Original Article

Recurrent Patellar Dislocation: Reappraising our Approach to Surgery

Andrew KS Lim,[1] *MBBS, MRCSEd*, Haw Chong Chang,[2] *MBBS, FRCS*, James HP Hui,[1] *MBBS, FRCSEd, FAMS*

Abstract

Introduction: The management of recurrent traumatic patellar dislocation includes surgical realignment. There is no clear distinction whether proximal soft tissue or distal procedures produce superior results. However, distal realignment procedures are commonly associated with greater morbidity. We advocate a distal procedure only for cases which are more severe, such as the presence of patellar maltracking. Materials and Methods: Between January 2002 and June 2007, all patients who had a history of traumatic patellar dislocation with recurrent symptoms and failed conservative management underwent surgical realignment. Patients who had evidence of lateral patellar subluxation on computed tomography (CT) scan were offered a distal realignment procedure using the Elmslie-Trillat or Roux Goldthwaite procedure. All other patients underwent proximal soft tissue medial patellofemoral ligament (MPFL) reconstruction. Pre and postoperative functional International Knee Documentation Committee (IKDC), Lysholm and Tegner score assessments were performed for a minimum follow-up period of 6 months. The mean scores for each group were analysed using the Wilcoxon Matched-Pairs Signed-Ranks test and the Mann-Whitney U test was used to evaluate the difference between the groups. Results: A total of 23 patients underwent surgery for patellar realignment. Of whom, 14 patients had a distal realignment procedure while 9 patients had a proximal procedure of MPFL reconstruction. There was greater morbidity reported with distal realignment procedures. Pre and postoperative IKDC, Lysholm and Tegner scores showed significant improvement for both treatment arms. However, there was no significant difference between the improvement scores for both groups. Conclusion: Patients with significant patellar maltracking following traumatic patellar dislocation would benefit from distal realignment using the Elmslie-Trillat or Roux Goldthwaite procedure. Otherwise, a proximal soft tissue procedure involving MPFL reconstruction would be adequate. A management algorithm is proposed for clinical use.

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Key words: Algorithm, Distal realignment, Medial patellofemoral ligament

Introduction

Traumatic patellar dislocations affect mainly adolescents and young adults. Up to 44% of patients will develop recurrent dislocation.[1] To reduce the risk of osteoarthritis secondary to articular injury caused by recurrent dislocations as well as to encourage normal development of the patellofemoral joint, surgical stabilisation of the patellar is important in this age group.[2]

Patellar realignment surgery is broadly classified into proximal soft tissue or distal bony realignment procedures, with the reference point from the inferior pole of the patellar. Proximal soft tissue procedures would include lateral release, vastus medialis obliquus (VMO) plasty and medial patellofemoral ligament (MPFL) reconstruction. Distal bony realignment procedures would include medialisation of the tibial tubercle such as the Fulkerson or Elmslie-Trillat procedure. There has been no clear indication which produces superior functional results.[3]

However, we believe that patients with recurrent traumatic patellar dislocations should undergo a distal realignment procedure only if there is significant evidence of patellar maltracking.

Materials and Methods

Between January 2002 and June 2007, all patients who had a history of traumatic patellar dislocation were referred

[1] Department of Orthopaedic Surgery, National University Hospital, Singapore
[2] Department of Orthopaedic Surgery, Changi General Hospital, Singapore
Address for Correspondence: Dr Andrew KS Lim, Department of Orthopaedic Surgery, National University Hospital, 5 Lower Kent Ridge Road, Singapore 119074.
Email: andrew.lim@nathealthgroup.com

to the orthopaedic clinic. Initial X-rays of these patients were taken to exclude an osteochondral fragment. Following a 3- to 9-month trial of physical therapy, patients who continued to experience recurrent symptoms of instability or pain, underwent further evaluation for this study. This included a magnetic resonance imaging (MRI) as well as computed tomography (CT) scan of the knee from 0 to 30 degrees to assess patellar tracking. Patients who had evidence of subluxation were offered a distal realignment procedure. All other patients underwent MPFL reconstruction. Patients with significant chondral injury to the patellar or femoral condyle (Outerbridge grade III or IV) were excluded from this study.

The distal realignment procedure was performed via a midline incision over the inferior aspect of the knee. For a skeletally mature patient, a lateral release of the patellar followed by the Trillat procedure was performed, in which the tibial tuberosity was transposed medially by 1 cm (Fig. 1) and held by a single screw, keeping the medial periosteum intact (Fig. 2). In a patient with an open physis, the Roux Goldthwaite procedure was performed, in which the lateral half of the patellar tendon was transposed medially. Patellar tracking was visually assessed.

