ORIGINAL ARTICLE

Immediate Effects of Dry Needling on Pain and Function among Individuals with Patellofemoral Pain Syndrome

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ABSTRACT

Objective: The purpose of this study was to determine the immediate effects of dry needling on pain and function among individuals with myofascial trigger points due to patellofemoral pain syndrome.

Study Design: It was a single centered quasi experimental study.

Place and Duration of Study: It was performed at University of Lahore teaching hospital from August 2018 to January 2019.

Materials and Methods: Thirty participants aged between 20 to 40 years were recruited. Participants obtained a single treatment session of dry needling. Function and pain was assessed at baseline and at 72 hours of trigger point dry needling. Mean and standard deviation were reported, pre and post intervention scores were compared using Wilcoxon signed rank. P value of less than 0.05 was considered significant.

Results: Significant improvement was measured in pain (92.7±15.9) at 72 hours of intervention as compared to baseline value (89.0±12.2) on Knee Society Score. The function score (73.6±11.1) was also improved. 90% individuals showed positive ranks on the Lower Extremity Functional Scale at 72 hours after the dry needling intervention.

Conclusion: Dry needling cause's immediate and clinically significant reduction in pain and improvement in function of knee joint in the subjects with patellofemoral pain syndrome at 72 hours post treatment session. The immediate effects were studied but it is suggested that dry needling should be studied for its long term effects in patients with PFPS. Dry needling needs further investigation to be accepted as an isolated intervention for patients with Patellofemoral Pain.

Key Words*: Acupuncture therapy, Anterior Knee Pain syndrome, Myofascial pain syndrome, Patellofemoral Pain Syndrome, Trigger areas.*

Introduction

Patellofemoral pain syndrome is one of the most frequent injuries of the knee joint as well as the most common orthopedic illness. The incidence rate of this condition was found to be 1.5 to 7.3% in United States.[1] This syndrome is common among athletic and nonathletic teenagers.[2] The syndrome is caused due to daily life activities exerting compression on the joint for example descending stairs, performing squats, running and prolonged sitting.[3] This challenging condition is recurrently seen with chronic symptoms in 70-90% of individuals.[4]

In the past decades, several treatment strategies have been utilized for the treatment of patellofemoral pain syndrome.[5] An increasingly attention gaining method of treatment for the patellofemoral pain syndrome is dry needling, also referred as westernized acupuncture.[6]

Dry needling is considered as an emerging intervention strategy. It is the insertion of a solid needle into the skin and myofascial trigger area for the reduction of neuromuscular pain and restoration of range of motion. This technique is cheap, less invasive and can be performed with minimal risk but the actual mechanism behind is yet to be elucidated.[7] According to literature, the proposed mechanism of action is that dry needling generates localized and centralized nervous system responses, augmented blood flow, improved oxygenation[8,9] and reduced peripheral and central pain sensitization.[10,11] It has

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been reported that there is also a role of pain gate theory in alleviating pain.[12]

Previous clinical studies have revealed that dry needling initiates a localized action resulting in increased range of motion and decreased pain at the tender point.[13] Elizabeth et al conducted a systematic review comparing the effects of dry needling to standard care in different painful body areas, and it was concluded that there is less evidence available in the favor of dry needling.[14]

There is increasing demand of use of dry needling by physical therapists and certified professionals for the trigger points in various body parts.[15] Despite the positive effectiveness of dry needling in pain relief, improved range of motion and quality of life, the utilization of dry needling is yet to be established and demonstrated. It is essential to continually evaluate and review the existing evidence to counter or favor the use of dry needling in myofascial trigger point release.[16]

Recent investigations have depicted that dry needling can provide a positive effect on pain in various musculoskeletal conditions.[17] To our knowledge there has not been a single study targeting patellofemoral syndrome with dry needling, its management is largely based on the expert opinions. A literature gap exists when considering the effect of dry needling as management strategy among patients with patellofemoral trigger points for pain reduction and improvement in overall function. Therefore, the purpose of current study was to evaluate the immediate effects of dry needling as an intervention on the pain and function in the patients having myofascial trigger points due to PFPS.

