Missed Transient Patellar Dislocation in Younger Patients With Traumatic Knee Injuries

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Abstract

Background: Acute patellar dislocation is a common injury, with up to 40% of the cases missed due to a high rate of spontaneous reduction. Complications mainly arise due to osteochondral fractures, resulting in patellofemoral osteoarthritis and rupture of medial patellar stabilizers, leading to recurrent patellar instability.

Methods: Institutional database was retrospectively reviewed to find patients with missed transient patellar dislocation. From January 2010 to January 2015, ten otherwise healthy patients with a history of indirect trauma to the knee were diagnosed with missed patellar dislocation. They all had persistent pain and effusion, despite conservative treatment.

Results: Eight patients eventually underwent arthroscopic debridement of osteochondral fractures and repair of ruptured ligaments, with no case of recurrent instability.

Conclusions: Detailed history taking and physical examination of all acute knee injuries, with a standard three dimensional (3D) X-ray imaging and a low threshold to obtain magnetic resonance imaging (MRI) studies, could minimize cases of missed patellar dislocation and possibly severe complications.

Keywords: Transient Patellar Dislocation, Patellar Instability, Osteochondral Fracture

1. Background

Acute patellar dislocation (APD) is a common injury, comprising 2% - 3% of all acute knee injuries (1). The true incidence of APD is unknown, since most patients experience a spontaneous reduction and less than 20% of the patients with APD present a frank dislocation (2, 3).

Injuries associated with APD are well-studied, including osteochondral fractures and rupture of the medial stabilizing structures (1, 4). However, in patients who presented spontaneously reduced patellar dislocation, failure to diagnose associated injuries may lead to chronic pain and discomfort, instability and recurrent patellar dislocation (5).

2. Objectives

The current study aimed to report on the series of patients with missed acute patellar dislocations, referred to transient patellar dislocation throughout the article, focus on how to establish a correct diagnosis at the right time, and review the literature regarding treatment algorithms.

3. Methods

During a five-year period, 10 patients referred to the knee clinic at Imam Khomeini hospital complex. The mean age of the patients was 18.5 (range 13 - 23) years old; eight were female. All had a history of low-energy knee trauma; five were sport-related injuries; seven described feeling a popping sensation at the time of injury, followed by severe pain, effusion, and inability to resume their previous activity. All patients were transferred to the nearest hospital for further workup and treatment. X-rays were performed for eight of the patients, consisting only of a routine anterior-posterior (AP) and lateral radiographs. Following non-significant radiographs, all were diagnosed with knee sprain, and discharged with instructions to refer to a knee clinic.

All 10 patients had persisting pain at presentation to the institute, with minimal presentation of the symptoms. The mean time from injury to referring to the institute was 22 days (7 - 40 days). Other presented symptoms included knee effusion (90%), giving way (70%), instability in the affected knee (50%) and at least two episodes of locking after injury (30%). A thorough physical examination was performed on
all of the patients. Tenderness on the medial side of the patella (90%), tenderness on the lateral side of the distal femur (70%) and knee effusion (70%) were the most common findings.

Limited and painful range of knee motion was a universal finding. Assessment of the cruciate ligaments was not possible for three patients due to pain, the rest had normal tests. Patellar mobility was assessed medially and laterally; eight patients showed more than one quadrant of lateral displacement, denoting injured medial patellar structures. Apprehension test was performed next, attempting to subluxate the patella laterally, which was positive in six patients, with all experiencing moderate to severe pain.

Radiographies were then performed, with a three dimensional (3D) radiography of the affected knee (AP, lateral, Merchant view), on all of the patients (Figures 1A, B). AP and lateral views showed no abnormality. Lateral patellar tilt was suspected in six patients, defined as tilt angle > 5 degrees on Merchant’s view; three revealed an osteochondral fragment.

