RATIONALE

The development of an infection after ACLR can have significant complications including loss of articular cartilage, graft failure and loss of knee function [1-3]. Although there is wide agreement that treatment must be initiated as early as possible, several different treatment algorithms have been proposed [4-7]. With regards to the postoperative treatment, there are no studies directly focusing on rehabilitation protocols.

While it is well-established that a graded knee-strengthening program (including quadriiceps and hamstrings strengthening) has to be started within the first postoperative days [4,8–11], there is no agreement regarding weightbearing status and range of motion parameters.

Rehabilitative treatment after surgical debridement of an infected ACLR does not differ substantially from primary reconstruction. It should be focused on preventing stiffness and regaining motion through passive and active-assisted range of motion exercises.

There are no studies suggesting an altered rehabilitation protocol in the setting of a postoperative infection. Monaco et al. [10] suggest the use of a brace locked in extension for two weeks, followed by a progressive increase in the range of movement and muscular strength. Alternatively, many authors allow immediate full range of movement under the supervision of a physical therapist [7,11]. Indelli et al. [12] and Wang et al. [3] recommend starting rehabilitation only after complete resolution of symptoms, and suggest only passive motion of the knee and the ankle in the meantime.

There is a lack of consensus on weightbearing status after treatment of an ACL infection. Torres-Claramunt et al. [4,13] suggest starting a strengthening program two weeks after surgery with progressive weightbearing after symptoms decrease. Likewise, weightbearing was gradually increased until resolution of symptoms in the rehabilitation protocol developed by Hantes et al. [14]. However, McAllister et al. [15] and Schub et al. [16], suggest beginning the weightbearing six weeks after surgery.

Overall, there is a lack of evidence to support a standardized approach to rehabilitation after the surgical debridement of an infected ACLR. High-quality controlled trials are needed to provide guidelines for this rare and difficult complication.

REFERENCES


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QUESTION 9: When can patients safely undergo revision anterior cruciate ligament reconstruction (ACLR) following treatment for prior infection?

RECOMMENDATION: It is considered safe to perform a revision ACLR following completion of successful treatment for infection and normalization of clinical and laboratory parameters upon resolution of the infection. The literature does not suggest a specific timeframe following resolution of the infection prior to performing revision ACLR.

LEVEL OF EVIDENCE: Consensus

DELEGATE VOTE: Agree: 92%, Disagree: 0%, Abstain: 8% (Super Majority, Strong Consensus)

RATIONALE

Infection following ACLR is rare, with a reported incidence of 0.14% to 2.25% [1,2]. When infection does occur, there are potentially significant consequences, particularly regarding patient outcomes [3]. Following allograft ACLR, there is a well-known risk of disease
transmission, although a recent literature review found no difference in infection rates between autograft and allograft ACL reconstructions [4,5].

Graft retention following an infected ACLR is a viable option, as a recent meta-analysis and systematic review reported a success rate of 85% [2]. Matava et al. surveyed 61 orthopaedic surgeons and found that graft removal was not popular as the initial treatment, with only 6% and 33% of respondents removing the autograft and allograft following ACLR infection, respectively. However, in cases of persistent infection, 76% of surgeons removed the graft as part of their treatment regimen [6]. The same survey showed that the most common time frame for revision surgery was a minimum of 6 to 9 months (range, 3 to 15 months) after eradication of the infection [6].

Despite successful outcomes with graft retention, graft removal and revision ACLR remains the preferred method for some surgeons following infection [7]. In a retrospective review, Burks et al. reported on 8 infections out of 1,918 ACL reconstructions. Seven of these were treated with immediate irrigation and debridement with subsequent graft removal and administration of intravenous antibiotics for six weeks. Of those, four successfully underwent revision ACLR at a mean of three weeks (range one to six weeks) after completing antibiotic treatment [7]. In another systematic review and expected value decision analysis of 19 studies, revision ACLR, within 3 to 6 weeks after the infection, was shown to have promising results [8]. Gille et al. prospectively studied 31 patients with ACL infection where the graft was salvaged in 8 patients (26%) and removed in 12 patients (39%). Only two patients underwent revision ACLR at six and eight months post infection [9].

Williams et al. reported on 2,500 ACLRs with 7 infections: the graft was removed in 4 cases. One of these cases underwent successful revision ACLR one year later [10]. In a retrospective review of 3,500 ACL reconstructions, Indelli et al. identified 6 infections treated with arthroscopic debridement of which 2 grafts were removed, culminating in 1 revision ACLR and 1 total knee arthroplasty (TKA) a year later [11]. Furthermore, another study reported on 8 infections out of 1,918 ACL reconstructions. Seven of these were treated with initial graft removal and successful revision ACL surgery one year after treatment [12]. Zalavras et al. also described a series of five infected ACL reconstructions treated with radical debridement and graft removal. Two patients had further procedures: 1 revision ACL reconstruction 14 months later and 1 TKA nine months later [13].

Hantes et al. reported 7 infected cases in a series of 1,242 ACL reconstructions. One patient did well with irrigation and debridement and six had a recurrence of infection, requiring subsequent graft and hardware removal. These patients were offered subsequent revision graft and graft reimplantation three months after the last operation. Four of the six patients underwent revision with ipsilateral bone patellar tendon bone autograft at an average of five months (range four to nine) post eradication of infection. The authors recommend revision ACLR after eradication of the infection for at least three months, with normal knee motion, no knee effusion and normal laboratory values [14].

Despite the lack of randomized clinical trials, there are several retrospective studies with low numbers of revision ACLR following treatment for prior infection. There is no consensus on the appropriate timing of revision reconstruction, with a reported range of three weeks to over a year. In general, it seems appropriate to delay surgery for a minimum of six weeks, but waiting up to six months post-eradication of infection may be optimal. Importantly, criteria such as normal knee motion, lack of knee effusion and normal laboratory markers must be considered before proceeding.

REFERENCES