Materials and Methods

A single centered quasi experimental study was performed at University of Lahore teaching hospital from August 2018 to January 2019. Thirty participants aged between 20 to 40 years were recruited for the study. The sample size calculation was done using WHO sample size calculator keeping level of significance as 95%, standard deviation as 4.58 study power kept as 90%. The sampling technique used was non probability convenient sampling. Informed consent was obtained from each participant of the study. The study was approved by Institutional Review Board at University of Lahore with reference number as IRB-UOL-FAHS/508/2019. Those patients with patellofemoral pain syndrome diagnosed by orthopedic physician based on the inclusion criteria were taken in the study. Inclusion criteria also comprised of patients who presented with complain of anterior knee pain almost for six months and had knee pain ranging from three to six on Numeric Pain Rating Scale. Patients who experienced knee pain during at least two activities such as ascending and descending stairs, squatting, prolonged sitting periods with knee joint flexion, jumping activities and running were also included. Those patients were excluded from the study who had history of arthritis, any surgical procedure around knee, meniscal injury, muscle or ligamentous rupture. Exclusion criteria also constituted individuals who previously received acupuncture therapy or dry needling technique for knee extensor muscle in last six months. Participants obtained a single treatment session of dry needling. They were instructed to fill the outcome measure questionnaire before the treatment and upon the second visit which was after 72 hours of intervention.

The patient was instructed to lie supine and palpation of quadriceps muscle was performed on the effected side. Three of the quadriceps muscles were targeted having two more painful areas each. The needling therapy was performed using Classic Plus sterile acupuncture needle 0.25*40mm. Needles being inserted for approximately six to ten secondsand the motion sparrow pecking was used. Quick in and out motion with coning was performed so that the twitching response can be achieved. The motions continue for a while until twitching can no more be elicited. Subjects were asked to report any side effect noticed during anytime of the intervention. The intervention was executed by experienced and certified Physical Therapist. Knee Society Score was used to assess function and pain at baseline and at 72 hours of trigger point dry needling. It is composed of two domains pain and function. Each domain is graded as 0 to 100 scores; the greater value represents better function and less pain. Grading for The Knee Society Score is 80-100 being excellent, 70-79 being good, and 60-69 being fair and below 60 is considered as poor. The Lower Extremity Functional Scale was used to evaluate the functional level. It is scored on 5-point scale and total

score is 80. Minimally detectable change recorded for this is 9 points. Data was analyzed using SPSS version 21. The normality of collected data was checked and it came out to be non-parametric on Shapiro-wilk test. Mean and standard deviation were reported, pre and post intervention scores were compared using Wilcoxon signed rank test. *P* value of less than 0.05 was considered significant.

Results

Between August 2018 to January 2019 total of the thirty consecutive subjects met eligibility criteria for the study. There were 22 (73%) female and 08 (27%) male study participant. The mean age calculated was 29.7 years with standard deviation being 9.5. Mean intensity of knee pain was calculated at baseline Numeric Pain Rating Scale during squatting (4.1±2.3), upgoing (1.7±1.9) and down going (2.3±1.8) the stairs. (Table I)

Pain and function level was measured by Knee Society Score test and within-Group Mean change Scores were evaluated showing p value less than 0.05 in both function (p=0.003) and pain (p=0.001) subscales. (Table II) The scoring was done at baseline and at 72 hours of intervention depicting the improvement through mean and standard deviation values. The baseline scores were less than the 72 hours recorded scores for KSS function score, showing that the function was improved after the needling intervention. Wilcoxon signed rank test was used to evaluate the function level through The Lower Extremity Functional Scale before and after intervention. (Table III)

None of the subjects reported any adverse event to discontinue the treatment, and there have been no experience of minor side effects like blackouts, nausea, lethargy or weakness after the dry needling session.

Table I: Participants Self-Reported Baseline Demographics and Variables

Subject Characteristics	Frequency/Mean± Standard Deviation
Patients (n)	30
Age (Y)	29.7±9.5
Gender (M/F)	08/22
NPRS squatting	4.1±2.3
NPRS downstairs	2.3±1.8
NPRS upstairs	1.7±1.9

F: female, M: male, NPRS: Numeric Pain Rating Scale, Y: years

Table II: Knee Society Score Within-Group Mean Change Scores

Outcome	Dry Needling Group	n	P-value
KSS pain score (0-100)			
Baseline(S.D)	89.0±12.2		
72 hours(S.D)	92.7±15.9		
		30	0.001
KSS function score (0-100)			
Baseline(S.D)	65.7±10.9		
72 hours(S.D)	73.6±11.1		
		30	0.003

