Case Report

Trochleoplasty and medial patellofemoral ligament reconstruction for recurrent patellar dislocation

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Abstract

We report a case of recurrent patellar dislocation with high-grade trochlear dysplasia which persisted despite two previous operations. We did a Dejour's sulcus deepening trochleoplasty, medial patellofemoral ligament reconstruction, and lateral retinacular release. Trochleoplasty and medial patellofemoral ligament reconstruction is required in patients with high grade trochlear dysplasia.

Key words: Medial patellofemoral ligament reconstruction, patellar dislocation, trochleoplasty

Introduction

The patellofemoral joint has a low degree of congruency by nature; therefore it is susceptible to dislocation. There are active and passive restraints that prevent the patella from being subluxated or dislocated. The passive stability depends on static anatomical restraints and the congruence between the trochlea and patella, which is low, as mentioned above. The active stability is provided by the dynamic restraints: the muscles and the balance between the ligaments: Both bony and soft tissues structures provide an active and passive stability which allows the patella to function during knee movements. Patellar dislocation has a low rate of recurrence. Some predisposing factors, mostly congenital, lead to chronic patellar instability; these factors have a high genetic incidence. Henri Dejour [established in 1987 a classification of patellofemoral instability and described four major factors for instability with statistical threshold. The four instability factors were: Trochlear dysplasia, Patella Alta, excessive distance between tibial tubercle and trochlear groove (TT-TG>20 mm) and excessive patellar tilt (>20°).

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Access this article online	
Quick Response Code:	Website: www.ijoonline.com
	DOI: 10.4103/0019-5413.93691

Trochlear dysplasia is the main determinant; it is present in 96% of the objective patellar dislocation population (at least one patellar dislocation). Sometimes it is obligatory to correct the sulcus angle if there is a high grade trochlear dysplasia (type B and D) to achieve normal patellar tracking. The trochlear shape can be modified by two types of trochleoplasties either lifting the lateral facet or deepening the trochlea creating a new trochlear groove. We present a case of recurrent patellar instability treated by Dejour's sulcus deepening trochleoplasty to correct dysplasia and medial patellofemoral ligament reconstruction for lax medial retinacular structures.

Case Report

An 18-year-old girl presented to us with recurrent dislocation of patella. She had two previous surgeries, first one at the age of 16 years and the second surgery a year later, in two different hospitals. Lateral release and medial plication was done in 2007 and extensive lateral release and vastus medialis advancement was done in 2008. Unfortunately, the problem persisted and the patella continued to dislocate when she presented to us. On clinical and radiological examination, she had generalized ligamentous laxity, apprehension test was positive and the medial patellar glide was <1/4, indicating a tight lateral retinaculum. Tibial tubercle- trochlear groove (TT-TG) distance, a measure of Quadriceps angle by CT scan was 23.2 mm. Patella alta measurement by Caton Deschamps's index was 1.2. CT showed Patellar tilt angle of 43 degrees, Type 'C' Dejour's trochlear dysplasia[1] ie. lateral femoral convexity and medial femoral hypoplasia [Figures 1-3].

She underwent sulcus deepening trochleoplasty as described by Dejour[1] and medial patellofemoral ligament (MPFL) reconstruction along with lateral retinacular release. Through

a midline skin incision and medial parapatellar arthrotomy, the trochlea was exposed under tourniquet control. The peritrochlear periosteum and synovium were incised about 5 mm from the trochlear cartilage margin. This width of 5 mm of the bone will correspond to the prominence of the trochlea (distance between the anterior cortex of the femur and the boundary of the trochlear cartilage). The cortex was osteotomized in the same plane and an osteochondral flap of about 5 mm thick was raised in "V" shape. The trochlear sulcus was referenced off the intercondylar notch, and was mapped proximally and 6° laterally.[1] A thin layer of cancellous bone was removed with a curette up to the notch, more in the middle of the trochlea. The trochlear bone shell was impacted into the trough created in the cancellous bone. However, the sulcus formed was not deep enough. Hence, to achieve sufficient correction, we split the cartilage along the center of the groove. The newly established trochlea was fixed with two small staples astride the osteochondral junction, one on either side of the groove. There was no impingement as the knee was taken through its range of motion. The peritrochlear periosteum and the synovium were sutured.

