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Early Outcome of Arthroscopic Tightrope Fixation for Posterior Cruciate Ligament Avulsion Fracture: A Case Report.

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ABSTRACT

A posterior cruciate ligament (PCL) avulsion fracture is an uncommon injury with the general consensus towards operative fixation and of late, arthroscopic tight-rope fixation has gain attention with several case reports on its efficacy and good outcome. Our patient is a young gentleman who sustained a PCL avulsion fracture following a motor-vehicle accident. We subsequently proceeded with arthroscopic tight-rope fixation of the avulsion fracture. We were able to achieve a stable fixation under direct visualization and x-rays were acceptable. At 3 months post-surgery, his knee function is good with Tegner-Lysholm score of 84 (good). Fixation for PCL avulsion fracture through an arthroscopic approach is favourable due to smaller wounds and the ability to address possible concomitant injury however, it is technically demanding. A tight-rope fixation was recently described due to its increasing popularity and in most of the case reports including ours, a good outcome is achievable.

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ABSTRACT

A posterior cruciate ligament (PCL) avulsion fracture is an uncommon injury with the general consensus towards operative fixation and of late, arthroscopic tight-rope fixation has gain attention with several case reports on its efficacy and good outcome. Our patient is a young gentleman who sustained a PCL avulsion fracture following a motor-vehicle accident. We subsequently proceeded with arthroscopic tight-rope fixation of the avulsion fracture. We were able to achieve a stable fixation under direct visualization and x-rays were acceptable. At 3 months post-surgery, his knee function is good with Tegner-Lysholm score of 84 (good). Fixation for PCL avulsion fracture through an arthroscopic approach is favourable due to smaller wounds and the ability to address possible concomitant injury however, it is technically demanding. A tight-rope fixation was recently described due to its increasing popularity and in most of the case reports including ours, a good outcome is achievable.

Keywords: Arthroscopy, Avulsion, Fractures, Lysholm knee score, Posterior cruciate ligament

INTRODUCTION

A posterior cruciate ligament (PCL) injury is not uncommon with an incidence reported between 3 – 38% depending on the population studied. Fanelli et al reported a total incidence of traumatic PCL at 38.3%; majority of the injury was an intra-substance tear with avulsion fracture accounting for only 2.4%.[1] The most common cause of injury was due to motor-vehicle accident (up to 45.3%) followed by sports injury (up to 39.9%). This is further reflected in the mechanism of injury where the most common was a 'dashboard injury' (up to 38.5%) followed by a fall on a flexed knee with foot in plantarflexion (24.6%).[2] In management of an avulsion fracture, general consensus is towards operative fixation as conservative management even for minimally displaced fragment may result in non-union and instability of the knee.[3] However, debate still on-going on which is best; either open or arthroscopic approach and what type of fixation to be used.[4-10] An arthroscopic tight-rope fixation has gain attention of late with several case reports on its efficacy and good outcome.[5,6] We present here a case of PCL avulsion fracture successfully repaired via an arthroscopic tight-rope fixation and share our experience of using this procedure.

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CASE REPORT

A 20 years old Malay man was referred to our team from the Accident & Emergency Department with the complaint of left knee pain and swelling following a motor-vehicle accident. He was unable to recall the exact mechanism of injury owing to having a brief period of unconsciousness immediately after the accident but on examination there was a large abrasion wound on the anterior aspect of the left leg that suggested a fall involving a flexed knee. There was a moderate effusion of the left knee with posterior sagging of the left tibia and posterior drawer test was positive (grade III). A left knee radiograph revealed an avulsion fracture of the left tibia PCL attachment (Figure 1).

