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Functional Outcomes of Conservative Treatment of Recurrent Patellar Instability

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Abstract

Background: Patellar instability is a common orthopedic condition, particularly among young individuals and females. It is characterized by discomfort during knee flexion or sports activities and accounts for approximately 2-3% of all knee injuries. The incidence rate is 5.8 per 100,000 in the general population and 29 per 100,000 in the 10 to 17-year-old age group. Contributing factors to patellar instability include acute trauma, anatomical abnormalities, and muscle imbalances, which can lead to chronic instability and issues with the patellofemoral joint (PFJ).

Objective: This study aims to evaluate the clinical outcomes of conservative treatment in patients with recurrent patellofemoral joint instability using a combination of exercises targeting the vastus medialis oblique (VMO) muscle.

Methods: A prospective observational study was conducted between December 2023 and July 2024 involving 10 female patients (mean age 30 years) with recurrent patellofemoral joint

instability. Patients were treated with VMO strengthening exercises for six months. The functional outcome was assessed using the modified Lysholm knee scoring scale. Pre and post-treatment scores were compared to evaluate the effectiveness of the conservative management approach.

Results: All patients showed improvements in knee function after six months of exercise therapy. The average post-treatment scores indicated good to excellent knee function in the majority of the cases. Conservative treatment reduced pain, improved joint stability, and minimized the risk of recurrent dislocations.

Conclusion: Conservative management, including targeted VMO exercises, effectively improves knee function and reduces the recurrence of patellofemoral joint instability in non-traumatic cases. Surgical intervention remains necessary for severe or recurrent cases unresponsive to physiotherapy.

1. Introduction

Patellar instability is a common medical condition in which the patella bone comes loose from the patellofemoral joint; This could be a subluxation or a complete dislocation [1]. Their pain usually comes after sitting or walking for long hours or when they are involved in sports [2]. About 2-3 out of every hundred knee injuries are the result of patellar instability. Internal medicine cases in girls between 10 and 17 years are the highest, amounting to a rate of 29 per 100,000 people.[3]Many things can cause the patellar joint to be unstable, but mainly, it happens due to structural and mechanical disturbances affecting the PFJ; This condition can make the joint stay unstable while also leading to flatness on the side of the femoral trochlear. You are more likely to develop this condition if you have suffered from acute trauma, have trochlear dysplasia, uneven muscles, a distance between TT and TG, valgus or a femur deformity, mainly formed as anteversion [4].

A flat joint known as the patellofemoral joint consists of the part of the femur called the patellar surface and the rear area of the patella.[1]It is the sesamoid bone that is most clearly seen inside the body. It is shaped with the head on one end and the base curved on the other end [6]. Most individuals have a bone called the patella with three back surfaces: a medial facet, a lateral facet, and an oblique facet [7]. There is a vertical ridge separating the medial and lateral parts of the scapula. It is the quadriceps muscle tendon that keeps the kneecap in position. The patellar ligament attaches from the top of the patella to the tibial tuberosity and develops from a tendon of the quadriceps on the patella's distal end [8].

Treatment

Without treating instability, it will put continuous pressure on the PFJ, cause pain and discomfort and end up requiring joint surgery. Treatment for PFJ disorders includes restoring stability and function and reducing chances of future dislocations, helping the patient return to normal life.

For people experiencing a first-time dislocation without loose bodies or chondral injury, treating the injury conservatively should be an option and this usually includes anti-inflammatory agents, rest and immobilization for a few weeks, followed by physiotherapy exercises that mainly focus on the VMO muscles [10]. In up to two-thirds of primary patella dislocation cases, VMO injuries happen and this may lead to the atrophy of the VMO and cause the patella to start tracking and moving abnormally. Twelve to thirty percent of patients may experience a Recurrence. In terms of fixing patellar instability, the procedures used are separated into soft tissue work (performed on the lateral side, medial side and medial patellofemoral ligament) and bony procedures (oriented toward shifting the tibial tubercle or removing bony overgrowths). When there is no bony misalignment, repairs that compress or restore stretched or injured soft tissue around the joint, like MPFL repair, may be done alone; otherwise, soft tissue repairs and bony corrections can be combined [9]; for this reason, MPFL repair is widely used as the new standard for the main surgical treatment since almost every patellar dislocation leads to an MPFL tear [12]

2. Materials and methods

3.1 Patient and method

This is a prospective case series that involved ten Patients from 31 December 2023 to 15 July 2024. In the orthopedic department of AL Karama teaching hospital and private clinic, 0 males and 10 females were involved. Their mean age was 30 ± 11.9 (10—more than 50 years old).

