

CITATION: Patellofemoral pain: Challenging current practice – A case report
Benjamin E. Smith, Derby Teaching Hospitals NHS Foundation Trust, Paul Hendrick,
Pip Logan, University of Nottingham
<http://dx.doi.org/10.1016/j.math.2015.09.002>

Patellofemoral pain: challenging current practice – a case report

Benjamin E. Smith^a, Paul Hendrick^b, Pip Logan^b

^a *Derby Teaching Hospitals NHS Foundation Trust, Physiotherapy Outpatients (Level 3), London Road Community Hospital, Derby, DE1 2QY, UK*

^b *University of Nottingham, UK*

Abstract:

Patellofemoral pain (PFP) is a common problem in young people, with 1 in 6 suffering at any one time. It is unclear which management approach is the optimal method for treating PFP in the long term, with traditional physiotherapy examination focusing on assessing for specific structural dysfunction. A rationale for a different assessment and treatment approach, one that moves the focus away from a biomedical / tissue pathology model towards one directed at the neurophysiology of pain, has been suggested.

The patient was a 21 year old male with a 6 year history of PFP with previous failed physiotherapeutic treatment. He reported previous multiple healthcare practitioners' advice to avoid activities that were painful as reasons for being unable to participate in sporting activities. No specific structural testing was performed, such as specific muscle strength, length, foot position, patella movement and position, or movement patterns.

Descriptions of tissue based pathology models of pain, *e.g.* patella mal-tracking, were actively discouraged and challenged. The patient was taught to perform one uncomfortable / painful exercise as part of his rehabilitation programme twice a day.

The patient achieved 80% improvement in his symptoms over 7 appointments and a return to physical activity following a 5 month rehabilitation programme purposively designed to elicit pain by means of gradually exercising and loading the tissues. This case report highlights the need for further research into exercise protocols for patients suffering with PFP based upon neurophysiology models of pain.

Keywords:

Patellofemoral; PFP; anterior knee pain

1. Introduction

Patellofemoral pain (PFP) is a debilitating disorder, causing significant pain and disability (Kooiker et al., 2014). It is one of the most common reasons why young people seek medical help with 1 in 6 suffering at any one time (Mølgaard et al., 2011; Vahasarja, 1995). Symptoms typically lead to withdrawal of participation in exercise and physical activity, with consequent development of fear and anxiety (Doménech et al., 2014; Piva et al., 2009b; Rathleff et al., 2012).

Long term outcomes are poor, with 91% of patients reporting pain and dysfunction at a minimum follow-up of 4 years post diagnosis (Stathopulu and Baildam, 2003). Although strengthening exercises have been shown to have the best evidence for improvements in pain and disability, a recent study of reviews concluded that it is unclear which management approach is the optimal method for treating PFP in the long term (Papadopoulos et al., 2015).

A rationale for an assessment and treatment approach that moves the focus away from a biomedical / tissue pathology model, towards one directed at the neurophysiology of pain, has been suggested (Smith et al., 2015a). It is thought that exercises that are purposely painful could have a positive impact upon pain and function whilst reducing fear avoidance and catastrophising beliefs (Littlewood et al., 2013; Smith et al., 2015a). The purpose of this case report is to describe this method of assessment and treatment applied to a patient with long term severe and debilitating PFP with previous failed physiotherapeutic treatment.

2. Case description

2.1 Patient history

The patient was a 21 year old male who complained of a 6 year history of bilateral retropatella pain. Symptoms had developed insidiously over a number of months, remained unchanged for many years and were not associated with trauma or injury. The symptoms were intermittent, but ascending and descending stairs, rising from a chair, sitting for longer than 30 minutes and walking were consistently painful. Symptoms eased with rest, providing he didn't sit for longer than 30 minutes with his knees in a flexed position. Prior to developing the knee pain the patient participated in a variety of sporting activities, which he gradually withdrew from over the following 6 years. He worked as a shop assistant and did not partake in any regularly physical activity. He listed swimming and cycling as an activity he would like to return to, but cited high levels of pain, fear of making his condition worse and previous advice from multiple healthcare practitioners to avoid painful activities as reasons for being unable to participate in activities.

