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Effectiveness of Knee Joint Injury Treatments in the Prevention of Post-Traumatic Osteoarthritis

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Abstract

The purpose of this research and systematic literature review is to determine the effectiveness of conservative versus surgical intervention following anterior cruciate ligament (ACL) or meniscus injuries. Short and long term studies were evaluated to compare the prevalence and progression of osteoarthritis after joint injury. Sources included for review had research on ACL or meniscus injuries specifically. Other knee injuries, non-knee injuries and non-human subjects were excluded. After inclusion and exclusion criteria were implemented, 11 articles remained. Patients with ACL and meniscus injuries have a high prevalence of post-traumatic osteoarthritis (PTOA). Studies have shown that trialing physical therapy, specifically neuromuscular strengthening exercises, prior to surgical intervention greatly reduces the need for surgery, and that surgical intervention of ACL or meniscus injuries may increase PTOA prevalence due to additional joint injury. In other studies, surgical intervention of ACL injuries with or without formal physical therapy shows advantages in functional outcomes over physical therapy alone. However, patients with meniscus injuries are shown to have better functional and osteoarthritis outcomes when avoiding surgical intervention and opting for physical therapy instead. Keywords: Knee injury and Osteoarthritis Outcome Score, post-traumatic osteoarthritis, knee injury, osteoarthritis, outcomes, conservative treatment, and surgical intervention

Introduction

Knee injuries among athletes have become increasingly common and have unfortunately resulted in long-term consequences. Researchers estimate that around 25-50% of knee injuries will lead to PTOA due to significant inflammation caused by joint trauma (Evers et al, 2022). Today, nearly 27 million American adults ages 25 and over have symptomatic knee osteoarthritis, of which about 5.6 million are associated with PTOA of the lower extremity (Thomas et al., 2017). Patients with PTOA are often burdened by persistent symptoms, reduced mobility, and other life-altering complications due to their injury. To add to this, significant financial costs and work-related time losses are also reported following PTOA. Further research is underway to examine the potential preventive effects of common knee joint treatments, to reduce these potential burdens.

New preventive treatments for PTOA are also being researched and are currently in the preclinical phase, but no anti-inflammatory therapies for PTOA are yet available. In the meantime, it is important to understand which available treatments can improve patient outcomes in the long term. This study aims to compare the incidence of post-traumatic osteoarthritis after surgical and conservative treatments to determine if one form of treatment should be indicated over the other for the prevention or reduction of the incidence of PTOA.

Statement of the Problem

Many patients seek treatment for their osteoarthritic symptoms at their primary care visits. Currently, there are many options to manage symptoms, but none will directly prevent PTOA from developing. It is important to understand which treatments available could slow the progression of PTOA. This review will examine current research on knee joint injury treatments and their short- and long-term effects on patient outcomes.

Research Question

For patients with knee joint injuries, does conservative treatment influence the future risk of post-traumatic osteoarthritis compared to surgical intervention?



<https://ostrovit.com/en/blog/knee-pain-causes-prevention-and-treatment-which-diseases-cause-joint-pain-1648706943.html>

Literature Review

Knee joint outcomes < 10 years following ACL injury

- Patients who underwent surgical treatment reported superior quality of life and function in sports, and had superior knee symptoms, functional outcomes, knee-specific quality of life and health-related quality of life compared to conservative treatment (Ardern et al., 2017).
- Rehabilitation plus early ACL reconstruction did not significantly improve outcomes in young and active adults with acute ACL injuries compared to rehabilitation plus optional late reconstruction. However, rehabilitation with an optional late ACL reconstruction strategy reduced the frequency of surgical interventions needed in the long term (Frobell et al., 2010).
- There was a higher prevalence of knee osteoarthritis in those with a history of previous knee surgery (23% versus 4%, $p < 0.001$). Those with a history of ACL surgery specifically had a knee osteoarthritis prevalence of 24% ($p < 0.001$, Smith et al., 2017).

Knee joint outcomes \geq 10 years following ACL injury

- Patients undergoing ACL surgery subjectively remained asymptomatic in the long term based but showed significant osteoarthritis progression compared to their contralateral knee (Zaedhmohammad et al., 2022).
- ACL repair did not reduce or increase the risk of osteoarthritis in the long term or increase the subjective outcomes scores, but ACL repair lead to less knee instability (Meunier et al., 2006).

Literature Review (cont'd)

Knee joint outcomes < 10 years following meniscus injury

- Differences between surgical versus conservative treatments were minimal, and the only significant finding was that exercise therapy showed positive effects over surgery alone in improving knee strength in the short term (Kise et al., 2016).
- No significant differences in short-term outcomes of medial meniscus tears with surgical intervention or a sham procedure (Sihvonen et al., 2013).
- Neuromuscular strengthening exercises significantly improved pain, symptoms, function in daily living, function in sport and recreation, and quality of life. None opted for later surgery (Skou et al., 2018).
- Non-operative repair of meniscal injuries had a higher likelihood of poor clinical function, increased arthroplasty rates, and worsened arthritis of the knee at the five-year follow-up (Krych et al., 2016).

Knee joint outcomes \geq 10 years following meniscus injury

- Significant predictors of poor outcomes requiring a total knee replacement include ages between 40-50 ($p < 0.01$), malalignment ($p < 0.01$), lateral or total meniscectomies (both, $p < 0.01$) and female sex ($p < 0.01$, Aparato et al., 2021).
- Nearly 80.8% of those undergoing meniscal repair did not show signs of osteoarthritis progression at follow-up compared to 40% after meniscectomy ($p = 0.005$) and the preinjury activity level was maintained post-operatively in 96.2% of the meniscal repair group and 50% of the meniscectomy group ($p = 0.001$, Stein et al., 2010).

Discussion

There is no consensus yet as to which therapy, conservative or surgical, may improve PTOA outcomes or prevent PTOA altogether.

ACL injury outcomes

- Early repair of ACL tears lead to early stabilization and better functional and stability scores in the short term.
- Some studies also show that patients remain asymptomatic in the long term after surgical repair.
- Surgery may increase the incidence of PTOA due to additional joint injury.
- However, offering physical therapy first may decrease the need for future surgical intervention.

Meniscus injury outcomes

- Exercise therapy strengthens surrounding muscles leading to greater stability of the joint, which may also decrease need for future surgical intervention.
- These exercises may improve function and activity levels regardless of undergoing surgery.
- Meniscal repair showed better functional outcomes and less osteoarthritis progression than meniscectomy.

Applicability to Clinical Practice

- There is no current treatment recommendation for the prevention of post-traumatic osteoarthritis, so treatment should be determined on a case-by-case basis.
- It is important to consider the type of injury, severity of injury, the previous level of activity, the age of the patient and their overall health when deciding on treatment plan.
- With the lack of strong research on PTOA prevention, the treatment decision should continue to surround symptomatic relief and mobility improvement until further research can be carried out or new treatments become available.

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