

[Orthopaedic Surgery]

A Treatment Algorithm for Primary Patellar Dislocations

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Context: Primary patellar dislocation continues to be a common problem facing clinicians today. These injuries are associated with significant morbidity and a substantial recurrence rate. Myriad operative and nonoperative options have been described to treat these injuries, although the evidence-based literature is sparse.

Evidence Acquisition: PubMed was searched from 1970-2010 to identify publications on patellar dislocations, including clinical presentation, natural history, radiographic workup, and treatment.

Results: The initial workup of a patella dislocation includes a history, physical examination, and radiographs. If there is evidence of a displaced osteochondral fragment or hemarthrosis, then magnetic resonance imaging should be obtained. The treatment of first-time patella dislocators has been controversial, and no study has demonstrated a clear benefit to early operative intervention.

Conclusion: First-time patellar dislocations should be treated conservatively unless there is evidence of a displaced osteochondral fragment.

Keywords: patella dislocation; patellofemoral instability; treatment

The management of primary patellofemoral dislocations has remained a controversial topic. Acute patellar dislocations are a common problem faced by orthopaedic surgeons and can be associated with prolonged disability and high rates of recurrence.^{6,9,10} This review is an update to a previously described algorithm providing a structured method for approaching such patients.¹³

EPIDEMIOLOGY AND NATURAL HISTORY

The average annual incidence of primary patellar dislocation is 5.8 per 100 000 in the general population, with the highest incidence in the 10- to 17-year age group (29 per 100 000).⁹ The majority of these patients will not experience further instability, with reported recurrence rates of 15% to 44% after conservative treatment.^{6,9,10} Although recurrence is the exception and not the rule, many patients continue to be symptomatic following their dislocation episodes. Atkin et al² noted that at 6 months postinjury, 58% of patients continue to have limitations with strenuous activity. Failure to return to sport is found in as many as 55% of patients. For these reasons, surgical intervention has been advocated in an attempt to reduce the recurrence rate,^{18,19} which has led to confusion and controversy regarding surgical indications in the acute setting.

Great strides have recently been made in our understanding of the natural history of primary patellar dislocations. Most literature consists of case series, representing the experience of a single author and thus making meaningful comparisons difficult. Several prospective trials have recently been published, which aid in clinical decision making.^{4,5,14,15,18,19} Incorporating these recent contributions, the algorithm presented here takes the clinician through the workup and management of the patient with primary patellar dislocation (Figure 1).

INITIAL EVALUATION

The initial evaluation should include a thorough history and physical examination to confirm that a patellar dislocation has occurred and to rule out other injuries, such as anterior cruciate and medial collateral tears that involve similar mechanisms. Two common activities that can result in patellar dislocation are sports (61%) and dance (9%).⁹ Contrary to previous belief, the most commonly affected demographic is not obese inactive females but, instead, young athletes of either sex, with males and females having similar rates of primary dislocation.⁹ Particular care should be taken to determine whether the patient has had a previous patellar dislocation on the index or contralateral knee. A history of contralateral patellar dislocation

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No potential conflict of interest declared.