MPFL reconstruction was performed using autologous gracilis graft harvesting. Through an incision anterior to the medial femoral epicondyle, the adductor tubercle was then exposed. The point just distal to the tubercle was identified as the femoral origin of the MPFL reconstruction. The graft was looped and secured to the proximal two-thirds patellar in a 'V' fashion using 3 anchor sutures. This was performed with careful and isometric tensioning at 20 degrees of knee flexion with the patella centred on the trochlear (Fig. 3).

Following surgery, patients underwent rehabilitation therapy in a ranger knee brace for 6 weeks with partial weight bearing. Postoperatively, they were reviewed in the clinic for functional International Knee Documentation Committee (IKDC), Lysholm and Tegner score[4] assessments at 3 monthly intervals for a minimum follow-up period of 6 months. Mean pre and postoperative functional scores for each treatment arm were calculated and analysed for statistical significance. The Wilcoxon Matched-Pairs Signed-Ranks test was used as a statistical method to evaluate the difference within each group and the Mann-Whitney U test to evaluate the difference between the groups.

Results

From January 2002 to June 2007, a total of 23 patients underwent surgery for patellar realignment; of whom, 14 patients had the distal realignment procedure (Group A) while 9 patients had the proximal procedure of MPFL reconstruction (Group B).

The mean age of group A was 21.3 years (range, 14 to 32) with 9 males and 5 females. The mean duration of symptoms preoperatively was 7.2 months while the mean postoperative follow-up duration was 16.5 months (range, 6 to 24) (Table 1). The mean age of group B was 20.2 years (range, 14 to 23) with 6 males and 3 females. The mean duration of symptoms preoperatively was 5.6 months while the mean postoperative follow-up duration was 11.2 months (range, 6 to 19) (Table 2).

There was no difference demographically between group A and group B. One patient in group A reported parasthesia over the wound site. There was also a case of pain over the

Table 1. Distal Realignment (Group A)

	Initials	Age (y)	Gender	Duration of symptoms (Pre-operative) (mo)	Duration of follow-up (Post-operative) (mo)
1	HLL	27	F	6	6
2	VK	18	M	9	24
3	QS	20	M	8	6
4	LPF	23	F	5	24
5	LPF	23	F	9	12
6	MM	14	M	5	6
7	MT	16	M	7	24
8	JL	24	F	8	18
9	MO	21	M	9	18
10	HK	20	F	9	9
11	RL	22	M	9	24
12	CZX	21	M	6	24
13	MC	32	M	3	24
14	LSW	18	M	8	12

F: female; M: male

Table 2. MPFL Reconstruction (Group B)

	Initials	Age (y)	Gender	Duration of symptoms (Pre-operative) (mo)	Duration of follow-up (Post-operative) (mo)
1	MF	19	M	3	6
2	SK	21	M	6	19
3	CWS	22	M	5	6
4	PC	21	M	7	13
5	TM	14	F	9	15
6	DP	20	F	5	8
7	TLT	21	F	7	12
8	OS	23	M	5	10
9	RW	21	M	4	12

F: female; M: male

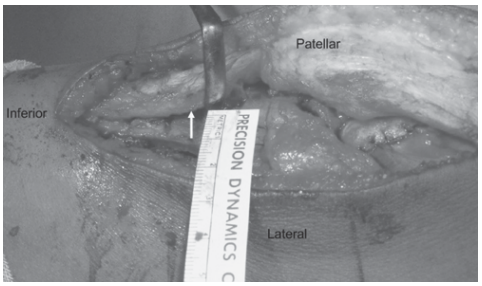

Fig. 1. Elmslie-Trillat procedure of left knee. Lateral release of patellar followed by tibial tubercle osteotomy and transposition medially by 1cm (white arrow).

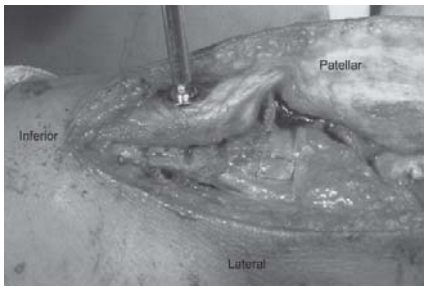

Fig. 2. Elmslie-Trillat procedure of left knee. Insertion of single screw to secure tibial tubercle transfer keeping medial periosteum intact.