The patient saw an orthopaedic consultant 4 years prior, who diagnosed osteochondritis dissecans of the patella. The patient reported unchanged symptoms, and bilateral x-rays at that time showed nothing abnormal. He was advised to avoid activity and flexion of the knee greater than 90°, which the patient had diligently followed ever since. Previous physiotherapy treatment involved lower limb stretches, strengthening exercises and foot insoles, with very little benefit. He stopped wearing the insoles a number of years ago. The patient reported that previous healthcare practitioners had highlighted his poor foot position and muscle strength around the patella as causes of his pain. Specifically, his patella was mal-tracking as a result of these two factors causing a greater amount of stress behind the patella. The patient was fit and well with no medical history to note. He took Tramadol and Paracetamol as prescribed by his GP. He reported no locking or giving way of his knee.

2.2 Examination

Observation of the patient revealed comparatively normal gait pattern, posture, and lower limb alignment. His foot position was not formally measured, but was assessed as having a comparatively normal appearance. There was no pain at rest, and observation of the patient's knee revealed no swelling, bruising, or obvious bony deformity. A baseline examination showed the patient was able to fully flex and extend both knees. There was mild to moderate retro-patella pain

towards the end of physiological flexion. Patella position and movement was defined as normal during physiological range of movement testing of the knee. Palpation of the knee showed no pain on the patella tendon and no joint line tenderness. Repeated spinal movements did not reproduce any pain and there were no signs of red flags suggestive of systemic pathology or acute illness.

The assessment then moved its focus onto functional movements and pain provocation testing. With minimal pain, the patient was able to perform an active straight leg raise on each leg and a single leg balance on each leg. Squatting to 90° resulted in a small amount of pain. However, performing a sideways step down test (Loudon et al., 2002) 5 times caused moderate pain. During the step down test the patient required the use of 1 finger resting on a wall for support. At this stage it was felt the examination had reached the maximum possible level of functional testing, without exacerbating the patient symptoms, therefore the examination ended. The patient reported that on cessation of the step down test the pain was no worse than before the test. During the functional tests no specific structural testing such as muscle strength, muscle length, foot position, patella movement and position, or movement pattern was performed.

3. Evaluation

Following the examination process it was felt that the patient's signs and symptoms were consistent with PFP. He complained of pain when the patellofemoral joint was loaded. The patella tendon was not painful when palpated and he reported signs of fear and anxiety of movement and physical activity.

4. Intervention

The patient was taught to perform twice daily one uncomfortable / painful exercise as part of his rehabilitation programme. This was a modification of the step down test (Loudon et al., 2002); a single leg squatting exercise sideways on a step. By performing sideways the patient was able to use the guide of the wall and/or banister more easily. The exercise requires balance, knee extension strength, eccentric and concentric control and isometric hip strength. The patient was advised to exercise to the point of fatigue, through some manageable pain and discomfort.

Exercise progression and regression was advised to be guided by symptomatic response, such that on cessation of the exercise the pain should remain no worse than pre-exercise. The patient was advised to gradually increase the number of repetitions over a number of days and weeks. The patient was encouraged to self-direct their progression thus internalising the locus of control and moving towards self-management (Beinart et al., 2013).

Descriptions of tissue based pathology models of pain, *e.g.* patella mal-tracking, or limb mal-alignment were actively discouraged and challenged by the physiotherapist with pain described as 'de-conditioned' tissue. Education regarding pain models took up a large portion of clinical time, to address any beliefs or fear within the patient that pain is a sign of tissue damage (Moseley, 2007).

Self-management strategies in relation to exercise and skill acquisition, self-monitoring of progress and pain, dealing with flare ups and barriers to exercise and goal setting, were also discussed. Furthermore, the patient was advised to gradually return to his sporting activities (walking, cycling and swimming) with advice given on not to fear or avoid the pain. See Table 1 for main outcomes of the follow-up appointment. Appointments were scheduled approximately 2 – 4 weeks apart, working around the physiotherapist's and the patient's diary.

