# Effects of Stretch of Popliteal Fascia on Patellofemoral Pain Syndrome (Runner's Knee)

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**Abstract**

**Introduction:** The Patellofemoral pain syndrome (PFPS) also called Runner's knee is a very prevalent clinical condition that affects about 7% to 40% of active young adults and adolescents. The popliteal fossa is covered with popliteal fascia that performs as a one-layer aponeurotic sheet. For hamstring muscle, popliteal fascia can be defined as a three-layered architecture acting as a kinetic retinaculum. The aim of this project was to examine effects of stretch of popliteal fascia on patients having patellofemoral pain syndrome.

**Methodology:** Total of 30 patients participated, who were suffering from patellofemoral pain syndrome. The subjects were divided into 2 group and each of the group consisted of 15 participants, Group A was the Experimental Group which were given popliteal fascia stretch, and Group B was the Control Group which was given popliteal fascia stretch with hamstring stretch. The improvement in pain was measured by Visual Analogue Scale (VAS) and to assess the anterior knee pain Kujala Scoring Questionnaire was measured.

**Result:** VAS score which implicated pain was reduced in the control group as compared to experimental group. Similar findings were seen in KUJALA Scoring Questionnaire, the control group had better results in functionality as compared to the experimental group.

**Conclusion:** Popliteal stretch was not an effective treatment for patellofemoral pain syndrome as there was no significant difference in Pre and Post data of pain (VAS), similar finding was founded in Kujala Scoring Questionnaire. During the evaluation, a personalized multi modal management program is needed, which focuses on targeting patient's functional limit as well as specific impairments.

**Keywords:** Patellofemoral pain syndrome, popliteal fascia, hamstring muscle, popliteal fascia stretch

## Introduction

The Patellofemoral pain syndrome (PFPS) also called Runner's knee is a very prevalent clinical condition that affects about 7% to 40% of active young adults and adolescents[1]. Diagnosis of PFPS could be made by the presence of anterior or retro patellar knee pain which is associated with sitting for a prolonged period or weight-bearing movements that brings load on the patellofemoral joint such as ascending and descending stairs, squatting, jogging,

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kneeling, running, and jumping.[2] Studies have found that PFPS affects women double as men showing 3.8% in males and 6.5% in females.[3]

The popliteal fossa is covered with popliteal fascia that performs as a one-layer aponeurotic sheet. For thigh flexor muscles the fascia acts as a three- layered retinaculum and provides a secured channel for neurovascular structure in the lower limb. To ensure the flexors muscles remain in their original position, the popliteal fascia's superficial layer covering the thigh is tightly woven with biceps femoris' epimysium laterally and semimembranosus medially.

The Patellofemoral pain mechanism is due to tightness of the hamstring and popliteus muscles. For hamstring muscle, popliteal fascia can be defined as a three-layered architecture acting as a kinetic retinaculum. "Retinaculum" is described as a transverse thickening that is localized happening in the deep fascia which gets attached to bony prominence which is locally situated. The retinaculum keeps tendon that runs deep into them which would be pulled or bow out of their original position due to the activity of muscles.[4]

In two works of literatures, there is evidence there is a major link between tightness of hamstrings and PFPS.[5,6] Finding was significant tightness of hamstring. During an isometric contraction, there was an earlier contraction of lateral hamstring than the medial hamstring.[7] Tightness of the hamstring is a cause of PFPs as it can lead to pain as there is an increase of pressure behind the kneecap. There is increase in pressure between thefemur and patella as greater posterior force is placed on the knee due to tight hamstrings.[8]

All these factors lead to the suffering of patella, with greater stress and the structures which are supporting.There are 2 studies that recommend that stretching the tight muscles could be beneficiary.[5,6]

## Aim

The aim of this project was to examine effects of stretch of popliteal fascia on patients having patellofemoral pain syndrome (runner's knee).

