

Management of multifactorial causes of Patellofemoral Instability in a 19 year old girl

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Abstract

Background: Patellofemoral instability is a common cause of recurrent patellar dislocation in adolescent females and athletes. The various risk factors for this condition include generalised ligamentous laxity, abnormal lower limb alignment, abnormal patella and trochlear morphology. We report a case where we encountered multiple factors causing recurrent patellar instability and addressed each problem in a step by step surgical approach.

Case Report: A 19 year old female presented with 5 episodes of recurrent patella dislocation a year. On examination, she had a beighton score of 8/11, a positive J sign and apprehension test. Radiographic evaluation showed a laterally subluxed patella with trochlear dysplasia and patella alta. CT scan and MRI confirmed a dejour type 2 trochlear dysplasia with increased tibial tuberosity –trochlear Groove distance and a deficient medial patellofemoral ligament (MPFL). She underwent an MPFL reconstruction with deepening trochleoplasty and medialization of the tibial tubercle.

Conclusion: This case highlights the complex presentation of patellar instability and the need for careful clinical and radiographic evaluation, along with a step by step surgical correction of each problem. This is to prevent overdoing any one procedure while addressing a multi factorial pathology by a surgeon resulting in increased patellofemoral pressures but instead use multiple procedures to ensure efficient correction and good clinical result.

Keywords: Recurrent patellar dislocation, Patella instability, trochlear dysplasia, TT-TG distance, MPFL reconstruction, patellofemoral arthritis, trochleoplasty

Introduction

The etiology of recurrent patellar dislocation varies from acute trauma to congenital causes. Some of these are patella alta, tibial tuberosity to trochlear groove (TT-TG) distance of more than 20mm, increased ligamentous laxity or an inadequate vastus medialis obliquus [1]. Due to its varying aetiology and patho-mechanics, a careful assessment and understanding are required, to formulate an effective treatment strategy.

Patellofemoral stability and patellar tracking is determined by static and dynamic stabilizers. The static stabilizers are limb alignment, medial and lateral anatomical structures and patellar and trochlear geometry. The dynamic stability is provided by the quadriceps complex which includes an active vastus medialis obliquus, retinacular ligaments and the MPFL which provides 80 percent of the stabilising force from 0 to 30 degrees of flexion [2][3].

patellofemoral joint. Comprehension and treatment of patellofemoral disorders have suffered from the lack of a generally accepted classification therefore it is difficult to find a single treatment protocol that would be applicable for every patient [4].

A thorough clinical and radiological understanding is required to formulate a plan for effectively treating this condition. There by preventing over correction of any one of the causative factors, leading to changes in the patellofemoral joint mechanics and pressures resulting in accelerated patellofemoral arthritis.

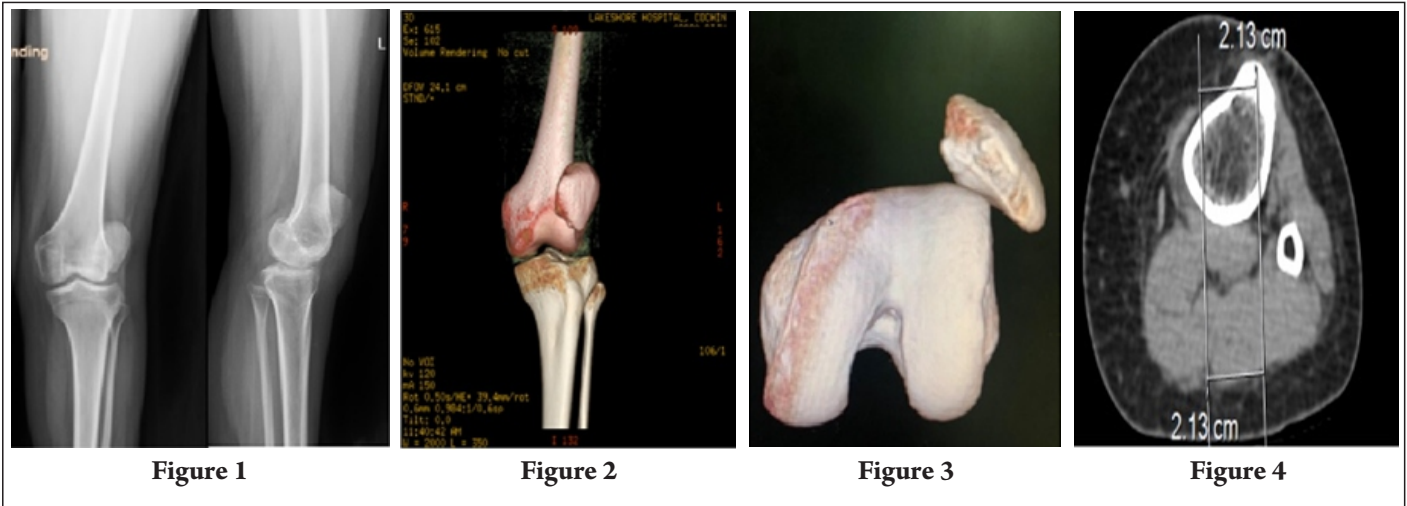
In this case report, we surgically corrected each one of the identified causes of recurrent patellar dislocation to the required amount, so as to provide a long-term functional outcome by not

