Available online at www.medicinescience.org

ORIGINAL ARTICLE

Medicine Science International Medical Journal

Medicine Science 2023;12(3):753-7

Three-dimentional reposition of tibial tubercle and surgical procedure of permanent dislocation of the patella

Taner Bekmezci, Selcuk Orsel

Private Clinic, Orthopaedic and Traumatology, İstanbul, Türkiye

Received 05 June 2023; Accepted 03 August 2023
Available online 20.08.2023 with doi: 10.5455/medscience.2023.06.082

Abstract

Four knees of 3 patients were treated with medial patellofemoral ligament (MPFL) reconstruction and Fulkerson osteotomy for the dislocation of the permanent patella. Perioperative flexion limitation was treated with tibial tubercle elevation. In this study, we evaluated newly applied patella height and range of motion (ROM). Four knees of 3 patients (2 females and 1 male) underwent surgery. The mean age was 24.6 years (between 17 and 30 years). The mean follow-up period was 35 months (between 30 and 40 months). Mean preoperative ROM, mean perioperative ROM before tubercle elevation and mean postoperative ROM after tubercle elevation were 126 degrees (between 125 and 130 degrees), 71 degrees (between 60 and 80 degrees), and 131 degrees (between 130 and 135 degrees), respectively. Mean Lysholm score increased from 66 to 100. Tibial tubercle transfer/osteotomy and medial patellofemoral reconstruction are good treatment options for the dislocation of the permanent patella. In addition, during the recentering of the patella located in the outer part of the trochlea or rarely of the lateral condyle, the flexion can be restricted depending on the shortness of the extensor mechanisms. In our study, we elevated the tibial tubercle, and patella height remained within physiological limits. We believe tubercle elevation is a convenient solution for the flexion limitation that occurs during the reconstruction of the dislocation of the patella.

Keywords: Permanent, patella, dislocation, osteotomy

Introduction

Patellar instability is characterized by the displacement of the patella out of trochlea during knee range of motion (ROM). Active and passive static structures keep patella within the trochlea during the movement of the knee. Passive structures are consisted of the patellar and femoral trochlea bone structures, and active structures are ligaments and muscle tissues around the patella [1]. Instabilities occur due to various congenital or acquired forms of the static structures and insufficiency or increased tension of the dynamic structures. The common causes of the instability are trochlear dysplasia, MPFL tear, tibial tuberosity-trochlear groove (TT-TG) distance, femoral and tibial rotation defects, genu recurvatum, and genu valgum [1,2]. The success of patellofemoral alignment surgery is achieved by the anatomical correction. However, a relapse rate of up to 40% was reported in *Patellar Instability* series [3,4].

Permanent Dislocation of the Patella is a atraumatic and isolated condition in which patella is located lateral to the trochlea and is asymptomatic during the first and second decades of life [5]. Treatment approach is affected by the anatomical and clinical differences of the periodical patellar instability and permanent dislocations of the patella. In this study, we evaluated the surgical treatment that we applied to our cases with symptomatic, permanent dislocation of the patella and the intraoperative problems.

CITATION
Bekmezci T, Orsel S. Three-dimentional reposition of tibial tubercle and surgical procedure of permanent dislocation of the patella. Med Science. 2023;12(3):753-7.

Corresponding Author: Taner Bekmezci, Private Clinic, Orthopaedic and Traumatology, İstanbul, Türkiye
Email: tanerbekmezci@hotmail.com

DOI: 10.5455/medscience.2023.06.082

Material and Methods

The study was carried out with the permission of Ümraniye Training and Research Hospital Clinical Researches Ethics Committee (Date: 29/05/2023, Decision No: E-54 132726-000-216515087). Authors read the Helsinki Declaration and approved ethical obligations for study. Informed consent was obtained from all patients.

Permanent patella dislocation was diagnosed in 4 knees of 3 patients (2 females and 1 male). The patients had no known trauma-dislocation history. They had complaints defining insufficiency particularly in eccentric contractions in where quadricep muscles are supposed to produce force and complaints of increasing pain and swelling in places like stairs and slopes. Anterior-posterior and lateral graphs, computed tomography (CT) scans were used for radiological evaluation, and Lysholm scores were used for clinical evaluation. Axial morphology of the patella was evaluated with Ficat Classification and the evaluation of the morphology of the sagittal plan was carried out with morphological classification of Grelsamer [6,7]. Caton-Deschamps index (CDI) was used for the evaluation of the patella height [8]. Fulkerson's CT method was used for patellar tilt angles, trochlear sulcus angles, and congruence angles [9].

