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Asia-Pacific Journal of Sports Medicine, Arthroscopy, Rehabilitation and Technology 1 (2014) 67–71
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Original article

# Arthroscopic suture fixation in patients with a tibial intercondylar eminence fracture using a simple device to penetrate the anterior cruciate ligament

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Received 30 October 2013; accepted 30 November 2013
Available online 2 April 2014

**Abstract**

Displaced tibial intercondylar eminence fractures require early reduction and stable fixation to prevent nonunion, knee instability, and a lack of extension. Many types of surgical procedure are recommended including arthrotomy or an arthroscopic technique to stabilize the fracture segment using Kirschner wire, screws, staples, and suture fixation. However, contemporary arthroscopic techniques and devices can facilitate intra-articular surgery and have been applied to the treatment of this fracture. In our current report, we describe a simple suture fixation method under arthroscopy for the treatment of tibial intercondylar eminence fractures. We treated eight knees of eight patients. One patient had a Type II fracture and seven patients had a Type III fracture according to Meyer's classification. Following the arthroscopic inspection of concomitant injuries, debridement of hematoma, and reduction of the fragment, two nonabsorbable sutures (Ethibond No. 2, Johnson & Johnson, Somerville, NJ, USA) were advanced through the suture passer device, which is used to penetrate the anterior cruciate ligament (ACL) near to the insertion site of the displaced fragment. Two surgical sutures were pulled out by the suture retriever from the anterior proximal tibia hole and were fixed to the tibia cortex bone with a double-spike plate. At follow-up, radiographic examinations showed that bone union was achieved in all cases. All but one patient could resume normal activities with no restrictions and no ligamentous instability. All knees had a negative Lachman's test and showed a gain of stable ligament function by KT2000 arthrometer evaluation. One patient had an insignificant extension limitation and experienced slight pain after walking but these symptoms were minimal. In conclusion current arthroscopic surgery techniques for tibial intercondylar fractures can be easily performed and reproducibly achieve secure fixation and early mobilization of the knee.


*Keywords:* Anterior cruciate ligament; Arthroscopy; Intercondylar eminence fracture

## Introduction

A tibial intercondylar fracture is an uncommon traumatic injury, that usually occurs in children and people of a younger age[1] as a result of sporting or traffic accidents.[1,2] A stable and minimally displaced fracture can be treated conservatively using closed reduction and a cast.[2–4] However, a displaced fragment may develop an overgrowth and obstruct knee extension *via* impingement of the femoral condyle.[2,5] To avoid these complications, surgery is usually indicated for patients with a displaced tibial intercondylar eminence fracture. Recently, arthroscopic surgery has been popular with the development of modern techniques and instruments for this procedure. In our present report, we describe a simple method of arthroscopic reduction and suture fixation of the tibial intercondylar eminence fracture using an ACCU-PASS Suture Shuttle and Suture retriever (Smith & Nephew, Andover, MA, USA). The purpose of this retrospective study was to evaluate the postoperative outcomes of arthroscopic surgery for a tibial intercondylar fracture.

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http://dx.doi.org/10.1016/j.asmart.2014.02.003

## Materials and methods

We treated eight patients (5 males) with displaced tibial intercondylar eminence fractures by arthroscopic fixation between 2002 and 2008 at our institution. All patients gave written informed consent. Three cases were children (age range, 7–8 years) and the remaining five patients were adults (age range, 20–56 years). The mean age at the time of injury was 25 years. The injuries were right-sided and left-sided in four patients each. Routine anteroposterior and lateral radiography of the knees revealed tibial intercondylar eminence fractures. One patient showed a Type II fracture with 7 patients displaying a Type III fracture according to the Meyers's classification.[4]

