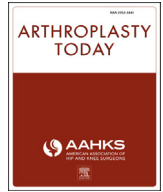




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Surgical technique

External fixator immobilization after extensor mechanism reconstruction in total knee arthroplasty

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ABSTRACT

Extensor mechanism disruption after total knee arthroplasty is a complicated problem that typically requires surgical reconstruction. After extensor mechanism failure, reconstruction is typically indicated to restore active knee extension and provide a stable limb for ambulation. Immobilization of the knee in extension is vital in the initial postoperative period after extensor mechanism reconstruction. We describe a series of 4 patients who underwent extensor mechanism reconstruction followed by external fixator application to maintain the knee extended in the initial postoperative period. Our results have been favorable. However, close follow-up is important to monitor for the development of pin site infections.

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Introduction

Extensor mechanism disruption in the setting of total knee arthroplasty (TKA) is associated with considerable morbidity and represents a challenging surgical problem [1–3]. After extensor mechanism failure, reconstruction is typically indicated to restore active knee extension and provide a stable limb for ambulation. Numerous reconstructive techniques have been described with varying results [3–9]. Difficulty obtaining consistently good outcomes is common among them. Although it is a rare complication, extensor mechanism failure after TKA will become more prevalent as the number of TKAs performed continues to rise [10]. Therefore, methods of improving outcomes in these patients are desirable.

During the initial postoperative period after extensor mechanism reconstruction, immobilization of the knee in full extension is critical to allow soft tissue healing and graft incorporation. Inadvertent knee flexion can result in stretching of the repair,

subsequent extensor lag, and rerupture. Braces have been used to immobilize the knee [11], but they allow knee flexion if removed. Casting has also been described [9], but these can be difficult to apply to large extremities and can result in wound complications. We recently incorporated external fixation as a means of maintaining knee extension in the initial postoperative period and have found it advantageous. The following report describes our experience with 4 patients.

Surgical technique

We reconstruct the extensor mechanism with synthetic polypropylene mesh, as described by Browne and Hanssen [9]. Briefly, the previous anterior knee incision is used. The extensor mechanism is identified and the quadriceps muscle and tendon are mobilized. If necessary, the patella is mobilized and brought down to an anatomic position. The mesh is tubularized and cemented into a trough placed in the anterior proximal tibia. Once the cement is dry, an additional screw and washer are inserted for supplemental fixation. The graft is passed through the patellar remnant and underneath the quadriceps musculature. With the knee in extension, the graft is placed under tension and sewn securely into the extensor mechanism such that it is covered by the quadriceps muscle and tendon. The remaining extensor mechanism is repaired as anatomically as possible. The wound is then closed in layers.

The external fixator is then mounted using 2 half pins in the proximal femur, using a standard percutaneous technique.

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Figure 1. Photograph of external fixator mounted after extensor mechanism reconstruction. Note that pins are placed far from the knee joint to prevent contamination of total knee components.

Care must be taken in this area to avoid injury to branches of the superficial femoral artery (SFA) and lateral femoral circumflex artery. Blunt dissection is performed down to the femur, and drilling and pin insertion are performed using a soft tissue protecting triple sleeve. Two bicortical half pins are then placed in the anterior tibia, keeping them well distal to the tibial prosthesis. The frame is then assembled and secured with the knee in full extension (Fig. 1). Pin care commences on postoperative day 2 and consists of gentle cleansing with a 1:1 mixture of water and hydrogen peroxide. The external fixator is removed after 4–6 weeks and the knee is then immobilized with a brace in extension for an additional 4 weeks. Range of motion is gradually progressed thereafter.

Case 1

A 66-year-old female with an incompetent right extensor mechanism after TKA was seen after multiple failed attempts at extensor mechanism repair as well as reconstruction with an Achilles tendon allograft. Because of the extensor mechanism deficiency and a severely arthritic contralateral left knee, her mobility was greatly limited. On examination of the right knee, she had an extension lag of 50°. Passive range of motion was 10°–110°. Radiographs demonstrated well-fixed right total knee components and patella baja as well as end-stage arthritis of the left knee. Three months after successful left TKA, the patient was taken to the operating room for extensor mechanism reconstruction of the right knee, as described above. At the time of surgery, the quad tendon and prior allograft reconstruction were intact, but had stretched rendering the construct incompetent. At the completion of the case, an external fixator was placed. It was removed after 4 weeks. At 9 months' follow-up, she was ambulating independently and had a 10° flexion contracture of the right knee with no quad lag (Video 1).

Case 2

A 66-year-old female with morbid obesity was referred to our clinic after a failed attempt at primary repair of a quad tendon rupture 5 years after TKA. On initial presentation, she had significant right knee pain and had difficulty ambulating short distances with a walker. On examination, there was a palpable defect in the quad tendon and she was unable to actively extend at the knee. She underwent extensor mechanism reconstruction as described above. At the completion of the case, an external fixator was mounted as described above. It was removed after 4 weeks. At 6 months' follow-up, active range of motion was 10°–100°, with no extensor lag.

Case 3

A 56-year-old male, 3-month status after revision TKA for instability presented to the clinic complaining of knee pain and inability to extend his knee after hearing a “pop.” On examination, he was unable to extend the knee against gravity. Radiographs demonstrated patella alta consistent with patellar tendon rupture. He underwent extensor mechanism reconstruction with external fixator application, as described above. At 6 months' follow-up, range of motion was 0°–100° with a 10° extensor lag (Fig. 2).

Case 4

A 71-year-old female 1-year status after revision TKA presented to our clinic complaining of an inability to extend the knee. Before presentation, she had undergone multiple operations for debridement and an attempted extensor mechanism reconstruction with synthetic mesh. On examination, she had no active knee extension and a palpable defect in her patella tendon. Radiographs demonstrated revision total knee components with cemented stems and marked patella alta (Fig. 3). An infection work-up was negative. Revision extensor mechanism reconstruction was performed and an external fixator was applied for postoperative immobilization. Because of the presence of stemmed components, fixator pins had to be placed very proximal in the femur and distal in the tibia. In addition, a cerclage cable was used to assist in



Figure 2. Active extension 6 months' status post (s/p) extensor mechanism reconstruction. This patient had a 10° extensor lag.

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