A total of 4 knees of 3 patients (2 females and 1 male) were operated. Mean age was 24.6 years (between 17 and 30 years). Mean follow-up period was 35 months (between 30 and 40 months).

Surgical method

The patients were applied hemostatic tourniquet while lying down in supine position. An anterior longitudinal incision beginning from the proximal patella to 4-5 cm distal to tibial tubercle was made. Lateral retinaculum was cut and loosen 1 cm lateral to the patella. Lateral release was performed until distal tibia joint line and until patella was rotated to lateral position by 90 degrees in proximal (Figure 1). Gracilis tendon was taken and folded in two. For MPFL reconstruction, 30 mm deep tunnel incisions were made at 1 cm distal and 1 cm posterior to medial epicondyle in femur, 15 mm deep over the line in the middle of the patella in medial edge of the patella. Graft placed in the patella was fixated with tenodesis screw. Patella was taken to the midline and the maximum flexion degree of the knee was measured (Figure 2). Oblique osteotomy (as described by Fulkerson, from medial to lateral, from anterior to posterior) was applied and tuberositas tibia (TT) was moved anteriorly and medially. Knee flexion was double-checked. If there was a flexion limitation, TT was moved proximally until intended flexion was achieved and fixated with two 6.5 mm cannulated screws (Figure 3). The tension of MPFL was adjusted so the patella was in midline during full knee ROM and fixated with 1 interference screw in femoral tunnel. A brace was used in postoperative period for the knee extension. Weight-bearing as tolerated (WBAT) was assigned with brace and crutches. Ice packs were applied, and isometric quadriceps strength exercises were started in postoperative first week. Passive flexion was increased by 30 degree each week and full ROM was achieved at the end of six weeks. After 6 weeks was completed, braces were removed upon radiographical evaluation and active extension was allowed.

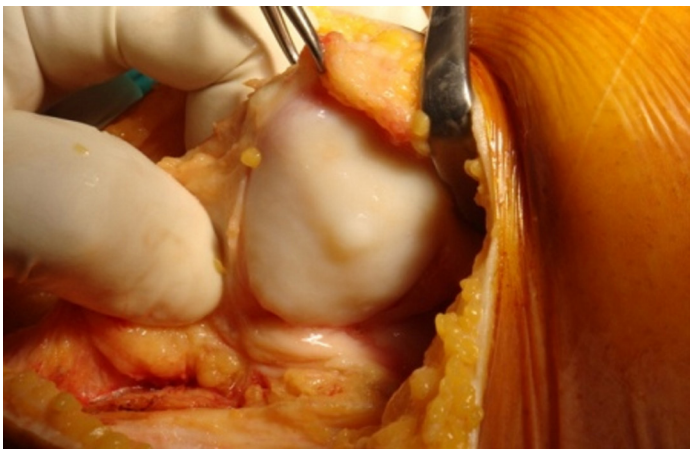

Figure 1. The elevation of the patella after lateral release

Figure 2. Medial patellofemoral ligament reconstruction

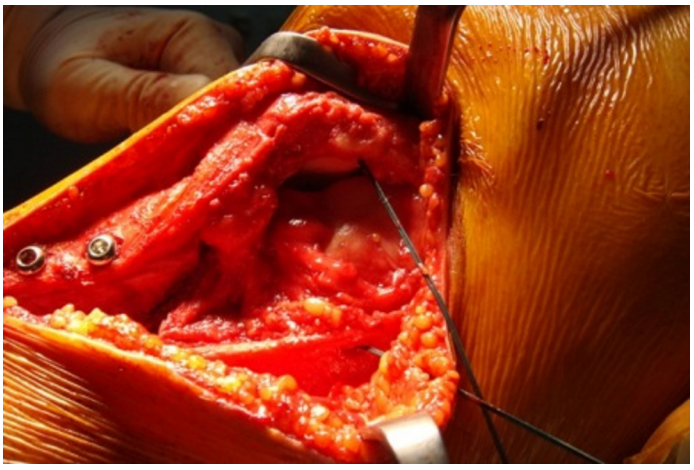

Figure 3. Anteromedialization of the tibial tubercle with added superiorization

Results

Patients pre-postoperative results including sulcus angles, congruence angles, tilt angles, and morphological classifications of the patella and trochlea are reported in Table 1 and Table 2.

Preoperative CDI was not evaluated as patella was not monitored in front of trochlea in sagittal imagining (Figure 4). Mean postoperative CDI was 0.88 (between 0.75 and 1) (Figure 5).