KSS: Knee Society Score, S.D: Standard Deviation

Table III: Wilcoxon Signed Ranks Test – Ranks

		N	Mean Rank	Sum of Ranks
LEFS: post intervention score - LEFS: pre intervention score	Negative Ranks	2[a]	2.00	4.00
	Positive Ranks	27[b]	15.50	418.50
	Ties	1[c]		
	Total	30		

a. Lower Extremity Functional Scale: post intervention score < Lower Extremity Functional Scale: pre intervention score

b. Lower Extremity Functional Scale: post intervention score > Lower Extremity Functional Scale: pre intervention score

c. Lower Extremity Functional Scale: post intervention score = Lower Extremity Functional Scale: pre intervention score

	LEFS: post intervention score - LEFS: pre intervention score
Z	-4.672[a]
Asymp. Sig. (2-tailed)	.000

[a]Based on negative ranks

Discussion

Patellofemoral pain syndrome is a multifaceted and complex clinical issue. Numerous biomechanical and neuromuscular etiological factors cause the joint reaction forces contributing to pain and poor function.[18,19] A number of intervention strategies have been advised due to variations in etiological factors. Dry needling is an innovative therapeutic intervention that is supported by recent researches.[14,20,21] Effects of dry needling have been studied widely in subjects complaining low back pain[22,23,24,25] cervical pain[26,27,28] and shoulder girdle pain.[20,29,30] Limited researches have evaluated the dry needling impact on less prevalent musculoskeletal conditions including plantar fasciitis[31] and

temporomandibular joint dysfunction.[32] There has been no previous research on dry needling in the subjects of patellofemoral pain syndrome. Thus, the primary objective of this study was to explore the immediate effects of dry needling among individuals with myofascial trigger points due to patellofemoral pain syndrome. Post intervention improvement was examined on Knee Society Score test.

The current study investigated the immediate response of subjects having patellofemoral pain syndrome to a single treatment session of dry needling therapy. This was the probable limitation of the present study as the results were evaluated at 72 hours of intervention. Whereas many other studies have reported the results of their randomized trials with weekly or monthly follow up period.[33,34,35]

The conflicting results were described by two literature studies that were exploring the effects of acupuncture needling in the patients having anterior knee pain. No published study has been seen targeting dry needling in the patellofemoral pain syndrome patients. One study utilized the traditional acupuncture technique targeting the trigger points in low back area and the muscles around knee joint including vastus lateralis and medialis. The pain was reduced in the subjects which was noted at five-month post-treatment period.[36] The other study stimulated the proximal and distal sites of the knee joint twice a week. The reduction in pain was noted at six month follow up period with no significant differences.[33] However the interventional strategy used in the above studies was not exactly the dry needling, so it is not possible to compare the conclusions with our study.

Our study targeted the quadriceps femoris muscle for dry needling technique as patellofemoral syndrome is closely related to this weakened muscle group. Gain in muscle strength and function of quadriceps group plays good prognostic role and early rehabilitation of patellofemoral syndrome patients. A study proposed that needling the quadriceps group of muscles improve the peripatellar pain. Our study in accordance to that study targeted the vastuslateralis, medialis and rectus femoris muscle, hypothesizing the early rehabilitation, diminished pain and improved function associated with patellofemoral syndrome.

The study had some potential limitations being less patients recruited, and the study setting for the patient selection was a single hospital. Secondly, the study did not include follow up period as the results were calculated at 72 hour interval only. It could not be predicted whether the long term evaluation will have same results. The study did not include the control group for comparison. Future studies should target the other muscles involved in the patellofemoral syndrome that are gluteal, lateral rotators and trunk musculature. Additionally, multicenter studies should be done to increase generalizability of the results and dry needling to be used in conjunction with other specific treatment strategies like manual therapy and taping.

Conclusion

Dry needling cause's clinically significant reduction in pain and improvement in function of knee joint in the subjects with patellofemoral pain syndrome at 72 hours post treatment session. The immediate effects were studied but it is suggested that dry needling should be studied for its long term effects in patients with PFPS. Dry needling needs further investigation to be accepted as an isolated intervention for patients with Patellofemoral Pain.

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