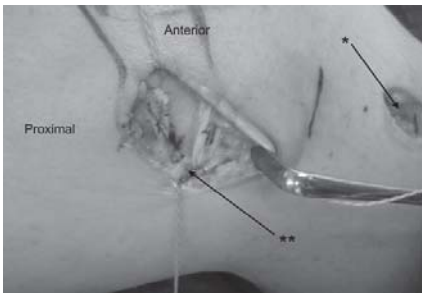

Fig. 3. MPFL reconstruction of left knee. Autologous gracilis tendon graft harvesting site (marked *) followed by looping and anchoring of tendon in 'V' fashion. Apex of 'V' at point just distal to adductor tubercle (marked **) with 2 limbs at superior and mid pole of medial patellar.

Table 3. Comparison of Functional Scores For Distal Realignment (Group A) and Proximal Realignment (Group B)

Group	Functional scoring system	Mean preoperative score (95% CI)	Mean postoperative score (95% CI)	Statistical significance
A	IKDC	40.8 (29.4-52.2)	67.0 (52.7-81.1)	*P* <=0.001
	Lysholm	42.2 (29.3-55.0)	60.5 (43.4-77.6)	*P* <=0.003
	Tegner	1.45 (0.48-2.42)	3.45 (2.13-4.77)	*P* <=0.008
B	IKDC	59.1 (25.2-92.9)	93.6 (88.3-98.7)	*P* <=0.002
	Lysholm	57.4 (25.6-89.2)	89.4 (80.2-98.5)	*P* <=0.008
	Tegner	5.00 (3.24-6.75)	6.80 (6.24-7.35)	*P* <=0.031

95% CI: 95% confidence interval; IKDC: International Knee Documentation Committee

screw site and inability to kneel. In particular, there was no postoperative infection, osteotomy non-union, patellar tendon rupture or patellar dislocation for either group. Mean pre and postoperative IKDC, Lysholm and Tegner activity scores were compared for both groups (Table 3).

All IKDC, Lysholm and Tegner scores in both groups A and B showed significant pre and postoperative change (Wilcoxon Matched-Pairs Signed-Ranks test). However, there was no significant difference between the improvement of scores for both groups (Mann-Whitney U test).

Discussion

Traumatic patellar dislocations are often due to indirect trauma such as a twisting injury and occasionally due to a direct blow to the knee. Following the reduction of an acute first episode traumatic patellar dislocation, patients should have X-rays taken to exclude an osteochondral injury.[5] A magnetic resonance imaging (MRI) would confirm the diagnosis and to exclude an anterior cruciate ligament (ACL) injury. Surgical intervention in the form of fixation of the osteochondral fragment would be indicated. Plain X-rays can also demonstrate evidence of patellar tilt or subluxation on skyline view, patellar alta (Insall-Salvati index) or trochlear dysplasia (Dejour classification[6]) on lateral view and even abnormal genu valgum on AP view.

The management of traumatic patellar dislocations should include intensive physiotherapy. This can include patellar taping and bracing. Quadriceps strengthening exercises to focus on the VMO should be emphasised. Patients who represent with recurrent pain or instability episodes in the form of subluxation or repeated dislocation would warrant further investigations. This would include axial CT scan in particular to demonstrate any evidence of patellar maltracking in early flexion since the patellar engages the trochlear only beyond 30 degrees of flexion.[7] A MRI would also be helpful to exclude any chondral lesion of the patellar or femoral condyle, to assess the state of the medial stabilisers, in particular the MPFL.[8] Many patients have an attenuated MPFL following traumatic patellar dislocation as well as some degree of patellar maltracking.

Often, the aim of a distal realignment procedure would be to alter and improve the Q-angle. In this manner, the magnitude of the lateral quadriceps vector would be diminished to prevent lateral displacement of the patellar in early flexion before it engages the trochlear. However, the Q-angle can be measured to be falsely normal should the patellar be in a subluxed position. Hence, we utilised the patellofemoral congruence angle instead as a measure of patellar subluxation. The presence of patellar tilt and subluxation would indicate significant patellar malalignment and maltracking.

