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Lateral Knee Pain in a Female Runner: A Case Study

Cassidy Steinessen

LATERAL KNEE PAIN IN A FEMALE RUNNER: A CASE STUDY

by

Cassidy Stienessen
Bachelor of General Studies,
University of North Dakota, 2019
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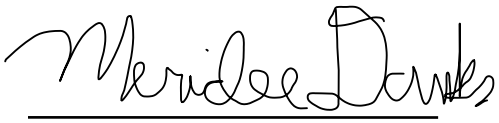

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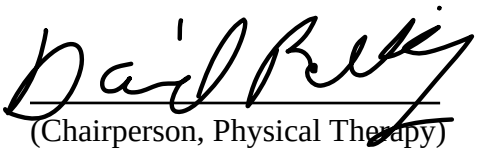

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ABSTRACT

Background and Purpose. Knee pain is the most common site for lower extremity injuries in runners, especially female runners. Knee pain is defined by a variety of conditions, one of which is patellofemoral pain syndrome (PFPS). The purpose of this case report is to follow the six-week management of a distance runner with left lateral knee pain, with a suspected diagnosis of PFPS. **Case Description**. The patient is a 37-year-old female who was seeking treatment for left knee pain with secondary pain in her right hip that she had been experiencing for over six months. She was found to have decreased strength in her left hip abductors and quadriceps and decreased left knee flexion. **Intervention.** Therapy provided focused on stretching and strengthening the lower extremities with an emphasis on the hip abductors and the quadriceps. Manual therapy and modalities were utilized to decrease pain. Plyometric exercises were introduced and caused irritation, which decreased overtime. **Outcomes.** The Activities of Daily Living portion of the Knee Outcome Survey (KOS-ADL) was used as an outcome assessment. At the end of the six-weeks the patient was able to meet the minimally diagnostic change of the KOS-ADL (7.1 points) and began feeling less pain when performing activities. The patient was able to achieve reduced pain when running, lunging, and performing stairs at the end of the six-weeks. **Discussion.** While this case report does not follow the patient through discharge, the treatment episode was successful

in reducing pain and improving tolerance to activities. Further research would allow for the advancement of prognostic factors for PFPS.

CHAPTER I

BACKGROUND AND PURPOSE

The most common site for lower extremity injuries in runners is the knee.[1] Etiological factors and conditions of knee pain vary but can include trauma, sudden exercise overload, training errors/overuse, systemic disease, biomechanical irritation, and inflammatory conditions, such as osteoarthritis (OA). Knee pain affects approximately 25% of adults and is defined by a variety of conditions including osteoarthritis, patellofemoral pain syndrome, and tears of the meniscus, tendon, or ligaments.[1,2]

Patellofemoral pain syndrome (PFPS) is the most common cause of anterior knee pain.[3] Onset of PFPS presents gradually over the anterior or retro patellar knee and is typically experienced under loading and compressive forces, like running. Activities involving significant quadriceps demand with knee flexion such as running, squatting, hopping, stair climbing, and even prolonged sitting can produce symptoms. The cause of PFPS is thought to be from abnormal tracking of the patella in the trochlear groove with contributing factors such as lower extremity malalignment, muscular imbalance or insufficiency, decreased flexibility, patellar hypermobility, faulty running mechanics, and over-activity. In fact, PFPS is among the most common injuries in runners, especially in female runners, and is often the reason that recreational runners cease running. Patellofemoral joint stress is an associated etiology of PFPS and can be elevated with weakness in the quadriceps.[4]

Literature review for the examination and evaluation reveals that a thorough history should be taken including mechanism of injury, aggravating/easing factors, nature of symptoms, pattern of symptoms, sleep disturbance, and medical history.[1] A thorough history will allow clinicians to narrow down possible etiologies and identify which diagnostic tests are appropriate. A systematic review by Decary et al,[5] found that lateral tilts, patellar compression and crepitus diagnostic tests presented with moderate intra-rater reliability. While lateral glide, lateral tilt, lateral pull and quality of movement of the patella presented with moderate to good inter-rater reliability. However, these authors do state that the findings were not consistent across studies reviewed and that further research would be required before applying these findings into clinical practice.

