ClinicSearch

Orthopaedics Case Reports

Lázaro Martínez Aparicio *

Open Access

Research Article

Considerations on Recurrent Patella Dislocation in the Adolescent Athlete

Lázaro Martínez Aparicio *, Lázaro Martín Martínez Estupiñan, Leonardo Martínez Aparicio, Sergio Morales Piñéiro and Roberto Mata Cuevas

University General Hospital "Mártires del 9 de Abril", Cuba.

***Correspondence Author:** Lázaro Martínez Aparicio, University General Hospital "Mártires del 9 de Abril". Email. lazarome@infomed.sld.cu

Received Date: May 16, 2022 | Accepted Date: July 20, 2022 | Published Date: August 30, 2022

Citation: Lázaro M. Aparicio, Lázaro M. M. Estupiñan, Leonardo M. Aparicio, Sergio M. Piñéiro and Roberto M. Cuevas, (2022), Considerations on Recurrent Patella Dislocation in the Adolescent Athlete. *Orthopaedics Case Reports*. 1(1); DOI:10.31579/2835-8465/002

Abstract

Recurrent patellar dislocation is described as loss of joint congruence between the femoral trochlea and the articular facet of the patella after a second episode. The etiology is multifactorial, including local, rotational and dynamic anatomical factors, and there is no clarity about its real influence, despite its high incidence and clinical importance. A search of Pubmed, Elsevier, Scielo, and Uptodate was conducted to identify recent articles on patellofemoral instability and recurrent patella dislocation. The pathogenic origin of recurrent patellar dislocation involves structural abnormalities, or muscle imbalances, its management is difficult, and multiple surgical techniques can be used. We recommend studying the possible causes and being consistent with them to carry out definitive treatment.

Keywords: patella; recurrent patella luxation; patellar instability

Introduction

Recurrent patellar dislocation is described as loss of joint congruence between the femoral trochlea and the articular facet of the patella after a second episode. It is associated with factors such as direct trauma, trochlear dysplasia, ligament laxity, patella alta, bone misalignment, anatomical malrotations, and connective tissue disorder. The presence of these factors can lead to a relapse rate or residual instability of up to 80% of cases [1]. It usually occurs in adolescents due to sports activities with direct trauma, forced valgus, or knee twisting.

The etiology is multifactorial, including local, rotational and dynamic anatomical factors, and there is no clarity about its real influence, despite its high incidence and clinical importance. This ignorance is mainly due to the complexity of the patellofemoral joint, to the different causes of pain in the anterior compartment of the knee.

It is known that the fundamental factor for the development of knee instability is trochlear dysplasia. Other influencing factors are: the high position of the patella, caused by a patellar tendon that is too long, which prevents the patella from attaching well to the femoral trochlea; Also quadriceps femoris dysplasia refers to an abnormality in the insertion of the vastusmedialis in the patella. Another important condition is the too lateral position of the tibial tuberosity, which determines the valgus of the knee extensor apparatus and therefore this results in distortion in the distance between the tibial tuberosity and the trochlear Groove [2].

The etiology of patella instability is usually multifactorial. It may be related to alterations in the alignment and rotation of the lower limb, the integrity of certain ligament structures, and excessive tension of the external aileron and hypotonia of the medial aileron. Genu valgum and genu recurvatum, excessive external knee rotation and / or excessive femoral anteversion [3].

The surgical treatment of recurrent patellar luxation is controversial, since there are many techniques developed for its treatment. No gold standard technique prevails.

With the presentation of our research, we intend to recognize the main concepts about this condition, update the predisposing anatomical conditions and analyze the main therapeutic options.

Method

A search of Pubmed, Elsevier, Scielo, and upto date was conducted to identify recent articles on patellofemoral instability and recurrent patella dislocation. The search terms were "patellofemoral instability", "medial patellofemoral ligament", "dislocation", "subluxation", "patella." The search was carried out in the period between January 3, 2021 and May 3 of the same year.