Figure 1: Preoperative anteroposterior (a) lateral (b) and skyline (c) views showing trochlear dysplasia. The postoperative anteroposterior and lateral view (d) after trochleoplasty showing patellar anchors and well aligned patello-femoral joint

After this procedure, we reconstructed the MPFL, as described by Erasmus,[2] but with a few variations. A double-looped semitendinosus tendon was anchored to the medial border of patella at the junction of upper and middle thirds, typically where the perimeter of patella becomes more vertical with a titanium anchor. A tunnel was drilled at the isometric point on the medial femoral epicondyle through which the tendon was pulled through and was fixed with a biodegradable interference screw [Figure 4]. Medial patellar retinaculum

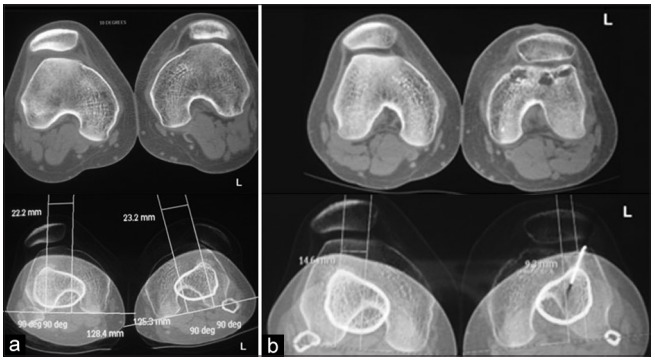

Figure 2: (a) CT scan showing trochlear dysplasia and TT–TG distance. (b) Postoperative CT scan showing trochlea and TT–TG distance

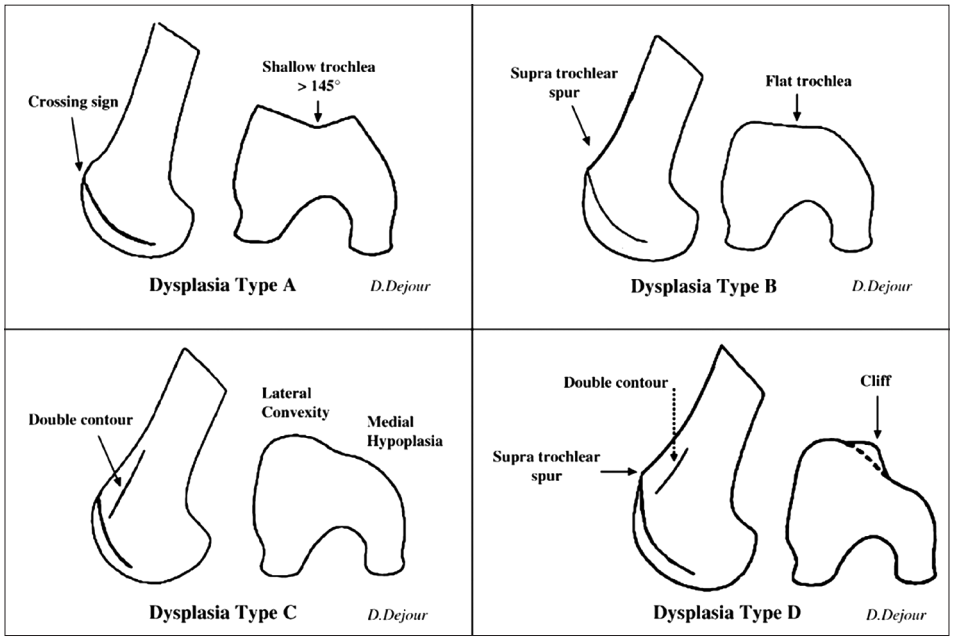

Figure 3: Trochlear dysplasia classification (Dejour)

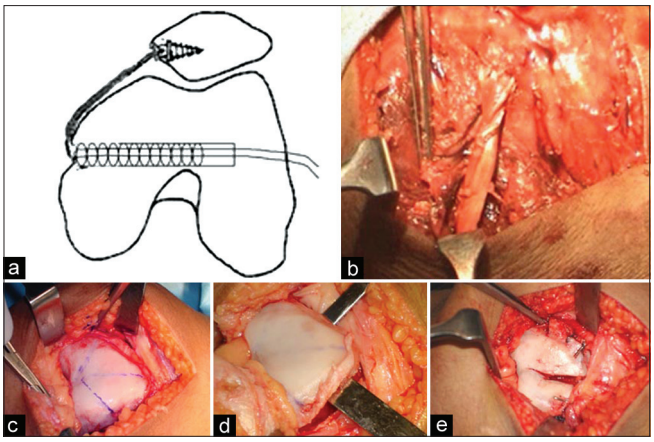

Figure 4: (a, b) MPFL ligament reconstruct – FASTak anchor on patellar edge and bio screw in femoral tunnel (c-e) Sulcus deepening trochleoplasty

was repaired at this ligament. Lateral retinacular release was done from inside out prior to the reconstruction of medial patella ligament since medial patellar glide was restricted in our patient. Since the new trochlear groove was angled at 6° laterally, distal realignment by tibial tubercle osteotomy was not done.

A hinged knee brace to allow 30° flexion was used for 3 weeks. Daily knee flexion exercises were allowed. Weight bearing was allowed from the first day using crutches.