Follow-up		
2 weeks	Patient's reported progress	The patient reported he initially started performing the exercise with 5 repetitions each side, using 1 finger on the wall. Within two weeks he was now able to perform the exercise 10 times without the use of a finger to maintain balance.
	Treatment sessions main focus	No formal movement pattern assessment was undertaken. Self-management strategies were further discussed, questioning the patient's belief and behaviour.
5 weeks	Patient's reported progress	The patient was still performing the exercise with 10 repetitions on each leg.
	Treatment sessions main focus	Long discussion regarding prognosis, pacing and progression of exercises.
7 weeks	Patient's reported progress	The patient was now able to perform the exercise 20 times on each leg.
	Treatment sessions main focus	It was mutually agreed he should aim for 40 repetitions in the proceeding 4-6 weeks.
11 weeks	Patient's reported progress	The patient was now able to perform the exercise for 40 repetitions on each leg. He now reported a drastic reduction in his pain levels, and reported he was able to walk up to 7 miles pain free.
	Treatment sessions main focus	The exercise was now mutually progressed to double leg jumping. The patient was able to demonstrate 3 small repetitions in the physiotherapy appointment. As with the previous exercise, progression was advised to be self-directed by the patient.
13 weeks	Patient's reported progress	The patient reported he initially started doing 5 repetitions of small jumps, and within two weeks was now up to 10 repetitions.
	Treatment sessions main focus	It was mutually agreed that the patient should aim for 20 repetitions within the proceeding 4 – 6 weeks.
15 weeks	Patient's reported progress	The patient was now able to perform 20 jumps and reported he was able to now cycle up to 7 miles pain free.
	Treatment sessions main focus	The exercise was now progressed to single leg hops. Repetitions and progression was self directed by the patient.

Table 1 - Follow-up Appointments

5. Outcome

19 week follow-up appointment

The patient was able to perform 30 single leg hops as his rehabilitation exercise on each leg. He reported being 80% better, was no longer taking painkillers and was able to attend kick boxing classes, cycle and walk pain free. At this point it was mutually agreed he should continue with his exercises long term and he was discharged.

6. Discussion

There is no consensus on the causes of PFP (Doménech et al., 2014), with multiple factors attributed in the development of pain and disability (Clijisen et al., 2014). Traditional assessment and treatments techniques are based upon tissue based pathology models of pain (Smith et al., 2015a) whereby musculoskeletal abnormalities and dysfunction are often assumed to affect the patella alignment, resulting in greater joint stress and the development of pain and dysfunction (Barton et al., 2014; Clijisen et al., 2014; Wilson, 2007). Structures that historically have been attributed as

contributing factors include muscle weakness, soft tissue tightness, lower limb structural abnormalities, movement dysfunction and quadriceps mal-timing (Smith et al., 2015a).

Physiotherapy typically involves exercises and/or treatments aimed at reducing pain and correcting the assumed structural abnormality / dysfunction (Barton et al., 2014; Wilson, 2007). These include strengthening and stretching exercises, taping, and foot orthoses (Barton et al., 2015). Patients are commonly told to avoid exercises if they are painful, and to cease activity that aggravates the pain (Barton et al., 2015).

There exists some debate over the role of anatomical variations/dysfunction in the development of PFP (Sanchis-Alfonso, 2014). A recent narrative review questioned the traditional assessments and treatments for PFP and discussed the underpinning theoretical effects of exercise interventions for PFP in the context of pain mechanisms (Smith et al., 2015a). This patient group commonly show signs of kinesiophobia coupled with excessively negative thoughts towards their pain and function (Domenech et al., 2013; Piva et al., 2009a). Catastrophising and negative thoughts can affect the physiological responses to pain and it has been suggested that this could negatively impact upon levels of pain experienced (Quartana et al., 2009). It has also been postulated that tissue specific diagnosis of musculoskeletal pain can lead to increases in patients' fear and kinesiophobia (Nijs et al., 2013), particularly with knee pain (Smith et al., 2015b).

Traditional pain models that describe tissue pathology as a source of nociceptive input and a pain response have been insufficient in the assessment and treatment of PFP (Smith et al., 2015a), it is understood that nociception is neither sufficient nor necessary for pain (Moseley, 2007). There is some positive evidence, in terms of pain and disability, for exercise therapy based upon movements that are painful for musculoskeletal conditions (Bernhardsson et al., 2011; Cook et al., 2005; Holmgren et al., 2012; Littlewood et al., 2015; Long et al., 2004). Littlewood et al (2013) suggested that a painful loaded exercise programme, within the context of pain education and self-management strategies, impacts the central nervous system in a positive way through a modified pain output. The exercise programme addresses fear avoidance and catastrophising beliefs with pain described as 'de-conditioned' tissue. It has been proposed that this approach could have a similar benefit with patients with PFP (Smith et al., 2015a).