An arthroscopic evaluation of the left knee followed by a tight-rope fixation for the PCL was performed a month after the initial trauma, after his wound has healed. The standard lateral and medial infra-patellar portal with the standard 30° arthroscope were used initially for evaluation of the left knee followed by posteromedial portal with 70° arthroscope to improve the visualization and fixation of the PCL avulsion fracture. Intraoperatively, no other structures were noted to be injured and the PCL fragment was displaced minimally. After clearing of the fracture site of soft tissues we were able to push down the fragment by using the PCL jig (Arthrex, USA) and subsequently used it to guide the guidewire for the tibial tunnel used to pass the tightrope. An ethibond suture was pass from the posteromedial portal and out through the tibia tunnel and used to pull the tightrope (shuttle relay technique). Once the fragment was compressed, another button was added to the tightrope at anterior tibia and was tightened while maintaining an anterior translation of the left tibia with the knee in 90° flexion (Figure 2). Finally, the tightrope was knotted securely and the excess suture was cut. All the wounds were then closed in a standard manner after thorough irrigation of the knee joint.

Postoperatively, the patient was placed in a posterior cylinder support backslab using plaster of paris and was maintained in position for two weeks followed by conversion to a posterior knee support splint from week 3 onwards. For the initial two weeks only isometric quadriceps exercise with patella mobilization were prescribed to the patient and from week 3 onwards, gradual range of motion exercise of the left knee with patient in prone was started gradually up to 90°. Patient was advised for non-weightbearing for 6 weeks and afterwards was allowed for partial weightbearing with crutches. Postoperative

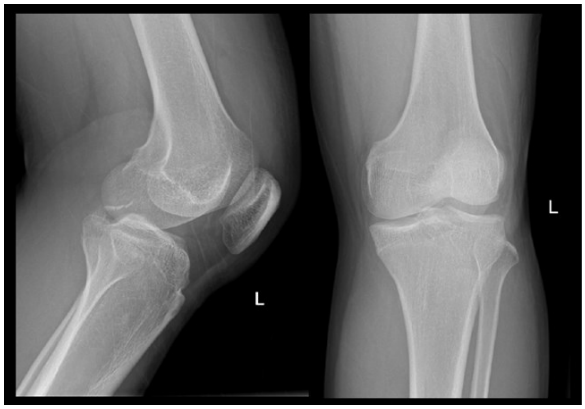

Figure 1: Pre-operative left knee radiograph showing posterior cruciate ligament avulsion fracture (tibial side). CLICK IMAGE TO ENLARGE.

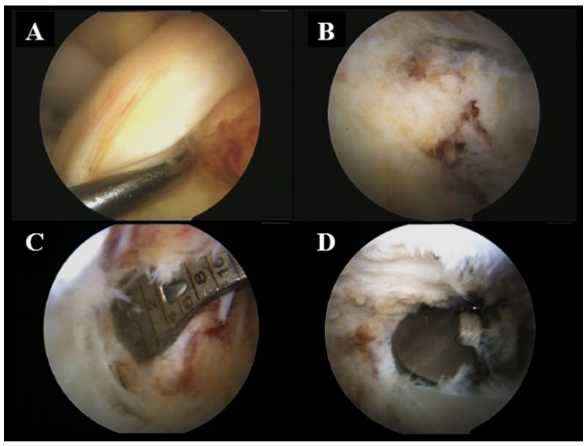

Figure 2: Intra-operative arthroscopic images showing pseudo-laxity of the left anterior cruciate ligament (A). The avulsed posterior cruciate ligament footprint (B) was minimally displaced and was able to be pressed down by using the PCL jig (C). The endo-button was seated properly on top of the avulsed fragment (D). CLICK IMAGE TO ENLARGE.

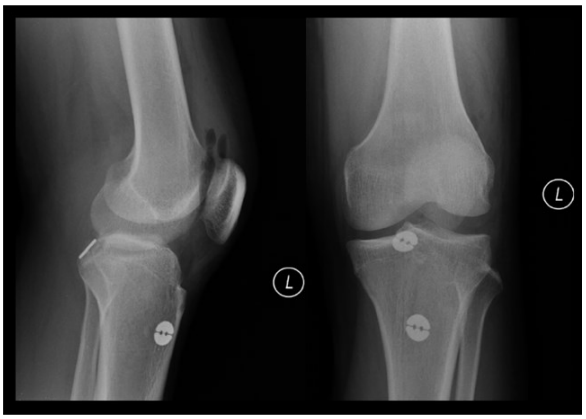

Figure 3: Post-operative left knee radiograph showed well-seated tightrope fixation device and reduced fracture. CLICK IMAGE TO ENLARGE.

