

I.S.Mu.L.T. first-time patellar dislocation guidelines

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Summary

Primary traumatic patellar dislocation is common, particularly in young active individuals. A consensus on its management is still lacking. The present work provides easily accessible guidelines to be considered as recommendations for a good clinical practice developed through a process of systematic review of the literature and expert opinion, to improve the quality of care and rationalize the use of resources.

Level of evidence: Ia.

KEY WORDS: first-time patellar dislocation, patellar instability, surgery, patella, rehabilitation, guidelines.

Introduction

Acute patellar dislocation is a common knee injury which typically occurs in young and physically active individuals, and is associated with a high rate of recurrent patellar instability, instability symptoms and eventually patellofemoral osteoarthritis. A variable amount of anatomic abnormalities may be involved in patients with primary patellar dislocation. Usually, conservative treatment is the initial management. Surgical intervention is required for patients who are at a high risk of redislocation or when conservative management has failed. However, there remains little consensus about the optimal operative or nonoperative method of managing these patients.

Approach to guidelines

These recommendations developed through a process of systematic review of the literature and expert opinion, to be used to improve the quality of care and rationalize the use of resources. Clinical decisions on individual patients require the application of the recommendations, based on the best scientific evidence and clinical experience of the physician.

Methodology

The Authors were divided into four groups:

- A Coordinator conceived and organized the work and the groups, and selected the most important questions on the topic at hand
- A Control Group controlled the development of the work and discussed the recommendations
- The Group of the experts individually received a question and developed the Answers according to the rules of EBM, when it was possible
- The Group of Preparation and Evaluation of Literature drew up the text and assisted the group of experts in evaluating the literature.

Methods and criteria study selection

For research were consulted the following databases:

- PubMed
- Embase
- Google Scholar
- Cochrane Library.

Randomized controlled trials (RCTs); Systematic reviews; to follow if missing the first two, the other levels of evidence. The literature is updated at November, 2015.

Level of Evidence *Criteria for analysis and inclusion*

- I** Meta-analyses and systematic reviews of randomized controlled trials (RCTs) of

high quality, or RCTs with minimum or low risk of bias. Systematic reviews of high quality relative to cohort studies or case-control

- II** Cohort studies or randomized case-control high quality, with minimal risk of confounding or bias and with high or discrete probability of causation.

- III** Case-control studies and retrospective comparison of well-conducted with reasonable probability of causation

- IV** Non-analytic studies as case series or individual cases

Level of Recommendation *Criteria for analysis*

- A** Supported by at least two studies of level Ib or from a review level Ia ("it was shown")

- B** Supported by at least two independent studies of level II or extrapolations from studies of level I ("it is possible")

- C** Not supported by adequate studies of level I or II ("indications")

- D** Indications of experts ("there is no evidence")

Epidemiology

Acute dislocation of the patella represents about 3% of all knee injuries and is the second most common cause of post traumatic haemarthrosis. It can result from direct or indirect trauma in a knee without apparent patellar instability or, more often, with underlying predisposing factors to instability. A distinction must be made between dislocation and subluxation. Irreducible dislocation of the patella is rare. Usually, the first episode of acute patellar dislocation occurs in patients younger than 20 years in about 70% of cases, with an incidence of about 29 cases per 100,000 population. Some Authors point out that the incidence may reach 69 cases per 100,000 inhabitants in the military population subjected to physical efficiency tests during their military service. The incidence tends to gradually decrease with age; it is reported a percentage of about 20% in the third decade, of 5% in the fourth, and of 3.5% in the fifth and sixth decades of life. Half of the patients involved are women, and 20% of these women will experience subsequent episodes of dislocation. The first dislocation of the patella typically results from sports injuries and this is the reason why it occurs in people younger than 25 years or in "high demanders" in 2/3 of cases. It should be noted the impact of dancing in the pathogenesis of this disease (9% of cases). However, it may occur during the usual activities of daily living in about 21% of cases.