3.2 Inclusion criteria

- Isolated patellofemoral joint instability was diagnosed by a senior orthopedic doctor.
- Any age
- Recurrent nontraumatic patellofemoral joint instability
- Positive Apprehension test

- Generalized joint hypermobility.

3.3 Exclusion criteria

- Traumatic patellofemoral joint instability.
- Knee Osteoarthritis.
- Inflammatory knee arthritis.
- Previous knee surgery.
- Had a fracture on the distal femur, other tibial head, and multiple ligament injuries.

3.4 Diagnosis

3.4.1 History

Patients are presented with chronic recurrent knee pain, chronic knee swelling, and giving way. None of the Patients had a history of traumatic knee injury or other preceding factors that would affect the knee joint.

3.4.2 Examination

Knee swelling, the existence of tenderness, instability in the knee, and limited movement were all tested in the patients. The apprehension test was used to analyse them, since it is very good at detecting patellar instability. A positive test is when the patient feels anxious because the knee may be dislocated or feels pain in the inner area of the kneecap while pressure is being applied by a doctor, in the supine position with the leg calm and the knee slightly bent.

The patellofemoral grind test was performed on the patient. Patients were told to lie down with their knees totally straight ahead. The thumb should rest above the patella. The patients were given instructions to focus on pushing down with their quads. The test is said to be inferior when you are unable to perform it properly or the patella slips.

For examining Generalised Joint Hyper-mobility (GJH), a doctor used the Beighton score and scored from 0_3 was usual and from 4_9 was considered to be positively Beighton and GJH.

3.4.3 Investigation

Imaging:

Routine knee radiograph, anterior-posterior, lateral, and skyline views. Looking for patella alta in the joint (figures 1 and 2).



Figure 1. X-ray image showing the knee joint.



Figure 2. X-ray image showing knee joint on AP.

Advanced imaging includes a CT scan and MRI of the knee joint, which were done for all 10 Patients. The radiologist requested Sagittal and coronal views to confirm the diagnosis and to look for PT- TG, Trochlear morphology, and MRI, which have been used to look for MPFL and medial Retinaculum attenuation (strength).

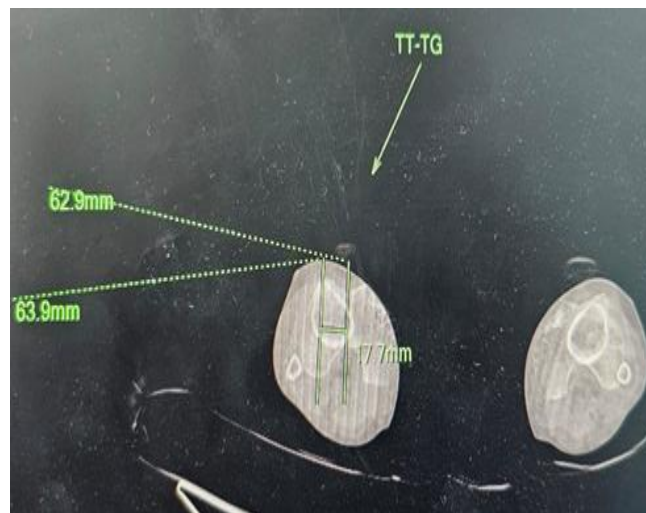


Figure 3. CT scan, axial view, measurement of femoral anteversion TT-TG distance.

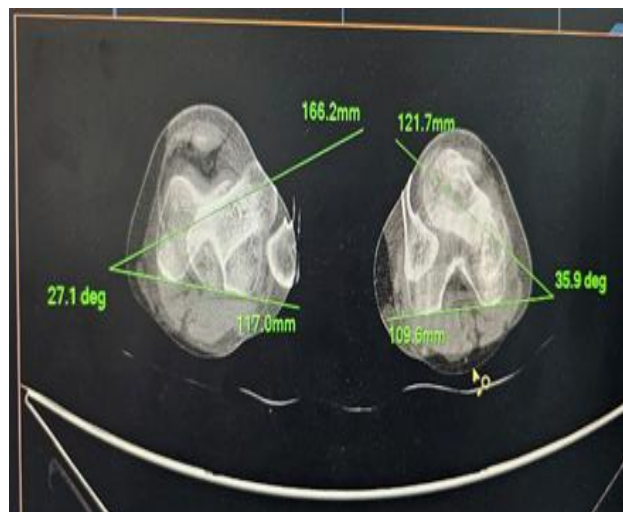


Figure 4. CT scan, axial view shows Femoral anteversion.

