

FIXATION OF TIBIAL SPINE AVULSION FRACTURE BY SUTURE PULLOUT

A CASE SERIES



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Abstract:

Anterior cruciate ligament avulsion from the tibia with a bony fragment of the tibial spine is an uncommon injury of the knee joint and occasionally encountered in orthopaedic practice.

In this article we present our series of 9 patients who underwent arthroscopic fixation using high-strength nonabsorbable sutures utilizing intravenous cannula needles as suture passers and retrievers.

Introduction:

Avulsion of the tibial eminence was first delineated by Poncet in 1875(1). This injury constitutes 2% to 5% of the knee and 14% of anterior cruciate ligament (ACL) injuries. The higher prevalence is seen in skeletally immature patients in the age group of 8 to 14 years(2,3,4,5). The reason is, during the years of growth, the strength of the ligaments is more than the ossifying tibial eminence bone. Recently there has been a trend in the increase in the number of these fractures in adults also(3). Hayes et al observed that 40% of tibial eminence fractures which were reported in the literature occurred in adults(4). In adults mode of injuries are usually high-energy trauma like RTA, Sports, etc, so concomitant injuries to collateral ligaments and menisci occur more in the adult age group(5). The Meyers and McKeever classification is the most commonly used classification of tibial spine fractures(3). This injury produces disabilities in form of flexion deformity, loss of extension and instability of the knee joint as ACL is also involved, so it is important to fix this injury (especially type 3 and 4) to prevent such complications(5). Various techniques are described to achieve secure fixation of the avulsed fragment in type III and IV fractures. In the last decade, the arthroscopic pull-out suture technique seems to have gained popularity over other techniques.

Methods:

Patients with ACL avulsion fracture (type III and IV, less than 4 weeks old) were included in the study. Age groups ranging from 13 to 45 were included. Diagnosis is confirmed by plain radiograph and Magnetic resonance imaging (MRI). Follow-up period ranging from 5 months to 36 years.

Surgical Technique:

Under spinal anesthesia, diagnostic arthroscopy was performed through the standard anterolateral portal, and the type of fracture was confirmed (Fig 1A). The fracture bed is cleared from hematoma. After making an anteromedial portal associated meniscal injuries were managed. Interposing intermeniscal ligament was retracted by traction suture (Fig 1B). A 3 cm incision was made over the anteromedial aspect of the proximal tibia and using ACL jig, a K wire (1.8mm) was drilled aiming to the lateral edge of the fracture crater. In the same way, one more k wire was drilled aiming to the medial edge. Then k wires were pulled out and replaced by 14-gauge I.V. cannula loaded with looped 2-0 ethilon suture loops (Fig 1C). The fracture was then reduced and fixed with percutaneous k wire. Next, an 18-gauge cannula loaded with no. 1-0 PDS was passed into the joint from medial to the lateral side, once it was seen inside the joint the tip was advanced into a medial loop then piercing the anterior third of ACL at the junction of ACL and avulsed bone once the tip of the needle was visualized, Then PDS was advanced into a lateral loop and was pulled out through anteromedial loop.

The same step was repeated by taking a bite at the posterior third of the ACL. Then these PDS sutures were replaced by no-2 ultra-braided fibre wire by shuttling technique (Fig 1D). Then the needle and suture loops were pulled out of the tibial tunnel which also pulled the fibre wire. Sutures were then tied one by one over the bony bridge of the tibia keeping the knee in 30-degree flexion. The K-wire used for a temporary reduction was removed, ACL was checked for adequate tension and surgical incisions were closed in layers (Fig 1E).

Postoperatively, the knee was immobilized in an extension brace for 3 weeks and the patient was allowed non-weight bearing ambulation after three weeks. Full weight-bearing was started after 6 weeks after fracture union.

Results:

The study consisted of 9 patients whose age varied from 14 years to 45 years. The right knee was involved in 6 patients and the left knee in three patients. 7 patients were type III fracture and 2 patients were type IV fracture. The mode of injury was a road traffic accident in 5 patients and a sports injury in four patients. All fractures showed union at the follow-up of 3 months. At the end of follow-up (6 months) mean Lysholm score is 93.26 and the IKDC score is 94.35. None of the patients had flexion or extension deficit. However, one patient had knee stiffness at end of the two-month follow-up which was resolved by aggressive physiotherapy.