DOI: 10.5455/medscience.2023.06.082

Table 1. Morphological findings of the patella

	Morphology of the patella ficat	Morphology of the patella grelsamer	Morphology of trochlea wiberg	Trochlear sulcus angle	Alignment of the extremities
Patient 1 right knee	Alpine hunter	Type 1	Lateral hypoplasia	144°	4°Valgus
Patient 1 left knee	Alpine hunter	Type 1	Trochlear dysplasia	160°	4°Valgus
Patient 2 right knee	Halfmoon	Type 1	Trochlear dysplasia	155°	4°Valgus
Patient 3 right knee	Alpine hunter	Type 1	Trochlear dysplasia	155°	3°Valgus

Table 2. Preoperative and postoperative measurements of the patellar alignment

	Postop CDI	Preop congruence angle	Postop congruence angle	Preop tilt angle	Postop tilt angle	Preop ROM	Intraop ROM	Postop ROM
Patient 1 right knee	0.97	+30°	-5°	22° Lateral	6° Lateral	125°	80°	130°
Patient 1 left knee	1.00	+45°	-20°	25° Lateral	20° Medial	125°	75°	130°
Patient 2 right knee	0.87	+65°	+8°	57° Lateral	0°	130°	60°	135°
Patient 3 right knee	0.75	+40°	-15°	30° Lateral	3° Medial	125°	70°	130°

Figure 4. Three-dimentional image of preoperative patella dislocation

Figure 5. Postoperative sagittal alignment

DOI: 10.5455/medscience.2023.06.082

Mean Lysholm score increased from 66 to 100. Mean preoperative ROM was 126 degrees (between 125 and 130 degrees), mean perioperative ROM was 71 degrees (between 60 and 80 degrees) before tubercle elevation, and mean postoperative ROM was 131 degrees (between 130 and 135 degrees) after tubercle elevation. Patients were applied a mean tubercle elevation of 11.2 mm (between 10 and 14 mm).

Discussion

In our study we observed a limitation in knee flexion angles after we applied Fulkerson osteotomy and MPFL reconstruction to place patella to the center of trochlea. This problematic condition is already described in permanent and congenital patella dislocations, and proximal segment of the extensor mechanism is recommended to be lengthened to regain the flexion angle [4,10]. After this process, known as V-Y Quadricepsplasty, flexion is regained; however, varying levels of insufficiency might occur [10]. In our study, we applied a controlled elevation to osteotomized and anteromedialized tibial tubercle in order to increase the knee flexion degree. Following an average of 11.2 mm tubercle elevation, we applied fixation. During the follow-up period, we did not observe extensor lag (insufficiency) or iatrogenic patella alta (Figure 6). Results of the measured sagittal patellar height were within physiological limits.

It is possible to perceive permanent patella dislocation as having different anatomical marks with distinct clinical outcomes. In permanent patella dislocation, patella insufficiently articulates with trochlea, or it does not articulate at all and completes knee ROM [11]. Patella and trochlea are in dysplastic forms. MPFL may have lost its tension. Genu valgum may accompany [5,10,11].

Some authors claimed that a conservative approach should be taken in permanent patella dislocation cases due to its clinically asymptomatic nature in early decades despite of its extraordinary morphology [5,12]. One of the supporters of this idea, Bistolfi et al. reported severe articular cartilage degeneration in the arthroscopic results of a 51-year-old asymptomatic bilateral permanent patella dislocation patient [5]. Limited numbers of case series indeed include arthroplasty results due to valgus arthrosis development [13,14].

In our study we observed that, patella remained within the physiological height although tubercle was elevated. This condition makes us wonder whether there was a presence of preoperative patella baja. Would the patients have developed patella baja if tubercle had not been elevated? Our study has limitations due to our not having been able to measure preoperative CDI. However, intraoperative measurements, carried out before tubercle elevation, showed that flexion was limited between 60 to 80 degrees. In patella baja model of Lucykx et al. patellofemoral contact pressure reached a peak between 60 and 80 degrees of knee flexion [15]. We believe observing limited ROM in same flexion angles in the current study is significant.

Figure 6. Postoperative active range of motion

In permanent patella dislocations accompanied by genu valgum, we know that the whole extensor mechanism follows a more vertical, linear, and a shorter path. Quadriceps muscle cannot produce enough strength unless patella works as a balance-support element at the center of the lever arms [13]. Indeed, due to the location of the patella, needed quadriceps extensor strength is also produced as a flexor [4,5]. In fact, in case studies in which proximal alignment surgery along with arthroplasty were applied and patella was reduced to the center of the trochlea, extensor strength was emphasized to be restored [13,14]. Location of the patella is of higher importance when arthroplasty was performed. Mormor et al. reported a knee dislocation when they performed arthroplasty with leaving the patella in place [12].