The inclusion criteria were narrative or systematic review articles and original articles whose main topic was recurrent patellar dislocation and patellofemoral instability, evaluation and treatment. English and Spanish literature was included. From a total of 151 articles selected, 120 articles that did not meet our expectations or objectives were excluded and 31 articles that met the inclusion criteria were used.

Developing

Recurrent dislocation of the patella is a rare injury, although it immediately leads us to think of an acute traumatic entity with a history of previous, evident and intense injury, but this does not happen, external violence is generally not a relevant data, they are found a series of previous anatomical and functional alterations, which facilitate dislocation.

The initial traumatic episode can be minimal and be accompanied by torsion, with intense physiological stresses on the ligaments, which produces external displacement of the patella, if this is accompanied by other pre-existing anatomical affectations, it completely dislocates the patella. All of this produces internal capsular tear and hemarthrosis.

The incidence of primary patellar dislocation is 5.8 per 100,000, and this increases to 29 per 100,000 in the age group 10-17 years. Patellar instability is estimated to affect between 5 to 7 people per 100,000 inhabitants [4, 5]. The recurrence rate ranges from 15% to 44% after nonsurgical treatment of an acute injury [6]. If the patient experiences a posterior patellar dislocation, there is a 50% chance of recurrent episodes. Although the recurrence rate is relatively low after a primary patellar dislocation, many patients continue to have pain and mechanical symptoms after the initial dislocation episode [7] It has been reported that up to 55% of patients are unable to return to sports activity after a primary patellar dislocation [8, 9].

Other authors suggest that patella luxation, mainly lateral, appears in 3% of knee injuries (the same as generalized instability) and does not show a predilection by sex. The recurrence of a second episode of patella luxation varies between 15-60% [10, 11].

One of the most frequent causes is traumatic, through external rotation of the tibia with the foot resting on the ground, but there are predisposing factors that affect the morphology of the patella (such as trochlear dysplasia), muscle power (such as dystrophies) or ligamentous hypermobility syndromes (such as Ehlers-Danlos). Another risk factor is the Q angle> 15º in men and> 20º in women [12].

Patellar luxation and subluxation are grouped as instabilities because it is a difference in the degree of the affection and not in its nature. CalzadoCalderón et al. Report in their high-class Center that fortunately more than 80% of these disorders respond to conservative treatment. On the occasions when conservative treatment fails, it is necessary to perform surgical treatment, the debate is then established about which procedure would be the most suitable for each patient. It indicates that a large number of techniques for realignment and stabilization of the extensor mechanism are described in the literature, up to 137 surgical techniques, but which one would be the most appropriate in each case has yet to be stated [13].

LópezFernández and Viera González [14] report that in the cases studied for this reason, 52.17% had patella alta, 13.04% had Genus recurvatum, 17.39% had genus valgun, they also found familial joint laxity and arthrogryposis.

To assess the ratio of patellar height, the Insall-Salvati index is used. In a sagittal image, the length of the patellar tendon on its posterior aspect is measured from the apex of the patellar tendon to its attachment to the anterior tuberosity of the tibia and divided by the maximum length of the superior inferior diameter of the patella. A ratio of 1 is the normal range, if >1.3 it indicates a high kneecap and a ratio <0.8 indicates a low kneecap.

The position of the tibial tubercle is important for the inferolateral force vector of the patella. In a normal joint, the tibial tuberosity lies vertically below the femoral sulcus. A distance between the tibial tubercle and the trochlear groove of less than 15 mm is considered normal. The distances between 15-20 mm are in the limits and more than 20 mm indicate marked lateralization that represents an important cause of patellar instability and chronic knee pain.

Genetic predisposition

Patients with joint instability, due to familial joint laxity, have generalized hypermobility, as well as chronic joint pain and other neuro-musculoskeletal signs related to a defect in collagen. Benign joint hypermobility syndrome has a strong genetic component with an autosomal dominant pattern. First-degree relatives with the disorder can be identified in up to 50% of cases. The syndrome appears to be due to an abnormality in collagen or the ratio of collagen subtypes. Mutations in the fibrillin gene have also been identified [15].

