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Non-Operative Rehabilitation for Patellar Instability: A Literature Review

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Abstract

Background: patellar instability is a common orthopaedic condition that can significantly impact an individual's quality of life and athletic performance. This literature review aimed to assess the effectiveness of non-operative rehabilitation in managing patellar instability. Non-operative rehabilitation including physical therapy aim to address the underlying musculoskeletal factors contributing to patellar instability. These treatment approaches typically involve exercises designed to strengthen the quadriceps, hamstrings and hip muscles and other methods like taping to enhance dynamic knee stability.

Methodology: A search was conducted across reputable database including PubMed, Goole Scholar and Cochrane. The inclusion requirements were articles published in last twenty years, from 2003 to 2023 and with entire English text. Articles prior to 2003 as well as those with an inaccurate abstract were excluded.

Result: the literature review revealed that non-operative rehabilitation approaches can give positive result in patellar instability.

Conclusion: Non-operative rehabilitation may offer positive outcomes in addressing patellar instability. Consequently, further large-scale studies are warranted to establish more robust evidence and guide clinicians in formulating evidence-based treatment protocols.

Keywords: patellar instability, non-operative rehabilitation, physical therapy, Literature review.

1. Introduction

In order to maintain pain-free and optimal function, stability is defined as the inability to keep the distal bone centred within the boundaries of the proximal bone. For the patellofemoral joint, this refers to the patella's inability to remain within the boundaries of the trochlea from 20 degrees of knee flexion¹. The majority of young adults with recurrent patellofemoral instability are female and in their second and third decades of life².

Types of Instability

Two main categories of instability exist.

1. Dislocation that happens when the distal bone is broken and extends over the proximal bone's boundaries, necessitating an external force to move it¹.
2. Subluxation that happens when the distal bone actively moves during movement but is moved past the usual boundaries of the proximal bone¹.

Symptomatic patella subluxation or dislocation related to trochlea occurs in the patients, most frequently in the lateral direction. Usingn the national electronic injury registry patellar subluxation and dislocation might be hard to distinguish from one another. Subluxation depicts the patella slipping out of the trochlea's usual tracking mechanism, whereas dislocation involves the patella totally slipping out of the groove. Patellar dislocation occurs 2.29 times per 100,000 person-years, according to waterman et al surveillance system (2003 to 2008). More than half (52%) of patellar dislocations happened during sports activity with patients between the ages of 15 and 19 experiencing the highest frequency of dislocation³. Instability of the patellofemoral joint is a complicated problem. Patellar stability is influenced by several factors, including leg position, the osseous structure of the patella

and trochlea, the integrity of the soft-tissue constraints, and the interaction of the nearby muscles. It is critical to comprehend these relationships and how to assess them in order to treat patellar instability⁴. Susceptibility to patellar dislocation is significantly influenced by the patellofemoral joint's morphology. Trochlear dysplasia, patella alta, lateralized tibial tuberosity, and lateral patellar tilt are significant risk factors³.

Biomechanics of Patellar Instability

The intricate interplay of muscles, ligaments, bone architecture, and lower extremity alignment has an impact on patellar mobility. The MPFL is the main soft-tissue constraint to the lateral translation of the patella during the first 20 to 30 degrees of knee flexion, making the retinacular patellofemoral ligaments one of the most crucial patella stabilizers. This ligament helps guide the patella into the trochlea during the initial phases of flexion because it is tautest when the knee is fully extended and the quadriceps are contracted. The least resistance to the patella's lateral translation occurs at 20 degrees of flexion, according to research by Amis and colleagues and Senavongse and colleagues, but resistance increases with increasing extension and flexion. Once the trochlea is engaged the greatest influence on stability as knee flexion develops is given by the patellofemoral joint compression produced by the rising force vectors of the quadriceps and patellar tendons in combination with patellofemoral joint geometry. The greatest barrier to lateral translation of the patella when it is tracking inside the trochlea is the slope of the lateral aspect of the trochlea. Studies have been done on how the muscles, namely the vastus medialis obliquus (VMO), affect knee stability⁵. It's crucial to consider the trauma's severity and age at when the patellar dislocation first appeared⁶.

