MedCrave
Step into the World of Research

Hematology & Transfusion International Journal

Short Communication

Open Access

CrossMark

Non-surgical options to diagnose and treat patellofemoral syndrome a pilot study

Abstract

Patellofemoral Syndrome (PFS) accounts for approximately 70% of knee pain and about 4.1million office visits to physicians in the United States each year.[1] The American knee brace industry is $800Million per year.[2] Additionally there are over 300,000 knee replacement surgeries, at a cost of $11.9Billion for the year 2003.[3] and at least as many knee arthroscopies. (A knee replacement averages $31,000 and knee arthroscopy is less at $3000) This does not include the dollars spent on knee X-Ray and MRI that are often done prior to surgery. A simple maneuver can be used to test for patellofemoral syndrome. If this maneuver relieves pain and increases mobility, a simple brace can be worn to both help treat and to help rehabilitate the knee joint muscles. If the maneuver does not totally or partially relieve pain or increase mobility, the primary knee problem is not solely due to PFS and further testing is necessary. The use of this maneuver to test for PFS can lead to early diagnosis and treatment of PFS with improved outcomes and could save billions in medical dollars spent annually, while reducing pain, disability and work loss that accompany invasive procedures.

Keywords: patellofemoral, maneuver, chondromalacia, condyles, tibial plateau

Volume 3 Issue 3 - 2016

Jack R Brown
In the Groove, USA

Correspondence: Jack R. Brown, In the Groove, LLC, USA, Email: abrown@inthegroovebrace.com

Received: February 25, 2016 | **Published:** December 30, 2016

Abbreviations: PFS, patellofemoral syndrome; MWM, mobilization with movement

Introduction

Anterior knee pain is often clinically diagnosed as patellofemoral syndrome. It accounts for approximately 70% of patients complaining of knee pain and is generally diagnosed by exclusion or rarely by knee X-Ray and/or MRI as the mal is tracking so minor as not to be detectable by the naked eye.[4] Patellofemoral syndrome is a painful syndrome that results from the mal-alignment of the femur and the tibia. The patella is unable to track in the trochlear groove of the femur and scrapes over the femoral condyles with each and every movement. This direct contact damages both the underside of the patella and the femoral condyle, the walls of the menisci, and stretches the lateral and medial ligaments.[5] If the damage continues the body mounts its defenses and causes swelling, inflammation, pain and eventually will lead to formation of chondromalacia and/or Baker's cyst, a herniation of the posterior wall of the joint capsule and permanent damage to the knee joint. Severe cases require surgical replacement of the knee joint. If patellofemoral syndrome is diagnosed early, there is the possibility that the femur and the tibia can be aligned the muscles of the knee joint can be trained to maintain this alignment and prevent or decrease further damage to the tissues of the knee joint.

Background information

The knee is the largest joint in the human body. It has a unique anatomy due to its unusual movement. The femoral condyles rotate downward and slightly medial with each flexion of the lower leg, reversing this motion with each extension. The knee has a three dimensional movement, not the two-dimensional hinge as it is often described. It is this hinge analogy that has lead to a generalization of the actual motion of the knee joint and unintentional elimination of the 13-degree rotation found in normal walking which if not included in diagnostic techniques, knee bracing or some physical therapy exercises can lead to less than optimum outcome.[6] Exercises should be performed in pain free range.[7,8] The knee joint contains: the femoral condyles, the tibial plateau, cartilage covering over both menisci wells on top of the tibial plateau, cruciate ligaments, medial and lateral ligaments, synovial lining, synovial fluid and the knee joint capsule. The proximal end of the femur is split into a v shape with two rounded condyles that fit into the two menisci wells of the tibial plateau. The medial and lateral ligaments of the knee joint are not strong enough to hold the femur and tibia in alignment alone. The weight of the body and gravity are the primary mechanism to maintain alignment of the femur and the tibia. In normal usage, the knee joint should never wear out, as long as the total loading of the knee joint is 400 pounds or less and there is normal movement of the knee (Figure 1 & 2).

