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Review Article

A meta-analysis of observational research on the relationship between prior knee injuries and knee osteoarthritis

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Statistics

Figures	00
Tables	00
References	08

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Abstract

Background: Although knee injury has been linked to a higher chance of developing knee Osteoarthritis (OA), the amount of quantifiable risk varies greatly. Our goal was to thoroughly examine the connection between previous knee injuries and OA.

Methods: Between August and October 2010, six electronic databases were checked. The Odds Ratio (OR), 95% Confidence Intervals (CI), and relative risk estimates were taken from observational studies that met the inclusion criteria. Using the Egger's test and the funnel plot, publication bias was identified. Utilising the Cochran Q test and I2 statistic, heterogeneity was investigated. The heterogeneous data were combined using a random effects model, and the results were then presented using an OR. In order to investigate potential sources of heterogeneity, subgroup analyses were carried out.

Results: The meta-analysis includes twenty-four observational studies (20,997 individuals), including seven cohort, five cross-sectional, and twelve case-control studies. A total pooled OR of 4.20 (95% CI 3.11-5.66, I2=81.0%) was calculated. For specified injuries, such as ligament or tendon injuries, meniscus damage or meniscectomy, and fractures of the femur, knee, or lower leg (OR=5.95, 95% 4.57-7.75), compared to unspecified injuries (OR=3.12, 95% 2.17-4.50), there was a significantly different association between history of knee injuries and knee OA.

Conclusion: Regardless of the study design or definition of a knee injury, a history of knee injuries is a significant risk factor for the development of knee OA. The future preventative programme for lowering the risk of knee OA should include knee injury as one of the few modifiable/preventable risk factors.

Keywords: Knee injury, knee osteoarthritis, meta-analysis

INTRODUCTION

One of the main causes of pain and disability in older adults is knee Osteoarthritis (OA), a significant public health issue. There are a number of risk factors, including knee injury, that can lead to the development of knee OA. Prospective research suggests that having experienced an acute knee injury in the past may increase the chance of developing both radiographic knee OA and clinically severe symptoms of knee OA. Other studies have linked cruciate ligament and meniscal injuries to a greater prevalence of future OA in the knee. These local biomechanical injuries may interact with underlying risk factors [1].

According to a retrospective cross-sectional study that assessed patients with complaints at various points after the event, individuals who suffered serious knee injuries at an older age develop knee OA more quickly than those who suffered injuries at a younger age. Furthermore, post-meniscectomy knee OA has also been linked to obesity. It is obvious that a knee injury severe enough to harm joint structures can compromise structural integrity, change joint biomechanics, put stress on joint tissues, and raise the chance of developing knee OA. Despite the scientific explanation for knee OA being credible, epidemiological research have demonstrated that the intensity of the connection with knee injury varies widely [2].

The reported Relative Risk (RR) estimates for the relationship between a prior knee injury and the development of knee OA varied from 0.1 to 95.2, possibly illustrating the difficulties in determining the extent of joint injury and the different definitions of trauma or injury. To measure the relationship between injury history and knee OA, we performed a meta-analysis of observational research (cohort/prospective, cross-sectional, and case-control studies) [3].

LITERATURE REVIEW

STUDY DESIGN

Duplicate or redundant articles were removed, and all references collected from each database were exported to Endnote's version X.0.2 referencing database. Then, selected abstracts were checked for relevancy after article titles had been screened. Then, the entire texts of the accepted publications were retrieved and examined.

The following requirements had to be met for studies to be included:

1. Epidemiological studies (cohort/prospective, cross-sectional, or case-control study) examining the relationship between prior knee trauma and the development of knee OA.
2. Any definition of prior knee trauma or injury to include both unspecified and specified injuries such as cruciate and/or collateral ligament injuries; meniscus injuries; or fracture of the tibia, fibula, or subchondral bone.
3. Knee OA is the only joint examined and defined using radiographic findings.

Studies on twin or familial studies, reviews or editorials, case reports, randomised control studies, or cohorts on drug trials as well as musculoskeletal conditions other than Osteoarthritis (OA) were also omitted. Studies that were eligible but lacked a sufficient control or referent group could not be used to estimate risk. Therefore, for these studies, the majority of the participants are OA patients (with no non-OA controls) or cohorts with identified injuries at study recruitment, such as meniscal injury or acute cruciate ligament injuries.

DATA EXTRACTION

Data extraction forms specific to the study design were used to record extracted data on study characteristics (source of population or setting, sample selection, total number of study participants, age-mean or range of participants, gender ratio, BMI mean/range, and country of study); clear definition of knee injury [defined arthroscopically, by Magnetic Resonance Imaging (MRI) or self-report] and whether it was a primary exposure variable; definition of OA; reported or unreported OA; and whether the study population was male. We further divided research into categories based on the many ways that knee injury or damage are defined. For instance, some studies defined past knee injuries as those serious enough to prevent weight bearing or necessitate a doctor's consultation, such as those caused by severe twisting of either knee with a sprain or swelling lasting longer than one week. It is therefore likely that these studies considered both less serious and serious injuries [4].

As a result, we looked at studies that gave risk estimates or offered information on significant, specific knee injuries such meniscal, ligament cruciate, etc. separately from those that did not provide a clear definition of suffered injuries. It was also noted if the researchers had run an adjusted statistical analysis to account for the confounders that they thought were necessary. Even if an adjusted analysis was conducted, unadjusted risk values were still reported [5].