Interventions for patellofemoral pain include strengthening the quadriceps and hip abductors. PFPS can be caused by maltracking of the patella due to a muscular imbalance of the quadriceps and the hip abductors.[6] Strengthening these muscles can be done through open or closed chain exercises. As the patient begins regaining their strength it is recommended to start incorporating more knee loading exercises as the patient can tolerate.[7] Closed chain exercises are often the preference of strengthening exercises over open chain exercises. A study conducted by Witvrouw et al,[8] found that when looking at four categories (pain and functionality, functional assessment, strength, and length) closed chain exercises did have more statistically significant increases than open chain exercises. However, when comparing the open and closed chain exercises to each other there were no significant differences. The authors suggest using a combination of both closed and open chain exercises in the clinical treatment of PFPS. Examples of open and closed chain exercises that were utilized in the study are listed in Table 1.

Table 1. Open and Closed Chain Exercises Utilized in Witvrouw et al Study[8]

Open chain exercises	Closed chain exercises
• Maximal static quadriceps muscle contractions with the knee in full extension • Straight-leg raises with the patient supine • Short arc movements from 10^{o} of knee flexion to terminal extension • Leg adduction exercise in the lateral decubitus position	• Seated leg presses • One-third knee bends on one leg and on both legs • Stationary bicycling • Rowing-machine exercise • Step-up and step-down exercises • Progressive jumping exercises

The objective of this case report is to follow the six-week management of a 37-year-old female distance runner with left lateral knee pain, with a suspected diagnosis of PFPS. This report will look at the clinical decision making that was presented during the examination, evaluation, prognosis, treatment, and outcome measures that were presented in the clinic. This report will also provide an opportunity to reflect on the skills practiced and treatments that were provided in the clinic so that, as a student and future clinician, I am able to improve my future rehabilitation practices.

CHAPTER II

CASE DESCRIPTION

The patient is a 37-year-old, non-Caucasian, English speaking female who was seeking treatment for left knee pain with secondary pain in her right hip. Her pain began in March 2019 with an insidious onset and worsened over the next six months as she kept training before seeking therapy in October 2019. Patient is an active runner who in the past 2 years has run four half-marathons in the month of October. At the time of evaluation, the patient had one race left in the month. Due to her pain she has difficulty running, performing stairs, performing reverse lunges, getting in/out of her car, and standing. Patient's pain interrupts her sleep at least two times per night. She reports that her knee feels stiff and sore in the morning and often limits the activity she was usually able to do. The only alleviating factors that she has found are stopping the activity that is causing her pain and resting. Her stated goal is to return to pain free running.

Patient lived with her husband and two sons. She worked as a nursery director which required her to be on her feet and active all day. She was very involved in her church and charity races, which she expressed had personal value to her. Patient was very physically active between her races with at-home workouts which she completed at least five times a week. Patient was eager and very willing to participate in the rehab process, and even at times needed to be reminded to not do too much physical activity. The patient presented with no pertinent previous medical history or comorbidities.

This case report follows the patient from initial eval through six-weeks of treatment. It does not follow the patient to discharge due to the patient taking a trip and the author's clinical education ending before the patient would return to physical therapy.

Examination, Evaluation and Diagnosis

Examination was conducted at the initial assessment and used components based on Dutton's orthopedic evaluation of the knee.[7] The patient did not present with any obvious gait deviations and was able to bear weight equally between lower extremities. The patient presented with equal knee flexion bilaterally, however, left knee hyperextension was limited by 8º when compared bilaterally and did experience pain (Table 2). Strength was tested and assessed as ⅘ strength in left hip abduction and left quadricep strength with her right side presenting in 5/5 strength (Table 3). Special testing included valgus/varus at 0º, varus/valgus instability at 30º, and Lachman's test, which did not cause an increase in symptoms or result in a positive finding. Although current research does not provide a consensus on the validity and reliability of the special tests used, Decary et al[5], found that commonly used tests for ACL injuries, including Lachman's test, is considered reliable. Patient did note tenderness with palpation on the lateral aspect of her left knee near the fibular head. When palpated near the joint line, the patient did not note any tenderness. A lower extremity function screen was completed by performing a full squat and rise to standing, which she was able to perform with symmetrical weight bearing.

