Short Term Outcome of Fixation of Isolated Avulsion Fractures of Posterior Cruciate Ligament; Case Series

Naveed Khan, Asif Peracha, Imran Khan, Osama Bin Zia, Faizan Iqbal, Shahjahan Siyal

ABSTRACT

Objective: To evaluate the outcome of isolated posterior cruciate ligament avulsion injuries after open reduction and screw fixation in our setup.

Methods: This was a prospective observational cross sectional study conducted during January 2012 to July 2015. Performa was made which comprises of bio-data, mechanism of injury, pre-operative x-rays, MRI, classification and physical examination. Patients who had isolated posterior cruciate ligament avulsion injury with bony fragment of around 1cm, they underwent open reduction and screw fixation included in this study. Short-term outcome assessment was carried out at 6 months in terms of stability, range of motion achieved using Lysholm knee scores. Patient between 20-35 years of age included in the study. All patient underwent fixation through 4.5 cannulated screw along with washer.

Results: There were total 5 patients who presented with isolated PCL injuries. Motor vehicle trauma was found in 4 patients and 1 patient had sports related injury. Type III fractures were found in 4 patients and while the remaining 1 patient had type II fracture. Postoperatively all the patients had improved posterior drawer test, and radiological examination showed complete healing. There were no wound infections and 1 patient developed hypertrophic scar and 3 patients developed knee swelling which was resolved with compression bandages and continuous physiotherapy.

Conclusions: Early operative intervention of isolated posterior cruciate ligament avulsion fractures achieves better stability and optimal results with few complications. Further studies are warranted in this regard.

Key Words: Posterior Cruciate Ligament surgery, Lysholm Knee Score, Knee Injuries, Joint instability

INTRODUCTION

Posterior cruciate ligament (PCL) injuries have been a topic of discussion in the trauma management science since the early days. PCL ruptures have been subjected to conservative treatments like bracing [1], primary operative repairs [2], and reconstructions [3] using autografts and allograft. However PCL avulsion fractures almost always undergo operative fixation and there is no conflict regarding such injuries management.

Various methods have been described in the literature regarding fixation of PCL avulsion injuries. Arthroscopic fixation is less morbid but has a long learning curve and cost issues, whereas open approach is easy to perform but leads to a longer rehabilitation curve and is less favorable by the patients.

PCL is one of the strongest ligaments of the body. Posterior cruciate ligament (PCL) is intraarticular but extra synovial ligament that's why it has the healing capacity. PCL injuries are very rare in the western world and most of the studies evaluating PCL fixations have a wide range of concomitant injuries that may have an effect on the overall outcomes. In the eastern part of the world motorcycles are a major cause of injuries [4] . Low velocity injuries due to these vehicles are common cause of ligamentous knee injuries in general and solitary tibial spine avulsion fractures leading to PCL incompetency as seen in our population. We performed screw fixation on five of these isolated PCL avulsions and evaluated them for a period of 6 months.

Department of Orthopaedics, K-Block,
Liaquat National Hospital, Stadium Road, Karachi
Correspondence: Naveed Khan
Email: drkhannaveed@gmail.com

METHODS

It was a prospective cross section observational study. All the patients with age between 18-42 years with avulsion injury of the posterior tibial spine where PCL attachment is present were included in the study. The injury was identified on lateral radiograph of the knee joint and furthermore confirmed with a magnetic resonance imaging scan (MRI). Injuries less than 3 weeks old were included in the study. Patients with chronic cases, signs of pre-existent osteoarthritis of the affected knee and con-comitant injuries were excluded. Avulsion injuries were classified according to Meyers and McKeever classification [5] modified by Griffith 2004 [6]. Examination under anesthesia was done to note the grade of posterior drawer test. All patients underwent arthroscopic examination of the knee for any other concomitant injuries followed by PCL fixation in the same anesthesia. PCL fixation was carried out in prone position via open approach as described by Abbott and Carpenter [7]. The avulsed fragment was anatomically reduced and fixed with 4.5 mm cannulated screw with washer depending on the size of the fracture fragment that was avulsed. Post operatively knee was immobilized in a plaster cast for 4 weeks, followed by gradual range of motion and strengthening exercises. At 6 months patients underwent posterior drawers test, knee range of motion examination and Lysholm knee scoring in order to evaluate their outcome.

RESULTS

Total 17 patients presented to our hospital with such injuries as identified on radiographs and MRI. However 12 out of these 17 were excluded since one had pre-existent knee osteoarthritis and 11 had concomitant meniscal, collateral ligament and anterior cruciate ligament tears. The remaining five patients underwent arthroscopic examination and were followed accordingly.

All the patients were male with mean age of 27.25 years (range 21-43 years). The mean time from injury to presentation was 7.25 days (range 3-15 days). Examination under anesthesia revealed a grade III posterior drawers test in all the patients. Motor vehicle trauma was cause of injury in 4 patients and 1 was injured during sports. There were 4 type III and 1 were type II fractures according to Meyers and McKeever classification. All the patients who had Motor vehicle trauma had type III injuries. Posterior directed blow to the tibia from dashboard injuries was found in 1 patient whereas rest of the 3 patients had Bike versus car accident. The remaining 1 patient who had sports related injury was due to kick to the posterior aspect of the knee while playing football. Follow-up was planned at 2-week, 4-week, 8-week, 4 months and 6-month.

Postoperatively all the patients were followed for 6 months. All fractures were united on radiological assessment on the last visit. There were 4 patients who had a negative posterior drawers test while 1 patient had a grade I laxity. Knee range of motion of all the patients was found to be significantly improved ranging between 100-110° as these patients had restricted knee range of motion during presentation. Outcome according to Lysholm knee scoring was found to be excellent in 4 cases and fair in 1 patient. Postoperatively none of the patients had any wound infections. Hypertrophic scar formation was seen in 1 patient, which was treated with intra-lesional steroid injections. Knee joint swelling was noted in 3 patients, which was resolved by continuous physiotherapy and compression dressings.

