

Clinical Outcome of Patella Stability after Fixation of Osteochondral Fracture in Acute Primary Traumatic Patella Dislocation Without MPFL Repair or Reconstruction

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Abstract

Introduction: Conservative management is advisable for acute primary traumatic patella dislocation (PTPD). Surgical treatment is reserved for osteochondral fractures (OCF), medial patello femoral ligament (MPFL) avulsion/tear, compound injuries, and any underlying bony abnormalities requiring correction. MPFL repair (at avulsed site) or reconstruction along with underlying bony correction in PTPD is controversial. The purpose of this study is to evaluate patella stability after fixation of OCF in PTPD without performing MPFL repair or reconstruction, even in the presence of any underlying bony abnormalities.

Material and Methods: This is a retrospective study of eight patients who had PTPD with OCF along with MPFL injury who presented between 2016 and 2019. Pre-operative X-rays and MRI were done to assess the status of MPFL, identify the presence of OCF and to calculate Insall-Salvati index, Tibial Tuberosity-Trochlear groove distance and Trochlear dysplasia. All patients underwent surgery by open approach and OCF fixation by bioabsorbable pins or suture material. MPFL was neither repaired at avulsed site nor reconstructed and even no bony corrections were done.

Results: Average size of OCF fragments is 15*7 mm and all involving medial facet of patella. Lysholm score improved significantly from 32.8 to 94.8 and Kujala score from 49.1 to 96 at the end of 6 months. None of the patient had patella instability till latest follow-up, average follow-up period is 4.5 years (3–6 years). Clinically, apprehension test was negative in all cases with full ROM. Post-operative imaging including X-ray and MRI showed complete healing of the OCF along with complete healing/regeneration of MPFL with same pre-existing bony abnormalities if present preoperatively.

Conclusion: This study shows excellent patella stability and full knee function along with complete union of OCF and complete healing/regeneration of MPFL in PTPD even in the presence of underlying bony abnormality. Hence, in PTPD with OCF, there is no need to repair/reconstruct MPFL or to correct underlying bony pathology, only OCF fixation is required.

Keywords: Patella dislocation, traumatic osteochondral fracture, medial patello femoral ligament, Lysholm and Kujala score.

Introduction

Acute primary traumatic patellar dislocations (PTPD) accounts for nearly 3% of knee injuries [1] usually as a result of sporting activities and are common in young, active individuals, and athletes [2]. Primary patellar dislocations should be differentiated from habitual and recurrent patellar dislocations because

treatment approaches differ with each entity. PTPD is defined as traumatic disruption of previously uninjured medial peripatellar structures [3,4].

Average annual incidence of patellar dislocation is between 5.8 and 7.0/100,000 person-years in the general population which rises to 29/100,000 person-years in the 10–17-year age

group. However, the incidence was increased to 69/100,000 person-years in the military population [5].

Hemarthrosis, medial patello femoral ligament (MPFL) injury, and medial retinacular disruption are usually presented in almost all patients with acute PTPD while osteochondral fractures (OCFs) have been noted in nearly 25% cases [2]. The chances of redislocation and recurrent instability are reported up to 80% in literature and attributable to predisposing factors such as vastus medialis muscle hypoplasia, hyperlaxity of the ligaments [6, 7]