Myotomes, dermatomes, and reflexes were not completed as the patient did not present with any neurological signs, however, Dutton's orthopedic evaluation would

advocate for a thorough evaluation of the knee which would include these testing measures.[6]

Table 2. Knee AROM

	Left	Right
Flexion	140^{o}	140^{o}
Extension	2^{o} hyperextension- painful over lateral aspect of knee	10^{o} hyperextension

Table 3. Lower Extremity Strength

	Left	Right
Hip abduction	4/5	4+/5
Hamstring	5/5	5/5
Quad	4/5	5/5

Prognosis and Plan of Care

The patient was diagnosed with left lateral knee pain with signs and symptoms consistent with mechanical knee pain likely due to an overload injury from running with contributing left lower extremity weakness in abductors and quadriceps. ICD-10 code for left knee pain is M25.562.

Patellofemoral pain syndrome was not a formal diagnosis that was given to this patient. Due to the numerous possibilities of potential knee pain it cannot be assumed that PFPS was the sole cause of this patient's knee pain. However, because this patient was female and a runner it was likely that PFPS could be the explanation of her pain. Regardless, the cause of the patient's symptoms would not significantly alter the intended plan of care because the main focus was on reducing pain and having the patient return to her previous level of activity.

Prognosis for knee injuries are varied and depend on many factors including type of injury, extent of soft tissue damage, coexisting conditions, and patient motivation. This patient was in good health (no existing comorbidities), was highly motivated, and was active with a set workout plan. Poor outcomes of those who have patellofemoral pain were associated with patient characteristics of a duration of knee pain longer than four-months, older age, greater than usual pain severity, and a lower baseline anterior knee pain score. Evidence of a successful outcome was a greater change in midfoot width from non-weight-bearing to weight-bearing after treatment with foot orthoses.[9] This patient did experience pain for more than four-months which would categorize her as having a poor prognosis but she did not met any other criteria for a poor prognosis. Foot orthoses were not a method of treatment for this case, but in retrospect may have been beneficial if there were any faulty foot alignments that were causing her pain.

Goals for this case were:

1. Following physical therapy intervention, patient will be able to ascend and descend one flight of stairs (8 steps) without a pain increase greater 3/10 so that she is able to navigate stairs in her house with minimal pain (to be met in 5 weeks).
2. Following physical therapy intervention, patient will improve score on the KOS-ADL from 72 to at least 80, so that she is able to return to normal activities with minimal to no pain (to be met in 10 weeks).

At the end of the six-weeks that this case study followed, the patient had scored 82 (compared to 72 at initial evaluation) on the KOS-ADL meeting the second goal. She had also stated that she had been experiencing less pain in her knee at rest and with

activities but had not quantified pain so it cannot be concluded that the first goal was met.

It is in this author's opinion that this patient had a good prognosis and would be able to meet her physical therapy goals by the end of her plan of care. This opinion is based on the patient's motivation to return to activities pain free, her age, her activity level, and her state of fair health without any other existing comorbidities.

CHAPTER III

INTERVENTION

The patient was seen two times per week for the first five-weeks, and then tapering to one time per week for the remaining five-weeks of her ten-week plan of care (POC). After six-weeks, the patient had taken a three-week hiatus due to a previously planned trip. Because of this break, the patient's entire physical therapy treatment through discharge was not able to be included in this case study. This case study follows the patient up until the sixth week, just before the patient's break.

The first week of treatment consisted of stretching and strengthening the lower extremities. Stretches consisted of dynamic hamstring stretches, and IT band stretches. Strengthening consisted of monster walks (Figure 1), side steps, and wall sits with TheraBands placed just above the knees. Soft tissue massage was applied to the left lateral knee to provide pain relief. Modalities were also introduced via Game Ready (https://gameready.com/), which provided compression and icing, as another form of pain relief. The knee sleeve was used on the Game Ready and placed on the L knee. A home exercise program (HEP) was provided to the patient which consisted of hip abductions (held for 30 seconds for 2 sets of 3 reps to be performed 1 time per day), dynamic hamstring stretching (performed for 3 sets of 30 reps 1 time per day). Patient was also advised to avoid high impact exercises from her regular training program such as burpees and running until after her last race.

Figure 1. Monster walks with TheraBand around ankles.

