Is dry needling an effective treatment for patellofemoral pain syndrome? A critically appraised topic

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Abstract

Clinical scenario: Patellofemoral Pain Syndrome (PFPS) is a common knee pathology found often in females. The poor biomechanical and neuromuscular factors that contribute to the dysfunction and pain seen with PFPS may be addressed with the implantation of dry needling techniques. **Clinical Question:** Is dry needling an effective treatment method for decreasing pain and increasing function in patients with patellofemoral pain syndrome? **Summary of Key Findings:** Two studies demonstrated that dry needling in combination with traditional knee therapy increases the function and pain in those with PFPS. One study found improvement in pain, physical function, and vastus medialis oblique (VMO)/vastus lateralis (VL) coordination in PFPS patients. One study demonstrated that those given dry needling experienced a clinically meaningful reduction of pain. **Clinical Bottom Line:** The evidence suggests that the use of dry needling as a therapeutic technique may improve pain and overall function in individuals with PFPS, especially in conjunction with traditional strength training rehabilitation. **Strength of Recommendation:** Based on the PEDro scale grading criteria , these studies provide good to excellent evidence that dry needling can increase function and decrease pain for individuals with PFPS.

Keywords: Knee Pain, Function, Alternative Treatments

Clinical Scenario

Patellofemoral Pain Syndrome (PFPS) is a highly common knee pathology, especially within the female population with an incidence rate of 20-40% of all knee problems.[1] PFPS can be characterized by the patient having pain around or behind the kneecap that increases with activity and there are no other distinct knee pathology to account for such pain.[2] Although PFPS is a common problem, there is not much regarding the cause. It has been thought that poor biomechanics and neuromuscular factors lead to stress on the patellofemoral joint inducing pain and dysfunction.[3] While little is known regarding the cause of PFPS, there has been discussion regarding effective ways to decrease pain and increase functionality of individuals with this diagnosis. Research has demonstrated the importance of muscle strengthening, specifically the quadriceps and hip musculature.[4] When looking at the difference between PFPS improvement with the implantation of hip vs knee strengthening exercises, Hott et al[2] found there was no difference in PFPS improvement; in other words, subjects in both groups found an increase in strength and a decrease in pain. After investigating the effects of functional retraining on patients with PFPS, Leibbrandt and Louw[5] found significant improvements in pain and function after the three-month follow-up.

Along with increasing muscular strength, the decrease in improper muscle firing due to muscle spasming can lead to changes in biomechanics and altered pull and pressure on the patella and patellofemoral joint causing pain.[3] A study conducted by Emamvirdi et al[6] found that improvement in dynamic knee performance led to a better ratio between abductors and adductors along with external and internal hip eccentric muscles helped to improve the pain and strength in patients with PFPS. In a study looking at the effects of dry needling treating myofascial trigger points in the upper trap, it was determined there was a significant change in pain intensity and disability scores for those treated with dry needling along with significant changes in VAS scores.[7] Dommerholt[8] concluded that dry needling is an effective manual therapeutic technique that can aid in the reduction of pain and return to function due to its ability to help reduce trigger points. Due to biomechanical concerns leading to PFPS and the effect of muscle spasming causing these changes, the dry needling technique has been identified as a possible treatment technique to decrease muscle spasms and in turn alleviate PFPS pain and increase patient function.

Focused Clinical Question

Is dry needling an effective treatment method for decreasing pain and increasing function in patients with patellofemoral pain syndrome?

Search Strategy

Terms used to guide search strategy

dry needling AND patellofemoral pain syndrome.

The search was restricted to research articles found in PubMed, Google Scholar, and PEDro within the past five years.

Patient: *Patients with PFPS*

Intervention: *Dry needling*

Comparison: *Non dry needling*

Outcome: *Pain reduction and functional increase*

Inclusion criteria

- Available in English Language
- Last 5 years
- Patients diagnosed with Patellofemoral pain syndrome
- Use of dry needling technique
- Randomized control trial

Exclusion criteria

- Other techniques used to treat PFPS
- Patients not diagnosed with PFPS
- Pain and function not measured outcome

Evidence Quality Assessment

The scale used to appraise the quality of research used for each of the studies was the Physiotherapy Evidence Database[1]. All studies selected were deemed good and excellent based upon the PEDro scale. Table 1 demonstrates articles with PEDro scores ranging from six to nine out of ten.