Larsen syndrome is a rare skeletal dysplasia, characterized by congenital joint dislocations, it is a rare disease. It is caused by a genetic defect in the gene that codes for filamin B, a Cytoplasmic protein important in the regulation of the structure and activity of the cytoskeleton. The gene that causes the disease is well described in the literature, located in a region where the gene that encodes human type VII collagen is also found. Other related conditions described in publications are type I oto-palatal-digital syndrome and skeletal dysplasia associated with CHST3; chondrodysplasia with gPAPP-type joint dislocations [16].

Discussion

Anatomical Considerations

Skeletal immaturity and intense physical activity in adolescence make her more prone to knee injuries. Clinical assessment can be difficult due to the severity of pain, inflammation and joint effusion, with anterior knee pain being the most frequent symptom, which can be produced by various pathological conditions. The structures that make up the knee extensor mechanism are the muscles that make up the quadriceps, the quadriceps tendon, the patella, the medial and lateral retinacles of the patella, the patellar tendon, the anterior tuberosity of the tibia, the patellar femoral joint, the infrapatellar (Hoffa), quadriceps, and prefemoral fat pads and adjacent soft tissues.

The patella is the largest sesamoid bone in the body and is located within the quadriceps and patellar tendon complex. The functions of the ball joint are both lever and pulley. As a lever, the patella magnifies the force exerted by the quadriceps in the extension of the knee; and as a pulley, the patella redirects the force of the quadriceps as it undergoes a normal lateral displacement during flexion.

According to Dejour et al. [2] suggest that trochlear dysplasia is defined as the abnormal presence of its configuration, which can be flat, shallow or convex and is present in 96% of patients with objective dislocation of the patella. This author and his collaborators described four major anatomical factors and four minor factors of patellofemoral instability. The major instability factors are trochlear dysplasia; patella alta; the distance from the tibial tuberosity to the trochlear groove increased; and the inclination of the patella. Based on these anatomical factors, they classified the Patellofemoral pathology in two groups: Objective Patellar Instability (IPO) and Potential Patellar Instability (IPP). Patients with (IPO) have a history of at least one true patella dislocation and also an anatomical abnormality. Patients with (IPP) do not have a history of a true dislocation but do have at least one anatomical abnormality and pain [17].

In the biomechanical function of the knee, the muscles that make up the quadriceps extend the knee when the leg is raised. The quadriceps contraction stabilizes the knee when the foot is on the ground. The patella allows the knee to be extended with a small contractile force from the quadriceps. The kneecap also redirects the force exerted by the quadriceps, which results in a great compressive force on the femoro-patellar joint. The extensor mechanism stabilizes the knee joint especially during deceleration and when walking downhill [13]. Lower limb deformities influence the patella and can produce dynamic or static alterations, which alter the kinematics of the patella.

Triggering initial trauma and its incomplete treatment

Structural abnormalities (patella alta, dysplasia or aplasia of the condylar groove), or Muscle imbalances (vastusmedialis weakness, thickening or retraction of the external aileron), at first, treatment can be oriented from a conservative point of view through a selective rehabilitation program, stabilizing knee orthoses and anti-inflammatory medication.

To date, no studies have demonstrated the efficacy of physical therapy or efforts in the conservative treatment of acute patellar dislocations. However, the goal of treatment after a patellar dislocation is to decrease edema, promote the vastusmedialis oblique and gluteal activity, and increase the knee's range of motion [18].

Edema has a detrimental effect on quadriceps activity, so the faster it is reduced, the better the outcome for the patient. Treatment regimens range from immediate mobilization without a brace to cast immobilization in extension for six weeks [19]. Extension immobilization can help heal the medial structures, but stiffness can be a problem with this treatment [20].

