Surgical Pearls in Revision Anterior Cruciate Ligament Surgery: When Must I Stage?

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KEYWORDS

• Revision ACL • Tunnel osteolysis • Two-stage ACL • ACL failure

KEY POINTS

- The cause of anterior cruciate ligament failure must be critically evaluated to allow for a successful outcome after a revision reconstruction.
- In a revision setting, although collagen fibers may be present on MRI, this does not mean that the tissue is functional. History and physical examination are critically important.
- With significant tunnel osteolysis (>14 mm) or if the proposed revision tunnel(s) are within the borders of the current tunnel(s), a 2-stage revision may be best. The sports surgeon must have several tricks and tools readily available to address the tunnel osteolysis.

INTRODUCTION

Anterior cruciate ligament (ACL) reconstruction is among the most commonly performed and studied surgeries in orthopedic sports medicine. The incidence of primary ACL reconstruction (ACLR) rose from an estimated 87,000 cases in 1994 to nearly 130,000 in 2006.[1] The increased number of reconstructions was most prominent in those younger than 20 or older than 40, and in the female population. The incidence of recurrent instability or failure rate after primary ACLR varies from 3% to 10%.[2–6] In the patient with a failed ACLR, a systematic approach must be used starting with identification of the cause for graft failure or recurrent instability, obtaining the appropriate imaging if needed to evaluate for malalignment or tunnel osteolysis, and deciding whether the patient may be treated with a single-stage revision or if a 2-stage revision is more appropriate. The surgeon must have several tricks and tools readily available for this potentially technically demanding revision reconstruction.

No outside research support or funding is pertinent to this review. No conflicts of interest to disclose.

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Clin Sports Med 36 (2017) 173–187

http://dx.doi.org/10.1016/j.csm.2016.08.008 **sportsmed.theclinics.com**

ETIOLOGY OF ANTERIOR CRUCIATE LIGAMENT FAILURES

Without addressing the likely cause of primary ACLR failure, the risk for recurrent failure and instability is high. Harner and colleagues[7] divided the causes of failure of ACLRs into 3 groups: new trauma, technical errors or failure to recognize concomitant injuries, and failure of graft incorporation (**Fig. 1**). Early failure is often associated with incomplete graft incorporation and failure at one of the fixation points, whereas late failure (the most common source for rerupture) typically occurs from noncontact trauma and may be the result of a suboptimal reconstruction.[8]

Errors in surgical technique account for most primary ACLR failures.[9] The most common technical error is placement of the tibial or femoral tunnels outside of the native ACL footprint. In the past, this was most evident with the "vertical" tunnel placement associated with transtibial ACLR.[10] Vertical femoral tunnel placement may normalize the anterior-posterior stability (ie, Lachman maneuver); however, a significant degree of rotational instability may still be present (ie, positive pivot shift). To remedy this problem, independent drilling of the tibial and femoral tunnels has been used, either through an accessory anteromedial portal or less commonly via a 2-incision (outside-in) technique. Flexible reamer systems allow an additional way of uncoupling the tibial and femoral tunnels to clearly visualize and establish an anatomic starting point within the femoral footprint of the native ACL while avoiding the complications associated with knee hyperflexion and straight reamers with the far anteromedial portal.[11] Although the literature is replete with ACL failures due to tunnel malposition, the reader should recognize that these data are becoming more obsolete with updated surgical techniques that allow anatomic tunnel placement. New information regarding ACLR failures in the setting of proper tunnel positions using accessory medial or double bundle reconstructions will need to be further investigated.

Other sources of failure include failure to recognize a concomitant injury, such as a posterolateral corner injury. Lower extremity malalignment, particularly varus, or

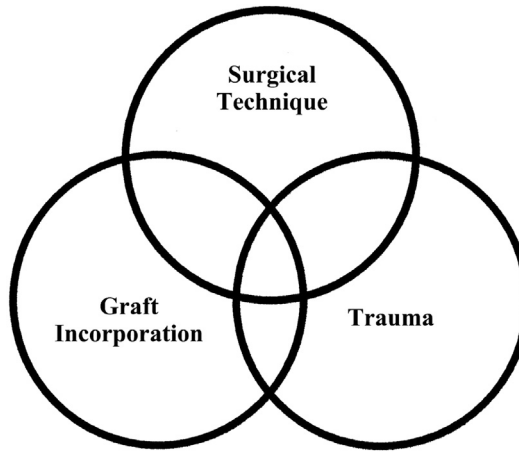

Fig. 1. Illustration showing that the causes of graft failure include surgical error, failure of graft incorporation, and trauma, either alone or in conjunction with one another. (*Reproduced from* Maday MG, Harner CD, Fu FH. Revision ACL surgery: evaluation and treatment. In: Feagin JA Jr, editor. The crucial ligaments: diagnosis and treatment of ligamentous injuries about the knee. 2nd edition. New York: Churchill Livingstone; 1994. p. 712; with permission.)