Summary of Search

Results of Search

PubMed, Google Scholar, and PEDro were searched for studies that investigated the effect of dry needling on PFPS.

- The initial literature search returned 833 relevant studies
- Four random control trials that met the inclusion criteria set out.[1,3,10-11]
- All four of the studies saw that the use of dry needling as a treatment technique for PFPS had significant improvements in pain and function scores.

Key Findings

Table 1 summarizes the studies that were included. They have been identified as best evidence for the purpose of this study based on the requirements of PEDro scale as referenced previously. Sutlive et. al. [3] found that both the sham and dry needling experienced clinically meaningful reduction in pain; however, there was no significant difference between the groups. Zarei et. al.[11] found that exercise combined with dry needling had clinically significant meaning for the outcome measures of decrease in pain, increase in functionality, and pain pressure threshold. Ma et. al. [10] found improvement in pain, physical function, and VMO/VL coordination in PFPS patients when compared to sham treatment. Karamiani et. al. [1] found trigger point dry needling in combination with traditional knee therapy had significant increase in physical function for women with PFPS compared to just traditional knee therapy alone.

Table 1: Summary of Best Evidence

Authors	Sutlive et. al.[8]	Zarei et. al.[9]	Ma et. al.[6]	Karamiani et. al.[7]
Study title	Short-term effects of trigger point	Added value of gluteus medius and quadratus	Effects of Trigger point dry needling on	The effect of Gluteus Medius Dry needling on

	dry needling on pain and disability in subjects with patellofemoral pain syndrome	lumborum dry needling in improving knee pain and function in female athletes with patellofemoral pain syndrome	neuromuscular performance and pain of individuals affected by patellofemoral pain	Pain and physical function of non-athlete women with unilateral patellofemoral pain syndrome
Participants	60 participants 18-40 years old; clinically diagnosed with PFPS	Female athletes with PFP; N=40. Ages 18-45	Ages 18-40; clinically diagnosed with PFPS; N=50; treatment age 22.48+2.40, height(cm) 170.57+8.13, weight(kg) 66.43+11.72; sham group age 25.14+6.02, height(cm) 170.9+9.3,	17-40 years old; diagnosed with PFPS; N=29

			weight(kg) 64.14+12.92	
Inclusion/Exclusion Criteria	Inclusion: A part of military health care beneficiary in Fort Sam Houston in Texas. Exclusion: previous knee surgeries/ other knee pathologies, taking anticoagulant medications or history of bleeding disorders.	Inclusion: female athlete, Unilateral patella pain, positive clarke's sign, Kujala score greater than 85 of 100, pain greater than 3 on numeric pain rating scale in previous week. Exclusion: no osteoarthritis, ligament or meniscus injury, bilateral anterior knee pain, previous knee physical	Inclusion: have retropatellar or anterior pain provoked by two or more activities: kneeling, squatting, climbing or going down stairs, prolonged sitting, kneeling or isometric quadricep contraction. Have a score of three or higher on numerical pain scale.	Inclusion: Unilateral PFPS, positive patellar-glide test, no history of knee injuries Exclusion: previous surgeries to patellofemoral joint, inflammation at knee joint, involvement of ligaments of knee, tenderness of patellar tendon, iliotibial band and pes anserinus

		therapy within the year	Exclusion: history of knee surgeries, systemic disease/ connective tissues disorders, competing knee pathology (meniscal tear, patellar tendinopathy, ligament sprain, osteoarthritis)	
Outcome measures	Numerica pain rating scale (NPRS) after functional tests (step-up, step-down, squat), Global Rating of Change	Outcomes were measured at baseline, 4 weeks after treatment, and 6 weeks after treatment. Knee pain intensity	Visual Analog scale for pain intensity; Kujala patellofemoral scale, myoelectric amplitude of VMO over VL.	Pain intensity using VAS scale from 0-100mm, physical function using Kujala anterior knee pain scale 13-item (AKPS)

	questionnaire, Kujala anterior knee pain scale (AKPS); Lower extremity functional scale, muscle strength, length, and ROM. Isometric strength was assessed using handheld dynamometer. Muscle length was measured using bubble goniometer during Thomas, Obers and hamstring 90/90. Range of	on 11-point numerical scale, Function via Kujala patellofemoral scale, step-down test, and modified star excursion balance test		