MR images were performed on all patients. Joint effusion (100%), medial patellar bone bruise (90%), the medial patellofemoral ligament (MPFL) rupture (90%), bone bruise in lateral distal femur (80%), cartilage injury on the inferomedial facet of patella (80%), medial retinacular rupture (70%), osteochondral fragment (60%), and meniscal injuries (50%) were the most common magnetic resonance imaging (MRI) findings (Figure 2). Osteochondral fragments were of femoral origin in four patients, and of patellar origin in two.

Computed tomography (CT) scans were then performed to assess osteochondral defects (60%) and loose bodies (50%). Patellar tilt, patellar height, tibial tubercle-trochlear groove (TT-TG) distance and trochlear dysplasia were then assessed for each patient.

The diagnosis of missed patellar dislocation with rupture of the medial stabilizers, with concomitant osteochondral fracture (in six of the patients) was made. All of the patients were offered surgical treatment; two were not willing to undergo surgery, and did not return for follow-up.

Arthroscopic surgery was performed within 34 days (ranging 24 - 44 days) of the injury on eight patients. Patellar cartilage injury was a universal finding (100%), followed by rupture of the medial stabilizers (90%), loose bodies (80%), osteochondral fragments (50%) and meniscal tears (40%). Arthroscopic debridement of the loose bodies and osteochondral defect sites, repair of medial structures, three small (< 1 cm) longitudinal, peripheral meniscal tears were encountered, which were deemed stable and were rasped to promote healing. No evidence of cruciate ligaments rupture was noted in each patient.

4. Results

Table 1 summarizes demographics, time from initial trauma to correct diagnosis, imaging modalities obtained after initial trauma and arthroscopic findings for all of the patients.

Post-operatively, all knees were immobilized extensively with a prefabricated hinged knee brace. After two weeks of partial-weight bearing with crutches, patients were encouraged to proceed to full-weight bearing with crutches. Formal physical therapy and rehabilitation initiated at six weeks post-op. patients were prohibited from any sports activity for three months.

At three-month follow-up visit, 120 degrees of flexion (100 - 130), with minimal pain in walking was achieved. Patients were then allowed to engage in light sport activities.

At a mean follow-up of 21 months (8 - 48 months), no
case of recurrent dislocation or instability was encountered, and none of the patients described symptoms of loose body (Figure 3).

5. Discussion

Acute patellar dislocation is the second most common cause of knee hemarthrosis (1, 4). Reported incidence is 44 - 107/100,000 (6), although with 80% of acute dislocations being spontaneously reduced, the true incidence remains unclear (3). Most patients report a low-energy, twisting mechanism of the injury, mostly during sporting activities (6, 7). The most common mechanism resulting in APD is knee valgus in slight flexion and external rotation (7).

The most common injuries associated with APD are rupture of the medial stabilizing structures, and osteochondral fractures (1). Up to 50% of the patients remain symptomatic, and a 40% rate of recurrent instability is reported after APD (4). Long-term sequelae could be serious, with persistent pain, patellar instability, and patellofemoral osteoarthritis as the most common (1).

Diagnosis is based on history and nature of the injury, thorough physical examination and imaging (4). Physical examination should include, but not be limited to assessing patellar instability, with a medial-lateral instability test and apprehension test. Failure to perform these examinations increases the likelihood of missing an acute patellar dislocation (8).

A prompt 3D X-ray series (anterior-posterior (AP), lateral and Merchant’s view) is the basic imaging evaluation of an acutely painful swelled knee (1). As was the case with the current study, overlooking Merchant’s view leads to a missed transient patellar dislocation (1, 4, 5) (Figure 1A and B). Osteochondral defects, patellar tilt, and some loose bodies are only visualized in Merchant’s view (5).

The roles of CT-scan and MR imaging are well documented (3, 5, 6). Patellar tilt, TT-TG distance, patellar height, and trochlear dysplasia could be assessed by CT images. By MR images, bone bruise, osteochondral defects of patella or distal femur, rupture of medial stabilizing structures (MPFL, medial retinaculum, and vastus medialis oblique (VMO), and concomitant ligamentous injuries are readily visualized (3, 9) (Figure 2).