DOI: 10.1177/1941738111399237

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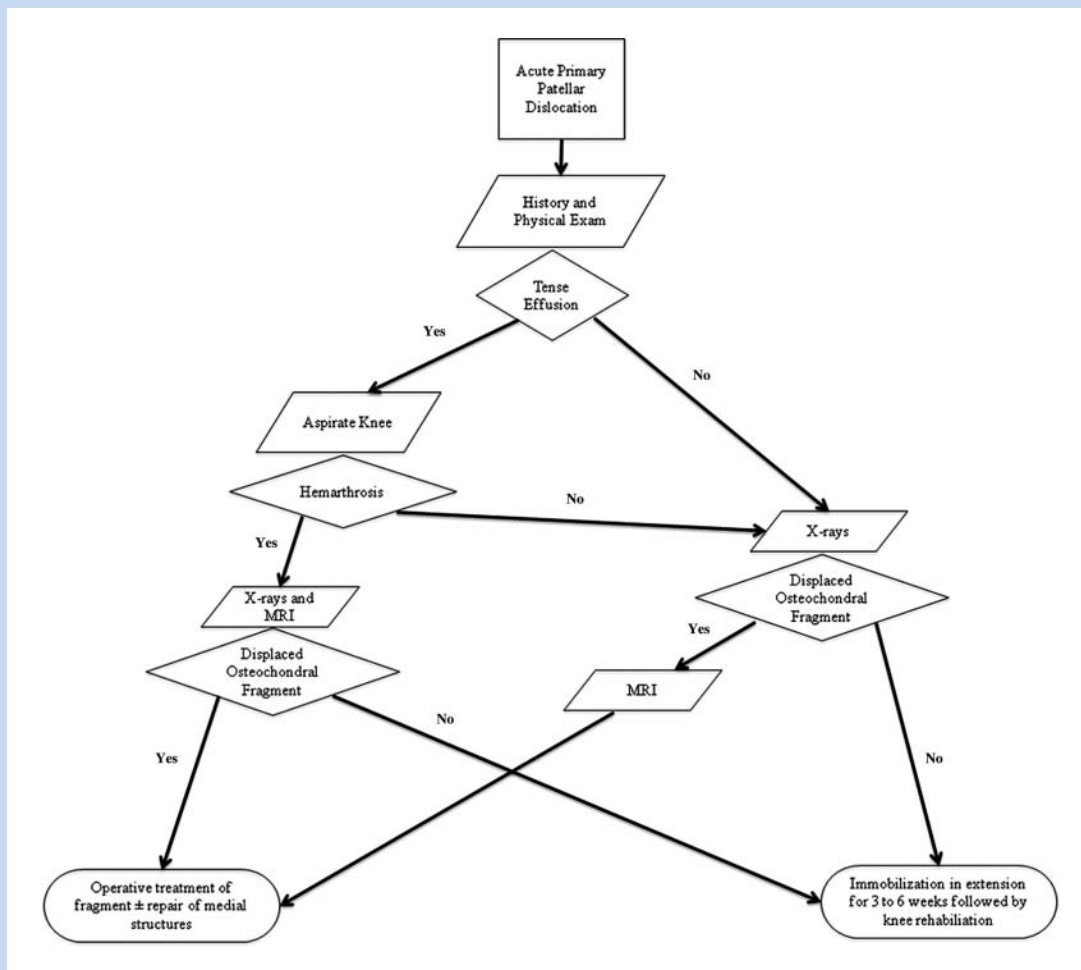


Figure 1. Algorithm for the workup and management of a primary patellar dislocation.

increases the risk of recurrence 6-fold, as much as a previous dislocation event on the index knee.⁹

The usual finding on physical examination is a large effusion, with tenderness about the medial retinaculum. This finding is not specific, so careful examination should be undertaken for ACL, PCL, collateral, and rotational laxity, as well as joint line tenderness. Lachman testing and ligament arthrometry, the quadriceps active test, and tests of collateral ligament integrity all use gentle palpation of endpoint to rule out injury; examination for patellar stability should be no different. Despite the patient's pain and apprehension following an injury, the physical examination should be sufficient to confirm the diagnosis in all but a few patients presenting with acute traumatic knee hemarthrosis, including those with acute dislocation of the patella. The physical examination should include assessment of lower extremity alignment and soft tissue constraints.

A large tense effusion is likely a hemarthrosis. If such an effusion exists, an aspiration may be performed to relieve pain, to facilitate the examination (by reducing guarding), and to determine if a hemarthrosis exists. The presence of a hemarthrosis raises the likelihood that a significant

osteochondral fracture has occurred. Osteochondral fractures are underestimated on radiographs; MRI more accurately evaluates the joint surfaces in this setting.^{7,11,22} Articular cartilage injuries are common, occurring in as many as 95% of first-time patellar dislocations.¹⁶

IMAGING

Anteroposterior, lateral, and axial (Merchant or Laurin) radiographs should be obtained on all patients presenting with traumatic knee injury and effusion and inspected for patellar location and an osteochondral fracture. Such a fracture visible on conventional radiographs likely represents a significant cartilage lesion. MRI should then be obtained to further delineate the pathology, or the surgeon may choose to proceed with operative intervention. Even when the radiographs are normal, an osteochondral fracture may have occurred. If a hemarthrosis is present, the likelihood of a significant osteochondral fracture increases, and MRI should be indicated for further evaluation. MRI reliably demonstrates osteochondral injuries in the first-time dislocator.⁸

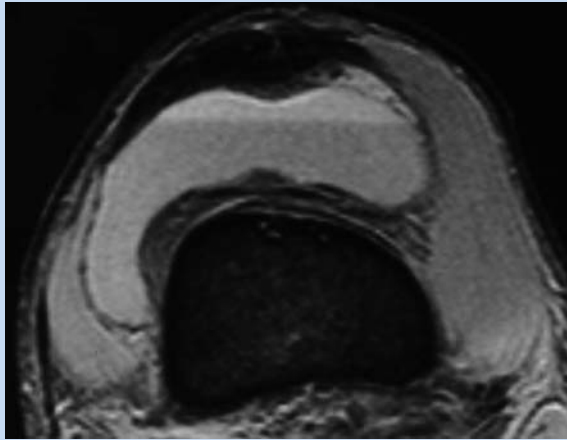


Figure 2. MRI demonstrating a large hemarthrosis after patella dislocation. This patient also had a displaced osteochondral fragment.