7. Conclusion

This case report describes the history, assessment and treatment of a patient with long term severe and debilitating PFP who achieved 80% improvement in his symptoms and a return to physical activity following a 5 month rehabilitation programme. This programme was based upon the neurophysiology of pain rather than the tissue pathology model. It was coupled with advice and self management strategies. The patient's belief (seemingly originating from previous healthcare practitioners) on lower limb alignment and structural dysfunction (i.e patella mal-tracking and foot position) was directly challenged. Treatment focused on exercising and gradually loading the tissues over many weeks through a graduated programme of exercises purposively designed to elicit pain. This case report highlights the need for further research into exercise protocols for patients suffering with PFP based upon neurophysiology models of pain.

References

- Barton, C., Balachandar, V., Lack, S., Morrissey, D., Patellar taping for patellofemoral pain: a systematic review and meta-analysis to evaluate clinical outcomes and biomechanical mechanisms. *Br. J. Sports Med.* 2014. 48, 417–24. doi:10.1136/bjsports-2013-092437
- Barton, C.J., Lack, S., Hemmings, S., Tufail, S., Morrissey, D., The “Best Practice Guide to Conservative Management of Patellofemoral Pain”: incorporating level 1 evidence with expert clinical reasoning. *Br. J. Sports Med.* 2015.49, 923–34. doi:10.1136/bjsports-2014-093637
- Beinart, N. a, Goodchild, C.E., Weinman, J. a, Ayis, S., Godfrey, E.L., Individual and intervention-related factors associated with adherence to home exercise in chronic low back pain: a systematic review. *Spine J.* 2013.13, 1940–50.
- Bernhardsson, S., Klintberg, I.H., Wendt, G.K., Evaluation of an exercise concept focusing on eccentric strength training of the rotator cuff for patients with subacromial impingement syndrome. *Clin. Rehabil.* 2011.25, 69–78. doi:10.1177/0269215510376005
- Clijisen, R., Fuchs, J., Taeymans, J., Effectiveness of Exercise Therapy in Treatment of Patients With Patellofemoral Pain Syndrome: A Systematic Review and Meta-Analysis. *Phys. Ther.* 2014. 94(12):1697-708. doi:10.2522/ptj.20130310
- Cook, C., Hegedus, E.J., Ramey, K., Physical Therapy Exercise Intervention Based on Classification Using the Patient Response Method: A Systematic Review of the Literature. *J. Man. Manip. Ther.* 2005.13, 152–162. doi:10.1179/106698105790824950
- Doménech, J., Sanchis-Alfonso, V., Espejo, B., Changes in catastrophizing and kinesiophobia are predictive of changes in disability and pain after treatment in patients with anterior knee pain. *Knee Surg. Sports Traumatol. Arthrosc.* 2014. 22, 2295–300. doi:10.1007/s00167-014-2968-7
- Domenech, J., Sanchis-Alfonso, V., López, L., Espejo, B., Influence of kinesiophobia and catastrophizing on pain and disability in anterior knee pain patients. *Knee Surgery, Sport. Traumatol. Arthrosc.* 2013. 21, 1562–1568. doi:10.1007/s00167-012-2238-5
- Holmgren, T., Björnsson Hallgren, H., Öberg, B., Adolfsson, L., Johansson, K., Effect of specific exercise strategy on need for surgery in patients with subacromial impingement syndrome: randomised controlled study. *BMJ.* 2012. 344, e787. doi:10.1136/bmj.e787
- Kooiker, L., Van De Port, I.G.L., Weir, A., Moen, M.H., Effects of physical therapist-guided quadriceps-strengthening exercises for the treatment of patellofemoral pain syndrome: a systematic review. *J. Orthop. Sports Phys. Ther.* 2014. 44, 391–B1. doi:10.2519/jospt.2014.4127
- Littlewood, C., Bateman, M., Brown, K., Bury, J., Mawson, S., May, S., Walters, S.J., A self-managed single exercise programme versus usual physiotherapy treatment for rotator cuff tendinopathy: A randomised controlled trial (the SELF study). *Clin Rehabil* Published. 2015. doi:10.1177/0269215515593784
- Littlewood, C., Malliaras, P., Bateman, M., Stace, R., May, S., Walters, S., The central nervous system - An additional consideration in “rotator cuff tendinopathy” and a potential basis for understanding response to loaded therapeutic exercise. *Man. Ther.* 2013. 18(6):468-72. doi:10.1016/j.math.2013.07.005