In an MRI study performed immediately after a first episode of acute patellar dislocation, Paakkala et al. showed a lesion of the medial patellofemoral ligament (MPFL) in 83% of cases, 70% on the patellar side of

the ligament, 57% on its femoral side. In addition to the capsuloligamentous injuries, osteochondral lesions of the patella or of the femoral condyles may occur in a percentage that varies according to the Authors and to the methods used to highlight them. Redislocation of the patella seems more common in adolescent patients, and this event can occur both in patients treated conservatively and in those undergoing surgery, with different percentages depending on the patient cohorts¹⁻⁷.

Key points:

- Acute patellar dislocation is common
- A distinction must be made between dislocation and subluxation
- In about 70% of cases, it involves subjects younger than 20
- It usually follows a trauma sustained during physical or sports activity, especially in subjects with underlying predisposing factors of patellar instability
- In patellar dislocation, capsuloligamentous injuries and/or osteochondral lesions of the patella or of the femoral condyles may occur.

Biomechanics of the patellofemoral joint

The relative motion between the distal femur and the patella, and accordingly the patellar stability, depends on four main factors: the joint geometry, the action of the muscles that act on the patella, the alignment of the lower limb, and the passive constraint exerted by the surrounding soft tissues. Physiologically, in the frontal plane, contraction of the quadriceps determines a lateral force acting on the patella, consequent to the angle, named Q angle, between the line of action of the quadriceps and the patellar tendon. An increased Q angle leads to an increase of this lateral force and, therefore, a greater risk of dislocation. The main antagonist to lateral patellar displacement is the femoral trochlear groove, especially the depth and pitch of the lateral femoral condyle. With increasing knee flexion, the vector force, resulting from the tension of the quadriceps and the traction of the patellar tendon, pushes the patella in the trochlear groove, making it less vulnerable to lateral dislocations. Instead, a dysplastic trochlea, with flattening of the lateral facet, is unable to withstand such lateral force exerted even at low degrees of flexion. The vastus medialis obliquus (VMO) muscle contributes significantly to joint stability, acting as a dynamic stabilizer of the patellofemoral joint. A decrease in the strength of the VMO can compromise the force required to displace the patella laterally, although this does not necessarily determine a lateral displacement in the absence of other predisposing factors.

The Medial Patellofemoral Ligament (MPFL) is the primary passive constraint of the patellofemoral joint; it provides between 50 and 60% of the resistance to lateral patellar displacement during early knee flexion (0-30°). Moreover, the distance be-

tween the vertical line through the center of gravity of the body and the axis of instantaneous rotation of the joint is one of the most important variables in the estimation of the forces acting on the patella⁸⁻²⁴.

Key points:

- The joint geometry, the action of the muscles that act on the patella, the alignment of the lower limb, and the passive constraint exerted by the surrounding soft tissues are the principal stabilizers of the patellofemoral joint
- The patellofemoral joint forces depend on the strength of the quadriceps and of the patellar tendon, the degree of the knee flexion, the distance between the vertical line through the center of gravity of the body and the axis of the instantaneous rotation.

Traumatic mechanism

Acute patellar dislocation is a traumatic event characterized by complete loss of articular relationship between the patella and the femoral trochlea. It occurs almost exclusively in the lateral direction. Medial dislocation is practically exclusively iatrogenic, usually from a failed surgical lateral retinaculum release or a reconstruction of the medial patellofemoral ligament which has been tensioned too much. The traumatic event is frequently indirect (in 93% of cases) and occurs during sports practice, as a result of movements of knee flexion with valgus stress and added torsional forces that develop at the knee. However, the dislocation can also be secondary to direct trauma caused by a tangential force, which produces a lateral dislocation. Acute dislocation of the patella is a leading cause of knee haemarthrosis, second only to a lesion of the anterior cruciate ligament. In case of concomitant osteochondral lesion, fat droplets will be visible in the blood. In 80% of patients, the dislocation resolves spontaneously; in the remaining 20% of patients, the knee is typically kept in a flexed position, and appears deformed from the lateral displacement of the patella. Major and minor anatomical predisposing factors can be identified. Partial or complete tear of the medial patellofemoral ligament is detectable in 94-100% of patients, and some Authors have suggested that the dislocation itself is impossible without lesion of this anatomical structure. Although the MPFL is the medial structure more often involved, the trauma can injure the other structures of the retinaculum, such as the medial patellobial ligament (MPTL), the superficial medial collateral ligament (MCL), and, more deeply, the medial patellomeniscal ligament (MPML). The post-traumatic marrow edema is usually seen in the femoral condyle in 80-100% of patients, while in 41-61% of patients it is detectable even at the level of the inferior-medial aspect of the patella. Osteochondral lesions are more common on the patellar (70%) rather than in femoral (40%) articular surface, and can result in intra-articular loose bodies in 1/3 of patients²⁵⁻³⁹.