Second week of treatment consisted of a combination of therapeutic exercises, manual therapy, and neuro re-education. Therapeutic exercises consisted of side steps with blue TheraBand, wall sits with blue TheraBands, leg extensions, leg curls, standing closed chain dorsiflexion, and single leg bridges. Manual therapy was performed via fibular, tibio-femoral, and superior patellar mobilizations. Grade 3-4 fibular mobilizations were performed after the second set of standing closed chain dorsiflexion, due to the patient's complaints of pain over the fibular head. After mobilizations the patient reported her pain was reduced when performing closed chain dorsiflexion. Grade 3-4 tibio-femoral mobilizations were performed after the second set of single leg ball bridges due to the patient reporting increased pain in the left knee. After mobilizations, the patient's pain had decreased and she was able to complete her third and final set. Neuro re-education was introduced to improve patient's balance via single leg stance ball tosses and standing fire hydrants (Figure 2) with TheraBand. Single leg bridges were added to her HEP and

were to be performed for 3 sets of 20 reps 1 time per day. Patient had stated that she had felt sore after the treatments during this week but did not have an increase in knee pain.

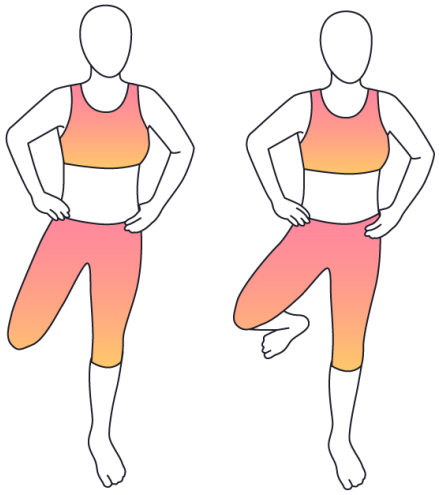

Figure 2. Standing fire hydrant exercise

The third week of treatment consisted of therapeutic exercises and neuro re-education. Therapeutic exercises included a warmup on an elliptical for five minutes, monster walks with a blue TheraBand, leg extensions, leg curls, quadruped hip extensions, single leg squats, and step ups on a Free Motion machine (https://www.freemotionfitness.com/). During this week, the weight used on the leg extension and leg curl machines were increased by five pounds to help increase the patient's developing strength. Neuro re-education was performed by having the patient in a single leg stance and bending down to pick up a cone from a stack, standing back up, and then bending back down to place the cone on a new stack. This task was performed for the entire stack of 8 cones bilaterally. During this week, the patient was also advised to alter her normal training program to reduce her squat and lunge activities and increase her single leg resistance activities.

At the start of the fourth week of treatment, the patient reported that her left knee had been feeling tender and that she had increased discomfort along the lateral left knee joint from the previous week. However, the patient had also stated that she feels like she is progressively getting better with less pain in her knee overall. The treatment during this week consisted of therapeutic exercises, plyometrics, and modalities. Therapeutic exercises were performed with an emphasis on stretching and strengthening the lower extremities, specifically the quads, hamstrings, and hip abductors. Therapeutic exercises included a warm up of five minutes on an elliptical machine, monster walks with a blue TheraBand, side steps with a blue TheraBand, supine hamstring/ITB stretch with a strap, single leg bridges, isometric hamstring curls with a swiss ball, leg press, sidelying abduction with a blue TheraBand, standing fire hydrants with a blue TheraBand, step ups performed on a Free Motion machine, and single leg presses. Plyometrics were introduced via speed skaters and four-way jumps, in order to reintroduce repetitive loading of the lower extremity. Patient noted that she had increased pain in her left lateral knee when pushing off in a forward motion but not when landing or pushing off backwards. Modalities were provided via 15 minutes of Game Ready applied to the left knee. She did not report any increase in symptoms from this week's treatments.

The fifth week of treatment consisted of only one treatment session due to the patient feeling ill and canceling two appointments. Due to the patient's illness she hadn't been able to do as many of her normal activities, which simultaneously allowed her knee to rest. During this session, the patient was introduced to a Sport Cord (https://www.sportcord.com/), which is a bungee-type resistance cord.[10] The Sport Cord was placed around the patient's waist with the cord behind her so that resistance was

applied as she was jogging forward. The patient utilized the sport cord when leaping forwards, backwards, and side to side. She did not experience any immediate increase in left lateral knee pain but did present with decreased left lower extremity stability during the landing phase when laterally leaping. The patient also trialed jogging with the Sport Cord which did not cause any aggravation in her left knee. The session also consisted of therapeutic exercises focusing on stretching and strengthening and neuro re-education. Therapeutic exercises consisted of leg presses, side steps with a blue TheraBand, supine hamstring/ITB stretches with a strap, and fire hydrants with a blue TheraBand. Neuro re-education was strongly focused on plyometrics with the Sport Cord (described above) and balance. Balance exercises included balancing on a BOSU ball with ball tosses. The patient presented with decreased stability and increased fatigue in her left lower extremity during single leg standing on a BOSU ball compared to the right leg. Following this session, the patient reported increased stiffness and soreness in her knee which remained for two days. This is likely due to the patient having decreased activity tolerance throughout the week since being ill and then introduced to increased activity during her therapy session.

