ANTERIOR CRUCIATE LIGAMENT AVULSION INJURIES IN MILITARY SOLDIERS: A TERTIARY CARE EXPERIENCE

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ABSTRACT

Objective: To evaluate the clinical outcome of fixation of anterior cruciate ligament avulsion injuries in Military Soldiers.

Study Design: Descriptive case series.

Place and Duration of Study: Orthopedic department, Combined Military Hospital (CMH) Rawalpindi, from Jun 2015 to Jun 2016.

Material and Methods: Open reduction and screw fixation was done in 30 soldiers presenting with McKeever type III and IV avulsion fractures of anterior cruciate ligament. Outcome evaluation was carried out at 3 and 6 months. Lachman test was used for stability. Standard AP and Lateralx-rayswere taken to monitor bony healing. Lysholm score was used for functional evaluation.

Results: All 30 patients showed complete healing at 3 months. Three patients revealed residual laxity. Mean extension loss was 5 degrees. Lysholm score improved from pre-operative mean of 29.97 (SD ± 5.46) to post-operative mean of 95.67 (SD ± 1.47).

Conclusion: This study demonstrated operative fixation of Grade III and IV anterior cruciate ligament avulsion injuries as a successful surgical option in Military soldiers.

Key words: ACL avulsion, Lysholm score, McKeever type, Screw fixation.

INTRODUCTION

Anterior cruciate ligament (ACL) prevents anterior translation of tibia against femur. Poncet first described the injury as avulsion fracture of tibial spine[1]. In military soldiers, the injury commonly occurs while crossing the ditch during assault course. It also occurs after fall from bike or during sports like basketball and volleyball. Forced Flexation and rotation of the knee are the main mechanisms of injury[2]. With the help of compouterized tomography (CT) scan these injuries are more frequently picked.

Meyer and McKeever first classified the injury into four types and described its management accordingly[3]. Type I is undisplaced avulsion fracture and Type II is partially displaced avulsion fracture with elevation of anterior cortex. Both type I and Type II injuries can be managed conservatively with aspiration of hematoma, Jones dressing and a period of rest. Type III injury is complete displacement of avulsed fragment from its bed. Type IV is comminution of avulsed displaced fragment. Fixation of fracture fragment is advised for type III and IV.

Type III and IV injuries can be fixed by open or arthoscopic methods. Cannulated and noncannulated screws sare used in open methods of fixation. Arthoscopic assisted fixation is done with the help of sutures. Bogunovic *etal* systematic review showed no advantage of suture over screw fixation in terms of clinical outcome[4].Our study evaluated the clinical outcome of open reduction and screw fixation of anterior cruciate ligament avulsion injuries in 30 military soldiers.

PATIENTS AND METHODS

This study included 30 patients presenting between June 2015 to June 2016. The ACL Injury

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was suspected on X-Rays (fig-1 & 2) and confirmed with the CT scan. Inclusion criteria was all patients with Meyers and McKeevers type III and type IV Injuries. The patients with open fractures around the knee and polytrauma were excluded from the study. Patient was placed supine under spinal anesthesia. Tourniquet was used to achieve bloodless operative field. Injured knee was approached through medial parapatellar approach in a flexed position. Retropatellar fat pad was excised draining the hemarthrosis and knee was washed with normal saline.

Avulsed displaced fracture fragment was identified. It was reduced in crater and held with temporary K–wires. Drill bit (2.0 mm) was used to drill two oblique holes through the fragments. Partially threaded screws (3.5 mm) with washer were used to fix the fragments (fig-3). Tourniquet was released, hemostasis was secured and wound was closed in standard manner. Post-operatively, plaster of Paris (POP) slab was given for 4 weeks in 40 degree of flexion. Patient was followed monthly with x-rays for 3 months to monitor the union. Last follow up was doneat 6

Table: The characteristics of all the patients and results

Sex/Age	Side	Mechanism of injury	Grade	Lachman	Radiological Union	Lysholm score	
						Pre	Post
M/20	Right	Assault course	III	No laxity	88 days	27	94
M/23	Right	Basket ball	III	No laxity	91 days	17	96
M/21	Left	Assault course	IV	No laxity	89 days	27	94
M/28	Right	Assault course	III	No laxity	90 days	30	98
M/26	Left	Bike	IV	No laxity	90 days	29	97
M/30	Left	Volley ball	III	1+ laxity	92 days	38	94
M/27	Right	Assault course	III	No laxity	88 days	29	98
M/20	Right	Bike	IV	No Laxity	90 days	32	95
M/21	Left	Volley ball	III	No laxity	91 days	42	96
M/22	Left	Basketball	III	No laxity	92 days	30	97
M/25	Right	Assault course	III	No laxity	90 days	27	96
M/26	Right	Assault course	III	No laxity	91 days	28	97
M/21	Left	Basket ball	III	No laxity	94 days	27	96
M/27	Left	Basket ball	IV	No Laxity	90 days	18	97
M/30	Right	Volley ball	III	No laxity	92 days	29	96
M/32	Right	Bike	III	No laxity	92 days	30	94
M/29	Right	Assault course	III	No laxity	90 days	40	96
M/30	Left	Assault course	IV	No laxity	91 days	27	96
M/31	Right	Bike	III	1+ Laxity	90 days	39	94
M/32	Right	Basketball	III	No laxity	91 days	29	97
M/31	Left	Bike	IV	No laxity	90 days	30	96
M/30	Left	Assault course	III	No laxity	92 days	32	96
M/28	Right	Volley ball	IV	No laxity	90 days	28	94
M/29	Right	Volley ball	III	No laxity	91 days	27	97
M/31	Right	Bike	III	No laxity	82 days	30	93
M/30	Right	Assault course	IV	1+ Laxity	86 days	29	97
M/42	Left	Volleyball	III	No laxity	90 days	38	96
M/23	Right	Bike	III	No laxity	91 days	28	95
M/24	Right	Basket ball	III	No laxity	87 days	34	96
M/22	Left	Volley ball	IV	No laxity	89 days	28	92