One year following the surgery, she had slight medial parapatellar tenderness and no patellar apprehension. Presently, terminal 5° of flexion is restricted. Radiological signs of trochlear dysplasia were corrected and patellar tilt angle improved from 48° to 18°[3]. Kujala score improved from 52 to 80 points.[4] Staples were removed 1 year after surgery. Near-normal looking trochlea surface was seen in postoperative computed tomography (CT) scan and during arthroscopy [Figure 5].

Discussion

The patellofemoral joint has a low degree of congruency. Its stability depends on bone components (shape of the patella and trochlea) and soft tissue components, viz. quadriceps muscle, in particular, the vastus medialis oblique, lateral retinaculum, medial retinaculum, MPFL and medial patellotibial ligament. The major restraint in the initial knee flexion (<30°) is the soft tissue structures, but after 30°, the patellar stability depends on bony anatomy.[5] The soft tissue and bony structures mentioned above give an active and passive stability, which allow the patella to be located within the trochlea during knee movements. H. Dejour (1987) established a classification of patellofemoral disorders[3] and described four principal instability factors with a statistical threshold and four

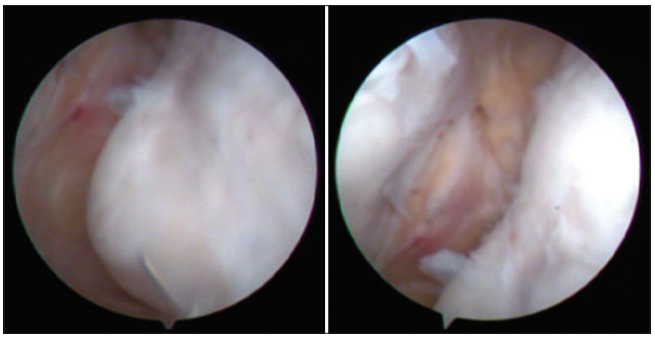

Figure 5: View from superiolateral portal at the time of implant removal

secondary instability factors with no statistical threshold. Major instability factors are patellar tilt, TT–TG distance (Q-angle quantification by CT scan), patella alta, and trochlear dysplasia. The secondary instability factors are excessive external femoral rotation, excessive external tibial rotation, genu recurvatum and genu valgum. These instability factors predispose to injury of the MPFL, which is the major soft tissue restraint.

The MPFL is a distinct soft tissue structure within the medial retinaculum, which originates from saddle between the adductor tubercle and medial epicondyle. It inserts at the superior two-thirds of the medial border of patella, typically where the perimeter of the patella becomes more vertical. It is approximately 55 mm long, and its width has been reported to range from 3 to 30 mm. This ligament is most taut in full extension, with the quadriceps contracted, and assists in guiding the patella into the trochlea during the early stages of flexion. It contributes to an average of 53% of the total force, preventing lateral displacement of the distal knee extensor mechanism.[6]

The common attachment of the tendon of the vastus medialis muscle and the ligament to the superomedial patella suggests that there may be a dynamic element to such a stabilizing function. It has been reported that in nearly all patella dislocations, there is damage to the MPFL. Nearly 70% are damaged at the patellar insertion, while the remaining are damaged at the femoral origin. In all, however, there is also interstitial damage.[7,8] MPFL reconstruction is most helpful for patients who have recurrent patellar dislocations associated with hyperelasticity and for patients who have obligatory patellar dislocations. Both these scenarios are associated with incompetent medial retinacular tissue.[9] Based on laboratory evidence that the MPFL is the primary ligamentous stabilizer against lateral patellar displacement, current techniques usually include an attempt to restore a functional MPFL by reconstructing with a graft. years. This provides excellent long term pain relief and functional return in patients with patellar instability and normal femoral trochlear anatomy. In addition, MPFL reconstruction stabilizes the patella with low-grade femoral

trochlear dysplasia also.[10,11] But in high-grade trochlear dysplasia, MPFL reconstruction should be coupled with trochleoplasty.

Trochlear dysplasia is defined by a sulcus angle of more than 145°.[12] The trochlear groove may even become flat or convex. The dysplasia is defined on the true lateral view by the ''crossing sign,"[3] that is, a line representing the deepest part of the trochlear groove crosses the anterior border of the two condyles, which means that the groove is flat at this point. Two other signs of dysplasia are the supratrochlear spur, which is a global prominence of the trochlea, and the double contour, a radiographic line representing the hypoplastic medial facet on the lateral view.[13] A classification with four grades of trochlea dysplasia has been described[14,15] [Figure 3]. Sulcus deepening trochleoplasty was first described by Masse[16] in 1978; it was subsequently modified by Dejour[13,17] in 1987. It is designed to establish a trochlear groove of correct depth, addressing the root cause of the dislocation by correcting different grades of trochlear dysplasia and it corrects TT-TG distance by new trochlear groove which is being lateralised.