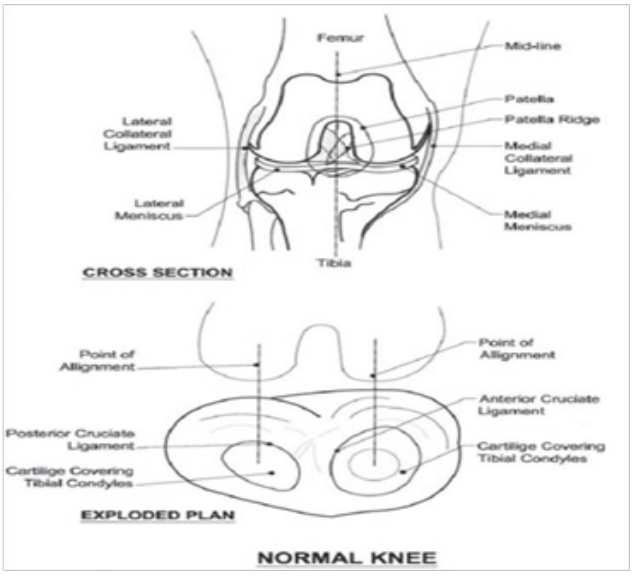

Figure 1 Normal knee.

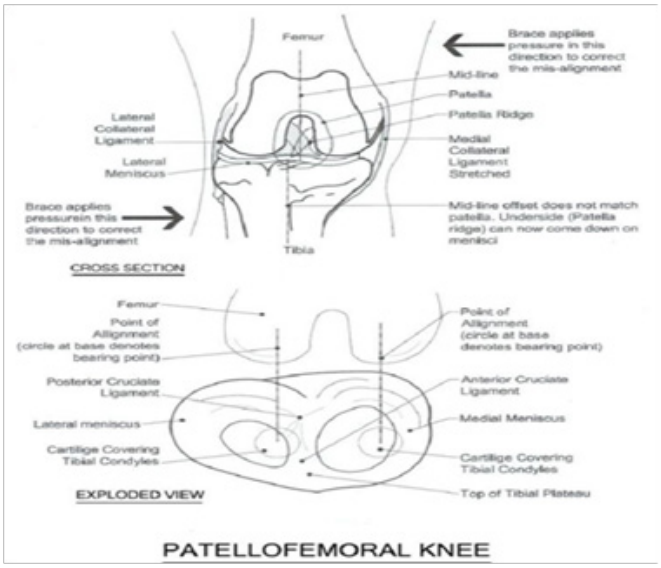

Figure 2 Patellofemoral knee.

It is when the knee joint is injured as in sports during "clipping", car accidents or other major trauma or when many micro traumas occur faster than the body, e.g., a runner, can heal them that the medial and lateral ligaments get stretched out of shape[9] and the knee gets out of alignment. Mechanical problems with the joint above the hip or the joints below the knee, the ankle and foot can also cause mal alignment and knee problems, including PFS. Q angle abnormalities associated with chronic pronation of the foot can also lead to PFS. (Q angle is defined as the angle between the patella tendon and the Quadriceps) (Figure 3 & 4).

Figure 3 How shift from normal angle of one joint.

Regardless of the cause of PFS, once out of alignment, the patella cannot track properly in the trochlear groove, the femoral condyles cannot seat properly into the menisci wells. Out of the groove, the patella scrapes over the femoral condyle, which one depends upon which direction the tibia is pushed and both the surfaces of the condyle and underside of the patella are damaged with each and every out of line movement of the knee joint. Movement of the knee becomes increasingly painful and difficult. The menisci walls are also damaged when the condyle is not contained within the menisci well and the collateral tendons are further stretched. In response to tissue injury, the inflammatory cascade mounts. Eventually tissue injury, inflammation and its sequelae: swelling, pain and heat lead to the formation of chondromalacia. In longstanding cases, arthritis of the knee joint results in damage or destruction of the contiguous tissues, pain and loss of mobility. Knee joint replacement is needed when the congruent surfaces are beyond repair. Even if knee joint replacement surgery is done, the ligaments are still stretched and can continue to be a source of pain and reduced mobility. This could be one reason for failed knee replacement or painful knee after replacement. Whether PFS is the original knee joint problem or not it eventually becomes part of the knee joint problem and treating this component of the total complex of symptoms will yield better results both subjectively and objectively in overall knee health, mobility, quality of life and pain relief.