The sixth week consisted of one session due to the holiday week. Patient reported that she was able to complete more activities on her own and was nearing independence with her HEP and managing her symptoms on her own. She stated that pain in her knee was reduced (did not quantify) and less sharp when running and performing reverse lunges. Therapeutic exercises with a focus on strengthening were performed via double and single leg presses at 115 pounds, monster walks with a blue TheraBand, and side steps with a blue TheraBand. Plyometric exercises were performed via jump roping for

one minute and step jumps. The patient reported increased pain in the knee when performing jumping with a jump rope which subsided when the exercise was stopped. The patient did not report any increased pain or soreness in her lower extremities during the rest of treatment. Follow up with the patient, was expected when the patient returned from her 10-day trip.

Witvrouw et al,[8] study on the effects of open versus closed kinetic chain exercises for patellofemoral pain found that overall the closed chain exercises had more statistically significant increases in four categories (pain and functionality, functional assessment, strength, and length) than open chain exercises did. However, the authors also found that when comparing the two to each other there were no significant differences. For this reason, the authors do not recommend replacing open chain exercises with closed chain exercises but rather using a combination of both. This case study includes both open chain exercises and closed chain exercises, which would support the interventions presented.

Manual therapy, specifically joint mobilizations have been found to be effective in decreasing pain when also used with therapeutic exercises. Mobilizations at the knee joint have been shown to be more effective when addressing knee pain, rather than mobilizations at the lumbopelvic region or other surrounding joints.[11] Mobilizations were performed with the intention of reducing the patient's pain and improving overall joint mobility, especially at the patellofemoral joint.

Cold and compression were used with Game Ready device were used throughout the plan of care through a Game Ready. A Game Ready uses cold and compression simultaneously and was applied utilizing the knee sleeve. This machine was used at the

end of treatment sessions to reduce pain and decrease any inflammation or irritation that the patient experienced during the sessions.

CHAPTER IV

OUTCOMES

The outcome measure used for this case was the Knee Outcome Survey-Activities of Daily Living (KOS-ADL). The patient filled out the KOS-ADL before almost every session, as was protocol at the clinic. This was done to track patient progress and to standardize outcome measures used.

The KOS-ADL (Appendix A) is used to determine symptoms and functional limitations in daily activities caused by various knee pathologies such as ligament/meniscal injury, osteoarthritis (OA), and patellofemoral pain. The newest version of the KOS-ADL consists of 14 items, 6 for symptoms and 8 for function. The KOS-ADL is calculated as the sum of scores from the responses to each item and is then converted into a percentage score from 0-100. A score of 100 on the KOS-ADL indicates no knee-related symptoms or functional limitations. The minimum clinically important difference is 7.1 points. The validity and reliability of the KOS-ADL has not been determined, however it "has demonstrated adequate internal consistency across multiple languages, as well as test-retest reliability" and "it adequately covered the range of functions/painful activities performed in daily life, ensuring face validity."[12]

At initial evaluation the patient scored herself at 72 on the KOS-ADL which indicated 20-39% impairment. Throughout the weeks the patient's KOS-ADL steadily improved which can be inferred as her improving and having less symptoms. In the fifth

week of treatment for this case, the patient did not fill out the KOS-ADL due to her running late for her appointment. During this week she was also ill which caused her to cancel two appointments. Because of her illness and missing appointments, the patient's knee had been feeling increasingly stiff and sore due to decreased activity. This had been reflected in the KOS-ADL score on the sixth week.

Table 4. Activities of Daily Living Section of the Knee Outcome Survey (KOS-ADL) Scores

Week	KOS-ADL Score (1-100, 100 indicating no-related symptoms or functional limitations)
1 (initial evaluation)	72/100
2	78
	81
3	82
	85
4	88
	87
5	No score obtained
6	82

The patient's pain had progressively decreased throughout her episode of care. By the fourth week of treatment, the patient had stated that she felt like she was progressively getting better. She had been able to perform light plyometric exercises without an immediate increase in left lateral knee pain and was able to jog with the Sport Cord without aggravation, which was an improvement from previous treatment sessions.