There is an equilibrium between bony, ligamentous, and capsular structures, which when altered exhibits pathological forces on the patella causing abnormalities in the normal functioning of the

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addressing a multi factorial problem with one surgical solution.

Case Report

A 19 year old female presented to our clinic with a chief complaint of left knee recurrent patella dislocation (5 episodes /year).

On physical examination she demonstrated a beighton criteria of 8/11 with a positive patellar apprehension test. We elicited a positive J sign and grade 3 laxity of the medial patellofemoral ligament while having full range of motion in the affected knee. She had a past history of surgical correction for club foot on the ipsilateral side during infancy.

Her imaging studies had the following findings:

The left knee anteroposterior and lateral

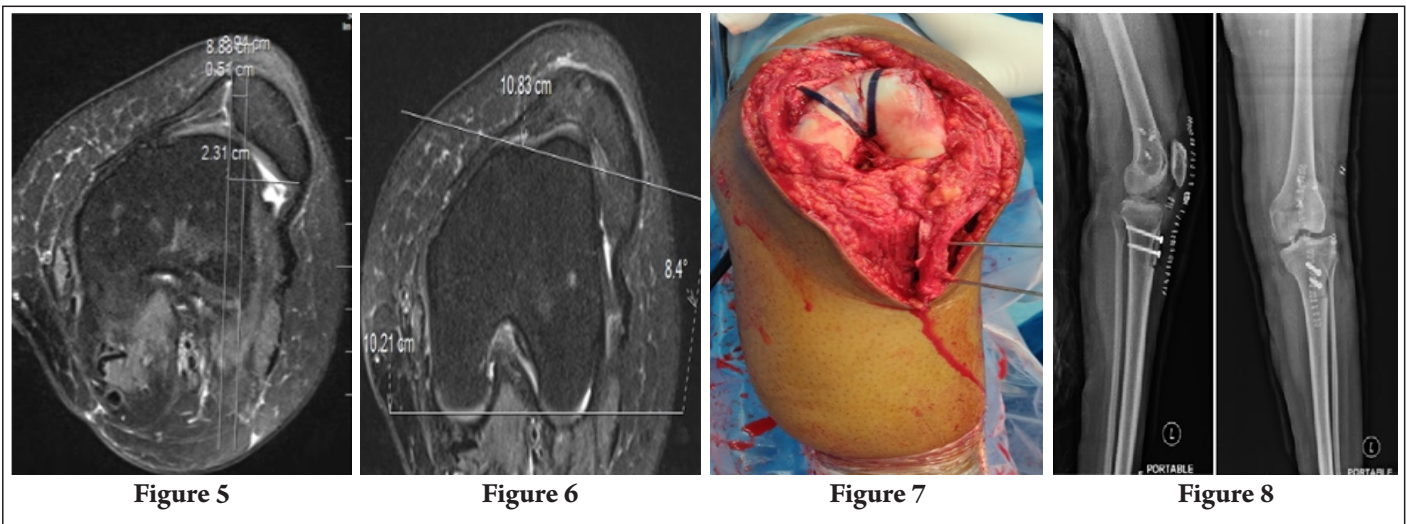
radiographs showed a laterally subluxated patella with patella alta (Caton Deschamp index 1.2) and dejour Type 2 trochlea (Figure 1), CT scan further confirmed the subluxated lateral position of the patella in extension (Figure 2), a femoral anteversion of 17 degrees, a shallow trochlear sulcus (132 degrees) (Figure 3) and external tibial torsion of 28 degrees with a TT-TG distance of 2.13cm (Figure 4). An MRI scan also confirmed the lax medial patellofemoral ligament (Figure 5). Furthermore, the lateral Trochlea angle was 8 degree, confirming a dysplastic trochlea (Figure 6), an axial Patella engagement Index of 0.2 (Normal 1) and sagittal patella engagement index of 0.23 .