Patients with chronic patellar instability can benefit from physical therapy, which can help them regain strength, movement, and proprioception. Patellar tape can help control excessive patellar movement during therapy. Taping has also been shown to increase quadriceps muscle torque and activate the vastusmedialis oblique earlier than the vastuslateralis during stair ascents and descents. Patients with chronic patellar instability often have weak gluteal muscles. This weakness results in adduction and internal rotation of the femur during weight-bearing activities, which can accentuate patellar instability. Strengthening the gluteal muscles or gluing the hips to promote external rotation of the femur can help solve this problem [20-22].

Definitive treatment

Patellar instability is a common and challenging condition to treat in the pediatric population, traumatic dislocations of the patella are among the most frequent knee injuries, its recurrent incidence is high. Radiology is useful for a more accurate assessment of the causes of patellofemoral instability, the simple examination is the initial complementary examination and is sufficient in most cases, reserving computed tomography for patients in whom the procedure has failed. conservative treatment and rehabilitation and are valued for surgical treatment.

Recurrence of patella injuries when dislocated and managed with physical therapy, muscle strengthening, and other techniques is high (70-90%), especially when there are difficulties in patella alignment [23].

Management of multiple large joint dislocations is often difficult,particularly if a patient has a recurrent patella dislocation. Chahla J and his collaborators [24] state that, if we do not correct the pathological misalignment, the distribution of forces in the knee, this being a load zone, will cause the injury to be perpetuated, or the appearance of new ones.

Insall J [25] reports that the most widely used surgical techniques for the correction of recurrent patellar dislocation are the Krosgius-Lecene, Cambell,Cambell-Goldthwaid, Insall, Ficat and external capsulotomy with internal application.

Osteotomy of the anterior tuberosity of the tibia is an effective and safe procedure to prevent recurrent patellar instability. By medializing, anteromedializing or distalizing the anterior tuberosity of the tibia, the force vectors acting on the patella can be redistributed, restoring normal anatomy and correct alignment of the extensor apparatus.

The main indication for medialization and distal reattachment of the patellar tendon, with reconstruction of the patello femoral ligament, refers to the patella alta. The combined treatment of soft tissues and patellar height may be insufficient in those patients with severe trochlear dysplasia.

Patella luxation is considered the most common cause of traumatic hemarthrosis in children and the second most common cause in adolescents after anterior cruciate ligament injury. It mainly affects young and active patients between the first and second decade of life and with a slightly higher incidence in women [26]. MartínezGiménez et al. [27] state that the Insall technique is associated with medial translation of the anterior tibial tuberosity and offers a high percentage of satisfactory results, with an almost complete absence complications. They also explain that Brown, using the Emslie-Trillat technique, obtains 81% good results in 42 months of follow-up, Cox et al. they obtain somewhat better results, using the Emslie-Trillat intervention (88% of excellent results and 6% of good results) in the medium term (24 months after the intervention); However, in the long term (7 years), this same author observes a deterioration down to 66% of satisfactory results. Other authors such as Hughston obtain 71% of favorable results and 29% of unfavorable results in a ten-year follow-up.

The medial patellofemoral ligament is primarily responsible for preventing lateral displacement of the patella between full extension and 30 ° of knee flexion (60% of force). Also involved: the patello-niscal ligament in 13%, the medial retinaculum in 3%, and the medial patello-tibial ligament in 3%. After 30 °, the bone structures (femoral trochlea) take on the fundamental role in containing the patella until maximum flexion [28, 29].

The medial patellofemoral ligament is the primary restrictor to translation of the patella. Treatment for this condition continues to evolve and remains controversial [30].

Trochlear dysplasia is characterized by a shallow, flattened trochlear groove associated with patellofemoral instability. Trochleoplasty, as a corrective procedure for bone abnormalities, is intended to improve patellofemoral stability in patients with severe trochlear dysplasia. There are different surgical techniques described, either performing a resection osteotomy in the external facet preserving the articular surface and fixing it with 2 screws as described by Masse, elevating the external facet with structural bone graft following the Albee technique or deepening the trochlear groove with a Powered reamer below the articular surface as described by Dejour [31]. In any case, this technique must always be associated with other procedures, whether of soft tissues such as the release of the external retinaculum or bone (osteotomies). The main complication inpatients treated with such a procedure is residual pain, at the expense of degenerative changes of the patellofemoral joint.