By the sixth week the patient stated that the pain in her knee had reduced when running but did not quantify this pain. During this week, she was able to perform reverse lunges with less pain, again not quantified. At the end of the sixth week, the patient had stated that her overall pain was less sharp, exercise was more tolerable, and that she was able to complete more activities independently. She was also nearing independence with her HEP, indicating that she would likely be able to manage any future symptoms on her own without seeking physical therapy.

CHAPTER V

DISCUSSION

Throughout the six-weeks of treatment, the patient's perceived pain in her left knee had reduced since starting physical therapy. Movements that had previously been painful and difficult for the patient to perform, such as running, performing stairs, and performing a backwards lunge had decreased in pain severity and were no longer limiting the patient's activity. Although this case report does not follow the patient to discharge, there was confidence that the patient would be able to return to activities pain free or at least independent in the management of symptoms at the end of her ten-weeks of treatment due to her being in fair health, a relatively young age, active, and eager to return to activities pain free.

Treatment for this patient included therapeutic exercise, neuromuscular re-education exercises, plyometric exercises, manual therapy, and modalities. Therapeutic exercises were focused on stretching and strengthening the lower extremities. Closed chain exercises have been shown to have statistical significance in reducing pain, improving flexibility, improving strength, and improving functional outcomes associated with PFPS.[8, 13]However it is recommended that combination of open and closed chain exercises be used as there is no significant differences between open and closed chain exercises in these categories. Both open and closed chain exercises were performed in this case and were mainly used to gain strength in the quadricep and hip abductor

muscles as weakness in these muscles may lead to faulty tracking of the patella, which can be the cause of PFPS. Plyometrics and neuromuscular re-education are advised to be used in conjunction with a strengthening program in order to focus on single leg hip and knee control, and plyometric loading and propulsion of the lower extremity.[11] Plyometrics were introduced in the fourth week of treatment. Plyometric exercises that consisted of pushing off with the left leg increased the patient's pain, but landing did not. Ability to tolerate plyometric exercises increased throughout treatments but she continued to tolerate pain. It is conceivable that when the patient returns to therapy from her break, she would be able to complete plyometrics without aggravating her symptoms. Cold and compression via Game Ready and mobilizations were used throughout treatment sessions as a way of decreasing the patient's pain and improving the mobility of her knee.

Upon review, it would have been beneficial to have performed a running analysis of the patient and evaluated for foot orthoses. A running analysis would have allowed for the ability to identify faulty running mechanics which could have been causing the patient's pain. Increased hip internal rotation and adduction, contralateral pelvic drop, and increased ground reaction forces with loading are likely to be demonstrated by runners.[11] Foot orthoses are recommended to relieve pain in the short term with PFPS but have also been linked with more positive outcomes.[9,13] Based on these literature findings performing a running analysis and trialing foot orthoses would have ensured a more comprehensive treatment approach and working towards a successful patient outcome.

Matthews et al[9] study on prognostic factors and treatment effect modifiers for PFPS suggest that a patient with symptoms lasting longer than four months would indicate poor outcome. The same study identified a greater change in midfoot width from

non-weight-bearing to weight-bearing as a potential treatment effect modifier for a successful outcome after foot orthoses treatment.[9] If this patient were applied to this study she would have been classified as having a poor outcome as her symptoms were greater than four months and foot orthoses were not utilized in treatment. However, a longitudinal study done by Collins et al,[14] found that a duration of PFPS symptoms over a twelve-month period and a low baseline score on the Kujula Patellofemoral Scale (KPS) were associated with poor outcomes. This would allow for this patient to not be classified as having a poor outcome considering her symptoms were for six-months. Due to the inconsistency between literature, it would be helpful in clinical practice for more studies, systematic reviews, and meta-analysis to be performed in order to identify characteristics of patients with PFPS that are associated with poor outcomes and those that are associated with good outcomes.

