reducing recurrence at 1 year follow-up. A weakness in this study was that they did not control or monitor patient's honesty in performing the exercises at home or during the year follow-up.

Table 4

Outcomes: Right Lower Extremity

OUTCOMES				
BODY FUNCTION OR STRUCTURE IMPAIRMENTS				
Outcome Measure	Initial	Follow-up (DC)	Change	Goal Met? (Y/N)
Strength	KE Strength: 4/5 KF Strength: 4/5 HABD Strength: 4/5 HEXT Strength: 4/5 HER Strength: 4/5	KE Strength : 5/5 KF Strength : 5/5 HABD Strength : 5/5 HEXT Strength: 5/5 HER Strength: 5/5	KE: 4 to 5 KF: 4 to 5 HABD: 4 to 5 HExt: 4 to 5 HER: 4 to 5 (MDC≥1)	Y Y Y Y Y
Pain	Right knee 6/10	Right knee 0/10	Right Knee: 6 (MDC_{95}=3)	Y
AROM	Hyperextension 5° Flexion: -5-0-120° with 7/10 pain	Hyperextension 2° Flexion: -2-0-140° with 0/10 pain	3° (MDC_{95}=4°) 10° (MDC_{95}= 4°)	N Y
FUNCTIONAL ACTIVITY				
Measurement Category	Test/Measure Results	Follow-up (DC)	Change	Goal Met? (Y/N)
Ascending/Descending stairs	8/10 on NPRS; < 8 stairs	0/10; ≥ 12 stairs	8 (MDC_{95}=3)	Y
Squatting	7/10 on NPRS; squat < 90°	0/10; squat > 90°	7 (MDC_{95}=3)	Y
Walking	7/10 on NPRS; < 2 miles	0/10; ≥ 4 miles	7 (MDC_{95}=3)	Y
Mobility: Moving Around	56/80	71/80	+15 (MDC_{95}=9)	Y
PARTICIPATION RESTRICTIONS				
Measurement Category	Test/Measure Results	Follow-up (DC)	Change	Goal Met? (Y/N)

Unable to perform housework and basic home maintenance	Performed housework and basic home maintenance with 8/10 pain as measured by the NPRS	0/10	8 (MDC_{95}=3)	Y
KE: knee extension; KF: knee flexion; HABD: hip abduction; HEXT: hip extension; HER: hip external rotation; ER: external rotation: NPRS: numerical pain rating scale				

Discharge Statement:

The patient was seen in an outpatient orthopedic clinic for 10 visits over two months. The treatments provided focused on: increasing strength of her knee flexors, knee extensors, hip external rotators, hip abductors, hip extensors; improving her motor control during step-ups and step-downs; and increasing patellar/knee mobility caudally and medially. The patient's strength, AROM, and motor control during functional movements improved throughout the course of care. The improved LEFS reflected her improvement in functional activities by surpassing the MCID. Her pain experienced during functional activities decreased on NPRS by surpassing the MDC_{95}. The patient was discharged to her home with an I-HEP after reaching all of her goals. This I-HEP incorporated strengthening exercises, stretching exercises, and a walking program with instructions for progression to continue on a path to become more physically active.

DC G-Code with modifier: G8980CI based on the LEFS

Chapter 7

Discussion

A 35-year old female came into the clinic with intermittent, severe, non-irritable right knee pain that developed insidiously two months prior to her initial evaluation and continued to progressively worsen over time. She presented with signs and symptoms typical of PFPS as reported in current literature. At first, the patient was skeptical in regards to how physical therapy would help reduce her right knee pain. She believed that a condition that left her so debilitated that she could not participate in housework and basic home maintenance, would require surgical intervention. After a brief and thorough patient education session about basic knee and hip anatomy and the importance of the interventions, the patient became less skeptical and agreed to participate in her rehabilitation. The patient's pain, strength, AROM, and motor control during functional movements improved throughout the course of care. Her activity and participation limitations due to her right knee pain were resolved. This was expected based on her good prognostic factors and willingness to participate in her rehabilitation program to reach her goals. Based on the outcomes of this patient, in the future I will be able to utilize a similar treatment approach for patients with the same demographics and pathology and expect a similar result.

After analyzing the case, there are a few components in the examination that I would reconsider when treating similar patients in the future. Firstly, the literature states that individuals who are prone for PFPS may have a greater dynamic Q-angle.[4] The Q-angle is the angle that is formed by the lines of pull of the quadriceps muscle

group and the patellar tendon. I did not measure the dynamic Q-angle on the patient; doing so would have given me more information on how the patella was tracking on the femur and the potential weakness of the hip abductors and external rotators. Secondly, the patient had a hypomobile patella that tracked laterally excessively during knee flexion. I should have tested a more functional movement, such as an anteromedial lunge, which would have produced an increase in compressive forces to the lateral patellofemoral articulation.[30] This is a common site of pain in individuals with PFPS. Performing these additional functional tests would have helped me observe the improving pathomechanics of the patient.

Aspects of a patient's presentation that need to be considered before performing objective examination and treatment may include: yellow flags, motivation of the patient, current knowledge of the condition, and willingness to participate in physical therapy. The patient of this case study arrived to the clinic presenting with all the signs and symptoms regarding PFPS pathology according to current research. All her pain complaints were reproduced with functional tests reported in the literature to increase patellofemoral joint forces. There were some atypical symptoms to PFPS in her clinical presentation such as deep pain in her knee and pain superior to the patella. According to current research, the best diagnostic tests for PFPS are functional movements such as a step-up and step-down, bilateral squats, and anteromedial lunges. Such tests that were used for this patient would be appropriate for other patients with the same signs and symptoms to diagnose PFPS.

The interventions utilized for this patient can be broadly applied to patients who present to the clinic with similar pathology. There are a couple things that I would consider when developing a plan of care for a specific patient. Firstly, it is important to address all the impairments that lead to the activity and participation limitation. Secondly, the interventions used to address the impairments at the body structure and function, activity and participation levels should be meaningful to the patient in order to increase the compliance of the patient. The limitations mentioned above could have helped improve the patient's path to recovery.

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