Key points:

- The knee flexion with a valgus stress is the typical mechanism underlying patellar dislocation.
- Acute dislocation of the patella is a leading cause of knee haemarthrosis
- A partial or complete tear of the medial patellofemoral ligament (MPFL) is detectable in 94-100% of patients
- The trauma can injure the other structures of the medial patellar retinaculum (e.g., MPTL, MCL, MPML)
- The impact of the inferior-medial aspect of the patella on the anterolateral area of the lateral femoral condyle may cause bruising and osteochondral lesions, most frequently on the patellar than on the femoral surface.

Clinical tests

Patellar dislocations are usually diagnosed on the basis of medical history and clinical examination. A variety of clinical tests has been described for evaluating the patellofemoral instability. Although physical examination is considered of paramount importance in the diagnosis of patellofemoral disease, the evidences in support of clinical tests are lacking and methodologically limited. Currently, there is no scientific evidence supporting the use of a specific test, and further studies are needed to support their appropriateness in assessing patellofemoral instability⁴⁰⁻⁵².

Level of recommendation: C

Key points:

The most reliable and sensitive clinical tests for the proper evaluation of the patellofemoral joint instability are:

- The Fairbanks sign (apprehension test)
- The Bassett's Sign for medial patellofemoral ligament
- The Gravity subluxation test, for medial patellar subluxation
- The Patellar Glide Test
- The Patellar Tilt Test
- The Quadriceps Pull Test.

Imaging

Conventional radiographs (X-Ray) should be performed in all patients with patellar dislocation suspicion, and the presence of a visible osteochondral fracture on conventional radiography is plausibly suggestive of a cartilage injury.

Ultrasound: its use for after acute patellar dislocation is not validated.

Magnetic Resonance Imaging (MRI) in acute lateral dislocations of the patella can identify lesions of the medial retinaculum, MPFL and vastus medialis oblique muscle. A concave deformation of the inferomedial portion of the patella could represent a specific sign of a primitive lateral patellar dislocation.

Dynamic MRI can be used to study dynamically the patellofemoral joint.

CT can be used to confirm osteochondral fracture and to evaluate the bony risk factors predisposing a patient to a dislocation⁵³⁻⁶².

Level of recommendation: B

Key points:

- MRI, CT, plain radiography and ultrasound have advantages and disadvantage in the instrumental diagnosis of the first episode of dislocation of the patella. None has sensitivity and specificity to be recommended as the only imaging investigation.

Conservative treatment

The initial approach to the dislocation of the patella is the reduction of the dislocation and the pharmacological management of pain and inflammation. Surgery after the first episode is controversial, even in patients who have a clear high risk of recurrence. Early immobilization of the knee and the use of crutches is always to be provided immediately after the reduction. It may be useful to administer dietary supplements of chondroitin sulfate and glucosamine, natural elements necessary for the biosynthesis of proteoglycans essential for the health of joint cartilage⁶³⁻⁶⁶.

Level of recommendation: D

Key points:

- Reduction of the dislocation and pharmacological management of pain and inflammation are the initial approach in patients with acute dislocation of the patella
- Reduction of the dislocation is usually simple and safe which, however, must be performed by a qualified physician
- Any associated lesions must be excluded before initiating reduction
- Early immobilization of the knee and use of crutches is to be provided after the reduction.