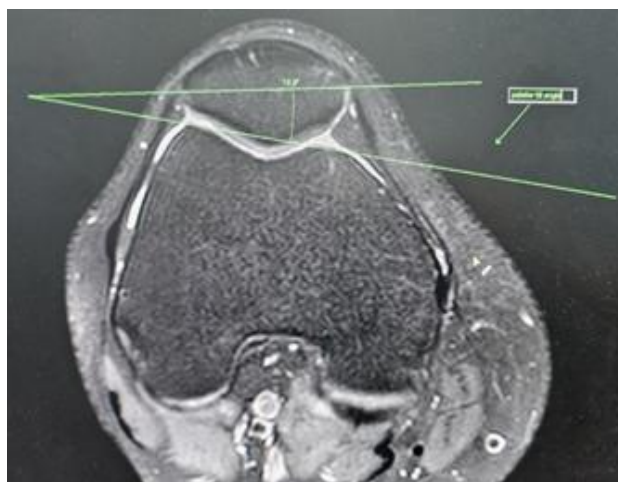


Figure 5. MRI, axial view of Patellar tilt angle.

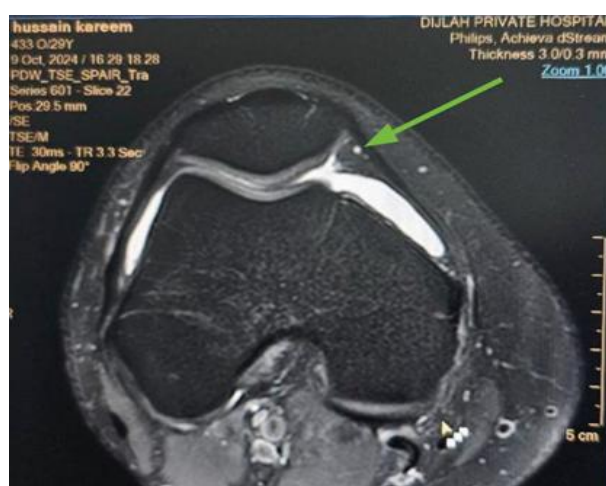


Figure 6. MRI, axial view of Attenuated MPFL.

The modified Lysholm knee scoring scale was used to evaluate all the patients and understand their functional status. To assess a patient's knee function, the Lysholm scoring scale asks eight questions: Limb has 5 points, support (walking aid) likewise has 5 points, locking requires 15 points, unsteadiness on the knee calls for 25 points, pain involves 25 points, swelling gives 10 points, climbing stairs carries 10 points and squats are also worth 5 points. Both the initial (baseline) and ultimate scores, 5 months later, were collected and studied to see the outcome of the conservative approach.

Understanding the Lysholm scale depends on the total score earned by the patient. So, the result of the game could be put into categories.

95-100 points: The knee works extremely well.

Good performance in the knee tests indicates a score of 84-94 points.

Considering people can attain up to 83 points, this shows you are satisfying critical key points in the area of knee function.

If your score is below 65, the knee functions poorly.

All the gathered information was entered and arranged in an Excel sheet. The SPSS software version 26 was chosen to analyze, show, and describe the data. When explaining numeric variables, we used SD and also mentioned the mean or minimum, and maximum values. For categorical factors, I used the numbers and percentages to represent how often things happened. To compare the mean results of two groups of continuous variables, we applied the independent sample student t-test and treated a P value of ≤ 0.05 as a significant finding in every test.

Ethical Consideration

The research proposal was fully discussed and approved by the ethical and scientific committee in the AL Karama Teaching Hospital. There was an oral consent form for each patient after they were fully informed about the goal of the study and assured that their information would be kept private and only used for the research.

3. Results

There were 10 patients (female) diagnosed with patellar instability (Mean 15 – 55 years) who underwent VMO muscle exercise included in our study to assess the functional outcomes pre- and post-exercise.

Table 1. The right patella was affected in 2, and the left patella was affected in 8.