## Objective

1. To assess the effectiveness of popliteal fascia, stretch on the Visual Analogue Scale (VAS) inpatients having Patellofemoral Pain Syndrome.
2. To assess the effectiveness of popliteal fascia, stretch on Kujala Scoring Questionnaire in patients having Patellofemoral Pain Syndrome

### Need of the Study

Study' need was no research on this topic yet and this research finds whether there was popliteal fascia stretch effects on patellofemoral pain syndrome or not as it is seen that there is tightness of hamstring muscles in PFPs and popliteal fascia acts as a retinaculum for hamstring muscle, so to see whether the stretch of popliteal fascia and hamstring stretch could reduce the patellofemoral pain.

## Methodology

**Study population:** patients having patellofemoral pain syndrome.

**Study Locale:** The patients of A+ Orthopaedics and Sports med centre, Delhi successfully participated.

**Sample size:** 30 participants

**Sampling Technique:** Chit-pull method

**Selection criteria-**

- Inclusion Criteria-
  1. Patients with patellofemoral pain syndrome
  2. 18-40 years' age[9]
  3. both female and male
  4. having pain in one or both the knees
  5. Visual Analog Scale pain intensity more than 3 or more.[10]
  6. Special test like Clark's sign and McConnell sign should be positive.[3]
- Exclusion Criteria-
  1. MRI or X-ray indicating knee pathologies like intra-articular or meniscal injury

2. Laxity or injury of any collateral or cruciate ligaments
3. Osteoarthritis of Knee[1]
4. Osgood Schlatter disease, jumpers knee[11]
5. any significant effusion of knee joint bursitis or tendinitis[11]
6. On clinical evaluation significant radiating pain from hip or lumbar spine, referring pain to knee[11]
7. recurrent dislocation or subluxation of patella.[8]

**Instrumentations**

1. Couch
2. Medium Size Towel
3. Low stool

**Outcome Measure**

1. Visual Analogue Scale (VAS)[12]
2. Kujala Scoring Questionnaire[13]

**Procedure**

1. The participants fulfilling the inclusion criteria were included in the study.
2. Before starting the treatment, a written consent form was taken from each of the participants regarding their consent to participate in study.
3. After that the demographic data was collected from participants.
4. The subjects were divided into 2 group and each of the group consisted of 15 participants each.

**Experimental Group (Group A)** which was given popliteal fascia stretch

**Stretch of popliteal:**

1. Patient in walk standing position, affected leg in front and unaffected leg at back, patient keeps its affected legs' forefoot on a step making sure his heels are touching the ground.[14]
2. Ask patient to little bit bent the knee and toes out slightly, after that rotate the leg straight, putting hands on knee then slowly bend and straight out the leg until a stretch is felt right behind the knee.

In each session patient was asked to maintain stretch for 20 seconds and perform 6 repetitions/ 1 set/ day.[14] This set was repeated 3 days/ week for 6 weeks.

**Control Group (Group B)** which was given popliteal fascia stretch with hamstring stretch. Control group received popliteal fascia stretch same as Group A, along with this hamstring stretch was given.

**Stretch of Hamstring:**

1. Patient in supine lying, patients place towel or strap across the affected foot.
2. Patient is suppose to hold the straps. The unaffected legs' knee bent.
3. Patient slowly extends the affected leg keeping knee slightly bent, patients raise leg slowlyuntil hamstring are stretched.
4. During initial phase the hold of stretch was 20 seconds, 6 repetition/ 1 set/ day.[15]

This set was repeated 3 days/ week for 6 weeks.

**Outcomes Variables:**

1. The pain measurement will be measured by the **Visual Analog Scale (VAS)-** it is self- assessing questionnaire compromising of 10 cm line in which 0 carries for no pain and 10 stands for maximum pain, in patients VAS reliability of PFPs usual pain is 0.60 to 0.79 and for worst pain 0.88.[12]
2. To assess anterior knee pain **Kujala Scoring Questionnaire**- it is a questionnaire of 13 items, for assessing the pain in anterior knee. It is the ability of the patients to perform activities like running, stair climbing, squatting etc.) and records if patient has any disabilities or symptoms like swelling, atrophy of thigh, limping). Total score is given from 0 to 100, in which higher the scores better the outcome. Anterior knee pain average score was 82.8, and for patellar instability 62.2 was average score[13].