Rehabilitation approaches

Conservative management following the first episode of a patellar dislocation is recommended when imaging does not detect chondral lesions, osteochondral fragments or serious injuries of the parapatellar ligament complex. The effective recovery as a result of conservative treatment has yet to be established, since some studies show that about 1/3 of patients treated conservatively present limitation of activities after 6 months to 3 years, even in the absence of a redislocation. Despite the lack of rigorous clinical evidence, many reviews report opinions and recommendations derived from the expertise and experience of the Authors. Therapeutic exercise seems to play a primary role in each stage of recovery. At present, there is no evidence about the choice of exercises⁶⁷⁻⁸¹.

Level of recommendation: C

Key points:

- There is no adequate clinical evidence regarding the most effective modalities for conservative management following the first episode of patellar dislocation
- Therapeutic exercise plays a primary role in each stage of patient recovery (initial tissue protection, pain reduction, recovery of joint movements, muscle bulk and knee function, prevention of patel-

- lofemoral instability and of redislocation)
- There is no evidence on the modality of therapeutic exercise (closed or open kinetic chain, preferential degrees of knee joint, vastus medialis obliquus muscle or general quadriceps strengthening, use of dynamic neuromuscular stabilization exercises, association or not with facilitation techniques, or taping, physical modalities).

Physical modalities

Physical and instrumental therapies are commonly used in the various phases of the treatment of patients who sustained a first episode of patellar dislocation. However, their actual clinical efficacy has never been demonstrated in prospective or retrospective studies, and the most “correct” way in which they should be used is at best unclear. Cryotherapy is useful in the first 48 hours of injury, but it can be used also in the following 3-4 weeks to address the joint effusion and the pain after exercise therapy and loading. Electrostimulation can prevent muscle atrophy, promote muscle strengthening, and facilitate functionally useful movements⁸²⁻⁹⁰.

Level of recommendation: D

Key points:

- At present, there are no safe clinical evidences on physical modalities in the management of patients following their first episode of patellar dislocation.

Taping, bracing and casting

Taping is used after the first 6 weeks to reduce pain, facilitate the recruitment of the VMO, and as psychological support. Casting has been advocated to allow healing of the medial retinaculum and of the MPFL, but prolonged immobilization results in adverse effects on ligament, bone, cartilage and muscles. The use of braces or tapes could offer faster functional recovery, but with a longer time for MPFL healing⁹¹⁻⁹³.

Level of recommendation: D

Key points:

- There is no evidence regarding the choice between the taping, bracing or complete immobilization is a cast in the management of patients with their first patellar dislocation
- Taping seems to help with symptoms, but has no effect on the patellar realignment
- Prolonged immobilisation has negative effects on the ligaments, cartilage, bone and muscles.

Proximal realignment surgery

The concept of proximal realignment and quadriceps plasty were introduced in 1975 to treat recurrent subluxation of the patella. The procedure was modified by Insall, who used an isolated proximal realignment. Proximal realignment remains a valuable intervention for some patients with patellar instability, but it is not used in patients with first time patellar dislocation⁹⁴⁻⁹⁷.

Level of recommendation: D

Key points:

- At present, there is no evidence in favour of isolated proximal realignment and quadriceps plasty for patients following their first episode of patellar dislocation.

Lateral retinacular release

Lateral retinacular release is improperly used in patients with patellar instability. From a biomechanical point of view, isolated lateral release cannot correct the causes of patellar instability (trochlear hypoplasia, vastus medialis atrophy, medial ligamentous laxity). The literature on the results of lateral release is based on retrospective studies with short follow-up and low level of evidence. In a systemic review, Lattermann confirmed that the medium and long-term results of this procedure are extremely unsatisfactory, and that the lateral release has no indication in the management of acute and chronic patellar instability. An excessive lateral release can cause iatrogenic patellar pathologies. In particular, a release can determine medial instability if performed too proximal to the upper border of the patella. In the presence of a cartilaginous lesion of the medial patella, release may increase the load in this area, resulting in worsening of the lesion. Also, if the patient has an increased Q angle, isolated release can increase this angle, thus increasing instability symptoms⁹⁸⁻¹⁰⁵.