- Long, A., Donelson, R., Fung, T., Does it matter which exercise? A randomized control trial of exercise for low back pain. *Spine (Phila. Pa. 1976)*. 2004. 29, 2593–602.
- Loudon, J.K., Wiesner, D., Goist-Foley, H.L., Asjes, C., Loudon, K.L., Intrarater reliability of functional performance tests for subjects with patellofemoral pain syndrome. *J. Athl. Train.* 2002. 37, 256–261.
- Mølgaard, C., Rathleff, M.S., Simonsen, O., Patellofemoral pain syndrome and its association with hip, ankle, and foot function in 16- to 18-year-old high school students: a single-blind case-control study. *J. Am. Podiatr. Med. Assoc.* 2011. 101, 215–22.
- Moseley, G.L., Reconceptualising pain according to modern pain science. *Phys. Ther. Rev.* 2007. 12(3), 169–178. doi:10.1179/108331907X223010
- Nijs, J., Roussel, N., Paul van Wilgen, C., Köke, A., Smeets, R., Thinking beyond muscles and joints: Therapists' and patients' attitudes and beliefs regarding chronic musculoskeletal pain are key to applying effective treatment. *Man. Ther.* 2013. 18, 96–102.
- Papadopoulos, K., Stasinopoulos, D., Ganchev, D., A Systematic Review of Reviews in Patellofemoral Pain Syndrome . Exploring the Risk Factors , Diagnostic Tests , Outcome Measurements and Exercise Treatment. *Open Sport. Med. J.* 2015. 9, 7–17.
- Piva, S.R., Fitzgerald, G.K., Irrgang, J.J., Fritz, J.M., Wisniewski, S., McGinty, G.T., Childs, J.D., Domenech, M.A., Jones, S., Delitto, A., Associates of physical function and pain in patients with patellofemoral pain syndrome. *Arch. Phys. Med. Rehabil.* 2009a. 90, 285–95. doi:10.1016/j.apmr.2008.08.214
- Piva, S.R., Fitzgerald, G.K., Wisniewski, S., Delitto, A., Predictors of pain and function outcome after rehabilitation in patients with patellofemoral pain syndrome. *J. Rehabil. Med.* 2009b. 41, 604–12. doi:10.2340/16501977-0372
- Quartana, P.J., Campbell, C.M., Edwards, R.R., Pain catastrophizing: a critical review. *Expert Rev. Neurother.* 2009. 9, 745–58. doi:10.1586/ern.09.34
- Rathleff, M.S., Rasmussen, S., Olesen, J.L., [Unsatisfactory long-term prognosis of conservative treatment of patellofemoral pain syndrome]. *Ugeskr. Laeger* 2012. 174, 1008–13.
- Sanchis-Alfonso, V., Holistic approach to understanding anterior knee pain. Clinical implications. *Knee Surg. Sports Traumatol. Arthrosc.* 2014. 22(10):2275–85. doi:10.1007/s00167-014-3011-8
- Smith, B.E., Rathleff, M.S., Selfe, J., Hendrick, P., Logan, P., Patellofemoral pain: is it time for a rethink? With tide; Off. UK Newsl. McKenzie Inst. Mech. Diagnosis Ther. Pract. 2015a. Summer 2015, 13–18.
- Smith, B.E., Thacker, D., Crewesmith, A., Hall, M., Special tests for assessing meniscal tears within the knee: a systematic review and meta-analysis. *Evid. Based. Med.* 2015b. 20, 88–97. doi:10.1136/ebmed-2014-110160
- Stathopulu, E., Baildam, E., Anterior knee pain: a long-term follow-up. *Rheumatology (Oxford)*. 2003. 42, 380–2.

Vahasarja, V., Prevalence of chronic knee pain in children and adolescents in northern Finland. *Acta Paediatr* 1995. 84, 803–805.

Wilson, T., The measurement of patellar alignment in patellofemoral pain syndrome: are we confusing assumptions with evidence? *J. Orthop. Sports Phys. Ther.* 2007. 37, 330–341.