

**Ajuied A, Wong F, et al. Anterior Cruciate Ligament Injury and Radiologic Progression of Knee Osteoarthritis. A Systematic Review and Meta-analysis. Am J Sports Med 2013;42:2242-2252.**

Design: systematic review and meta-analysis of observational and controlled clinical trials

Purpose of study: to review the literature concerning the progression of osteoarthritis (OA) following ACL injury using the Kellgren-Lawrence classification system only

PICOS:

- Patient population: any patients with ACL injury
- Interventions: ACL reconstruction for some of the studies with control groups; some studies did not have control groups
- Comparison: for most studies, the radiographic appearance of the contralateral knee at followup was the basis for comparison with the injured knee
- Outcomes: degree of OA using the Kellgren-Lawrence (K-L) criteria on x-ray of the ipsilateral knee and of the contralateral knee
  - o Grade 0=normal
  - o Grade 1=doubtful significance
  - o Grade 2=minimal changes
  - o Grade 3=moderate changes
  - o Grade 4=severe changes
- Study types:
  - o The only absolute requirement was that all studies had to have 10 years of followup from the time of ACL injury and had to be published in English
  - o All prospective and retrospective designs were eligible

Study selection:

- Databases included PubMed, EMBASE, AMED and MEDLINE from inception through end of Sept 2012
- Two authors independently screened and analyzed articles for inclusion and extracted data for the K-L OA classification
- A random effects model was used to pool data across studies

Results:

- 9 studies with a total of 615 patients with mean ages from 22 to 41 fulfilled the inclusion criteria
- All patients had their ACL injury diagnosed clinically, radiologically, arthroscopically, or by a combination of these 3 methods

- 475 patients had radiological assessment of the knee opposite their ACL injured knee for use as a control
- For the comparison of an injured knee with an uninjured knee, data from 6 studies with 972 knees were combined to yield an estimate that radiographic OA of any K-L grade was 3.89 times as frequent in the ACL-injured knee than in the contralateral knee, with a 95% confidence interval (CI) for that relative risk (RR) from 2.72 to 5.57
  - o A separate analysis of ACL-reconstructed knees vs. uninjured knees pooled data from 5 studies to estimate a RR of 3.62 with a 95% CI from 2.40 to 5.47
  - o For nonoperatively treated ACL-injured knees vs. uninjured knees the estimated RR from two studies was 4.98 with 95% CI from 2.45 to 10.15
- In ACL injured knees, the majority of radiographic OA (79.7%) was minimal and 20.3% was moderate or severe (Grade III or IV), and separate analyses of moderate to severe K-L III and IV were made in parallel with the above
  - o For all ACL injured knees, the RR for moderate-severe OA compared to the uninjured knee was 3.84 (95%CE 1.84-8.01)
  - o For ACL reconstructed knees, the RR was 4.71 (95% CI 2.98-7.45)
  - o For nonoperatively managed ACL injuries, the RR for moderate to severe OA was statistically non-significant compared to the opposite knee (RR of 2.41 with 95% CI from 0.15 to 39.29)

#### Authors' conclusions:

- 10 years after an ACL injury, the risk of radiographic OA increases approximately fourfold compared to the opposite uninjured knee, both for minimal OA and for moderate-severe OA
- Patients whose ACL has had reconstructive surgery may return to pivoting and cutting sports, possibly increasing their risk of developing moderate to severe radiologic changes
- The analysis is incomplete because only studies reporting the Kellgren-Lawrence classification of OA were included, but this system was selected to achieve consistency and because it is less likely to over diagnose the severity of OA changes
- The majority of studies used patellar rather than hamstring grafts; since patellar grafts are often overtightened, they may be implicated in the premature onset of knee OA, and this could represent a confounder
- There needs to be an emphasis on the use of a single validated radiographic grading system when evaluating followup studies of OA

#### Comments:

- The risk of OA in nonoperated knees cannot be compared with the risk in operated knees, because in some of the included studies, patients over 40 were selected to have

nonoperative management of their ACL injury, confounding the association with development of OA

- Therefore, it cannot be inferred from these studies that ACL reconstruction reduces the risk of developing OA, because the RR of OA in operated and nonoperated knees are not comparable
- The comparison of injured and uninjured knees does not require that the studies be randomized to support an inference of a strong association with ACL injury and later development of OA
- From other sources, there has been some evidence that ACL reconstruction is associated with lower rates of subsequent meniscal surgery; this is a very indirect surrogate for the risk of OA, and it is not unreasonable to consider the lowering of the risk of OA as a consideration in doing surgery for an ACL injury in patients who are appropriate candidates

Assessment: An adequate meta-analysis of observational studies which support strong evidence that an ACL injury increased the ten-year risk of developing Kellgren-Lawrence defined osteoarthritic changes compared to the uninjured knee, and that this risk is approximately fourfold both for minimal OA and for moderate to severe OA