As previously mentioned, there is not much literature support for the validity and reliability of the KOS-ADL. The Lower Extremity Functional Scale (LEFS) would have also been appropriate for this patient and is supported by literature. The LEFS scale (Appendix B) would have been appropriate for this case because it can address the entire lower extremity. Throughout the course of treatment, the patient would occasionally experience pain in other areas such as her ankle, hip, or foot, with her knee being the most consistent pain and the source of her seeking treatment. If the LEFS had been applied, it would have helped identify if other pains were impacting her ability to function and address those areas as necessary.

The LEFS has been found to be reliable, valid, and a responsive measure for assessing limitations in various lower extremity conditions including pain in the lower

extremity, osteoarthritis, total hip arthroplasty, and total knee arthroplasty. A change of at least six points indicates true change in patients suffering from a lower extremity condition and a change of at least nine points indicates clinically meaningful change.[15]

Limitations of this study include that it does not follow the patient through their entire course of treatment. This is due to the author ending her clinical experience and the patient being on vacation for two-weeks. Another limitation of this case report is a lack of objective detailed information. Unfortunately, not all objective data (pain ratings, ROM measurements, strength measurements, parameters of exercises, etc.) were collected by the author for this report. Having this objective data would have allowed for a more comprehensive picture of the patient, the treatment, and the progress made during the six-weeks of treatment. Further development should include the entire patient experience (evaluation to discharge), research as to when is an optimal time to start plyometric training, trialing foot orthoses, and a running analysis of the patient. A running analysis was not conducted at the start of the patient's physical therapy experience due to her having a race within a few days of the first treatment. The therapists did not want to aggravate the patient's symptoms and cause more discomfort during her upcoming race, however, it would have provided a more comprehensive picture of what may be causing the patient's pain. The patient, the physical therapist, and the physical therapy student shared similar values with a common goal of the patient returning to activities, including running, pain free. As far as the author is aware there were no ethical issues that were addressed during the patient's care.

Reflective Practice

While reflecting on the care given for this patient there are ways in which the care provided could have been improved. Sessions were provided between two physical therapists. While documentation can give direction on what was provided in previous sessions, it may not always provide enough information on how the patient responded to treatment. Having one physical therapist provide care would have allowed for less variability in knowing how the patient responded to certain treatments and exercises.

Another way that care could have been improved was to have a clear understanding of what the patient's typical work-out program was prior to starting physical therapy. This would have allowed for the patient and physical therapist to work together to develop an effective exercise program for the patient. This would have eliminated any exercises that were causing the patient pain when performing.

It was also the clinic's practice to have the patient start with a therapy tech if the physical therapist was running behind. The techs would have the patient perform exercises that they had already performed and were approved by the physical therapist. While this was helpful for the patients to be working while waiting, it may not be the most beneficial treatment for the patient because they are not working directly with the physical therapist. Most patient's, including the one featured in this case report, did not have problems with this practice.

Finally, it would have been helpful to collect more objective numbers. Being able to quantify pain and exercise parameters (sets, reps, and weights) would have allowed for a more comprehensive case report. When I left the clinic, I was not aware of just how much information I would need. For future case reports, I now know to collect all data.

Conclusion

Patellofemoral pain syndrome is the most common cause of anterior knee pain and is a common injury in runners. Causes of PFPS are abnormal tracking of the patella in the trochlear groove which can be caused by muscular imbalance or insufficiency of the quadriceps and hip abductor muscles. A six-week following of an amateur runner with knee pain that could have been classified as PFPS showed that exercise, plyometrics, modalities, manual therapy and neuromuscular re-education was able to reduce the patient's pain and symptoms.

Further research would allow for the advancement of developing consistent prognostic factors that could be applied in the clinic to determine whether or not a patient with PFPS would have a good or poor outcome. This report is not without limitations and would benefit from performing a running analysis at evaluation to identify faulty running mechanics, screening for orthotics, providing more detailed objective measures to create a more comprehensive picture of the patient, and following a patient from initial eval to discharge. Despite these limitations, the patient was able to exceed the minimal diagnostic change for the KOS-ADL, thus achieving one of her goals indicating that the physical therapy interventions and plan of care had been beneficial in this patient’s rehabilitation.

APPENDIX

A

Knee Outcome Survey Activities of Daily Living Scale (ADLS).

