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Technical note

Knee extensor mechanism allograft reconstruction following chronic disruption

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ABSTRACT

The management of chronic extensor mechanism disruption can be complex. One of the options is allograft reconstruction. The goal of this study was to present the surgical procedure and provide preliminary results with this technique. The allograft uses the whole extensor mechanism (anterior tibial tubercle, patellar ligament, patella, quadriceps tendon). The native patella can be completely removed if the quality of the bone is poor, otherwise a bone groovecan be created to receive the allograft. The allograft is tightly tensioned with the knee in full extension. This surgical technique was performed 5 times with a minimum follow-up of 1 year. Active extension was recovered in all cases. The mean postoperative KOOS was 55.5 the IKS function score was 68.5 and the IKS knee score was 83.

1. Introduction

A chronic extensor mechanism (EM) disruption of the knee is a rare entity [1] whose functional consequences are significant. It can concern a native knee and be located either on the patellar ligament, the patella or more rarely the quadriceps tendon.

Its management depends on several factors (delay, functional demand, general condition, instability... [2]) and results can be disappointing [3]. Among the different therapeutic options [4–7], treatment by allograft is an alternative that can restore active extension of the knee [8–10]. The main advantage of this technique, which has rarely been described in the European literature, is to avoid autologous harvesting, reducing the morbidity of the surgical procedure. Moreover, biological integration is similar to that in autografts [10]. It is mainly indicated in chronic deficient patellar ligaments or for serious patellar fracture sequelae when reconstruction is impossible.

The main goal of this study was to describe and assess the preliminary results of this surgical technique.

2. Surgical technique

2.1. Preoperative planning

Planning begins with the choice of the allograft. The length of the native patellar ligament is measured and compared to the contralateral knee, then the most similar allograft is chosen. The surgical approach is decided based on previous approaches on these frequently multioperated knees. In case of disruption on total knee arthroplasty (TKA) the accurate position of the implant and an absence of loosening or signs of infection must be assessed before surgery.

Surgical technique (video)

The patient is placed in the supine position without tourniquet. Fibrous tissue is excised (Fig. 1). An evaluation of the quality of the EM is performed to assess the opportunity to preserve a maximum amount of autologous tissue, both bone and tendon. Depending on the status of the native patella, two options are possible: if the patella is in good condition, it is preserved and a bone groove is created as a recipient site for the allograft. Otherwise, the whole patella is entirely replaced with the bony part of the allograft.

The EM is released from its adhesions at the suprapatellar pouch in order to recover the length of the native quadriceps.

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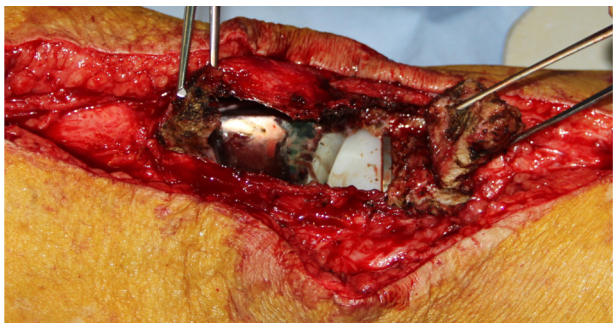

Fig. 1. Intraoperative view following patellectomy and resection of fibrous tissue.

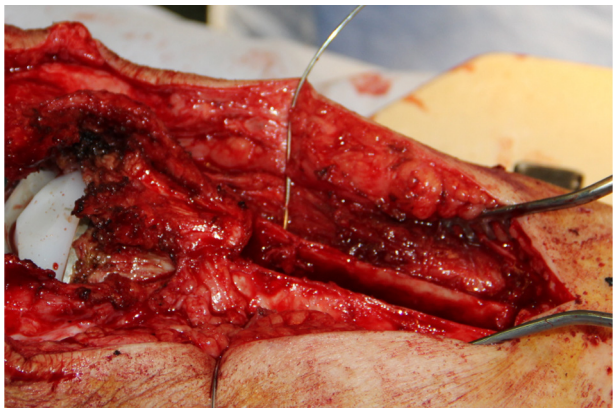

Fig. 2. Bone groove in the native anterior tibial tubercle to receive the allograft.