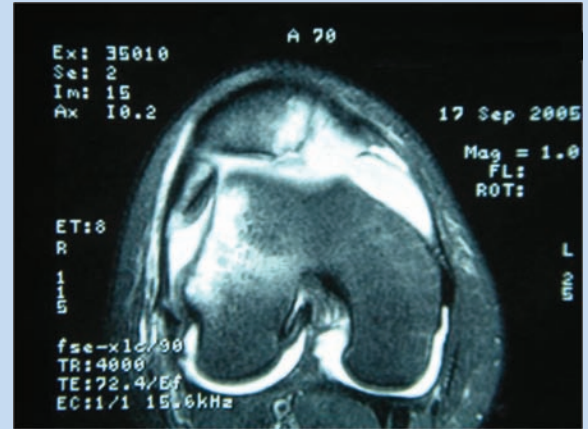


Figure 3. MRI demonstrating large displaced osteochondral fragment. Note the bone bruise pattern typical for patella dislocation.

If MRI demonstrates an osteochondral loose body that is significant in size and amenable to fixation, surgical intervention is warranted. There is no literature defining the size of a fixable fragment, but the fragment should have subchondral bone that is at least 9 mm. If a smaller osteochondral fracture exists, surgical intervention is considered elective. The patient may be followed to determine if knee function improves or if symptoms of a loose body develop. The presence of an osteochondral injury by itself—without a loose body that is large enough to warrant reduction and fixation—has not been shown to be a clear indication for surgery. When radiographs are normal and no hemarthrosis is present, the likelihood of a significant osteochondral fracture is small, and the patient may be followed clinically without MRI.

In the acute setting, MRI may be used to evaluate the integrity of the soft tissue constraints. Injury to the medial retinacular structures and medial patellofemoral ligament (MPFL) is commonly seen and may have implications for prognosis. Femoral-sided MPFL injury may be predictive of subsequent patellar instability, but it remains unclear if MPFL reconstruction in this setting leads to improved long term clinical outcomes (Figures 2 and 3).²⁰

OPERATIVE INTERVENTION

Articular surface injuries are common, but the majority do not involve significantly displaced fragments. The least controversial indication for operative intervention after acute first-time patellar dislocation is a large displaced osteochondral fracture with a loose body that may be amenable to fixation. A bony fragment is amenable to fixation if it can hold at least 1 or 2 absorbable pins. Typically, fragments can be fixated with three 2-mm pins (Figure 4). Nomura et al¹⁶ performed arthroscopic or macroscopic examination of the articular surfaces of 39 primary patellar dislocators: 37 (95%) demonstrated an articular cartilage injury, of which

23% represented patellar cracks only; the remaining 72% involved osteochondral or chondral fracture. Interestingly, 31% involved a cartilage injury to the lateral femoral condyle. Surgical intervention is not warranted in every case of articular cartilage injury. However, it does seem logical to reduce and stabilize large displaced osteochondral fragments in the acute setting if they are of sufficient size and involve enough bone to be amenable to fixation, as mentioned above. Smaller fragments not amenable to fixation require treatment only if they are symptomatic loose bodies.