In the majority of patients, that present with a patellar dislocation, there are underlying pathologies such as patellar tilt, abnormal TT-TG distance, patella alta and trochlear dysplasia. ligamentous hyper laxity. This underlying pathology predisposes to an acute overload of the soft tissue stabilizers and rupture of the MPFL with patella dislocation. The principles of repair philosophy is to reconstruct the MPFL with stronger tissue than before, to compensate for the underlying predisposing pathology, without changing the original position of the patella and it's original conformity with it's underlying trochlea. Medial patellofemoral ligament reconstruction provides excellent long term pain relief and functional return in patients with patellar instability with normal femoral trochlear anatomy. In addition, MPFL reconstruction will stabilise the patella with low grade femoral trochlear dysplasia also. Underlying pathology such as severe dysplastic trochlea, result in a greater reliance upon the reconstructed MPFL for patellar stability and reconstructed graft will fail in due course. In high grade trochlear dysplasia, MPFL reconstruction should be coupled with trochleoplasty to prevent recurrences after surgery.

Conclusions

Patellofemoral instability with underlying high grade trochlear dysplasia needs to be treated by trochleoplasty combined with medial patellofemoral ligament reconstruction.

References

1. Dejour D, Le Coultre B. Osteotomies in patella-femoral instibality sports. Med Arthrosc Rev 2007;15:39-46.
2. Erasmus PJ. Reconstruction of the medial patellofemoral ligament in recurrent dislocation of the patella. ISAKOS Buenos Aires. Arthroscopy Suppl 1998;14:42.
3. Dejour H, Walch G, Nove-Josserand L, Guier C. Factors of patellar instability: An anatomic radiographic study. Knee Surg Sports Traumatol Arthrosc 1994;2:19-26.
4. Kujala UM, Jaakkola LH, Koskinen SK, Taimela S, Hurme M, Nelimarkka O. Scoring of patellofemoral disorders. Arthroscopy 1993;9:159-63.
5. Heegaard J, Leyvraz PF, Van Kampen A, Rakotomanana L, Rubin PJ, Blankevoort L. Influence of soft tissue structures on patellar three dimensional tracking., Clin Orthop Relat Res 1994;299:235-43.
6. Conlan T, Garth WP, Lemons JE. Evaluation of the medial soft tissue restraints of the extensor mechanism of the knee. J Bone Joint Surg Am 1993;75:682-93.
7. Garth W P. Delayed proximal repair of the medial patellofemoral ligament in patients with recurrent patellar instability. Clin Orthop 2000;377:132-44.
8. Sallay PI, Poggi J, Speer KP, Garrett WE. Acute dislocation of the patella. A correlative patho-anatomic study. Am J Sports Med 1996;24:52-60.
9. Andrish J. The management of recurrent patellar dislocation. Orthop Clin N Am 2008;39:313-27.
10. Schöttle PB, Fucentese SF, Romero J. Clinical and radiological outcome of medial patello-femoral ligament reconstruction with a semitendinosus autograft for patella instability. Knee Surg Sports Traumatol Arthrosc 2005;13:516-21.
11. Steiner TM, Torga-Spak R, Teitge RA. Medial patellofemoral ligament reconstruction in patients with lateral patellar instability and trochlear dysplasia. Am J Sports Med 2006;34:1254-61.
12. Malghem J, Maldague B. Depth insufficiency of the proximal trochlear groove on lateral radiographs of the knee: Relation to patellar dislocation. Radiology 1989;70:507-10.
13. Dejour H, Walch G, Neyret P, Adeleine P. Dysplasia of the femoral trochlea. Rev Chir Orthop Reparatrice Appar Mot 1990;76:45-54.
14. Tavernier T, Dejour D. Knee imaging: What is the best modality. J Radiol 2001;82:387-405; 407-8.
15. Tecklenburg K, Dejour D, Hoser C, Fink C. Bony and cartilaginous anatomy of the patellofemoral joint. Knee Surg Sports Traumatol Arthrosc 2006;14:235-40.
16. Masse Y. Trochleoplasty. Restoration of the intercondylar groove in subluxations and dislocations of the patella. Rev Chir Orthop Reparatrice Appar Mot 1978;64:3-17.
17. Verdonk R, Jansegers E, Stuyts B. Trochleoplasty in dysplastic knee trochlea. Knee Surg Sports Traumatol Arthrosc 2005; 13:529-33.

How to cite this article: Reddy KR, Reddy NS. Trochleoplasty and medial patellofemoral ligament reconstruction for recurrent patellar dislocation. Indian J Orthop 2012;46:242-5.

Source of Support: Nil, **Conflict of Interest:** None.