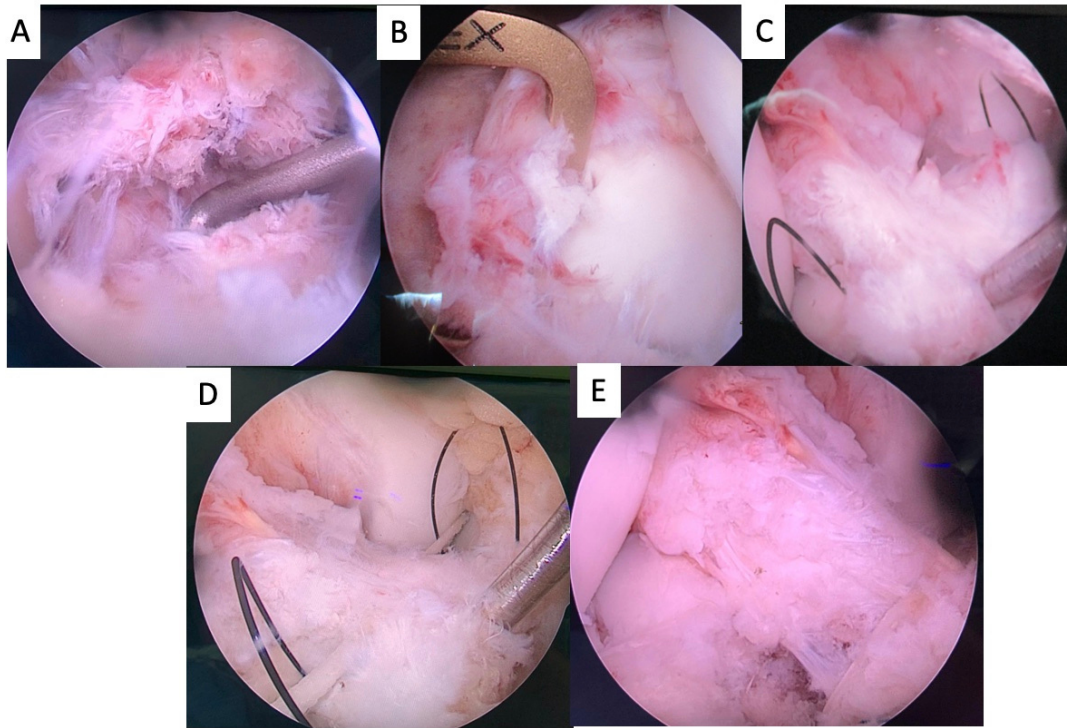


Fig 1: Surgical technique

A: ACL avulsion during diagnostic arthroscopy, B: Entrapped intermeniscal ligament, C: Ethilon loops on either side of fracture crater and a k wire fixing the fracture after reduction, D: Fiber suture passed from medial to lateral by taking a bite in ACL substance, E: Completed Fixation by pull out stitches

Discussion:

Avulsion fracture of the tibial spine is well described in the literature in both pediatric and adult populations. These fractures are also called ACL avulsion fractures. The higher incidence of these fractures in children is because of incompletely ossified tibial eminence and also because of the elasticity of ligaments in young people (6). In adults, these injuries are commonly related to high energy trauma usually road traffic accidents, and have a high incidence of associated injuries (1).

Although a variety of implants (screws, staples, wires, anchors, and sutures) have been used for arthroscopic fixation of the tibial spine, currently arthroscopic suture pull-out fixation seems to be the most preferred fixation method in all age groups(7).

The iv cannula used in our cases is of narrow diameter and may not cause growth disturbances in the pediatric age group. Several authors have determined that a physeal lesion of size less than 7 to 10% of the physeal diameter is not likely to cause growth changes (8).

The majority of the patients in our study were males and adult patients were more than pediatric patients. Motor vehicle accidents could be attributed to a higher incidence of adult patients than the pediatric age group. Associated injuries of the meniscus, cartilage, and co-lateral ligament are up to 60%. And more than 65% of the patients have entrapped intermeniscal ligaments. Postoperative laxity could be because of initial stretch before fracture or unrecognized intrasubstance tear(9). Postoperative stiffness is the most common complication noted by many authors

However recently reduction of this complication is because of early mobilization. Our series of cases had excellent functional outcome at the end of follow-up. A shorter follow-up period and a small number of cases is the limitation of our study.

Conclusion:

Arthroscopic fixation of ACL avulsion fractures by pullout stitches gives excellent clinical outcomes in all age groups.

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