Systematic Review

Cross Pin Versus Interference Screw for Femoral Graft Fixation in Hamstring Anterior Cruciate Ligament Reconstruction: A Systematic Review and Meta-analysis of Clinical Outcomes

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Purpose: To compare the effectiveness of a cross pin and interference screw for femoral graft fixation in primary anterior cruciate ligament reconstruction (ACLR) and provide an appropriate reference for orthopaedic surgeons. **Methods:** The Medline, Cochrane Library, Web of Science, Scopus, and PubMed databases were searched in March 2016, and comparative trials using cross-pin and interference screw devices for femoral graft fixation in primary hamstring ACLR with clinical outcome measurements were included in the review. Trials with no controlled groups, hybrid fixation, no clinical outcomes, or follow-up of less than 1 year were excluded. The quality of the included studies was assessed with the Cochrane Back Review Group 12-item scale. Abstracted data were pooled with fixed or random effects depending on the detected heterogeneity. The outcome measures were the scoring system and physical examination findings, including the Lysholm score, International Knee Documentation Committee score or grade, Tegner score, negative Lachman test, negative pivot-shift test, and instrumented side-to-side anterior-posterior laxity difference. **Results:** All the studies reviewed were of prospective design. Within the cross-pin group, patients who underwent hamstring ACLR showed a significantly smaller instrumented side-to-side anterior-posterior laxity difference when compared with interference screw fixation (weighted mean difference, 0.38 mm [95% confidence interval, 0.08-0.67 mm]; $P = .01$), whereas the results of a negative Lachman test and negative pivot-shift test were comparable. Outcomes regarding the scoring system did not reach a significant difference between the 2 groups. **Conclusions:** The statistically decreased instrumented side-to-side anterior-posterior laxity difference achieved by cross-pin transfixation appears to be of limited clinical significance when compared with interference screw fixation in primary hamstring ACLR. Clinically, the performance of cross-pin devices did not show a significant advantage over that of the interference screw for femoral graft fixation in hamstring ACLR. **Level of Evidence:** Level II.

Anterior cruciate ligament reconstruction (ACLR) is one of the most common procedures performed in orthopaedics. Hamstring autograft reconstruction has been used more frequently than bone–patellar tendon–bone autograft to address concerns over anterior knee symptoms, extension deficits, postoperative morbidity, and more versatility of fixation methods.[1,2] Graft fixation has been proposed to play an essential role in the mechanical behavior of the graft during the early postoperative period; therefore, it is deemed a crucial factor for the timing of rehabilitation and patients' functional recovery.[3-5]

A major concern with the use of hamstring autograft is that a mature histologic transition at the bone-tendon interface can take up to 12 to 24 weeks.[6,7] Ideal fixation needs to withstand the stresses on the graft resulting from an early rehabilitation protocol and hold the graft in place until its biological incorporation into the bone tunnel occurs. However, currently, no gold standard has been identified for graft fixation in hamstring ACLR.

Available options for the femoral side mainly include compression fixation with an interference screw,[8] suspensory fixation with a cortical button,[9] and

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transfemoral fixation or transfixation by cross pins.[10] These techniques are all clinically available, and the choice of fixation devices is surgeon dependent in most cases.[11] Biomechanical studies have shown that cortical button fixation was associated with a high ultimate failure load but also showed the inferior stiffness of this construct.[12,13] According to a systematic review by Han et al.,[14] intratunnel compression fixation with an interference screw provided an earlier release to full weight bearing and jogging or running when compared with cortical button fixation. Graft-tunnel motion, which is interpreted as the bungee-cord effect and windshield-wiper effect,[15-17] may have compromised bone-tunnel integration,[14,18] leading to relatively inferior results of cortical suspensory fixation. As for interference screws, they reduce the graft working length and avoid graft-tunnel motion by solid fixation close to the joint line.[19] However, interference screws are not devoid of problems. Graft slippage, graft irritation, and even laceration caused by metal screws could result in clinical failures in some cases.[20,21] Slipping of the graft might be caused by the micromotion between the graft and the interference screw within the bone tunnel under cyclic loading, which would eventually lead to secondary lengthening and loosening of the graft.[13,22] On the other hand, biomechanical analyses have shown that cross-pin devices were associated with a higher failure load and greater stiffness than those of the interference screw.[5,23-25]