DISCUSSION

Knee OA is significantly influenced by a history of knee injuries. However, there is a wide range of risk estimates that have been published for knee OA, which is partly due to the limited sample size and challenges in characterising and quantifying the degree of injury. The results of this meta-analysis, which included 24 observational studies with almost 21,000 participants, revealed a four-fold increased risk of knee OA in those with a history of knee injury.

The definition of prior knee injury varied significantly between research. Further sensitivity analyses were performed, and the results showed that the pooled estimates were significantly higher for the 10 studies that primarily reported particular injuries, such as ligament or tendon damage, meniscus damage, or menisectomies, as compared to studies that did not describe knee injuries. Additionally, it would appear that the component studies' method of measuring knee damage contributed to the results' heterogeneity. It is challenging to determine the severity of knee injuries sustained within particular research due to the dearth of eligible studies that determined the precise site or degree of injury [6].

However, pooling data from four studies that reported the risk for knee OA from self-reported meniscectomy or MRI defined meniscal damage (data not shown) gave comparable high risk estimates (OR=6.91; 95% CI 4.56-10.49, I2=69%, P for bias 0.249), further indicating that the type and severity of injury strongly influence quantifiable risk estimates.

Studies that look at knee injury as a risk factor for knee OA may be complicated by gender. This was clear from the high risk estimates generated by pooling studies, regardless of gender, but when subgroup analysis was done by gender, the OR between men and women was significantly different. Men seemed to have stronger correlations between knee injuries and OA than women did. The cause of the damage is one potential reason for this finding. It's probable that men were more likely to report knee injuries incurred while engaging in recreational or job activities that put them at risk for direct joint damage, such as weight-bearing knee bending at work or football [7].

However, it is important to use caution when interpreting differential ORs for men and women due to the small number of papers included in the meta-analysis. Overall, across all study designs, there was a statistically significant positive connection between a history of knee injuries and knee OA. Even after stratifying the analysis by research design, there was no trace of publication bias, indicating that the publication of studies with favourable findings was not likely to have influenced these results. However, case-control studies showed greater pooled estimates compared to cohort and cross-sectional studies. This is because the RR for common diseases (such knee OA) in the community is frequently overestimated by the OR from the case-control research design [8].

There are a few restrictions on this study. First off, the overall pooled risk estimate may be deceptive and as such should be evaluated with care due to variations in study designs, gender, definitions of knee OA, and injury definitions. In order to investigate potential sources of variation, we thus conducted a variety of stratified analyses. Our results indicate that heterogeneity measures were probably caused by the definition of knee injury, particularly in the female gender and kind of knee injury.

Second, the criteria and severity of prior knee injuries varied greatly between studies. For instance, the majority of studies mentioned "unspecified injuries," which were probably both less serious (such as minor "twisting" and "sprain") and serious knee insults requiring medical attention, like torn ligaments or tendons and meniscus injuries. It is highly likely that these variations are what cause the high level of variability. Furthermore, the impact of knee injury on OA may be understated due to improper characterization of the exposure. Our subgroup study, which showed that well-defined knee injuries had higher risk than poorly-defined injuries, supports this. Additionally, specific knee injuries could be easier to remember because they might be more severe than general knee injuries.

Last but not least, numerous investigations of knee injuries and the risk of OA have been conducted in cohorts of damaged patients without adequate control groups. These studies were not included because it was impossible to determine risk estimates from them. Systematic reviews reporting on knee OA after injury, however, might enhance our investigation.

CONCLUSION

As a result, our findings demonstrate that a history of knee injuries is a significant risk factor for the onset of knee OA. Prophylactic measures may be able to prevent many knee injuries, which suggests that increasing efforts to lessen accidents at home or at work may help lower the risk of developing knee OA in the future.

References:

1. *Quill GE. The use of a second-generation intramedullary nail in the fixation of difficult ankle and hindfoot arthrodesis. Am J Orthop. 1999;1:23-31.*
2. *Taylor BC, Hansen DC, Harrison R, et al. Primary retrograde tibiotalocalcaneal nailing for fragility ankle fractures. Iowa Orthop. J. 2016;36:75.*
3. *Kuhn S, Appelmann P, Mehler D, et al. Retrograde tibial nailing: a minimally invasive and biomechanically superior alternative to angle-stable plate osteosynthesis in distal tibia fractures. J. orthop. surg. res. 2014;9(1):1-8.*
4. *Massari L, Gildone A, Zerbinati F. Tibiotalocalcaneal arthrodesis by retrograde intramedullary nailing as a 'salvage procedure': clinical, radiographic and baropodometric evaluation of three cases. Foot ankle surg. 2002 ;8(1):3-12.*
5. *Bennett GL, Cameron B, Njus G. Tibiotalocalcaneal arthrodesis: a biomechanical assessment of stability. Foot ankle int. 2005;26(7):530-6.*
6. *Barber FA. Tripled semitendinosus–cancellous bone anterior cruciate ligament reconstruction with bioscrew fixation. Arthrosc. J. Arthrosc. Relat. Surg. 1999;15(4):360-7. [Google Scholar*
7. *Sayampanathan AA, Howe BK, Bin Abd Razak HR, et al. Epidemiology of surgically managed anterior cruciate ligament ruptures in a sports surgery practice. J. Orthop. Surg. 2017;25(1).*
8. *Gamboa JT, Shin EC, Pathare NP, et al Graft retensioning technique using an adjustable-loop fixation device in arthroscopic anterior cruciate ligament reconstruction. Arthrosc. tech. 2018;7(2):e185-91.*