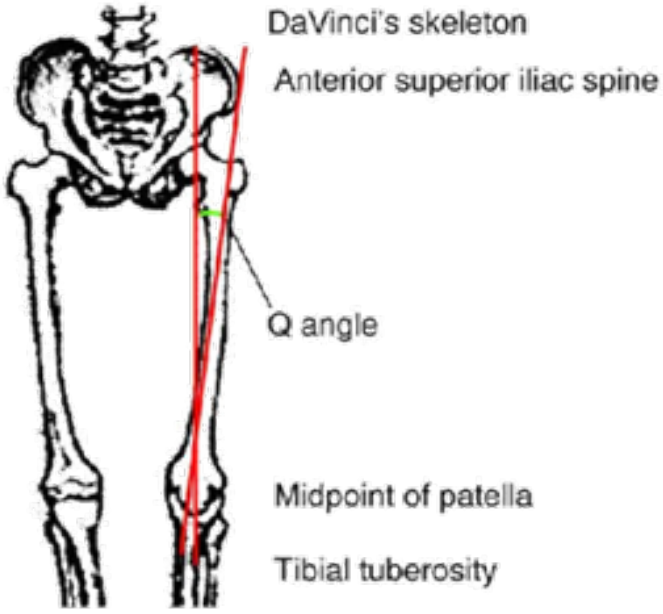

Figure 4 Q Angle effects neighboring joints.

In the 1980's Brian Mulligan, a physical therapist from New Zealand, developed a maneuver to diagnose and treat anterior knee pain as a part of his overall approach to improving mobility through mobilization and movement of affected body parts. His premise is that "minor positional faults occur following injury or sprain resulting in movement restrictions and/or pain. These are not readily palpable or visible on x-ray but when a correctional mobilization (a repositioning) is sustained pain free function is restored and several repetitions will begin to bring lasting improvements.[10]" For the knee joint, the maneuver is a Mobilization with Movement (MWM) glide where one hand is placed above the knee laterally and the other hand below the knee medially and gentle pressure is applied toward the midline of the leg. If this direction does not give relief, reverse the hand positions, the upper hand on the inside of the thigh and the lower hand on the outside of the leg, apply pressure toward the midline of the leg (Figure 5).

Citation: Brown JR. Non-surgical options to diagnose and treat patellofemoral syndrome a pilot study. *Hematol Transfus Int J.* 2016;3(3):192–196.
DOI: 10.15406/htij.2016.03.00068

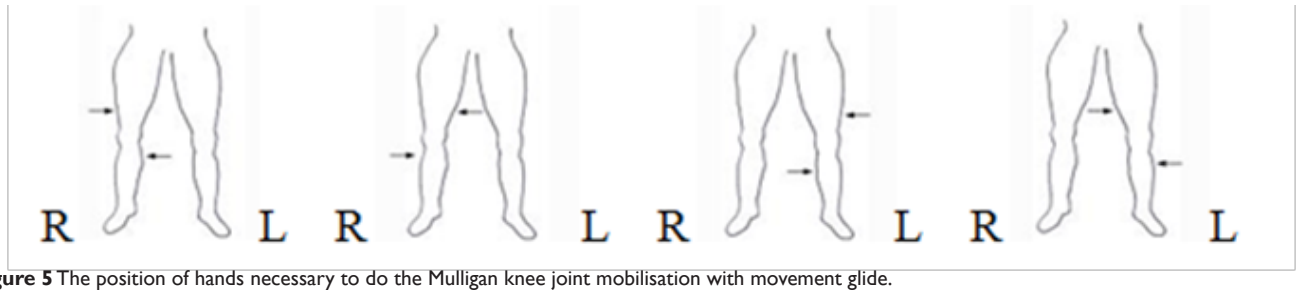

Figure 5 The position of hands necessary to do the Mulligan knee joint mobilisation with movement glide.