- Independent Variables- Stretches of popliteal fascia and hamstring stretches
- Dependent Variables- Kujala Scoring Questionnaire and VAS

**Data Analysis**

On the first session, Kujala Scoring Questionnaire was filled by the patients which was evaluated on their functionality. In their last session, this scale was given again to check if there were any improvements. The pain was evaluated on the VAS scale. The Level of alteration in pain and symptoms was analysed on basis of the stretch of popliteus or stretch of popliteus with hamstring. To analyse if there was improvement in the study in pain as well as functionality, pre-data and post-data of the experimental group and control group were evaluated. The difference between the pre-data and post-data was also evaluated. In addition to that t- test wasalso done.

## Results

**Table 1: VAS Pre and Post Data**

| Evaluation of Experimental Group (Group A) | | |
|---|---|---|
| | Pre- VAS | Post- VAS |
| Mean | 6.066 | 4.933 |
| Median | 6 | 5 |
| Evaluation of Control Group (Group B) | | |
| | Pre- VAS | Post- VAS |
| Mean | 6.066 | 4.533 |
| Median | 6 | 4 |

**VAS Score:** The individuals treated in experimental group having VAS which were treated with popliteal stretch had PRE-VAS mean score of 6.066 whereas after 6 weeks it improved to 4.99, whereas the group B had mean score of PRE-VAS score was 6.066 which was improved to 4.533. So, its seen that Group B had better reduction in pain as compared to Group A.

**Table 2: Kujala Pre and Post Data**

| Evaluation of Experimental Group (Group A) | | |
|---|---|---|
| | Pre- VAS | Post- VAS |
| Mean | 75.73 | 77.86 |
| Median | 76 | 78 |
| Evaluation of Control Group (Group B) | | |
| | Pre- VAS | Post- VAS |
| Mean | 71.93 | 75.066 |
| Median | 73 | 76 |

**Kujala Score**: The individuals treated, experimental group treated with popliteal stretch had PRE- KUJALA mean score of 75.73 whereas after 6 weeks it improved to 77.86, having a difference of 2.133, whereas the group B had mean score of PRE-KUJALA score was 71.93 which was improved to 75.066 having a difference of 3.133, resulting in that Group B had better results.

**Table 3: Paired T-Test for VAS**

| Data of Group A | | |
|---|---|---|
| | **Variable 1** | **Variable 2** |
| Mean | 6.06 | 4.93 |
| Variance | 0.49 | 0.63 |
| Observation | 15 | 15 |
| Hypothesized Mean Diff. | 0 | |
| t Stat | 8.5 | |
| P(T<=t) One Trail | 3.35748E-07 | |
| t Critical One-Trail | 1.761310136 | |
| Data of Group B | | |
| | **Variable 1** | **Variable 2** |
| Mean | 6.06 | 4.3 |
| Variance | 0.63 | 0.40 |
| Observation | 15 | 15 |
| Hypothesized Mean Diff. | 0 | |
| t Stat | 11.5 | |
| P(T<=t) One Trail | 8.06008E-07 | |
| t Critical One-Trail | 1.761310136 | |

**Table 4: Paired T-Test For Kujala Score**

| Data of Group A | | |
|---|---|---|
| | **Variable 1** | **Variable 2** |
| Mean | 75.73 | 77.86 |
| Variance | 31.35 | 25.40 |
| Observation | 15 | 15 |
| Hypothesized Mean Diff. | 0 | |

| t Stat | -6.34 | |
|---|---|---|
| P(T<=t) One Trail | 9.05435E-06 | |
| t Critical One-Trail | 1.761310136 | |
| Data of Group B | | |
| | **Variable 1** | **Variable 2** |
| Mean | 71.93 | 75.06 |
| Variance | 47.35 | 53.06 |
| Observation | 15 | 15 |
| Hypothesized Mean Diff. | 0 | |
| t Stat | -7.59 | |
| P(T<=t) One Trail | 1.24522E-06 | |
| t Critical One-Trail | 1.761310136 | |

In this article paired t-test has been used to compare the mean of two groups as each individual in the 1st group has been appeared in 2nd group. The alpha (α) score was taken as 0.05.