Sex	Male	Female		
	0	10		
Age groups	10- 20	21-30	31-40	>40
	3	2	1	4
Occupation	Employee	Non-employee		
	3	7		
Activity level	No exercise	Little exercise	Intense exercise	
	8	1	1	
Site of lesion	Right	Left		
	2	8		

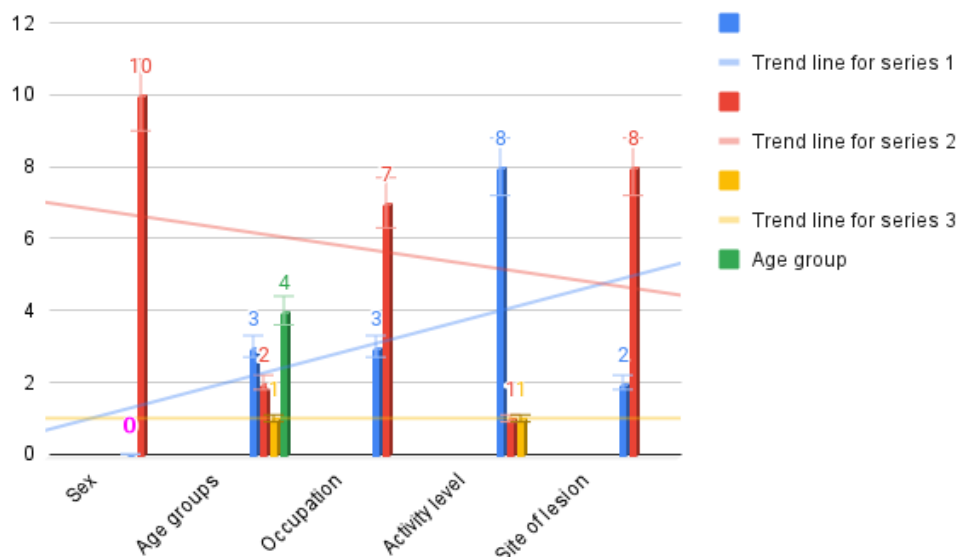


Figure 7. Demographics, Exercise Levels, and Patellar Instability Site in a Study on VMO Muscle Exercises.

Functional outcomes:

The mean $\pm$ SD of functional outcomes of patients with patellar instability after VMO exercise was 63 ± 6.169 , 74.5 ± 9.8008 , 80 ± 8.3666 , 84.2 ± 5.8080 , 86.4 ± 4.9486 in the 1,2,3,4,5 months respectively which was significantly higher in comparison to pre-exercise score (p-value = 0.000)

Table 2. higher in comparison to pre-exercise score (p-value = 0.000).

	Baseline	1M	2M	3M	4M	5M
MEAN	53.3	63	74.5	80	84.2	86.4
SD	9.0805	6.169	9.8008	8.3666	5.8080	4.9486
T-test		6.68	7.55	8.82	9.29	12.52
P-value		0.000	0.000	0.000	0.000	0.000

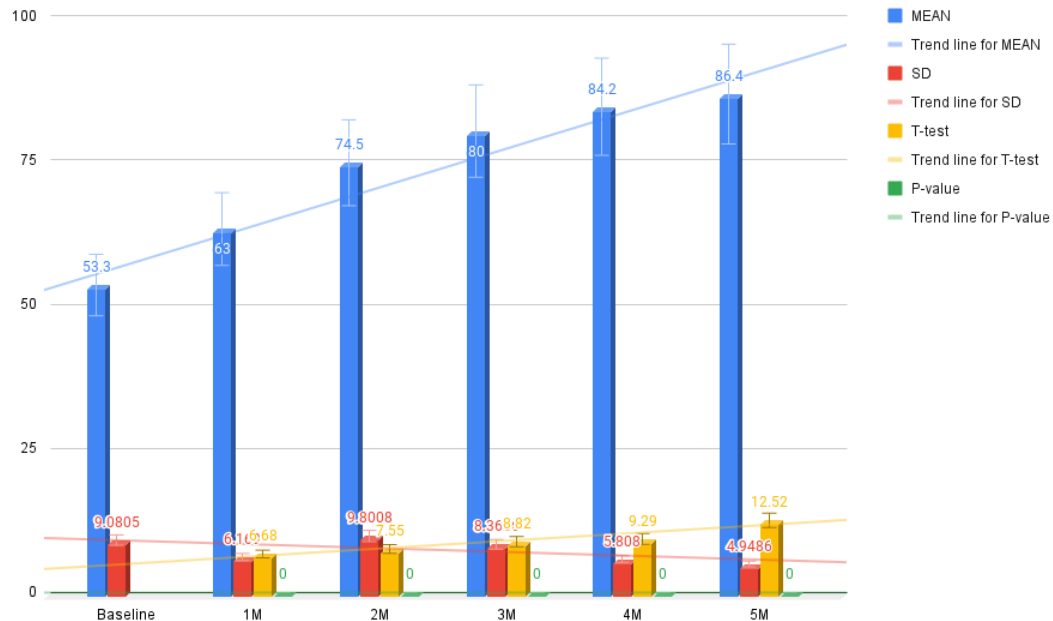


Figure 8. Demographics describes “Functional Outcomes Over 5 Months in Patients with Patellar Instability Following VMO Exercises: Mean, Standard Deviation, T-test, and P-value”

The mean $\pm$ SD of the Lysholm knee scoring scale Score post-exercise increased significantly between the first and second month (P-value = 0.001).