Relief of pain and increased mobility of any hand position above indicates PFS is cause of knee pain and decreased mobility. It also indicates which direction femur and tibia need to be shifted to improve alignment, decrease further damage to knee joint tissues, reduce pain and increase mobility. If none of the positions gives almost complete relief, PFS is not the major component of knee injury or pain.

Note: The knee can be mal aligned, either medially or laterally.

If the above Mulligan maneuver does give significant relief and allow almost pain free mobility, the patient will benefit from physical therapy exercises designed to help retrain the muscles of the knee joint to maintain better alignment and will benefit from a patellofemoral brace designed to emulate these physical therapy exercises. Retraining early in PFS, yields the best results. The more the ligaments of the knee joint are stretched, the less the knee is able to maintain proper alignment of the femur and tibia and the less they can be rehabilitated. If there is either no relief or only minimal relief with the above maneuvers, the primary problem is not PFS and further work up is necessary. In cases where the patient is not a surgical candidate and there is some relief with the Mulligan maneuver, it may still be of clinical value to treat the patient for PFS as this may give just enough relief to allow some increased mobility, decrease in pain and increase in quality of life.

Small clinical trial of mulligan Maneuver to diagnose and initiate treatment for PFS

Fifteen patients with knee pain and decreased mobility were tested with Mulligan Mobilization with Movement. Glide to determine if PFS was a cause of patient's knee pain. Of the fifteen patients all tested positive for PFS. Generally the best relief was given with the upper hand position on the lateral side of the leg (about 80% of the time). Three of the patients did go on to have knee x-ray and MRI, as their relief was only minimal. Of these three patients, two had torn or shredded menisci, which was corrected arthroscopically and the third patient had severe arthritis of the knee. This later patient had a strong family history of early onset knee arthritis, and did have knee replacement surgery. However, she was able to delay it for months by using a patent pending PFS brace. The remaining patients did well with exercise, physical therapy and optional use of a patent pending, patellofemoral, functional, and rehabilitative knee brace. 12 of 15 (80%) of the patients who responded to conservative therapy-physical therapy and a patent pending patellofemoral knee brace daily-only three (20%) continued to wear the brace after several months. The rest of the patients who did respond (9 of 15 or 60%) rehabilitated their knees to the point that they only wear the brace(s) (some had two braces), during extended activity or when they re-injured their knee.[11] The patient's ages ranged from 30 to 89.[12] All of the patients in the study complained of knee pain and were given the option to have a patent pending brace for a one-week free trial. At the end of the week the patients were asked to either purchase the brace or to return the brace. Not one brace was returned. All patients were happy with the brace(s) and purchased those wear one or was recommended by their physicians to wear the patent pending brace design in the study[13] (Table 1).

Table 1 Results of pilot study

Pt No	Diagnostic Tests					Treatment				
	Age	MWM*	X-Ray	MRI	Diagnosis	Knee Brace	Arthr o-scopy	Knee Replacement	Outcome	Notes
1	58	Y	Y	Y	PFS, Baker' cyst, pain, shredded meniscus, swelling	Invented	Y	R**	Walking with brace	Was in Wheelchair
2	79+***	Y	Y	Y	Swelling, pain, OA bilateral, difficulty walking	Y	N	N	Immediate improvement R 25% L 80%	Both legs
3	74	Y	N	N	Swelling, pain, Difficulty walking	Y	N	N	Improvement 80%, after 3 mo use, leg rehabilitated	Now uses only long walks
4	71	Y	N	N	PFS, OA, Swelling, Pain, lateral displace	Y	N	N	Immediate improvement 80%	
5	79+***	Y	Y	Y	PFS, OA severe	Y	N	R	Immediate Improvement 50%	Both legs

Citation: Brown JR. Non-surgical options to diagnose and treat patellofemoral syndrome a pilot study. *Hematol Transfus Int J.* 2016;3(3):192–196.
DOI: 10.15406/htij.2016.03.00068

Table Continued....