DISCUSSION

Three mechanisms of injury have been described by Trickey to cause PCL injuries in general [8]. First is force applied on the front of the proximal tibia in a flexed knee more commonly known as the dashboard injury. Second is the hyperextension mechanism also noted by Kennedy [9] in his cadaveric study on knee dislocations. Third is the posteriorly directed rotator injury. All these above mentioned forces produce a great deal of damage to the joint and result in multi ligamentous knee injury most of the instances. However in our study it was noted that the majority of the injuries were due to bike accidents rather than dashboard injuries.

The basic purpose of study at our centre was to determine results of PCL avulsion injuries when anatomically restored via operative intervention. Such injuries are quite rare in the literature of the western world but in the Asian region it is not an uncommon finding as described by Yang 2003 [10]. We found out that our results of isolated PCL avulsions were not very different from other authors who presented the outcome of PCL fixations in the face of concomitant ligament and bony trauma of the same leg. Chiu FY [11] noticed that 11 out of his 28 patients had associated injuries of the same knee but still he obtained 96% good results after PCL fixation. Bali K pointed out that isolated PCL fixations when carried out in acute setting

carry much better results than those treated late [12] which can be also noted in our study as early operative intervention of patients with PCL injuries resulted in better outcomes. However chronic injuries are not a contraindication for fixation and these also benefit from surgical intervention. Singla 2014 observed 6 excellent, 4 good and 1 fair result out of eleven patients who underwent PCL fixation after a mean delay of 8.6 months [13].

Open approach was our method of choice for visualization and fixation of the fracture. It is easier to perform but carries risk of knee stiffness and infection. Newer alternative open approaches have been described in the literature that claim smaller incisions and less morbidity [14,15]. Arthroscopic approach is better in regards of being minimally invasive, decreased postoperative pain, good cosmesis and less chances of knee stiffness. However it carries a longer and difficult learning curve, good operating facilities and a larger cost burden.

CONCLUSIONS

Posterior cruciate ligament avulsion fractures should be fixed early in order to achieve better stability and optimal results. Since the study sample is small. Further studies are warranted in this aspect.

REFERENCES

1. Ahn JH, Lee SH, Choi SH, Wang JH, Jang SW. Evaluation of clinical and magnetic resonance imaging results after treatment with casting and bracing for the acutely injured posterior cruciate ligament. Arthroscopy. 2011 Dec;27(12):1679-87. doi: 10.1016/j.arthro.2011.06.030.
2. Rademakers MV, Kerkhoffs GM, Kager J, Goslings JC, Marti RK, Raaymakers EL. Tibial spine fractures: a long-term follow-up study of open reduction and internal fixation. J Orthop Trauma. 2009 Mar;23(3):203-7. doi: 10.1097/BOT.0b013e31819b08ba.
3. Noyes FR, Barber-Westin SD. Two-strand posterior cruciate ligament reconstruction with a quadriceps tendon-patellar bone autograft: technical considerations and clinical results. Instr Course Lect. 2006 ;55:509-28.
4. Rastogi D, Meena S, Sharma V, Singh GK. Epidemiology of patients admitted to a major trauma centre in northern India. Chin J Traumatol. 2014 Apr 1;17(2):103-7.
5. Meyers MH, McKeever FM. Fracture of the intercondylar eminence of the tibia. J Bone Joint Surg Am. 1970 Dec;52(8):1677-84.
6. Griffith JF, Antonio GE, Tong CW, Ming CK. Cruciate ligament avulsion fractures. Arthroscopy. 2004 Oct;20(8):803-12.
7. Abbott Lc, Carpenter Wf. Surgical Approaches To The Knee Joint. J. Bone & Joint Surg. 1945 Apr;27(2):277-310.
8. Trickey EL. Injuries to the posterior cruciate ligament: diagnosis and treatment of early injuries and reconstruction of late instability. Clin Orthop Relat Res. 1980 Mar-Apr;(147):76-81.
9. Kennedy JC. Complete Dislocation Of The Knee Joint. J Bone Joint Surg Am. 1963 Jul;45:889-904.
10. Yang CK, Wu CD, Chih CJ, Wei KY, Su CC, Tsuang YH. Surgical treatment of avulsion fracture of the posterior cruciate ligament and postoperative management. J Trauma. 2003 Mar;54(3):516-9.
11. Chiu FY, Wu JJ, Hsu HC, Lin L, Lo WH. Management of avulsion injury of the PCL with reattachment. Injury. 1994 Jul;25(5):293-5.
12. Bali K, Prabhakar S, Saini U, Dhillon MS. Open reduction and internal fixation of isolated PCL fossa avulsion fractures. Knee Surg. Sports Traumatol, Arthrosco. 2012 Feb;20(2):315-21.
13. Singla R, Devgan A, Gogna P, Batra A. Fixation of delayed union or non-union posterior cruciate ligament avulsion fractures. J Orthop Surg (Hong Kong). 2014 Apr;22(1):70-4.
14. Rosch K, Proksch N, Preiss A, Giannakos A. Treatment of bony avulsions of the posterior cruciate ligament (PCL) by a minimally invasive dorsal approach. Oper Orthop Traumatol. 2012 Sep;24(4-5):348-53. doi: 10.1007/s00064-012-0208-1.
15. Lan J, Wang JW, Zhang KY. Treatment of tibial avulsion fracture at the insertion of the posterior cruciate ligament through a minimally posteromedial transverse incision in the hip knee flexion. Zhongguo gu shang = China journal of orthopaedics and traumatol. 2015 Jan;28(1):48-51.