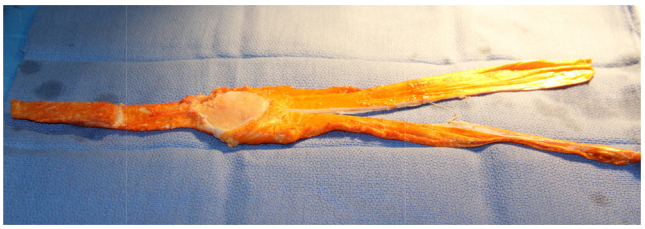

Fig. 3. Longitudinal incision of the allograft quadriceps and separation into two strands.

The position of the allograft is simulated with the patient's knee in extension and in 30° flexion to center the patella on the trochlea. After determining the optimal height and the position of the future graft, a 7 cm long, 15 mm wide and 2 cm deep bone trough is created on the native anterior tibial tubercle (ATT) (Fig. 2). The proximal section is beveled to improve primary stability of the reconstruction.

The allograft is prepared after soaking it for 20 min in a rifampicine solution (1200 mg per liter of saline solution). The graft used is a whole extensor mechanism with the ATT, the patella – the patellar ligament, and the quadriceps tendon (QT). The QT is divided into two strands longitudinally (Fig. 3). Four anteroposterior holes and a transverse tunnel are drilled into the patella (2.5 mm in diameter) to allow the future suture of the patellar retinaculum. If the native patella is being preserved, a trapezoid shaped bone groove with a proximal base that is approximately 10 mm deep is created.

The allograft ATT bone block is cut to the size of the native tibial bone groove (Fig. 4) with an oscillating saw.

The allograft ATT bone block is then impacted into the host bone trough for good primary stability. Double transosseus cerclage wire (1.2 mm wire) and two 4.5 mm diameter anteroposterior compression screws secure the allograft (Fig. 5). If the whole patella is being

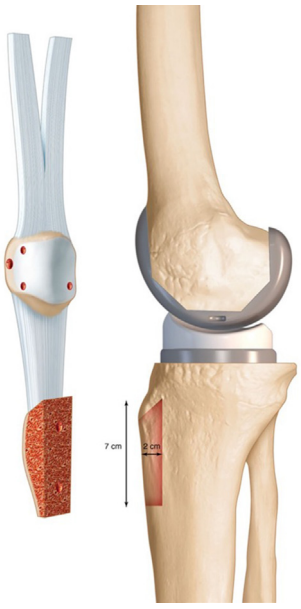

Fig. 4. Presentation of the allograft and securing the anterior tibial tubercle by impaction.

Fig. 5. Securing the tibial bone block with two wires and two anteroposterior screws.

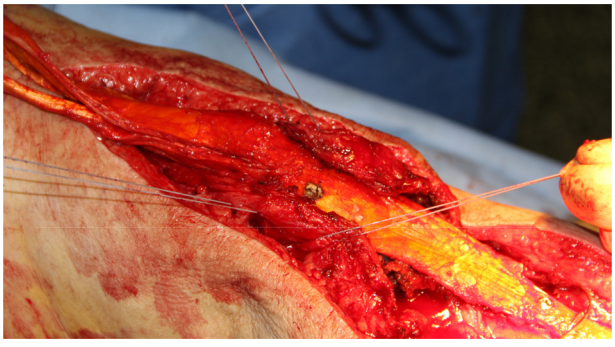

Fig. 6. Transosseous reattachment of the patellar retinaculum on the patella. The graft is secured under tension.

replaced, the allograft patella is centered thanks to a "U" point that passes through the transverse patellar tunnel and the retinaculum (Fig. 6). The allograft is tightly tensioned with the knee in full extension and secured with No. 2 non-absorbable transosseous sutures (FiberWire; Arthrex, Florida).