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The Knee



Review

Early or delayed reconstruction in multi-ligament knee injuries: A systematic review and meta-analysis

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ABSTRACT

Background: Whether early or delayed surgical intervention in patients with multi-ligament injuries results in better outcomes, is of current and controversial debate.

Purpose: The purpose of this study was to perform a meta-analysis comparing early versus late surgical treatment of multi-ligament knee injuries.

Methods: We performed a systematic review of Medline, Embase, Scopus, and Google Scholar to identify relevant studies in the English and German literature. Eligibility criteria included studies comparing early or delayed surgical interventions for multi-ligament knee injuries, with a minimum follow-up of two years, reporting the primary clinical outcome using a validated functional scoring system and range of motion. Exclusion criteria were patients treated with multi-trauma, head injury, non-union, lower extremity fractures, or a documented history of previous knee injuries. Publication bias was assessed by funnel plot, and the risk of bias was established using the Cochrane Collaboration's risk of bias tool. Heterogeneity was assessed using χ^2 and I_2 statistic.

Results: Eight studies (n = 260 patients) were included in the analysis. 149 patients were treated early with a mean of 10.6 days; 111 patients were treated late with a mean of 294 days. The pooled estimate for clinical outcome demonstrated that early surgery resulted in significantly higher Lysholm scores (SMD 0.669, 95% CI: 0.379 to 0.959, p = 0.0001, I_2 = 0%). Thirty-one per cent of all patients with early surgery had a normal or near normal knee, whereas only 15% of patients with late reconstruction reported the knee to be normal or near normal. The pooled estimates for total ROM did not demonstrate a significant difference between the groups (SMD 0.113, 95% CI: -0.271 to 0.498, p = 0.564, I_2 = 35.57%).

Conclusions: The results of this meta-analysis suggest that early surgical intervention in multi-ligament injuries of the knee produces a significantly superior clinical outcome, compared to late reconstruction. Although an overall trend of improved total range of knee motion was also demonstrated, this was very small and unlikely to be clinically relevant.

Level of evidence: Level 4; Systematic review and meta-analysis.

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1. Introduction

Knee dislocations and their associated ligamentous disruptions are potentially devastating injuries, and possibly more common than previously thought [1,2]. They account for 0.072 of all musculoskeletal trauma per 100 patients, with 17% of these open injuries and 83% closed injuries [3]. Despite their severity, the incidence is believed to be underestimated as a result of spontaneous reductions and missed diagnoses [4,5]. Treatment of these injuries is often complicated by associated vascular and neurological damage [6]. In cases with acute arterial injuries an immediate vascular repair is necessary, and the unstable knee is frequently stabilized temporarily with a spanning external fixator [1].

However, in patients with no associated popliteal artery damage, the timing of surgical reconstruction remains controversial. Early surgical intervention is advocated by many authors, with a general recommendation that reconstruction should be performed within the first three weeks [7–9]. Proponents of early surgical reconstruction have reported better functional and clinical outcomes, and have suggested the risk of further chondral and meniscal injuries is reduced [7,10,11].

Historically, many authors reported that early surgery resulted in stiffness, arthrofibrosis, and a reduced rate of return to work [12–15]. In contrast, delayed surgery allowed for restoration of pre-operative knee range of motion, recovery of soft tissues with resolution of swelling, and possibly less stiffness and wound complications post-operatively [10,13,15].

Given these divergent opinions, the purpose of this study was to perform a meta-analysis comparing functional results in patients undergoing early versus late surgical treatment of multi-ligament knee injuries. We hypothesized that early surgical intervention would result in superior functional outcomes and better range of motion, when compared to late surgical intervention.

2. Methods

The research was conducted according to the methods described in the Cochrane Handbook [16]. All results are reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines statement [17].

2.1. Eligibility criteria

All studies were identified that reported on surgical treatment and management of multi-ligament knee injuries, bi-cruciate ligament injuries and/or knee dislocations in patients 18 years and older. Case reports, letters to the editor, and review articles were excluded. The following inclusion criteria were applied: any studies describing surgical treatment, reconstruction, or repair of multi-ligament knee injuries with a minimum follow-up of at least 24 months, that utilized at least one functional outcome scoring system (Lysholm, IKDC, KOOS, Meyer, Tegner), and reported the total range of motion with complete documentation in tables or the main text describing demographic details. Studies were excluded if patients treated presented with multi-trauma, head injury, non-union, lower extremity fractures, or a documented history of previous knee injuries. Patients with upper extremity injuries were not excluded, as this would not influence the functional lower extremity outcome score. Although omission of the aforementioned data could have resulted in publication bias, this was accepted for this analysis.

2.2. Literature search

A systematic review of the literature was performed and all relevant publications in the English and German literature were identified. Medline, Embase, Scopus, and Google Scholar were searched using the following terms and Boolean operators: “knee dislocation”; “multi-ligament” AND “knee” AND “injuries” AND/OR “reconstruction” AND/OR “repair” AND/OR “surgical

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