The pre and postoperative scores for distal realignment showed improvement which was statistically significant. This was despite a higher initial postoperative morbidity. Preoperative scores for the distal realignment group appeared lower possibly indicating greater functional debility associated with significant patellar maltracking. Proximal soft tissue procedures involve less invasive surgery and can often be performed with smaller incisions compared to distal realignment procedures. However, our results did not indicate a greater statistically significant score improvement for the proximal realignment group possibly due to the very small subject numbers. The strength of the

study can be improved with greater patient numbers and the addition of a control group for comparison.

The Hauser technique introduced in 1938 was the initial standard procedure for the treatment of recurrent patellar dislocation. In this procedure, the tibial tublercle was moved distally and medially; however, resultant osteoarthritic changes in the patellofemoral joint were reported. On the contrary, the Elmslie-Trillat procedure introduced in 1964, which involved moving the tibial tubercle only medially, showed less osteoarthritic changes in the patellofemoral joint with good to excellent clinical outcome in more than 80% of knees.[9]

In the immature skeleton, bony realignment procedures would be contraindicated due to possible premature fusion of the anterior tibial physis resulting in genu recurvatum. In this group of patients, medial transposition of the lateral half of the patellar tendon using the Roux Goldthwaite procedure would be more appropriate.

The MPFL, being the major medial ligamentous stabiliser of the patellar, serves an extremely important function in preventing patellar dislocation as well as initiating smooth entry of the patellar into the femoral sulcus. Originating from the "saddle" region between the medial femoral epicondyle and the proximal adductor tubercle, the MPFL inserts onto the most proximal two thirds of the patellar.

Multiple techniques have been described for reconstruction of the MPFL. Although the techniques differ in the type of graft used and method of fixation to the femur and patellar, they are all based on restoration of the MPFL and its action on the patellar. These include the use of semitendinosus, quadriceps or adductor longus tendons with patellar tunneling, biotenodesis screw fixation or suture anchor fixation. The femoral origin of MPFL reconstruction is most sensitive to reproduction of proper ligament isometry.[10] Placement of the femoral origin too proximally will cause tightening of the MPFL reconstruction in flexion with overload of the medial patellar facet, while placement too distal will cause tightening of the MPFL in extension causing non-physiologic patellar motion.

Further objective assessment may be performed postoperatively through the use of CT or arthroscopy to reassess patellar tracking.

Conclusion

The management of recurrent traumatic patellar dislocation includes surgical stabilisation. Patients with significant patellar maltracking would benefit from a distal realignment procedure. Otherwise, a proximal soft tissue procedure involving MPFL reconstruction would be adequate with less morbidity and good functional results. A proposed algorithm for the management of traumatic patellar dislocation would be useful based on clinical and radiological findings (Fig. 4).

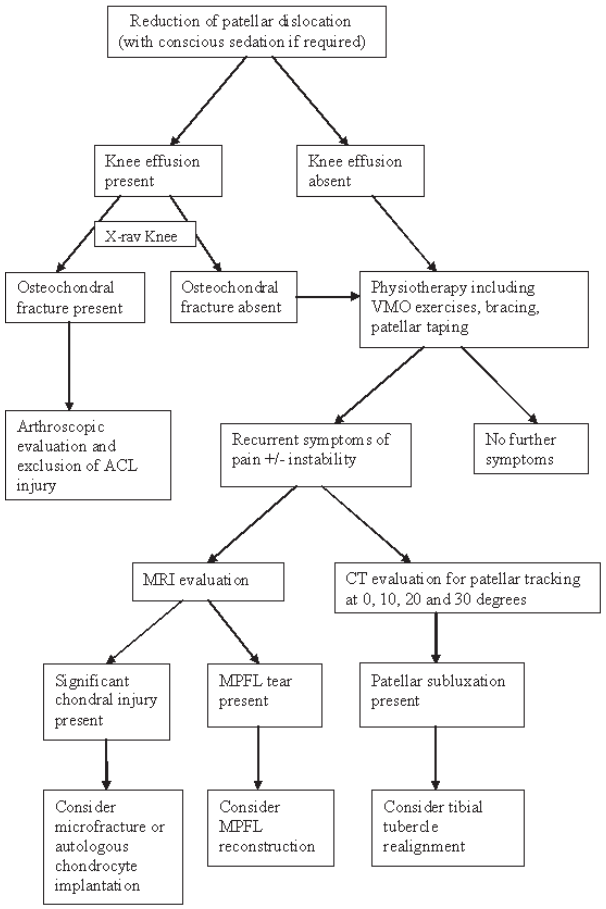

Fig. 4. Algorithm for the management of traumatic patellar dislocation

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