### *Surgical technique*

The patient was placed in the supine position with the injured knee flexed to 90°. The leg was placed in an arthroscopic leg holder and an arthroscopic examination was performed using a pneumatic tourniquet under general anaesthesia. After the removal of haemorrhaging and scar tissue under the bone fragment, the injured knee was assessed arthroscopically *via* a standard anteromedial and anteroletaral portal to examine concomitant meniscus injuries, damage to the cartilage, and interposed soft tissue between the fragment and tibial bony bed. There was one case of medial collateral ligament damage, which was treated by primary suture repair, but no knees with medial or lateral meniscus injury, or with serious damage to the cartilage. After the confirmation of anatomic reduction of the fragment on the articular surface, two nonabsorbable sutures (Ethibond No. 2, Johnson & Johnson, Somerville, NJ, USA) were inserted through the suture passing device (ACCU-PASS; Smith & Nephew, Andover, MA, USA) which was introduced from the medial or lateral arthroscopic portal (Fig. 1). These were used to penetrate the anterior cruciate ligament (ACL) near to the attachment of the fragment. An anteromedial 2 cm incision was made over the medial proximal tibia, and 2 × 2.4 mm K-wires were drilled through the ACL tibial drill guide from the proximal tibia into the joint (Fig. 2). In the three child cases, the K-wire was passed within the epiphysis of the proximal tibia under the fluoroscopic image using a freehand technique to avoid passing the epiphysis plate. The sutures were drawn from the epiphysis and fixed distally to the epiphyseal line.

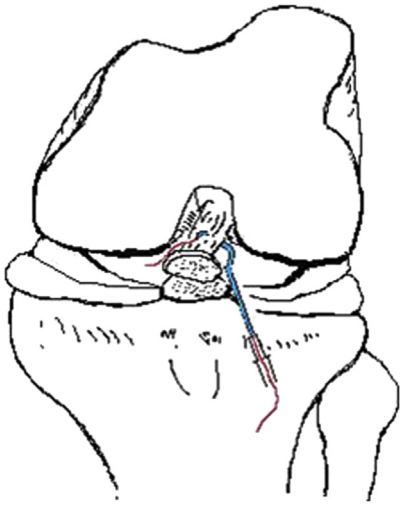

Fig. 1. Athroscopic insertion of the ACCU-PASS suture shuttle. To advance two strings of nonabsorbable thread, a 45°-curved needle was inserted using an arthroscopic technique.

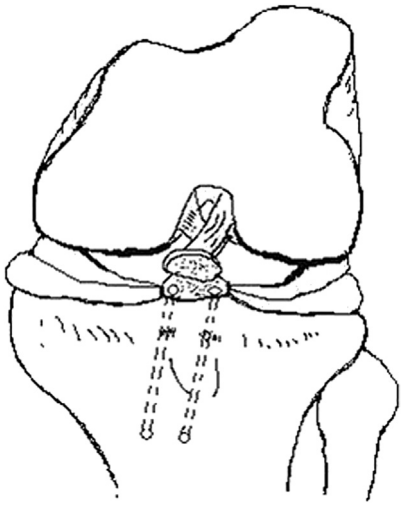

Fig. 2. Insertion of Kirchner wire. An anteromedial 2 cm incision was made over the medial proximal tibia, and 2 × 2.4 mm K-wires were drilled through the anterior cruciate ligament tibial drill guide from the proximal tibia into the joint.

The osteochondral fragment was confirmed to be reduced with the aid of a probe inserted through an anterior portal. Two sutures were retrieved through the tibial tunnel using a Suture retriever (Smith & Nephew), passed through the drilled holes of the tibia (Fig. 3) and finally fixed to the cortex using a Double-Spike Plate (DSP) Fixation Device (Smith & Nephew) maintaining a tension of 40 lb (Fig. 4).

### *Rehabilitation program*

After surgery, patients were instructed to wear a hinged knee brace which was adjusted to limit extension to 20° for 6 weeks. Full weight bearing was allowed immediately, and after 6 weeks full knee extension was allowed. Patients were permitted to engage in sporting activities or heavy labour from 3 months postsurgery.

### *Evaluation*

The average follow-up time was 23 ± 17 months (12–59 months). After the operation, bone plain radiography was performed every month to confirm bone union. At the final follow up time all knees were evaluated using various tests including a radiological assessment for consolidation of the fracture, a range of motion test, a Lachman test, and an anterior drawer test. Six patients were evaluated for anterior translation of the tibia using a KT-2000 arthrometer (Med Metric, San Diego, CA, USA). All patients were assessed according to the Lysholm functional rating score.