Non-Operative Rehabilitation

Except in cases of concomitant patellar displacement or osteochondral fracture of the lateral femoral condyle, the majority of first-time traumatic patellar dislocations are treated non-operatively. After a patellar dislocation, physiotherapy treatments attempt to reduce swelling, encourage vastus medialis obliquus and gluteal activity, enhance knee range of motion, and strengthen quadriceps muscle in order to reestablish soft tissue balance and patellar stability^{4,7}. In order to improve the patient's result, edema must be treated as soon as possible because it impairs quadriceps function. There are few research on non-operative care for primary patellar dislocation. Various treatment plans are available, ranging from rapid mobilization without a brace to six-week cast immobilization in extension. The medial structures may recover more quickly with immobilization in extension, but stiffness may be an issue⁴. Physical therapy can assist patients with persistent patellar instability restore strength, range of motion, and proprioception⁴.

2. Aim of Study

The aim of this research is to comprehensively review and analyze the existing body of literature on non-operative rehabilitation methods for patellar instability.

3. Objective of Study

The objective of this literature review is to systematically examine and evaluate the effectiveness and outcomes of

non-operative rehabilitation approaches in the management of patellar instability. By analyzing the existing literature on conservative treatment methods this review aims to synthesize the current evidence and provide insights into the optimal non-operative approaches for patellar instability.

4. Hypothesis

Alternative Hypothesis (HO):

Non-operative rehabilitation is effective in reducing patellar instability and improving functional outcomes in individuals with patellar instability.

Null Hypothesis (HI):

Non-operative rehabilitation does not have effect on reducing patellar instability or improving functional outcomes in individuals with patellar instability.

5. Need of Study

Patellar instability is a challenging condition affecting patient's quality of life. While surgical interventions have been commonly used, non-operative rehabilitation options have gained interest. However, there is a lack of comprehensive evidence and consensus in the literature. This review aims to synthesize existing research on non-operative approaches, providing valuable insights to improve patient care and guide treatment decisions.

6. Methodology

Inclusion Criteria

- Articles published in English language.
- Studies conducted from the year 2000 onwards.
- Relevant literature from PubMed, Google Scholar and Cochrane data base.

Exclusion Criteria

- Articles published before year 2000
- Articles that do not meet appropriate methodological standards such as lacking proper study design and insufficient data.

Study Selection

- The initial search results will be screened based on titles and abstracts to identify potentially relevant articles.
- Full texts of selected articles will be reviewed to ensure they meet the inclusion criteria

7. Results

No;	<ul style="list-style-type: none"> • AuthorName • Year • Type of research 	<ul style="list-style-type: none"> • Interventions used 	<ul style="list-style-type: none"> • Result 	<ul style="list-style-type: none"> • Conclusion
1	Diana J. Osterhues (2004) Case study	A case study is done in a 49yr old female physical therapist. 5 week session of taping, IFC, ROM exercise and core stabilization training is done.	As the patient is a physical therapist she felt decrease in pain and improvement in stability and quadriceps activation with tape application.	It concludes that the case study supports the use of kinesio taping to reduce pain and quadriceps activity and stability while doing functional tasks.
2	Jenny McConnellet.al (2007) Review article	A review article was conducted on a case study combining, placebo taping and physiotherapy	The physiotherapy group which comprised targeted specific	It concludes that for minimising stretching of the extended medial tissue taping can be done. Muscle
		management which include stretching of soft tissue muscle training and improve distal control for patellar instability.	Weight bearing, VMO training as well as stretches for the anterior hip tissue showed superior response in functional activities than placebo group.	training can be helpful to control femoral position and seating of patella in trochlea.
3	Toby O. Smith et.al (2010) Systemic review	A systemic review which includes 29 articles from Pub Med, Google scholar Database was conducted for patellar instability.	There are drawbacks such as poor Description of physiotherapy intervention, poor assessment in each study. It is not possible to determine treatment efficiency.	There are many physiotherapy interventions reported for treating lateral patellar dislocation. The best is not yet identified, for which a well-designed RCT is required.
4	Shin-Jae Rhee et.al (2012) Review article	An article reviews which analysis the anatomy biomechanics radiological and clinical evaluation of patellar instability. Reviews both surgical and non-surgical intervention.	Bracing immobilisation, taping and activation of VMO and vastus lateralis are Helpful in conservative management. Lateral release	Review of article suggests that non operative techniques should continue to be the mainstay of care for both acute and recurrent cases.
			In MPLF reconstruction, trochleoplasty and patellar osteotomy for surgical management.	
5	Sameer Dixit et.al (2017) Review article	An article review which analyse non operative interventions which include soft tissue massage, cryotherapy, electrotherapy, immobilization and strengthening of VMO and gluteus muscle.	For patients with primary patellar subluxation and dislocation knee immobilisation and physical therapy can be helpful.	It was found that physical therapy shows positive result in initial stage of patellar subluxation and dislocation but for osteochondral injury and recurrent patellar dislocation surgery is considered.
6	Kaibo Zhang et.al (2020) A Systematic Review and Meta-analysis of Comparative Studies	The systemic review and meta-analysis was conducted to compare surgical and non-surgical methods for patellar dislocation. Total 6 studies were included, searched from PubMed, Embase, Ovid, Cochrane database for English language studies.	The survey has shown lower redislocation rate compared to non-surgical within 5 years of treatment but beyond 5 years KOOS and Kujala score were in surgical compared to non-surgical.	It is found that survey is superior to non-surgical for short term redislocation rate in adolescents but both methods did not sustain for long term result. Future high quality RTCs are required to conclude the result.