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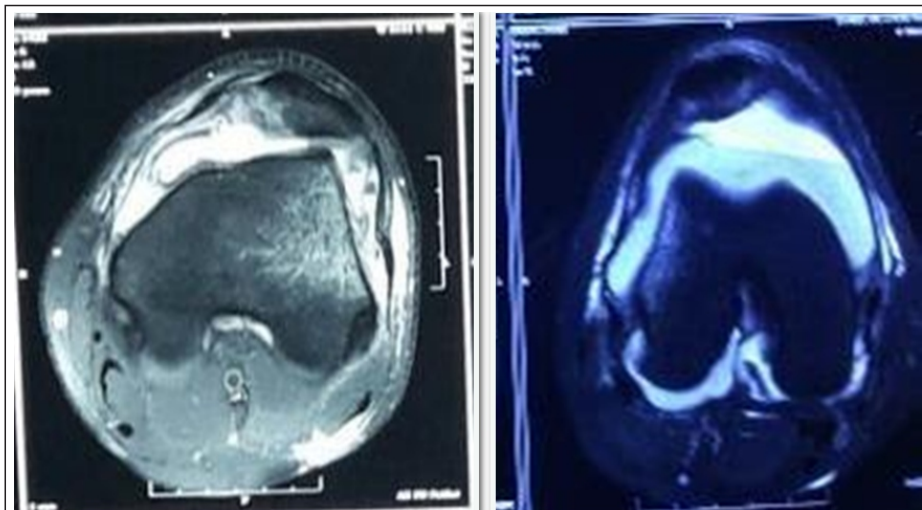


Figure 1: (a) Pre-operative MRI showing Medial Facet Osteochondral Patella Fracture with MPFL Avulsed from Femoral Site. (b) Pre-operative MRI showing Medial Facet Chondral Patella Fracture with no MPFL injury.

increased femoral anteversion with compensatory external tibial torsion [8], trochlear dysplasia [9, 10], patella alta [11, 12], dysplastic patella, increased Q-angle with lateralized tibial tuberosity, and genu valgum [13, 14]. Treatment of primary traumatic patella dislocation (PTPD) is usually conservative. Surgical indications are OCF and compound injuries. MPFL repair (at avulsed site) or reconstruction in PTPD is controversial. As per literature, MPFL repair or reconstruction along with OCF fixation is considered as essential management for PTPD [15, 16, 17, 18] mainly to prevent redislocation and recurrent instability.

Thus, the purpose of this study is to evaluate patellar stability after surgical management of acute PTPD treated with only OCF fixation without performing MPFL repair or reconstruction and without correcting underlying bony pathology.

Material and Methods

This is a retrospective study of eight patients of different age group who had undergone surgery for acute PTPD during period of 2016 to 2019 at Rathi Nursing Home (RNH) Hospital, Dhantoli, Nagpur, Maharashtra, India. Patients diagnosed with PTPD with

acute injury of <3 weeks were included in the study. The presence of OCF, size >5 mm confirmed by MRI/CT scan, and diagnostic arthroscopy was enrolled. All those who were diagnosed with habitual or recurrent patellar dislocation and OCF with size <5 mm were excluded from the study.

Patients presented to the emergency department/outpatient clinic at RNH Hospital, Nagpur with chief complaints of knee pain and swelling with restricted knee range of motion usually following some traumatic episode due to sports injury or road traffic accident.

Clinical examination demonstrated positive apprehension test to lateral patellar translation. Palpation showed areas of medial retinaculum and MPFL

avulsion or tear site. In cases of OCF, it was also associated with retro patellar tenderness. Generalized ligamentous laxity, coronal plane deformities such as genu valgum, and other bony abnormalities like increased femoral anteversion were also assessed clinically. Associated injuries such as a physal injury in skeletally immature patients, anterior cruciate ligament tear, and other ligamentous injuries were ruled out.

Radiological examination including antero-posterior, lateral, and skyline X-rays of knee was taken to diagnose presence of any fractures, patellar tilt, OCF of patella, and other loose bodies. MRI was performed in all cases which helped to detect patellar tilt, osteochondral injury, MPFL tear or avulsion, Tibial Tuberosity-Trochlear groove (TT-TG) distance, trochlear dysplasia, patellar height, Insall-Salvati Ratio, etc. All patients were operated within 4 weeks of trauma. Operative Technique - Midline medial parapatellar approach was used in all cases. Fixation of OCF fragment was performed using bioabsorbable pins of size 1.5/2 mm by ARTHREX or with absorbable suture material (Monocryl). Wound was closed in layers; medial retinaculum was closed first followed by subcutaneous closure followed by skin closure. Good patellar tracking was achieved intra operatively in all the cases. Neither MPFL repair (from avulsed site) or reconstruction was done,