Symptoms: To what degree does each of the following symptoms affect your level of activity? (check one answer on each line)

	I do not have the symptom	I have the symptom, but it does not affect my activity	The symptom affects my activity slightly	The symptom affects my activity moderately	The symptom affects my activity severely	The symptom prevents me from all daily activity
Pain	·	·	·	·	·	·
Stiffness	·	·	·	·	·	·
Swelling	·	·	·	·	·	·
Giving way, buckling, or shifting of the knee	·	·	·	·	·	·
Weakness	·	·	·	·	·	·
Limping	·	·	·	·	·	·

Functional Limitations With Activities of Daily Living: How does your knee affect your ability to: (check one answer on each line)

	Activity is not difficult	Activity is minimally difficult	Activity is somewhat difficult	Activity is fairly difficult	Activity is very difficult	I am unable to do the activity
	·	·	·	·	·	·
Walk						
Go up stairs	·	·	·	·	·	·
Go down stairs	·	·	·	·	·	·
Stand	·	·	·	·	·	·
Kneel on front of your knee	·	·	·	·	·	·
Squat	·	·	·	·	·	·
Sit with your knee bent	·	·	·	·	·	·
Rise from a chair	·	·	·	·	·	·

Scoring: The first column is scored 5 points for each item, followed in successive columns by scores of 4, 3, 2, 1, and 0 for the last column. The total points from all items are summed, then divided by 70 and multiplied by 100 for the ADLS score. For example, if the individual places marks for 12 items in the first column, and 2 items in the second column the total points would be 12x5 = 60 points, plus 2 x 4 = 8 points, for a total of 68 points. The ADLS score would then be 68/70 x 100 = 97%.

Lower Extremity Functional Scale (LEFS)

Source: Binkley JM, Stratford PW, Lott SA, Riddle DL. The Lower Extremity Functional Scale (LEFS): scale development, measurement properties, and clinical application. North American Orthopaedic Rehabilitation Research Network. *Phys Ther.* 1999 Apr;79(4):371-83.

The Lower Extremity Functional Scale (LEFS) is a questionnaire containing 20 questions about a person's ability to perform everyday tasks. The LEFS can be used by clinicians as a measure of patients' initial function, ongoing progress and outcome, as well as to set functional goals.

The LEFS can be used to evaluate the functional impairment of a patient with a disorder of one or both lower extremities. It can be used to monitor the patient over time and to evaluate the effectiveness of an intervention.

Scoring instructions

The columns on the scale are summed to get a total score. The maximum score is 80.

Interpretation of scores

- The lower the score the greater the disability.
- The minimal detectable change is 9 scale points.
- The minimal clinically important difference is 9 scale points.
- % of maximal function = (LEFS score) / 80 * 100

Performance:

- The potential error at a given point in time was +/- 5.3 scale points.
- Test-retest reliability was 0.94.
- Construct reliability was determined by comparison with the SF-36. The scale was found to be reliable with a sensitivity to change superior to the SF-36.

Instructions

We are interested in knowing whether you are having any difficulty at all with the activities listed below **because of your lower limb problem** for which you are currently seeking attention. Please provide an answer for **each** activity.

Today, *do you* or *would you* have any difficulty at all with:

Activities	Extreme difficulty or unable to perform activity	Quite a bit of difficulty	Moderate difficulty	A little bit of difficulty	No difficulty
1. Any of your usual work, housework or school activities.	0	1	2	3	4
2. Your usual hobbies, recreational or sporting activities.	0	1	2	3	4
3. Getting into or out of the bath.	0	1	2	3	4
4. Walking between rooms.	0	1	2	3	4
5. Putting on your shoes or socks.	0	1	2	3	4
6. Squatting.	0	1	2	3	4
7. Lifting an object, like a bag of groceries from the floor.	0	1	2	3	4
8. Performing light activities around your home.	0	1	2	3	4
9. Performing heavy activities around your home.	0	1	2	3	4
10. Getting into or out of a car.	0	1	2	3	4
11. Walking 2 blocks.	0	1	2	3	4
12. Walking a mile.	0	1	2	3	4
13. Going up or down 10 stairs (about 1 flight of stairs).	0	1	2	3	4
14. Standing for 1 hour.	0	1	2	3	4
15. Sitting for 1 hour.	0	1	2	3	4
16. Running on even ground.	0	1	2	3	4
17. Running on uneven ground.	0	1	2	3	4
18. Making sharp turns while running fast.	0	1	2	3	4
19. Hopping.	0	1	2	3	4
20. Rolling over in bed.	0	1	2	3	4
Column Totals:	0	1	2	3	4

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