8. Discussion

The impact of patellar instability on individuals' daily activities cannot be understated. The patella plays a crucial role in the proper functioning of the knee joint, facilitating smooth movement and weight-bearing during various activities, when patellar instability occurs recurrent subluxation or dislocation can result chronic pain,

instability and limitation in mobility, this condition can hinder simple tasks, such as walking, stair climbing or sitting for extended period, significantly impairing overall functions. While surgical interventions have been a traditional approach for managing severe cases of patellar instability, it is not without its limitations. Operative management involves potential risks, longer recovery

periods and financial implications. Moreover, the success of the surgical procedure is also important. In 2005 Risto Nikku et.al did a 7 year follow up study in 127 patients on operative treatment for patellar dislocation and concluded that proximal realignment surgery for patellar dislocation is not recommended, which all making it essential to explore alternative treatment options like non-operative rehabilitation. By focusing on non-operative rehabilitation methods, this study aims to evaluate the effectiveness and potential benefits of conservative approaches in managing patellar instability. A case study done by Diana J. Osterhues et.al to evaluate the effect of kinesio taping for patellar dislocation found that kinesio taping is a useful method to reduce pain, it is also helpful to increase quadriceps activity and stability while performing functional activities. An article review conducted by Jenny McConnell et.al found that taping can be helpful to minimise the stretching of elongated medial tissues in patellar instability and muscle training which include VMO and gluteus muscle training, weight bearing and stretches of anterior hip tissues showed good result in functional activities but surgical assessment is may require to improve passive joint stability. Toby O. Smith et.al, conducted a systemic review, in which many limitations were found in the articles such as poor assessment of subjects and poor physiotherapy interventions and made a conclusion that many physiotherapy interventions are there for patellar dislocation but the best not yet identified and a well-designed RTC is required for that. An article review was done by Shin- Jae Rhee et.al to review both surgical and non-surgical management. The physiotherapy management including bracing, immobilization, activation of VMO and vastus lateralis are helpful and conclude that non operative management can be continued to be the mainstay of care for both acute and recurrent patellar dislocation. Sameer Dixit et.al conducted an article review to analyse the non-operative management and concluded that physical therapy which involve soft tissue massage, cryotherapy, electrotherapy, immobilization, bracing and strengthening of VMO and gluteus muscle can give a positive result on initial stages of patellar subluxation and dislocation but surgery is suggested for recurrent patellar instability. A systemic review and meta-analysis done by Kaibo Zhang et.al concluded that surgery is superior to non-surgical for short term redislocation rate in adolescents but both methods did not sustain for long term result.

9. Conclusion

Based on the review of six relevant literature sources, it can be concluded that non-operative rehabilitation can be a viable option for patients with patellar instability, provided a thorough evaluation is conducted, encompassing patient history, physical examination and structural involvement in the injury. However, it is essential to acknowledge the limitations of the review, as a more extensive and in-depth study could potentially reveal additional insights and strengthen the relevance of non-operative rehabilitation in the management of patellar instability. Future research endeavours should focus on conducting larger-scale studies to further elucidate the efficacy and benefits of non-operative rehabilitation approaches, contributing to the advancement of patient care in this domain.

10. Conflicts of Interest

The authors declare that there is no conflict of interest associated with the completion of this literature review.

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