Pt No	Diagnostic Tests					Treatment				
	Age	MWM*	X-Ray	MRI	Diagnosis	Knee Brace	Arthr o-scopy	Knee Replacement	Outcome	Notes
6	63	Y	Y	N	PFS, acute knee strain	Y	Y	N	Immediate improvement 40%	
7	79+***	Y	N	N	PFS, OA severe	Y	N	R	Immediate improvement 80%	Now is willing to have hand surgery, will to live
8	51	Y	Y	Y	PFS, OA early age, genetic	Y	Y	R bilat. D right	Helped rehab R Knee L 50% immediate improvement	Delayed replacement 6 mo
9	77	Y	Y	Y	PFS, OA knee hips SD knee, long leg	Y		R	Immediate Improvement 50%	
10	78	Y			PFS, OA, swelling, Pain, Diabetes	Y		R	Immediate improvement 50%	
11	79+***	Y			OA knees, Diabetes, HBP	Y		R	Immediate improvement 40%, uses cane	
12	68	Y	N	N	PFS, Diabetes	Y	N	N	Immediate Improvement 50%	
13	79+***	Y	Y		PFS, medial meniscal tear	Y	R		Immediate improvement 40%	
14	30	Y	N	N	Knee pain	Y	N	N	40% immediate improvement	Hip replacement, 2000
15	51	Y	N	N	PFS, pain, swelling Difficulty walking	Y	N	N	80% immediate improvement	

i. *MM stands for the Mulligan Mobilization with Movement Glide performed on the patient. Only patients with a positive glide test were admitted into the study.

ii. **R means recommended to patient that knee replacement is necessary, D patient had knee replacement

iii. ***Patients 79 or older, the exact age cannot be revealed due to HIPPA concerns that patient identity could be discovered due to small numbers of patients in this age group

Note: Several persons had more than one leg in the study. The average age per leg tested was 69

2. 8 persons who were not patients in the practice heard about the knee brace and either asked to wear one or was recommended by their physicians to wear the patent pending brace design in the study. Of these persons age ranged from 32 to 79+***. All these patients had PFS, 3 had known OA, one had a family history of early age of knee replacement. All patients received relief ranging from 30-80% immediately. None had knee replacement surgeries, though 3 were recommended to have it. One was not a surgical candidate due to a stroke a month earlier. She was hemiparetic and was able to put the brace on by herself. She remained independent due to use of the brace, rather than being admitted to a nursing home. Only one patient had arthroscopy. He had torn menisci and recovered well after removal of fragment of menisci, the brace allowed him to finish vacation before having arthroscopy.[14–20]

Conclusion

A simple maneuver, the" Mulligan mobilization with movement glide", is a two person physical therapy exercise, a physical therapist and a patient, which can also be used as a quick, simple and cost effective tool to diagnose and help treat patellofemoral syndrome. The MWM glide exercise is one exercise of a physical therapy exercise program that can be done to retrain the muscles of the leg to better align the knee joint to relieve symptoms of PFS and increase mobility and quality of life. A patient with PFS designed the brace used in this

Citation: Brown JR. Non-surgical options to diagnose and treat patellofemoral syndrome a pilot study. *Hematol Transfus Int J.* 2016;3(3):192–196.
DOI: 10.15406/htij.2016.03.00068

study. In the Groove™ patellofemoral, functional, rehabilitative knee brace, is a useful adjunct in therapy for PFS and is both comfortable to wear and is affordable. Wearing the brace is not intended to replace physical therapy or a physician's diagnosis and treatment but rather to help maintain better alignment of femur and tibia and to aid in retraining of knee joint muscles during weight bearing activity. Early diagnosis and treatment of PFS can lead to better clinical outcomes for the patient and considerable cost savings to an already strapped medical budget, whether or not knee bracing is used.