PAIRED T-TEST FOR VAS DATA OF GROUP A- The PRE-VAS mean score of 6.066 whereas after 6 weeksit improved to 4.99, the P one tail is to know whether POST VAS score was improved or not, so the P value in Table-3 is 3.35748E-07, which means it's less than alpha score (0.05). This means we must reject the null hypothesis; it means that the average of post-VAS was more than the average of Pre- VAS.

PAIRED T-TEST FOR VAS DATA OF GROUP B- The mean of the PRE-VAS score was 6.066 which was improved to 4.533, the P one tail is to know whether POST VAS score was improved or not, so the P value in Table-3 is 8.06008E-09, which means its less than alpha score (0.05). This means we must reject null hypothesis; it means that the average of post-VAS is more than the average of Pre- VAS.

PAIRED T-TEST FOR KUJALA DATA OF GROUP A- The PRE-KUJALA mean score of 75.73 whereas after 6 weeks it improved to 77.86, the P one tail is to know whether POST KUJALA score was improved or not, so P value in Table-4 is 9.05435E-06, which means its less than alpha score (0.05). This means we mustreject null hypothesis; it means that the average of post-KUJALA is greater than the average of pre- KUJALA.

PAIRED T-TEST FOR KUJALA DATA OF GROUP B- The PRE-KUJALA mean score of 71.93 whereas after 6 weeks it improved to 77.066, the P one tail is to know whether POST KUJALA score was improved or not, so P value in Table-4 is 1.24522E-06, which means its less than alpha score (0.05). This means we mustreject null hypothesis; it means that the average of post-KUJALA is greater than the average of pre- KUJALA.

## Discussion

The study's aim was to find the stretch of popliteal fascia on patellofemoral pain syndrome. There were 30 participants divided into 2 groups, 15 each, which were categorized into Group A and Group B. The Group A was experimental group, popliteal stretch was given to them, and Group B was treated with hamstring stretch and received popliteal stretch same as Group A. Visual Analogue Scale and Kujala Scoring Questionnaire were two parameters used in this study.

In our study it was seen that the participants of age group 18-24 were only 13% and 86% of the population was between age group of 26-40.

We also observed that the female percentage 56% which was much greater than male percentage 43% participating in this study, similar findings was found in study by Lisa C White et.al that PFPs is verycommon in females but it is seen that males' hamstrings are tighter, and therefore there can be many reasons for this condition.

In our study, VAS score which implicated pain was reduced in the control group as compared to experimental group. Similar findings were seen in KUJALA Scoring Questionnaire, the control group had better results in functionality as compared to the experimental group, because it was seen that hamstring was tighter in individual with Patellofemoral Pain Syndrome and stretching of hamstring released the pressure behind the patella.[7]

It was found that the effectiveness of popliteal stretch with hamstring stretch was proven clinically effective but when analysed statistically it was proven insignificance maybe the protocol of 6 weeks was less to prove outcome if the protocol was taken

of 8-10 weeks it would have proven beneficiary another reason could be that the follow-up was not done properly. The expectations of future scope could be This study can be conducted in the future taking larger sample size and different outcome measure/variables can be used to see if it holds any significance. Also, it will be recommended that the study can be done in a longer duration of time to see if any changes can occur in the longer run along with this it will be recommended to take long term follow-ups.

PFPs patient presents with a broad variation of pathophysiology and impairment associated with them.[9] It is very crucial to assess individually each patient about their impairments, any functional limitations as well as restrictions due to activities.[17]

## Conclusion

Popliteal stretch was not an effective treatment for patellofemoral pain syndrome as there was no significant difference in Pre and Post data of pain (VAS), similar finding was founded in Kujala Scoring Questionnaire. Better results were found in patients treated with Hamstring stretch along with popliteal stretch. During the evaluation, a personalized multi modal management program is needed, which focuses on targeting patient's functional limit as well as specific impairments.

Ethical Clearance: Institutional Ethical committee of Amity University, Uttar Pradesh

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Conflict of Interest: Nil

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