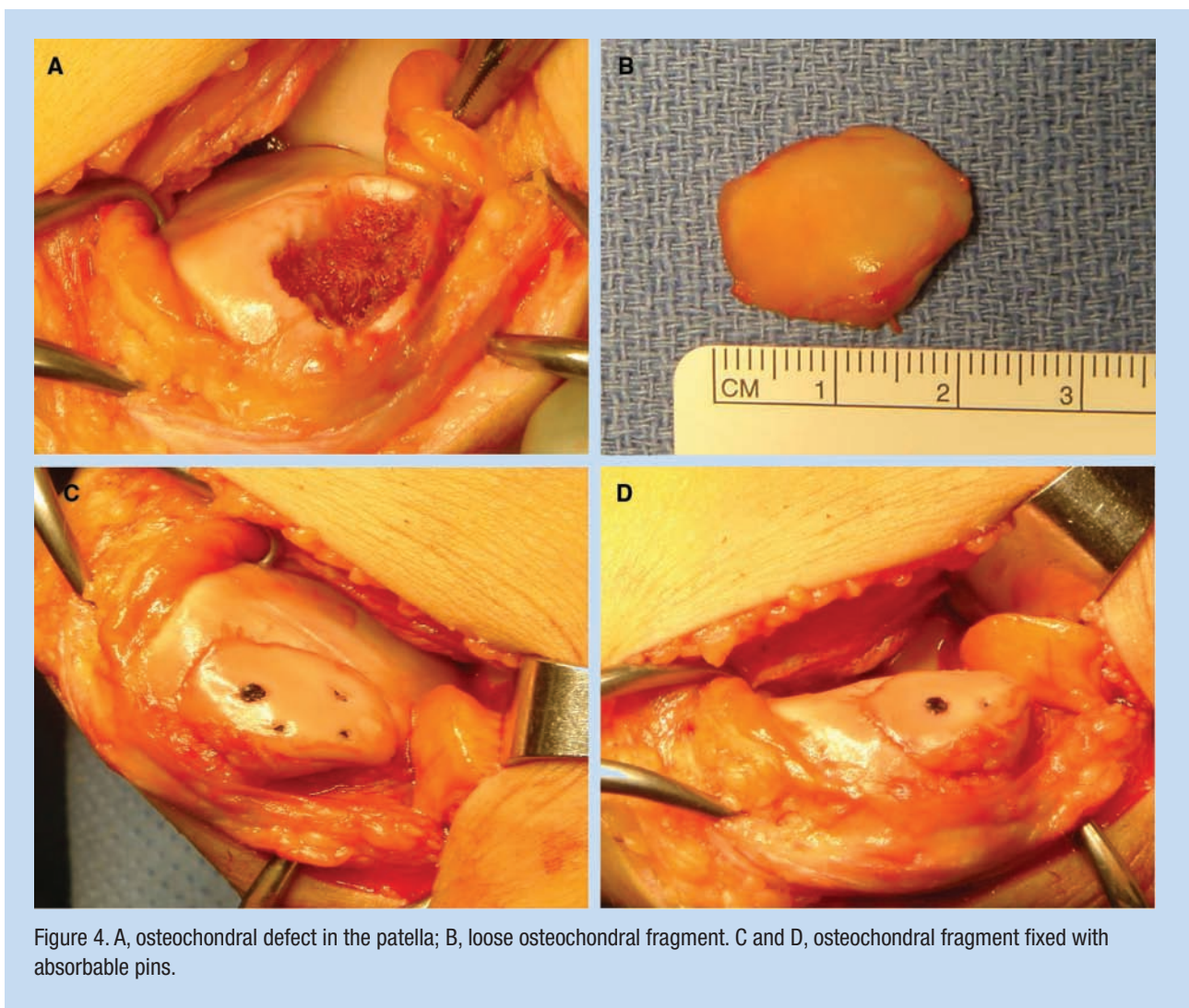
At the time of osteochondral fragment fixation, a repair of the medial structures, including the MPFL, may be performed. The medial structures are repaired if an arthrotomy is required for fixation of the osteochondral fracture. This adds little morbidity to the procedure and may improve MPFL function as a restraint to excessive lateral translation of the patella. However, little evidence exists to support this recommendation.

Because of the high rate of articular cartilage injury after first-time patellar dislocation, some surgeons advocate routine arthroscopy, which remains controversial. At the 2003 annual meeting of the International Patellofemoral Study Group (Amis and Dejour, unpublished data), consensus was that routine arthroscopy is not indicated in cases of primary patellar dislocation. Instead, MRI was recommended in patients at high risk, as evidenced by a large hemarthrosis.

A separate issue is whether primary patellar dislocators should undergo surgical management to reduce the risk of future instability. Although the literature is replete with case series of operative and nonoperative treatment of the primary patellar dislocator, few randomized controlled trials exist.[†]

Buchner et al³ retrospectively studied 126 patients at a mean of 8.1 years after primary patellar dislocation, 37 of whom had immediate surgical reconstruction of their parapatellar ligament complexes. At follow-up, no significant differences

[†]References 1, 3-5, 10, 14-17, 19, 21.



were found in redislocation rates, levels of activity, or functional and subjective outcome measures between those treated operatively and nonoperatively. Nikku et al^{14,15} initially published 2-year results and, subsequently, 7-year results of a prospective randomized trial. They found no difference in outcome scores or instability rates between the 2 groups at either time point.