The key symptom that we observed in our cases is the pain that develops during extensor strength production induced by things like going uphill and stair climbing. We believe the location of the patella along with its contribution to extensor strength and knee stabilization might create a dynamic, valgizing strength over the knee when quadriceps vector is localized lateral to the joint in frontal plane. As there are no existing articles on this matter,

DOI: 10.5455/medscience.2023.06.082

maybe this situation might be contributing to the development of arthritic process due to valgus alignment.

Despite of the limited number of patients, we observed that symptoms disappeared, and clinic scores increased from an average level of 66 to 100. Tubercle elevation did not have iatrogenic results (patella alta extension deficiency), so we retrospectively believe the application was correct. Larger scaled series and controlled studies are required; however, permanent patella dislocations are too rare to be included in larger-scale series, and it remains asymptomatic until arthrosis develops.

Conclusion

Permanent patella dislocation is a lot more uncommon compared to periodical patella dislocation or traumatic patella dislocation. Treating the symptomatic patients with available combined surgical processes seems adequate in order to eliminate the disorders in active and passive anatomical structures. In addition, the flexion can become limited according to the shortness of the extensor mechanism which became apparent during the recentering of the patella. A controlled elevation of the tubercle can be convenient for the treatment the flexion limitation.

Conflict of Interests
The authors declare that there is no conflict of interest in the study.

Financial Disclosure
The authors declare that they have received no financial support for the study.

Ethical Approval
The study was carried out with the permission of Ümraniye Training and Research Hospital Clinical Researches Ethics Committee (Date: 29/05/2023, Decision No: E-54 132726-000-216515087).

References

1. Dejour D, Le Coultre B. Osteotomies in patello-femoral instabilities. Sports Med Arthrosc Rev. 2007;15:39-46.
2. Servien E, Verdonk PC, Neyret P. Tibial tuberosity transfer for episodic patellar dislocation. Sports Med Arthrosc Rev. 2007;15:61-7.
3. Palmer SH, Servant CT, Maguire J, et al. Surgical reconstruction of severe patellofemoral maltracking. Clin Orthop Relat Res. 2004;419:144-8.
4. Wada A, Fujii T, Takamura K, et al. Congenital dislocation of the patella. J Child Orthop. 2008;2:119-23.
5. Bistolfi A, Massazza G, Backstein D, et al. Adult congenital permanent bilateral dislocation of the patella with full knee function: case report and literature review. Case Rep Med. 2012;2012:182795.
6. Ficat P. Pathologie femoro-patellaire. Masson et Cie, Paris, 1970;234.
7. Grelsamer RP, Proctor CS, Bazos AN. Evaluation of patellar shape in the sagittal plane. A clinical analysis. Am J Sports Med. 1994;22:61-6.
8. Caton J, Deschamps G, Chambat P, et al. Les rotules basses. A propos de 128 observations [Patella infera. Apropos of 128 cases]. Rev Chir Orthop Reparatrice Appar Mot. 1982;68:317-25.
9. Schutzer SF, Ramsby GR, Fulkerson JP. Computed tomographic classification of patellofemoral pain patients. Orthop Clin North Am. 1986;17:235-48.
10. Goldthwait JE. V. Permanent dislocation of the patella. The report of a case of twenty years' duration, successfully treated by transplantation of the patella tendons with the tubercle of the tibia. Ann Surg. 1899;29:62-8.
11. McLaren JS. II. Permanent (congenital) dislocation of the patella. Ann Surg. 1900;31:679-85.
12. Marmor L. Total knee arthroplasty in a patient with congenital dislocation of the patella. Case report. Clin Orthop Relat Res. 1988;226:129-33.
13. Kumagi M, Ikeda S, Uchida K, et al. Total knee replacement for osteoarthritis of the knee with congenital dislocation of the patella. J Bone Joint Surg Br. 2007;89:1522-4.
14. Tunay S, Ozkan H, Köse O, et al. Total knee arthroplasty in a patient with neglected congenital patellar dislocation. Orthopedics. 2009;32. doi:10.3928/01477447-20090818-22.
15. Luyckx T, Didden K, Vandenneucker H, et al. Is there a biomechanical explanation for anterior knee pain in patients with patella alta?: influence of patellar height on patellofemoral contact force, contact area and contact pressure. J Bone Joint Surg Br. 2009;91:344-50.