

John J. Joyce Award First Place Winner

Comparison of Open Versus Arthroscopic Fixation for Isolated PCL Tibial Bony Avulsions: A Prospective Randomized Study with Minimum 2 Year Follow-up

Dinshaw Noshir Pardiwala, INDIA

BACKGROUND & AIMS : Fixation is the treatment of choice for acute displaced tibial bony avulsions of the posterior cruciate ligament (PCL). Although open reduction via a posterior approach has been the traditional method for internal fixation, various PCL tibial bony avulsion arthroscopic fixation techniques have been reported and propagated in the last decade. The apparent advantages of the arthroscopic approach over the open approach include avoiding the potentially injurious exposure of the popliteal fossa, and the ability to identify and treat coexisting intra-articular pathology. There is, however, no scientific validation for these claims. Moreover, there is insufficient evidence that the arthroscopic procedure results in outcomes similar to the gold standard open reduction with internal fixation technique. The purpose of this prospective randomised controlled study was to compare the open technique versus the arthroscopic technique for fixation of isolated PCL tibial bony avulsions and to determine if the arthroscopic technique yielded equivalent surgical outcomes to the traditional open approach.

DESIGN OF THE STUDY: A five-year prospective randomised comparative study with minimum 2 year follow-up.

PATIENTS & METHODS : The study was carried out in the period of Jan 2003 to Dec 2007 at a university hospital which is the national referral center for PCL and multiple ligament knee injuries. The study group included 50 patients with unilateral isolated PCL tibial bony avulsions with fragment displacement > 5 mm, who presented within 3 weeks of injury, and who demonstrated signs suggestive of Grade II or III PCL laxity. Exclusion criteria were bilateral knee injuries, combined ligament injuries, undisplaced fractures of PCL tibial insertion, chronic (> 3 weeks) PCL tibial bony avulsions, patients with only grade I PCL laxity on posterior drawer test and arthrometry, open knee injuries, PCL tibial bony avulsions with popliteal vascular injuries, and patients over 65 years of age. Patients were randomized into 2 groups. Group A (n=25) underwent open reduction and internal fixation via a standard posteromedial approach that involved dissection between medial head of gastrocnemius and semimembranosus with lateral retraction of medial gastrocnemius. The popliteal neurovascular bundle was not dissected and was retracted along with the medial gastrocnemius. Fixation was achieved with either a single 4mm cannulated cancellous screw with washer if the bony fragment was large, or with a pull-through suture if the bony fragment was small or comminuted (Ethibond No. 5 in initial cases, Arthrex Fiberwire No. 2 in subsequent cases). Group B (n=25) underwent arthroscopic pull-through suture fixation. The arthroscopic technique involved creation of a standard anterolateral portal, a high anteromedial portal, 2 posteromedial portals (high and low), and in a few cases a posterolateral portal; followed by creation of 2 bone tunnels of 4.5 mm made from the anterior cortex of the tibia to the inferomedial and inferolateral border of the tibial PCL fossa (fracture crater site) using a PCL tibial guide. One or two strands of nonabsorbable sutures (Ethibond No. 5 in initial cases, Arthrex Fiberwire No. 2 in subsequent cases) which were tied / sutured to the osseoligamentous junction of the avulsed PCL, and which effectively formed a divergent suture bridge, were pulled through the tunnels and tied at the anterior tibial border after confirming anatomical fracture reduction. Coexisting meniscal and chondral injuries in Group B patients were treated at the same stage. Patients from both groups underwent a similar postoperative rehabilitation program. Each patient was evaluated preoperatively with clinical grading of PCL laxity, arthrometer (Aircast Rolimeter) testing, and MRI. Each patient was evaluated postoperatively

at 6 months, 1 year, 2 years, and latest follow-up with clinical grading of PCL laxity, arthrometer (Aircast Rolimeter) testing, stress radiography, and two different knee ligament rating scales (IKDC and HSS). The minimum follow-up was 2 years, and mean follow-up was 39 months (range 24 to 58 months). Statistical analysis was performed using the Fisher exact t test, Wilcoxon signed-ranks test, and Mann-Whitney test.

RESULTS : Preoperative MRI revealed coexisting meniscal tears in 4 Group A patients and 6 Group B patients, coexisting chondral injuries in 2 Group A patients and 1 Group B patient, and intraarticular osteochondral free fragments in 1 Group B patient. 3 Group A patients underwent second stage arthroscopy for evaluation and treatment of symptomatic meniscal / chondral injuries. This was performed between 6 to 19 months following initial surgery. Postoperative physical examination revealed normal posterior drawer and tibial step-off in 18 of 25 knees (72%) in Group A, and 17 of 25 knees (68%) in Group B. Arthrometer testing for sagittal plane laxity using the Aircast Rolimeter determined mean postoperative total anterior-posterior side-to-side difference of 3.9 + 2.3 mm in Group A and 4.1 + 1.9 mm in Group B. Postoperative stress radiography demonstrated PCL to be normal in 18 (72%), grade I laxity in 5 (20%), and grade II laxity in 2 (8%) Group A knees; and normal in 17 (68%), grade I laxity in 7 (28%), and grade II laxity in 1 (4%) Group B knees. At final IKDC evaluation, 21 patients (84%) were graded level A (normal), and 4 patients (16%) were graded level B (nearly normal) in Group A, whereas 22 patients (88%) were graded level A (normal), and 3 patients (12%) were graded level B (nearly normal) in Group B. The mean postoperative IKDC subjective score was 86 points in Group A and 89 points in Group B. The mean postoperative HSS score was 94 points in Group A and 96 points in Group B. There was no statistically significant difference in results between Group A and B in any of the evaluation measures. No patient in either group had a loss of extension, however 3 patients in Group A and 1 patient in Group B had terminal restriction of flexion not exceeding 20 degrees. 2 patients had minor wound healing problems in Group A. 3 patients in Group A required additional surgical procedures related to PCL implants. These included 1 implant removal through posterior approach for screw back-out noticed at 1 year follow-up, and 2 patients involved in kneeling activities with prominent anterior implants with bursitis underwent resection of prominent anterior screw tips through an anterior approach. Serial radiographs did not reveal a trend toward radiographic Fairbanks changes in the medial and patellofemoral compartments in either group.

DISCUSSION & CONCLUSIONS : Fixation of isolated PCL tibial bony avulsions through a traditional open posterior approach yielded equivalent surgical results and outcomes as compared to the arthroscopic technique in that there was no statistically significant difference in clinical grading of PCL laxity, arthrometer testing, stress radiography, and two different knee ligament rating scales (IKDC and HSS) between the two groups at a minimum 2 year follow-up. However, 6 patients in the open approach group had to undergo subsequent surgical procedures, 3 for coexisting symptomatic meniscal and chondral injuries, and 3 for implant related problems. Preoperative MRI revealed coexisting meniscal / chondral injury or intraarticular free osteochondral fragments in 28% of patients with isolated displaced PCL tibial bony avulsions.

CLINICAL RELEVANCE : In patients with isolated displaced PCL tibial bony avulsions if the preoperative MRI reveals coexisting meniscal / chondral injury or intraarticular free osteochondral fragments, then an arthroscopic approach for fixation would be preferable since it results in equivalent PCL stability and surgical outcomes as the open fixation technique, and at the same time manages the coexisting pathology. In the absence of coexisting intraarticular pathology on MRI, an open approach may be employed, however, there is a 12% incidence of implant related problems if a screw is used for fixation.