Acknowledgements

In the Groove™, LLC provided the knee braces for the one week free trial. In the Groove™, LLC also provided the braces at manufacturers cost to any participant who wished to purchase the brace after the one week free trial. Indigent patients in the trial were given the option to keep their brace(s) at no charge. No braces were surrendered except for a couple who exchanged their brace for a different size or style. One person needed style A to start then switched to style B. This patient was a non surgical candidate and had severe PFS. Another patient needed a smaller size after her knee swelling went down. Alice M. Brown, RPh., PharmD., FMPA developed the In the Groove® knee brace when she got relief of her pain with the Brian Mulligan Mobilization with Movement (MWM) glide during physical therapy. Her physical therapist, Mel Svorinic was so impressed with the simplicity and functionality of the brace she made for herself, that he recommended she patent the brace. She has a provisional patent and has filed a utility patent. Dr. Jack R. Brown is her husband and did the above research. The results were so impressive that they felt it was important to make the information available to other medical practioners. Just the use of the physical therapy maneuver alone could save millions in medical testing and treatment as well as provide decreased pain and suffering for patients.

Conflict of interest

The author declares no conflict of interest.

References

1. WebMD. *Health, Questions and Answers about Knee Problems*. USA: Public Information from the National Institutes of Health; 2001. p. 1–15.
2. Juhn MS. Patellofemoral pain syndrome: a review and guidelines for treatment. *Am Fam Physician*. 1999;60(7):2012–2018.
3. McNeal M, David Linter PT. *Patellofemoral Disorders-Degeneration and Instability*; 2003.
4. Waly A. Patellar Braces, *Short study for the Knee guru*; 2015. p. 1–4.
5. Dubin JC. Patellofemoral Syndrome/Pain on the Front of the Knee. *Dubin Chiropractic*. 2016;2(2):1–2.
6. Paluska SA, McKeag DB, Roberts WO. Using patellofemoral braces for anterior knee pain. *The Physician and Sports medicine*. 2015;27(8):81–82.
7. LaBotz M, Harmon KG, Rubin A. Patellofemoral syndrome-diagnostic pointers and individualized treatment. *The Physician and Sportsmedicin*. 2015;32(7):22–29.
8. Patella Problems p. 1-12.
9. Calmbach WL, Hutchens M. Evaluation of patients presenting with knee pain: Part I. History, physical examination, radiographs and laboratory tests. *Am Fam Physician*. 2003;68(5):907–912.
10. Hogan K. Patellofemoral Arthritis. eMedicine from WebMD; 2011. p. 1–15.
11. Gold GE, Besier TF, Draper CE, et al. Weight-bearing MRI of patellofemoral joint cartilage contact area. *J Magn Reson Imaging*. 2004;20(3):526–530.
12. *Anterior Knee Pain and Patellofemoral Problems*. UK: Chester Knee Clinic; 2002.
13. Katchburian MV, Bull AM, Shih YF, et al. Measurement of patellar tracking: assessment and analysis of the literature. *Clin Orthop Relat Res*. 2003;(412):241–259.
14. *Your Sports Podiatrist Talks about Patellofemoral Dysfunction (Runners Knee)*. USA: American academy of podiatric sports medicine; p. 1–8.
15. Potter PJ. Patellofemoral Syndrome. *eMedicine*. 2005. p. 1–22.
16. Labotz M. Coping with patellofemoral syndrome. *Phys Sportsmed*. 2004;32(7):30–31.
17. Sokolowska A. *Differential Diagnosis of Conditions Causing Patellofemoral Pain Syndrome*. 2016. p. 1–8.
18. Ingraham P. *Save Yourself from Patellofemoral Syndrome (Kneecap Pain)*. RMT; 2013. p. 1–14.
19. Patellofemoral Syndrome, Physical Medicine and Rehabilitation Center, USA; p. 1–3.
20. Splete H. Clinical pearls for managing atraumatic knee pain. *Family Practice News*. 2006;36(22):44.