months to assess the clinical outcome before sending the soldier back to active service. Data was analyzed by using SPSS version 21.

RESULTS

Thirty patients underwent open reduction and internal fixation (ORIF) for ACL Avulsion from tibial attachment. All the patients studied were male. Average age of the patients was 26 years ranging from 20-42 years. Right knee was involved in 18 patients (60%) and left knee was involved in 12 patients (40%). Mechanism of injury was anawkward fall (Flexion) while crossing the ditch in assault course 10 patients (33.3%). Twisting injury during contact sports and fall from bike was responsible for the avulsion in 13 patients (43.3%) and 7 patients (23.3%) of the cases respectively. There were 23 (76.6%) type III fractures and 7 (23.3%) type IV fractures.

The characteristics of all the patients and results are elaborated in the table.

Fig-1, 2 & 3 show the pre and post operative images of the patient who underwent the surgery. At 3 months follow up, all the fractures had healed. There was no major complication like infection, DVT or neurovascular injury. At 6 months follow up, 3 patients showed grade 1 laxity and 4 patients had relative instability due to associated posterior cruciate ligament injury. Mean loss of extension was 5 degrees (range 1-5 degrees). Mean Lysholm score improved from preoperative 29.97 (SD ± 5.46), ranging 17-42 to postoperative 95.67 (SD ± 1.47), ranging 92-98.

DISCUSSION

Anterior cruciate ligament is attached from tibial eminence to medial end of lateral femoral condyle. It provides functional stability to knee and prevents anterior translation of tibia over femur[5]. Incidence of tibial eminence fractures is less than 1%. Isolated ACL avulsion occurs during hyperextension of knee. Meyers and McKeevers type III and type IV avulsions are managed operatively. Avulsed fragment can be reduced by open or closed methods and fixed with the help of screws or sutures[6].

Fig-1

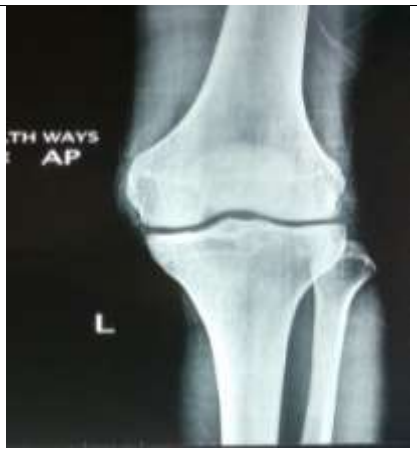

Fig-2

Fig-3

Figuresshow the pre and post operative image of the patients who underwent the surgery.

Each method of reduction and fixation has its own technicalities. Bogunovic *et al* in 2015 systematically reviewed the treatment of tibial eminence fractures[3-7]. Studies were pooled to evaluate the functional outcome in case of conservative vs operative management and suture vs screw fixation. Clinical instability was higher in cases managed non operatively (70%). Patient's perception of stability was no different between screw and suture fixation. We operated all the ACL Avulsion fractures by open method and used screws for fixation.

Bong MR reported screw pull out as one of the reason of failure of fixation[6-8]. In our study one patient had screw pull out due to fall on 7th

day. However, the purchase of screw was not sufficient in this patient as threads were not engaging the opposite cortex due to short length. Screw was repositioned and patient recovered uneventfully. All the other patients' fractures united at mean 03 months. Seon *et al* reported improvement in Lysholm score of upto 92.7 after fixation of ACL avulsion fractures with either sutures or screws[9]. In our study, the mean Lysholm score improved from preoperative 27 to postoperative 96.4 which are comparable to reported studies.

Loss of terminal extension is another problem after fixation of tibial eminence fractures. Kelly *et al* reported arthrofibrosis as one of the reasons for loss of range of motion[10]. In our study, 4 patients (13.3%) had 10 degrees loss of terminal extension at 6 months follow up. The deformity was mainly cosmetic and soldiers didn't report functional instability while engaged in high demand activities. Physiotherapy was advised to improve the range of motion.

CONCLUSION

Fixation of displaced (type III and IV) tibial eminence avulsion fractures improves the functional outcome. Open management of these fractures and fixation with screws is a successful surgical option. Arthroscopic suture fixation is another method of managing these injuries. Further studies are needed to establish the superiority of suture over screw fixation.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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