radiograph showed a well-reduced fracture with an intact tightrope fixation of the left knee (Figure 3). At three and four months post-operative outpatient assessments, he was able to fully weight-bear on the left lower limb with normal gait and no instability nor pain in the left knee. His left knee range of motion was from 0^o – 90^o at three months and improved to 0^o – 125^o at four months. He scored 84 (good) on the Tegner-Lysholm scoring scale and was satisfied with the outcome.

DISCUSSION

The posterior cruciate ligament (PCL) is a strong ligament with documented maximum tensile load in the range of 739 – 1627 N and it is the primary restraint (up to 90%) to posterior displacement of the tibia across most of knee flexion motion.[11] The PCL extends from its femoral attachment at the roof and medial side of the femoral intercondylar notch to its tibial attachment at the tibial posterior intercondylar fossa just posterior to the posterior horns of both menisci.[11] Other than that, the PCL may also be bounded by the anterior and posterior menisco-femoral ligament (of Humphrey and Wrisberg respectively) in some knees and it may act as a splint if the PCL is torn and as a secondary restraint to posterior drawer.[11] Owing to the wide attachment of the PCL, an avulsion injury is rare (2.4%) and most PCL injury is due to an intra-substance tear.[1]

Fixation for PCL avulsion fracture can be done either via an open or arthroscopic approach.[3-10] An open approach for fixation of the PCL fragment is commonly done through the posteromedial approach (Burks and Schaeffer) followed by screw fixation of the fragment.[9,10] Lately, an arthroscopic approach is favoured due to smaller wounds with less scaring and pain.[4] Another advantage of arthroscopic approach is the ability to address possible concomitant injury because most PCL injury are multi-ligamentous (in between 84.7% - 96.5%), with injury to posterolateral corner complex being the most common (29.8%).[1,2] However, it is technically demanding and the surgeon need to be well-versed and experienced in approaching the posterior knee compartment.[5,6] A tight-rope fixation was recently described due to increasing popularity of its use in treatment of acromioclavicular joint disruption.[5] In the case reports reviewed, the authors were able to achieve a good outcome with this fixation method.[5,6]

In general, the outcome following fixation of PCL avulsion (either arthroscopic or open) is rated as good if it is done early (within 2 weeks of injury). In the case series by Gwinner et al in 2016, they performed tight-rope fixation for PCL avulsion fractures in 4 patients and were able to achieve a mean Lysholm score of 82 points and all patients were able to return to their pre-injury level of knee function and sports while the mean posterior tibial translation was 2.8 mm.[6] In an earlier case series by Piedade et al in 2007, the author reported an open fixation for the PCL avulsion fractures in 21 patients.[8] In 12 out of the 21 patients, their Lysholm scale were rated at excellent while the remaining 9 were rated at good. However, longer follow-up revealed that 20 patient still have posterior translation of the tibia with 8 patients reported to have up to 1 cm posterior translation.

Despite these, their knee function remains good subjectively and all the patients were satisfied with the outcome. These results led the author to conclude that avulsion fracture of the PCL shouldn't be treated as a pure bony injury but instead should be treated as a bone-ligament injury where stretching and microscopic tears of the ligament prior to the avulsion was a possibility.

CONCLUSION

Our experience with this case highlights that a tight-rope arthroscopic fixation is a reliable and good surgical option for treating PCL avulsion fractures with good post-operative Lysholm score and function. We believed that it should be considered as the main surgical option in contrast to open approach provided that the surgeon is well-versed with the posterior compartment of the knees.

Disclosure Statement

The authors reported no conflict of interest or financial liability.

Informed Consent

Consent has been obtained from the patient in regards to the pictures and details included in this report.

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