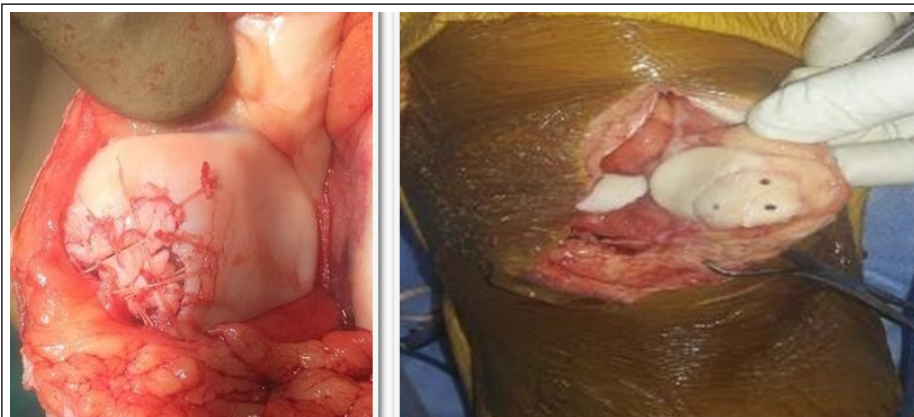


Figure 2: (a) Intra operative picture showing Osteochondral Fracture from Medial Facet Patella fixed with Biopin. (b) Intra operative picture showing chondral fracture form Medial Facet Patella fixed with 3-0 monocryl.

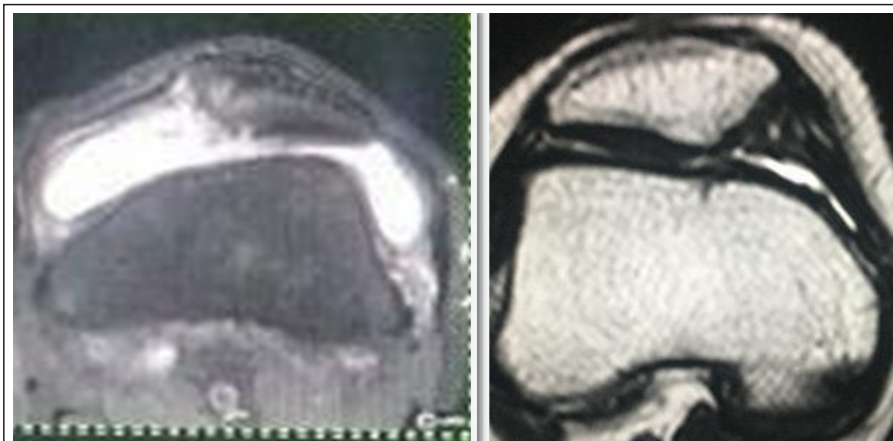


Figure 3: (a) Post-operative MRI showing complete healing of osteochondral fracture with regeneration of MPFL. (b) Post-operative MRI showing complete healing of chondral fracture with complete regeneration of MPFL.

nor any underlying bony corrections was done even in case of any abnormality. Rehabilitation protocol was non-weight bearing walking with static knee brace locked in extension was advised. Range of motion was initiated from 0 to 30°, 30 to 60°, and 60 to 90° every 7 days in increasing manner, with the patient prone to avoid quadriceps action until 4 weeks. After 4 weeks, quadriceps strengthening exercises and partial weight bearing walking were allowed, gradually increasing to full weight bearing.

The mean period of follow-up was 1 year postoperatively. The Lysholm and Kujala knee scoring systems were used to evaluate the knee function and patella stability. Post-operative X-ray and MRI were done to confirm the healing of osteochondral/chondral fragment which also demonstrated complete

healing of the medial structures (MPFL and medial retinaculum) with same underlying bony pathology. Pre-operative X-ray, intraoperative image, and post-operative X-ray of two patients are shown in Fig. 1 and 2.