Sillanpaa et al¹⁹ recently published a randomized prospective study on stabilizing surgery for primary traumatic patellar dislocations. Forty patients were randomized into initial surgical stabilization versus conservative care (including those who underwent arthroscopy for osteochondral fragments), with an average follow-up of 7 years. The operative group received either a reefing or Roux-Goldthwait procedure, based on surgeon preference. The redislocation rate was 27% in the conservative group versus 0% in the surgical stabilization group. Despite fewer redislocations in the operative group, Kujala subjective outcome scores and activity levels were the same for both groups.

Two other randomized controlled trials were recently published comparing nonoperative treatment and repair of the MPFL in acute patellar dislocation. Lind et al⁵ randomized 80 patients with primary patella dislocation, at a mean of 50

days after injury, to either bracing or surgery. The surgical technique for all patients was an anchor-based reattachment to the adductor tubercle. The redislocation rate was 17% and 20% in the operative and conservative groups, respectively, which was not significantly different given the size of their sample. This study assumes that MPFL rupture occurs at the adductor tubercle; it does not attempt to identify the location of MPFL rupture in its surgical group. A similar study done by Camanho et al⁴ did address the location of MPFL rupture in the acute dislocators. The MPFL was repaired in 8 acute dislocators at the site of injury as determined by MRI, and no recurrences were found, compared with a 50% recurrence rate in the nonoperative group at a mean follow-up of 40.4 months. Of the 17 patients in the operative group, 10 had an MPFL injury at the patella and 7 at the femur. These results suggest that surgical repair of a discrete lesion in the MPFL in the acute dislocator may reduce the risk of recurrence. These results have not been duplicated, but they do represent the first published level 1 evidence indicating that immediate surgical repair may improve outcomes following first-time patellar dislocation.

To advocate initial surgical management to stabilize the patella, sufficient evidence should exist that the patient's outcome can be improved with surgical intervention. Currently, there is no firm evidence that the natural history of the primary patellar dislocator is improved by acute surgical intervention. Surgical stabilization of the patella is not recommended after an initial dislocation event. After a second dislocation event, a much higher risk of redislocation exists (49%), and surgical intervention may be considered.⁹

NONOPERATIVE TREATMENT

Surprisingly little evidence exists addressing the nonoperative treatment of the primary patellar dislocation. Contemporary treatment regimens range from immediate mobilization without a brace to cast immobilization in extension for 6 weeks. Immobilization in extension may afford the medial structures—particularly, the MPFL—a better environment in which to heal. However, this comes at the expense of stiffness, weakness, and loss of limb and proximal control that often accompany prolonged immobilization. Patient compliance can also be a factor in deciding nonoperative treatment. For these reasons, many clinicians advocate a short period of immobilization, followed by rehabilitation of the knee, with or without a patellar brace. Maenpaa and Lehto¹² studied this issue further by dividing 100 primary patellar dislocations into 3 treatment groups: patellar bandage or brace, posterior splint, or plaster cast. The immobilization in the splint and cast groups was performed for 6 weeks. A 3-fold higher risk of redislocation was reported in those treated with immediate mobilization. Restriction in motion was more frequent in the cast group.

No studies exist on the efficacy of physical therapy after the first patellar dislocation. Similarly, the effect of patellar braces and straps on the outcome of acute primary patellar dislocation remains to be determined.

In light of the current evidence, some period of immobilization in extension is advisable after the first dislocation event by placing the patient in an extension brace for 6 weeks, followed by physical therapy or patient-directed home therapy focused on range of motion and quadriceps strengthening. In a patient who finds 6 weeks of immobilization unacceptable, a 3-week period of immobilization may be performed with the understanding that a higher redislocation rate may result.

CONCLUSION

Although the management of the primary patellar dislocation remains a topic of considerable controversy, certain conclusions can be drawn. If a hemarthrosis is present, patients should be evaluated for osteochondral fractures by radiographs and MRI. Displaced osteochondral fragments amenable to fixation should be reduced and stabilized acutely. Acute surgical stabilization remains controversial, with no clear long-term benefits demonstrated in the literature. If nonoperative management is

electd, a period of immobilization in extension up to 6 weeks will yield the lowest redislocation rate. In sum, this algorithm provides an evidence-based approach that assists the clinician in the treatment of the acute first-time patellar dislocation.

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