4. Discussion

Because patellar instability is related to several factors and is especially common in young females, it poses a significant problem for doctors. Commonly, unstable knees are a result of both physical problems and poor movement patterns that may lead to arthritis in the joint. The study points to the benefit of early and less invasive care for cases of recurrent non-traumatic patellofemoral joint instability. Three patients experienced an excellent outcome by reporting a high Lysholm score after doing VMO exercises; 6 showed good improvements, and 1 had fair results. Out of the 100 patients in the assessment, 90 experienced excellent or good results, which was determined to be statistically significant (P value < 0.05).

Studies done earlier also agree that the VMO and VL muscles play a major role in maintaining the stability of the patella. When these muscles are weak, there could be an issue with the vastus lateralis and the patella moving out of alignment. Specific exercises designed to strengthen the quadriceps (VMO) were successful in boosting the patients' abilities after three to five months. One of the main advantages here is that the modified Lysholm knee scoring scale reports on the knee's condition as well as the result of nonsurgical treatment. From the results, it seems that strengthening the muscles with physiotherapy is enough to manage patellar instability without patients needing surgical procedures.

Although, conservative treatments are still used as an option in this study. Even though things go well in most cases, patients with more severe deformities still face a risk of instability recurrence. When troubles with instability last and exercise doesn't repair the knee, doctors might consider performing an MPFL reconstruction or a tibial tubercle transfer.

All in all, the study points out that for the initial stage, knees should not be treated invasively, but options can be customized using an individual's features and level of instability. Some studies could look at the short and long-term effects of combining medications and support with surgery for IBD.

Koh and his team (2002) stated that when the patella is misaligned, the correction of the malalignment in both the vastus medialis and vastus lateralis is most significant. These authors agree with our study by reporting that exercises for these muscles are useful for improving clinical results and are therefore viewed as a non-invasive approach. [13]

Noyes et al. (2010) studied studies on the medical treatments of patellar instability. Most of those who received therapy (our group and others) found that they could use their knees much more normally and had fewer episodes of instability. Therefore, acting fast is essential in such situations. **Bae et al. (2015)** emphasized the importance of individualized rehabilitation protocols tailored to patients' anatomical variations. Their research highlights that a one-size-fits-all approach may not be practical, consistent with our observation that anatomical factors may influence treatment success. In our study, while most patients responded well to conservative management, those with significant structural issues may require surgical intervention for optimal outcomes. [15]

Lee et al. (2019) explored the role of biomechanical factors in patellar instability, noting that excessive lateral forces could exacerbate the condition. They suggested that strengthening the VMO could mitigate these forces and improve patellar tracking. Our findings corroborate this, as targeted exercises for the VMO yielded statistically significant improvements in knee function among participants. [16]

Feller et al. (2020) focused on long-term outcomes of conservative treatment in patients with patellar instability. Their study revealed that while short-term improvements were common, long-term outcomes varied significantly based on individual patient factors, including age and severity of instability; this reinforces our recognition of the limitations of conservative management, particularly in patients with more severe anatomical deformities, who may eventually require surgical options [17]

In conclusion, these studies collectively support the notion that conservative treatment, particularly VMO strengthening exercises, can effectively manage patellar instability. However, they also highlight the importance of considering individual anatomical differences and the severity of the condition. Further research is needed to explore the long-term outcomes of combining conservative and surgical treatments for more comprehensive care.

Limitations to the current study include:

- Small sample size (10 patients included in the study).
- Short follow-up period (5 months).

5. Conclusion

Conservative treatment, including selective exercises to strengthen the VMO muscle, has been successful in managing patients with recurrent nontraumatic patellofemoral joint instability. In this study, all patients showed a significant improvement of knee function and stability after 6 months' therapy, evaluated using the modified Lysholm knee scoring scale. The latter method was painless, improved stability, and reduced the possibility of recurrence.

6. Recommendation:

We recommend the following

- Increasing the number of studied patients (larger sample size).
- Longer duration of follow-up.

A comparative study between the control and studied groups for better results and a more accurate assessment of different prognostic factors that may affect outcomes.

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