Management

This patient had a dysplastic trochlea, patella alta, laxity of the MPFL, increased TT-TG distance; it was decided to address each of these surgical steps by performing an MPFL reconstruction with a semi-tendinosus graft, a deepening trochleoplasty, minimal medialization and distalization of the tibial tuberosity.

The consent of the patient was obtained to reproduce this in a publication, due to the nature of aetiologies involved in the cause of her recurrent patellar dislocation.

Arthroscopic evaluation revealed a deficient MPFL and a dysplastic trochlea with an intact patellar and trochlear cartilage. The semitendinosus was harvested from the ipsilateral knee and prepared into a double-stranded graft.



Through a medial parapatellar approach, a trochleoplasty was performed by deepening up to the bone with a specific jig and burr. The cartilage was further split down in the middle using an osteotome, an oblique cut was made towards the lateral side, which was fixed with vicryl tape and the medial side was sutured (number 2 Fiber wire), to recreate a normal trochlea shape. A transverse osteotomy of tibial tuberosity was performed, followed by 5mm distalization and fixation with 2 cortical screws (Figure 7).

The MPFL reconstruction was done with two supero-medial patellar tunnels such that the double-stranded semi-tendinosus graft was accommodated and fixed with 7 x 23 mm PEEK interference screw on the femur at Schottles' point (Figure 8).

Post-operatively the knee was immobilized in extension for 3 weeks with non weight bearing mobilization. After 3 weeks, range of motion (ROM) up to 40 degrees with passive extension of the knee and active straight leg rising was encouraged with the brace. By the end of 6 weeks we achieved 90 degrees of flexion. At 6 weeks she started partial weight bearing with a single crutch. At 8 weeks she started bearing full weight without any supports, with balance training. Weights were also added after 8 weeks during straight leg raise to further improve the quadriceps strength.

Discussion

This case study describes the difficult nature of patellofemoral problems causing patellofemoral instability. Many authors have mentioned the need for different surgical techniques along with a treatment algorithm to address each of the predisposing factors [4][7][8]. Literature suggests a tibial tubercle osteotomy (TTO) with varying degrees of obliquity to address the lateralized TT and increased TTTG distance, MPFL reconstruction for establishing the most important soft tissue constraint, a sulcus deepening trochleoplasty and the removal of the supratrochlear spur seen in dejour type 2 trochlea which pushes the patella laterally in early flexion.

However, each case needs to be considered and a tailored treatment is planned depending on the severity of the contributing factors. Each surgical technique comes with its own problems. The stronger and stiffer nature of the double bundled tendon graft when compared to the native MPFL could be problematic if malpositioned [8]. Camp and Stuart [9] reported possible underestimation of TT-TG distances by over 4 mm in MRI which challenges the 20mm threshold. Verdonk et al. [10] reported the incidence of arthrofibrosis post deepening trochleoplasty. We however did not encounter such complications.

Raghuvver and Somashekar Reddy [11]

reported a similar case where they performed a dejour's sulcus deepening trochleoplasty, an MPFL reconstruction, and lateral retinacular release. They did not perform a TTO as the new trochlear groove was angled at 6° laterally. Their patient on follow up had slight medial parapatellar tenderness and no patellar apprehension with restriction in the terminal 5° of flexion and their radiological signs of trochlear dysplasia were corrected, patellar tilt angle improved from 48° to 18° and Kujala score improved from 52 to 80 points.

There is lack of evidence and long term data on patella instability correction using combined approach of trochleoplasty, MPFL reconstruction, and TTO. In our case we followed a technical note published by Dean et al [12] and we could report that adequate correction of each causative factor lead to a good overall correction and clinical result. A combined treatment strategy in a multi factorial case such as this is more effective and efficient than addressing the problems with over correction using one procedure, potentially resulting in patellofemoral arthritis due to persistent patellofemoral joint abnormalities.

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