Level of recommendation: B

Key points:

- Isolated lateral release is not indicated for the management of patients with acute or recurrent patellar dislocation
- Isolated lateral release is contraindicated in patients following an acute dislocation of the patella, since this procedure does not address the cause of dislocation, but rather weakens the stabilizing forces on the patella.

Three-in-one procedure (lateral release, proximal vastus medialis realignment and plasty, and medial transfer of the medial one third of the patellar tendon)

The “three-in-one” procedure is indicated for recurrent dislocation of the patella in skeletally immature children and adolescents, who do not respond to conservative treatment and have a tilt associated to excessive lateralization of the patella. At present, there is no evidence in favour of this surgical procedure for the management of patients following their first episode of patellar dislocation¹⁰⁶⁻¹⁰⁹.

Level of recommendation: B

Key points:

- The “three-in-one” procedure is indicated for recurrent patellar dislocation
- It can be performed in the skeletally immature patients, avoiding damage to the proximal epiphysis of the tibia (not involved in the surgical procedure), and it does not preclude to perform additional stabilization interventions when required.

Isolated medial patellofemoral ligament (MPFL) reconstruction

An anatomical repair MPFL is necessary to prevent recurrence. The high success rate (79.2%) and the low rate of recurrence with this procedure probably depend on correct selection of patients¹¹⁰⁻¹¹⁹.

Level of recommendation: B

Key points:

- Several techniques have been described to reconstruct the MPFL, and at present there is no clear consensus on the best surgical procedure to reconstruct it
- Isolated MPFL reconstruction appears to be adequate also in the acute phase.

Tibial tubercle osteotomy

Distal realignment procedures are indicated in patients with lateralization of the tibial tuberosity. These techniques should be considered when recurrences are caused by skeletal deformities related to malalignment of the extensor apparatus. Bone realignments allow the correction of patellar “maltracking”, and the management of symptoms associated to this condition¹²⁰⁻¹²².

Level of recommendation: C

Key points:

- Distal realignment techniques should not be used in the management of patients following their first episode of dislocation
- This procedure could be considered only following their first episode of patellar dislocation in skeletally mature patients, and in patients with well documented lateralization of the tibial tuberosity.

Trochleoplasty

It aims to change the shape of the distal femur in those patients in whom recurrent patellar instability is associated with trochlear dysplasia. This procedure is not indicated following the first episode of dislocation of the patella, and it should only be performed in patients with recurrent dislocation. Also, in the presence of severe trochlear dysplasia, it may also be possible to obtain good results with other procedures, avoiding the knee rigidity which typically follows a trochleoplasty. Trochleoplasty carries a high risk of cartilage damage and of permanent modifications of the knee joint kinematics. All these factors are critical, and they may result in the development of early osteoarthritis¹²³⁻¹³⁰.

Level of recommendation: B

Key points:

- Trochleoplasty does not play a role in patients following their first episode of dislocation of the patella
- It must be reserved to selected patients, particularly when revision surgery is needed.

Post-surgical rehabilitation

Recovery after surgery depends on adequate post-operative rehabilitation. Having different surgical techniques implies that different rehabilitation protocols should be used, each specific to each approach. However, currently, there are no standardized protocols for rehabilitation following surgery for this condition¹³¹⁻¹³⁶.

Level of recommendation: D

Key points:

- Post-surgical rehabilitation is critical to recover function of the knee joint
- It is not possible to determine which is the most suitable rehabilitation approach for patients undergoing surgery, as there is lack of adequate clinical studies
- The transition between the different rehabilitative phases and the return to full activity should be based on functional rather than on time criteria.

Return to sport

Return to their sport at the same level as before the dislocation is the goal of injured athletes. Nevertheless, there is a lack of studies on the return to the sport after this traumatic event or after surgery¹³⁷⁻¹⁴⁵.

Level of recommendation: D

Key points:

- There are few studies in the literature on return to sport after the first episode of patellar dislocation
- To evaluate the suitability of a patient to return to sport, strength (strength limb symmetry index), functional performance tests, and tests to assess the dynamic stability of the knee and the trunk can be used. None should be used in isolation
- Early introduction to sports-specific exercises can improve self-confidence, can increase compliance and facilitate a more rapid and safe return to the sport practice.

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