	motion was measured using a standard goniometer.			
Main Findings	Both the dry needling and the sham dry needling group where the same procedure was conducted without the use of an actual acupuncture needle demonstrated clinically meaningful reductions in pain with functional activities both immediately	Both groups had significant improvements in pain. Kujala score, step down, and mSEBT performance from baseline to week 4. For experimental group significant improvements seen in pain, Kujala score, step-down test and mSEBT for baseline to	The VAS score was significantly decreased for the experimental group at week 3, week 6, and 3 months ($p<0.05$) while the control which had a sham treatment were stainless steel needles were used with the tips cut off only improved at week 3 and 6	Significant reduction in anterior knee pain score immediately post-intervention for both the experimental and control (only received conventional physiotherapy) groups ($p < 0.01$). Significant reduction of pain in experimental group 1 week after intervention ($p < 0.01$). Significant increase in knee

	and 72 hours after treatment. Difference between groups were not significant with NPRS scores (p=0.22). No significant or clinically meaningful difference between groups based on lower extremity functional scale (LEFS), Kujala , or GROC scores.	week 4 and week 4 to week6.	months. VAS score significantly lower at week 6 and 3- month compared to control group (p<0.05). Kujala score in experimental group increased significantly at week 3, 6 and 3 month (p<0.05).	physical function score in the experimental group after 1 week (p=0.01).
Evidence quality score	PEDro 9/10	PEDro 8/10	PEDro 7/10	PEDro 6/10
Support for the answer (yes/no)	Yes	Yes	Yes	Yes

Results of Evidence Quality Assessment

Based on the PEDro scale grading criteria, all four of the studies were in the range of good and excellent scale[9]. The studies that were selected utilized random allocation by random drawing or through computer generation into the treatment group or the control group. All participants were comparable at baseline within all the studies. Two of the four studies had blinding of the assessor of the group allocation. One of the studies had blinding of the participants during the study process while two of the studies had blinding of the participants for baseline measurements but treatment allocation was reviled prior to the start of treatment. All studies included a follow up with varying time frames. All the studies included between group comparisons along with inner group comparisons at various time points within the study.

Clinical Bottom Line

There is moderate to high level of evidence that the use of dry needling as a therapeutic technique improves pain and overall function in individuals with PFPS especially in conjunction with traditional strength training rehabilitation. All four studies found a decrease in pain score and in increase in functionality when dry needling therapy was applied.

Implications for Practice, Education, and Future Research

The evidence supports the use of dry needling in combination of strengthening experiences to reduce pain and increase the function of patients with patellofemoral pain syndrome. One study found minimal detectable change in pain, Kujala score, and the modified start excursion balance test for the group that received exercise and the dry needling therapy.[10] There was also significant improvement found in physical function with the group that received the dry needling trigger point treatment compared to the sham control group. When used in combination with conventional physical therapy, dry needling showed improvement in physical function and pain scale.[3,10-11]

Two studies reported limitations in the fact that they only used females in their study.[3,11] This limits the ability for the results to be generalized to male patients. Sutlive et. al. [3] performed a single session therapy of dry needling on their experimental group receiving the dry needling therapy however, having a single session of treatment during the whole study could have altered the true results since this may not have allowed for enough change to have occurred. Two studies also reported a limitation due to having the subjects performing either the exercise or stretching at home unsupervised.[10-11]

Additional research should investigate the effects of dry needling in conjunction with young athletes with PFPS. Only one of the studies used athletes within the study; however, this should be an area of focus since PFPS affects many female athletes. More studies should also examine dry needling trigger point therapy over an extended period and multiple treatment sessions. None of the current studies listed involved more than two treatment sessions and only one of the

studies had a follow up of three months.[10] Since altered biomechanics and muscle functioning is a suspected factor of the development of PFPS time is a big factor when trying to correct causes.

Future practice should take into consideration the positive effects that trigger point dry needling has on decreasing muscle spasms and improving pain and function in individuals with patellofemoral pain syndrome. This manual technique is a beneficial therapy that can be used in combination with traditional hip and knee strengthening therapy to improve PFPS pain and help with increasing the biomechanical functionality of these patients. The kill date for this CAT is December of 2026, when it is recommended the PICO be searched again.

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