Results

Eight patients were enrolled in the study; five males (62.5%) and three females (37.5%) with an average age of 20 years with mean 19.37 and SD 6.91 (Range 14–34 years). Six with left knee injury (75%) and two with right knee (25%). Mechanism of injury was sports for three patients (37.5%), fall for three patients (37.5%), and road traffic accidents for two patients (25%). Average post-trauma day is 17 (Range from 10 to 30 days). All patients had PTPD with no history of past episode of dislocation. All cases involved medial patellar facet OCF.

Average size of OCF fragments in two dimensions is 15*7 mm. All patients were operated within 4 weeks of injury. Out of eight patients mean Insall-Salvati Ratio is 1.01. One patient had TT-TG >20 mm (23 mm) and mean TT-TG was 18.37. The Mean Trochlear Groove height was 4.45 mm.

Lysholm score improved significantly from mean 32.8 with SD 7.61 preoperatively to mean 94.8 with SD 0.46 postoperatively ($P = 0.0001$). Kujala score improved significantly from mean 49.1 with SD 8.6 preoperatively to mean 96 with SD 3.2 postoperatively ($P = 0.0001$). A highly significant post-operative improvement was observed in knee function as compared to pre-operative status. Imaging evidence including X-ray and MRI revealed good healing of the OCFs with average union time of 24 weeks. Even MPFL healed or regenerated completely with same underlying bony pathology. The mean follow-up period was up to 4.5 years. Details of all eight patients are summarized in Table 1.

Discussion

Acute PTPD is the second most frequent cause of traumatic hemarthrosis of knee, after anterior cruciate ligament tear, and accounts for 3% of all traumatic knee lesions [1, 19] mainly due to sports injuries involving young and active individuals [2, 20].

The patellofemoral joint is a complex joint whose stability depends on static and dynamic stabilizing structures and osteoarticular conformation. The medial structures primarily MPFL along with vastus medialis obliquus and medial retinaculum has significant contribution in patellar stability [21]. PTPD should be differentiated from habitual and recurrent dislocations, where primary or inaugural patellar dislocation injures previously intact or uninjured medial parapatellar structures [3, 5]. If repeated several times, it becomes recurrent dislocation.

Table 1: Details of all Eight patients including mechanism of injury, pre-operative and post-operative score and union

Number of Patient	1	2	3	4	5	6	7	8
Age	14	16	14	18	22	14	34	23
Sex	F	F	M	M	M	F	M	M
Side	L	R	R	L	L	L	L	L
Mechanism of Injury	Fall	Fall	Sports	Sports	Sports	Fall	RTA	RTA
Duration since Injury (in days)	15	20	30	18	21	10	10	12
Dislocation	P	P	P	P	P	P	P	P
Fracture Site (facet)	M	M	M	M	M	M	M	M
Fracture fragment size (mm)	16*7	10*6	30*8	10*7	10*5	15*7	15*7	15*6
Insall-Salvati Index	1.1	1	0.9	1	1.1	0.9	1.1	1
TT:TG Ratio	20	18	14	16	20	18	18	23
Trochlear Groove Height(mm)	4.8	4.2	4.4	4.6	4.2	4.4	4.6	4.4
Lysholm Score (Pre op)	39	35	43	19	31	26	37	32
Lysholm Score (Post op)	94	95	95	95	95	94	95	95
Kujala Score (Pre op)	62	48	48	31	52	53	50	49
Kujala Score (Post op)	94	89	98	97	96	98	97	99
Follow-up in months	6	6	10	6	8	8	6	6
Union Time in weeks	24	24	20	24	24	20	28	24

Sex Female(F) and Male (M), Side Left (L) and Right (R), Dislocation Primary (P), Fracture site Medial Facet (M)

Almost all patients with traumatic patellar dislocation shows MPFL lesion but OFC is seen in 25% cases [2]. Risk of recurrent dislocation increases six-fold with history of ipsilateral or contralateral dislocation [20].