For Álvarez López A et al. [32] The indications for trochleoplasty are: high-grade TD, instability of the patella with inadequate or no patellofemoral congruence, and absence of patellofemoral osteoarthritis. It is contraindicated in patients with open epiphyses. This is a demanding and aggressive surgical technique, but with great potential to improve patellar entrainment, which should be reserved for those patients with severe degrees of dysplasia.

Conclusion

Patellar instability is a clinical syndrome due to a morphological abnormality of the femoro-patellar joint (femoral trochlea) where the patella is prone to recurrent lateral dislocation. To assess the ratio of patellar height, the Insall-Salvati index is used. Patellar tilt and / or lateralization may be the result of rupture of the medial stabilizers of the patella, after a patellar dislocation, or present without prior evidence of dislocation. Patellar tilt is a risk factor for patellar misalignment or instability. The position of the tibial tubercle is important for the inferolateral force vector of the patella. In a normal joint, the tibial tuberosity lies vertically below the femoral sulcus.

Conflict of Interests

The authors of this article declare that they have no conflict of interest with the objectives of the research.

Declaration of the personal contribution of each author to the research

The authors of this article participated in the diagnosis, treatment, study design, and writing of the first version, as well as the final version of the manuscript in equal parts.

References

1. Guillen Morales JC, Araujo Espinoza GE, Lozano Lurita C, Torres Manrique AD. (2021). Reconstrucción anatómica del ligamento patelofemoral medial con aloinjerto en la luxación patelar recurrente. Artroscopia. 28(3):238-242.
2. Dejour D, Le Coultre B. (2018). Osteotomies in Patello-Femoral Instabilities. Sports Med Arthrosc Rev. 26(1):8-15.

