Joint Diseases and Related Surgery

Jt Dis Relat Surg
2024;35(3):594-595

REVIEW

Established practices and future insights into patellar instability surgery: A review

Batuhan Bahadır, MD[1], Erdem Aras Sezgin, MD[2], O. Şahap Atik, MD[3]

[1]Department of Orthopedics and Traumatology, Bilkent City Hospital, Ankara, Türkiye
[2]Department of Orthopedics and Traumatology, Gazi University Faculty of Medicine, Ankara, Türkiye
[3]President, Turkish Joint Diseases Foundation, Ankara, Türkiye

Management of patellar instability poses a significant challenge, as the condition stems from a combination of static and dynamic abnormalities of bone or soft tissue structures. The conventional diagnostics focus on the physical examination findings of patellar maltracking and assessment of anatomical abnormalities such as trochlear dysplasia, patella alta, and increased tibial tubercle-trochlear groove (TT-TG) distance on plain X-rays and magnetic resonance imaging, which are static, two-dimensional modalities.[1] Depending on the underlying anatomy, the surgical treatment typically includes a medial patellofemoral ligament (MPFL) reconstruction and a combination of accompanying procedures such as tibial tubercle osteotomy, trochleoplasty or other osteotomies. However, contemporary research points out the necessity of a more comprehensive evaluation of different concepts, bringing intense discourse regarding surgical choices.

Received: July 29, 2024
Accepted: July 29, 2024
Published online: August 14, 2024

Correspondence: O. Şahap Atik, MD. Turkish Joint Diseases Foundation, Mustafa Kemal Mah., Dumlupınar Bul., 274/2, C2 Blok, Ofis 5, 06900 Çankaya, Ankara, Türkiye.
E-mail: satikmd@gmail.com
Doi: 10.52312/jdrs.2024.57924

Citation: Bahadır B, Sezgin EA, Atik OŞ. Established practices and future insights into patellar instability surgery: A review. Jt Dis Relat Surg 2024;35(3):594-595. doi: 10.52312/jdrs.2024.57924.

Patellar instability is currently increasingly being evaluated as a dynamic problem of the extensor mechanism, whose behavior varies depending on the position of the hip and knee joints and the amount of weight the extremity bears at any given time.[2] With the utilization of dynamic imaging, parameters such as TT-TG distance, patellar tilt, height and bisect offset have been shown to significantly change with the flexion of the knee and weight bearing.[3] These findings raise questions about the validity of traditional imaging.

The entire extensor mechanism, including the dynamic and static structures that generate a force vector or provide resistance are currently being evaluated as parameters for disruption of normal patellar tracking.[4] Moreover, rotational deformities in the proximal femur and between the distal femur and proximal tibia should also be recognized as commonly overlooked culprits of low energy or recurrent dislocations since they affect the system in a way which produces a force vector influencing the patellar stability.[5]

Despite the increasing debate on appropriate management of these patients with more advanced deformities or failed surgeries, biomechanical outcome of the proposed surgical corrections remains largely unexplored. It should be kept in mind that a combination of surgeries may restore patellar tracking in expense of natural patellofemoral loading, which ultimately leads to unsatisfactory outcome. Biomechanical studies on cadavers are commonly performed to answer such questions; however, testing a vast number of deformities and clinical scenarios poses challenges in feasibility and cost. At this point, finite element analysis offers unique opportunities to comprehend the complex three-dimensional

geometry, the dynamic effect of structures with varying mechanical characteristics as well as accurate assessment of contact pressures.[6-8] On top of its potential future use in testing various surgical methods for various deformities, it can be speculated that computational simulation demonstrates a merit in becoming a tool for planning patellofemoral surgery in the future, even on an individual basis.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: All authors contributed equally to the article.

Conflict of Interest: The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding: The authors received no financial support for the research and/or authorship of this article.

REFERENCES

1. Günaydin F, Kilinç Ö, Aydin M. A new and simple method for patellar height measurement: Fibula-condyle-patella angle. Jt Dis Relat Surg 2024;35:324-329. doi: 10.52312/jdrs.2024.1553.
2. Dandu N, Knapik DM, Trasolini NA, Zavras AG, Yanke AB. Future Directions in Patellofemoral Imaging and 3D Modeling. Curr Rev Musculoskelet Med 2022;15:82-89. doi: 10.1007/s12178-022-09746-7.
3. Becher C, Fleischer B, Rase M, Schumacher T, Ettinger M, Ostermeier S, Smith T. Effects of upright weight bearing and the knee flexion angle on patellofemoral indices using magnetic resonance imaging in patients with patellofemoral instability. Knee Surg Sports Traumatol Arthrosc 2017;25:2405-2413. doi: 10.1007/s00167-015-3829-8.
4. Maine ST, O'Gorman P, Barzan M, Stockton CA, Lloyd D, Carty CP. Rotational Malalignment of the Knee Extensor Mechanism: Defining Rotation of the Quadriceps and Its Role in the Spectrum of Patellofemoral Joint Instability. JB JS Open Access 2019;4:e0020. doi: 10.2106/JBJS.OA.19.00020.
5. Zhang Z, Song G, Li Y, Zheng T, Ni Q, Feng H, et al. Medial Patellofemoral Ligament Reconstruction With or Without Derotational Distal Femoral Osteotomy in Treating Recurrent Patellar Dislocation With Increased Femoral Anteversion: A Retrospective Comparative Study. Am J Sports Med 2021;49:200-206. doi: 10.1177/0363546520968566.
6. Kumbaracı M, Özer A, Bozoğlan M, Turgut A. Can a coracoclavicular screw added to the clavicular hook plate reduce subacromial stress? A finite element analysis. Jt Dis Relat Surg 2022;33:609-615. doi: 10.52312/jdrs.2022.837.
7. Özer A, Öner K, Okutan AE, Ayas MS. Comparative finite element analysis of four different internal fixation implants for Pauwels type III femoral neck fractures in various fracture angles in the sagittal plane. Jt Dis Relat Surg 2022;33:352-358. doi: 10.52312/jdrs.2022.676.
8. Berton A, Salvatore G, Nazarian A, Longo UG, Orsi A, Egan J, et al. Combined MPFL reconstruction and tibial tuberosity transfer avoid focal patella overload in the setting of elevated TT-TG distances. Knee Surg Sports Traumatol Arthrosc 2023;31:1771-1780. doi: 10.1007/s00167-022-07056-6.