As a relatively recently developed fixation method,[10] cross-pin devices have been compared with interference screws for femoral graft fixation in ACLR by several studies in recent years.[26,27] However, a comprehensive literature review regarding the topic is

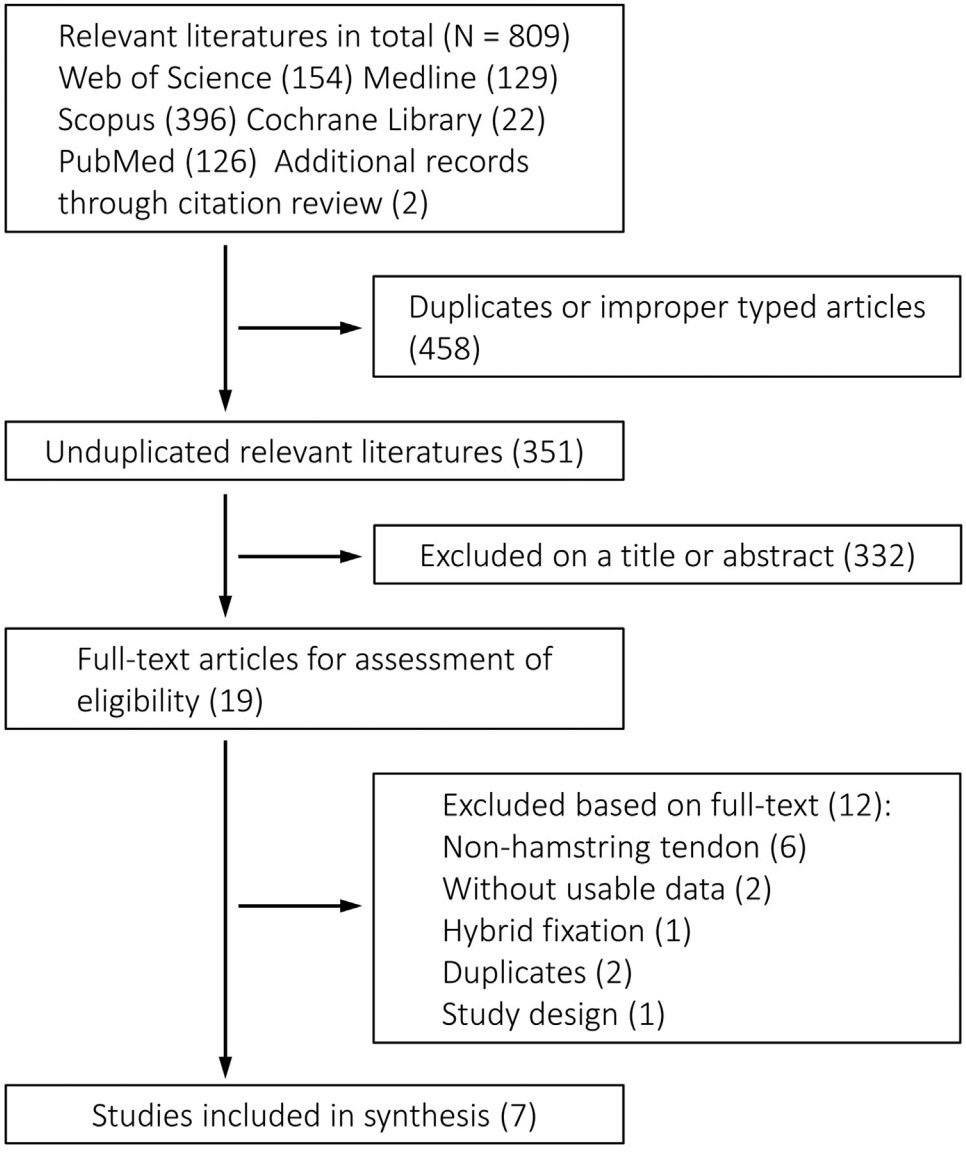

Fig 1. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) flowchart of literature search.