Principal predisposing factors for recurrent patella dislocation includes trochlear dysplasia [10], elevated TT-TG distance [23], Patella alta [11, 12], and Patella tilt. Secondary factors include elevated Q-angle with tibial tuberosity lateralization, genu valgum [13, 14] elevated femoral anteversion with lateral tibial torsion [8], vastus medialis hypoplasia, ligamentous hyperlaxity with genu recurvatum [6, 7], and patella dysplasia [24]. The guidelines for the treatment of recurrent patellar dislocation are well described in literature, where surgery is mandatory. The predisposing factors should be screened for and the treatment is personalized by “à la carte” approach, as described by Demey et al. where each above mentioned abnormality is dealt with in sequential manner as required [25]. Soft tissues should be repaired or reconstructed and bony abnormalities should be corrected.

The management of PTPD still remains a topic of considerable controversy. Proper treatment is essential to minimize squeals of recurrent dislocation/subluxation and patellofemoral osteoarthritis. Whether initial stabilizing surgery for the treatment of PTPD decreases, the risk of further instability is still in debate. Recurrence rates after primary dislocation can be relatively high, up to 40% [26]. Recommendations on treatment of acute patellar dislocation vary widely and lack higher quality evidence. The redislocation rates were high, varying between 10% and 30% for

surgical treatment [14, 19, 27, 28, 29] and between 13% and 52% for conservative treatment [22, 28, 30, 31, 32].

Stefancin and Parker recommended non-operative treatment in a review of 70 articles, except in case of chondral lesion, OCF or major lesions of the medial stabilizing structures like MPFL on clinical and radiological (CT and MRI) assessment [1]. Conservative management is advised by several surgeons in the form of immobilization in patellar brace, posterior splint or plaster cast in extension usually for 6 weeks [22]. This provides better environment for the medial structures to heal but at the expense of knee stiffness and muscle weakness.

Surgical treatment for PTPD is indicated in 1) evidence of OCF on clinical examination or imaging, 2) disruption of MPFL-VMO-adductor mechanism, 3) laterally subluxated patella on Mercermarchant view/skyline X-ray, 4) subsequent dislocation, and 5) failure of non-operative treatment in the presence of predisposing factor [1]. Chances of redislocation can be significantly reduced with surgical stabilization of the injured structures [33].

There is high prevalence of MPFL injury in association with acute PTPD [18, 33, 34]. It is considered and accepted that large defects or avulsions are not going to heal or have a good functional outcome with closed treatment especially in high-level athletes and those with evidence of one or more predisposing factors. MPFL injury has been demonstrated as the primary constraint in preventing lateralization of the patella [35, 36]. Immediate surgical repair of the injured medial patellar stabilizers, including the vastus medialis obliquus muscle and the

MPFL is advocated in this situation which helps preventing redislocation [37]. In other studies by Camanho et al. [16], Sallay et al. [17], Ahmad et al. [18], and Keller Army Hospital in USA [15], MPFL repair or reconstruction was performed at the time of surgery in patients diagnosed with PTPD along with MPFL lesion.

In our study, we managed PTPD with only fixation of large OCF and did not repair (from avulsed site) nor reconstructed MPFL, also all the predisposing factors even if abnormal were not operated upon. We achieved excellent results with full knee function and patellar stability with complete union of OCF on follow-up as assessed by Lysholm and Kujala scoring systems. Post-operative MRI showed regeneration of injured MPFL and complete healing of medial structures along with full fracture union. No complications of redislocation, patellofemoral pain, or loss of motion were encountered, and all patients returned to sports and daily activities.

Conclusion

We tend to conclude that while conservative management should be the treatment of choice in PTPD, surgical intervention should be reserved only in cases of large OCF or compound injuries. This study shows excellent patella stability and full knee function along with complete union of OCF and complete healing/regeneration of MPFL in PTPD even in the presence of underlying bony abnormality. Hence, in PTPD with OCF, there is no need to repair/reconstruct MPFL or to correct underlying bony pathology, only OCF fixation is required.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the Journal. The patient understands that his name and initials will not be published, and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

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