3. Zícaro JP, Yacuzzi C, Chávez M, Costa Paz M. (2017). (Inestabilidad Patelofemoral Asociada a Displasia Severa de Tróclea: Presentación de Un Paciente Tratado con Trocleoplastía. Artroscopia. 24(2):65-68.
4. Laidlaw M, Diduch D. (2017). Current Concepts in the Management of Patellar Instability. Indian J Orthop. 51(5):493-504.
5. Liu et al. (2018). Patellar Instability Management: A Survey of the International Patellofemoral Study Group. Am J Sports Med. 46(13): 3299-3306.
6. Dutton R, Khadavi M, Fredericson M. (2016). Patellofemoral Pain. Phys Med RehabilClin N Am. 27(1):31-52.
7. Duerr R, Chauhan A, Frank D, DeMeo P. (2016). An Algorithm for Diagnosing and Treating Primary and Recurrent Patellar Instability. JBJS Rev. 4(9).
8. Aysin I, Askin A, Mete B, Guvendi E. (2018). Investigation of the Relationship between Anterior Knee Pain and Chondromalacia Patellae and PatellofemoralMalalignment. Eurasian J Med. 50(1):28-33.
9. Félix Omar López. (2020). ContrerasEvaluación y tratamiento de la inestabilidad patelofemoral. Journal of American Health. 3(2):10-20.
10. Irrgang JJ, Anderson AF, Boland AL, et al. (2001). Development and validation of the international knee documentation committee subjective knee form. Am J Sports Med. 29:600-613.
11. Howells N. R., Barnett A. J., Ahearn N., Ansari A., Eldridge J. D. (2012). Medial Patellofemoral ligament reconstruction. JBJS Br. 94: 1202–1208.
12. Pérez Candela V, Naranjo Santana P. (2020). Estudio mediante resonancia magnética de la patología del mecanismo extensor de la rodilla en pediatría. Canarias Pediátrica. 44(2):122-129.
13. Calzado Calderón R, Febles Oviedo JL, Pérez Hernández LM, Arango García G, Labrado Berea G de la C, Fortum Planas P. (2005). Tratamiento quirúrgico del desequilibrio patelofemoral. Rev Cubana OrtopTraumatol 19(1):10-14.
14. López Fernández P, Viera González L. Luxaciones de rótula. (1988). RevEsp de CirOst. 397-403.
15. Figueroa Ramos DV, Cruz Carranza JS, Romero Zambrano EC, Kalil Salinas KT. (2021). Consideraciones sobre el síndrome de hipermovilidad articular benigna. Revista Cubana de Reumatología. 223(3): 238.
16. Mingo Saluzzi C, Salas F. (2020). Luxación recurrente habitual femorotibial en un paciente con síndrome de Larsen. Artroscopia. 27(4): 188-193.
17. Vergara- Amador E, Castro Gaona R. (2014). Tratamiento quirúrgico de la luxación recidivante de rótula en el niño asociada a displasia patelo-femoral. Archivos de Medicina (Col). 14(1):117-128.
18. Dietrich T, Fucentese S, Pfirrmann C. (2016). Images of individual anatomical risk factors for patellar instability. SeminMusculoskeletRadiol. 20(1):65-73.
19. Barton C, Lack S, Hemmings S, Tufail S. (2015). The 'Best Practice Guide to Conservative Management of Patellofemoral Pain': incorporating level 1 evidence with expert clinical reasoning. Br J SportsMed. 49(14):923-34.
20. Ngo T, Martin R. (2017). Instabilitérotulienne: diagnostic ettraitement [Patellar instability: diagnosis and treatment]. RevMedSuisse. 13(587):2164-2168.
21. Sisk D, Fredericson M. (2019). Update of Risk Factors, Diagnosis, and Management of Patellofemoral Pain. CurrRevMusculoskeletMed. 12(4): 534-541.
22. Capin J, Snyder-Mackler L. (2018). The current management of patients with patellofemoral pain from the physical therapist's perspective. Ann Jt. 3:40.
23. González Carranza J, Viteri Yunda A. (2019). Manejo de la inestabilidad rotuleana. Revista Ecuatoriana de Ortopedia y Traumatología. 8(1):41-44.
24. Chahla J, Stone J, Mandelbaum BR. (2019). How to Manage Cartilage Injuries? Arthroscopy. 35(10):2771–2773.
25. Insall J. Cirugía de la rodilla. Ed, Panamericana. 1986. 261-264.
26. Maestu R, Lamar Z, Medus M, Rainaudi P, Miguez D, Maestu R. (2019). Indicaciones y complicaciones de la osteotomía de la tat en el tratamiento de la inestabilidad patelofemoral. Artroscopia. 26(4):118-122.
27. Martínez Giménez JE., Calderón Arnedo A, Campos Rodenas S, Salmerón Martínez E, SaezBusquier E. (1993). Tratamiento quirúrgico de la luxación recidivante de rótula mediante técnica combinada de realineación proximal y distal.RevEspCirOsteoart. 28:305-309.
28. Redziniak Daniel E, Diduch David R, Mihalko William M, Fulkerson John P, Novicoff Wendy M, ShahinSheibani-Rad, Saleh Khaled J. (2009). Patellar Instability. JBJS Am. 91(9):2263-2275.
29. Firman E. Luxación recidivante de rótula. (2017). Reconstrucción del ligamento patelofemoral medial. AATD. 24(1):14-19.
30. Rosero Yépez A, UrquiaLagla C, Dávila Mora A. (2019). Reparación del ligamento patelofemoral medial en pacientes pediátricos con luxación patelofemoral. Revista Ecuatoriana de Ortopedia y Traumatología. 8(2):26-30.
31. La Prade RF, Cram TR, James EW, Rasmussen MT. (2014). Trochlear dysplasia and the role of trochleoplasty. ClinSportsMed. 33(3):531-545.
32. Álvarez López A, Fuentes Véjar R, Soto Carrasco SR, García Lorenzo YC. (2020). Algunas consideraciones sobre la trocleoplastia del fémur. MEDISAN 24(1):134-145.