Treatment depends primarily on associated injuries. Non-operative treatment should be considered for acute patellar dislocations without osteochondral loose bodies or ligamentous rupture, as reviewed on MR images (1, 2, 4). Osteochondral fragments and loose bodies render non-operative treatment implausible. Surgical intervention could be performed arthroscopically, or in an open fashion. There is no consensus on which osteochondral fragments should be fixed, but as a general rule fragments that comprise more than 10% of patellar surface, and are amenable to fixation (minimal comminution, and at least some subchondral bone attached to the fragment) should be considered for fixation (1, 4, 10, 11).
Table 1. Demographics, Delay From Initial Trauma to Diagnosis, Initial Imaging Modalities Which Led to Missed Diagnosis and Findings at Arthroscopy

<table>
<thead>
<tr>
<th>No.</th>
<th>Age</th>
<th>Gender</th>
<th>Delay to Diagnosis</th>
<th>Initial Imaging</th>
<th>Surgical Findings</th>
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<tbody>
<tr>
<td>1</td>
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<td>F</td>
<td>40</td>
<td>MRI</td>
<td>MPFL&lt;sup&gt;a&lt;/sup&gt;, OCD&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
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<td>15</td>
<td>F</td>
<td>16</td>
<td>X-ray</td>
<td>MPFL&lt;sup&gt;a&lt;/sup&gt;, OCD&lt;sup&gt;b&lt;/sup&gt;</td>
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<tr>
<td>3</td>
<td>17</td>
<td>F</td>
<td>21</td>
<td>X-ray</td>
<td>MPFL&lt;sup&gt;a&lt;/sup&gt;, meniscal tearing</td>
</tr>
<tr>
<td>4</td>
<td>18</td>
<td>F</td>
<td>23</td>
<td>X-ray, MRI</td>
<td>OCD&lt;sup&gt;b&lt;/sup&gt;</td>
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<tr>
<td>5</td>
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<td>F</td>
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<td>6</td>
<td>19</td>
<td>M</td>
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<td>23</td>
<td>X-ray, MRI</td>
<td>MPFL&lt;sup&gt;a&lt;/sup&gt;, OCD&lt;sup&gt;b&lt;/sup&gt;, meniscal tearing</td>
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Abbreviations: MRI, magnetic resonance imaging; N/A, surgery not performed; M, male; F, female.
<sup>a</sup>Rupture of medial patellofemoral ligament.
<sup>b</sup>Osteochondral fracture.

Figure 3. CT-Scan Illustrates Patellar Tilt, and a Defect on the Inferomedial Patella, Where the Osteochondral Fracture Occurred

After arthroscopic repair of medial structures, and excision of the osteochondral fragment, the patellar tilt was back to normal no recurrence occurred at 6-months post-op, and the patient was participating in various sporting activities with no pain.

Patients with ruptured medial structures are considered with high risk of recurrent instability and dislocation (2). Treatment of these injuries is more controversial. A trial of non-operative treatment and rehabilitation, direct repair of the ruptured structures, and various surgical reconstructions are proposed (2, 4, 6). Recurrent dislocation after surgical interventions is reported in at least 10% of the patients (1).

5.1. Conclusion

Authors believe that the role of early diagnosis of acute patellar dislocation could not be overemphasized. The presented series clearly signified the importance of a thorough physical examination. Basic imaging consists of a 3D X-ray (AP, lateral and Merchant’s view), inspected for patellar malalignment, osteochondral fractures and loose bodies, in addition to tibial and femoral fracture.

The current practice involved a low threshold to obtain an MRI study, having in mind the high rate of missing a transient patellar dislocation. Young patients with a history of indirect knee trauma and a voluminous knee effusion undergo an MRI study.

The role of CT-scan is less defined, and is restricted to cases of recurrent dislocation, or in patients selected for

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surgical treatment. These groups may benefit from assessing TT-TG distance and trochlear dysplasia, which may affect the treatment strategy (Figure 3).

As a conclusion, it is strongly believed that early diagnosis of acute patellar dislocation, plays a key role in preventing potentially devastating complications of a transient patellar dislocation.

References