Patella Dislocation

Recognizing the Injury and Its Complications

Mark R. Hutchinson, MD
Mary Lloyd Ireland, MD

Photo: © 1995. John Laptad/F-Stock

In brief **Whenever a patient has a patella dislocation, osteochondral fractures should be considered. A case study involving a 17-year-old swimmer whose knee was injured playing baseball details a patella dislocation that was accompanied by a defect of the medial patellar facet and a lateral impaction lesion of the lateral femoral gutter—both producing loose bodies. Careful physical examination and a radiographic series that includes anteroposterior, lateral, notch, and sunrise patella views assist in making an accurate diagnosis and guide the clinician to the appropriate treatment. Treatment involves a knee stabilizer followed by aggressive quadriceps strengthening. Loose bodies require arthroscopic surgery.**

A leg twists on a planted foot and the patient feels and hears a "pop." Such a scenario is common in the history of a knee injury. If a significant hemarthrosis quickly develops, three diagnoses are immediately considered: rupture of the an-

Dr Hutchinson is assistant professor of orthopedics in the Department of Orthopaedics, Sports Medicine Service, at the University of Illinois in Chicago. He is also team physician for the University of Illinois hockey team, The Chicago Cheetahs professional roller hockey team, and the US Olympic rhythmic gymnastics team. Dr Ireland is assistant professor in the Department of Surgery (Orthopaedics) and assistant professor in the Department of Family Medicine at the University of Kentucky in Lexington. She is an orthopedic consultant for the University of Kentucky and Eastern Kentucky University sports teams and director of the Kentucky Sports Medicine Clinic in Lexington.

Copyright © The McGraw-Hill Companies, Inc. Reprinted with permission.

Figure 1: Rich Pennell

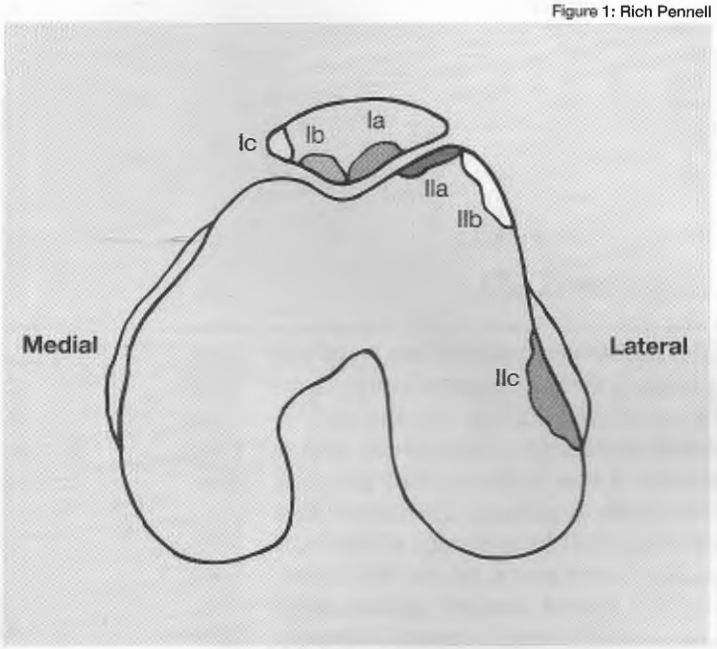

Figure 1. A diagram of the left knee indicates possible origins of osteochondral fractures caused by patella dislocation. Contact between the patella and the femur can damage the patella (Ia, Ib, and Ic) and/or femur (IIa, IIb, and IIc). The lateral impaction fracture (IIc) involves the non–weight–bearing femoral gutter.
Adapted with permission from Muller W: The Knee: Form, Function, and Ligament Reconstruction. New York City, Springer-Verlag New York Inc, 1983, p 83

terior cruciate ligament (ACL), intra-articular fracture, and patella dislocation. A peripheral meniscus tear usually causes a smaller effusion.

In 1905, Kroner[3] was the first to report the association between patella dislocation and osteochondral loose bodies. Prior to arthroscopy, multiple authors presented what was thought to be an uncommon association between patella dislocations and osteochondral fractures.[2,4-11] More recent reports state that osteochondral fractures occur in approximately 5% to 30% of acute patella dislocations.[12-15] The site of origin is most commonly the medial patellar facet, and more rarely the lateral femoral condyle.[13,16] The loose fragment may also originate by impaction of the medial border of the patella on the lateral nonarticulating condyle of the femur (the lateral impact lesion) as seen in figure 1.[1] Fractures may be isolated or associated with other osteochondral fractures.

The following case study provides a framework for reviewing osteochondral fractures and loose bodies that are often associated with patella dislocations.

Case Report

A 17-year-old competitive swimmer injured his left knee while playing baseball. He was attempting to catch a fly ball and was struck by another player from the lateral side. He said his foot was planted and "got stuck;" his knee twisted, then popped. Significant swelling developed within 30 minutes of the injury. He denied any previous knee injuries.

On physical examination, the left knee was significantly swollen and the patella was ballottable. The knee was exquisitely tender over the medial patella and focally tender over the lateral aspect of the lateral femoral condyle. Lateral translation of the patella produced apprehension and pain. Knee range of motion was 10° to 70°. Ligament examination was normal and symmetrical. There were no meniscal signs. Distal neurovascular status was normal.

Radiographic examination included anteroposterior (AP), lateral, notch, and sunrise patella views (figure 2). Two osteocartilaginous loose bodies could be seen radiographically: one in the lateral gutter and a second one above the tibial eminence. The osteochondral fragments were best seen on the notch and sunrise views.

Figure 2: Courtesy of Mary Lloyd Ireland, MD

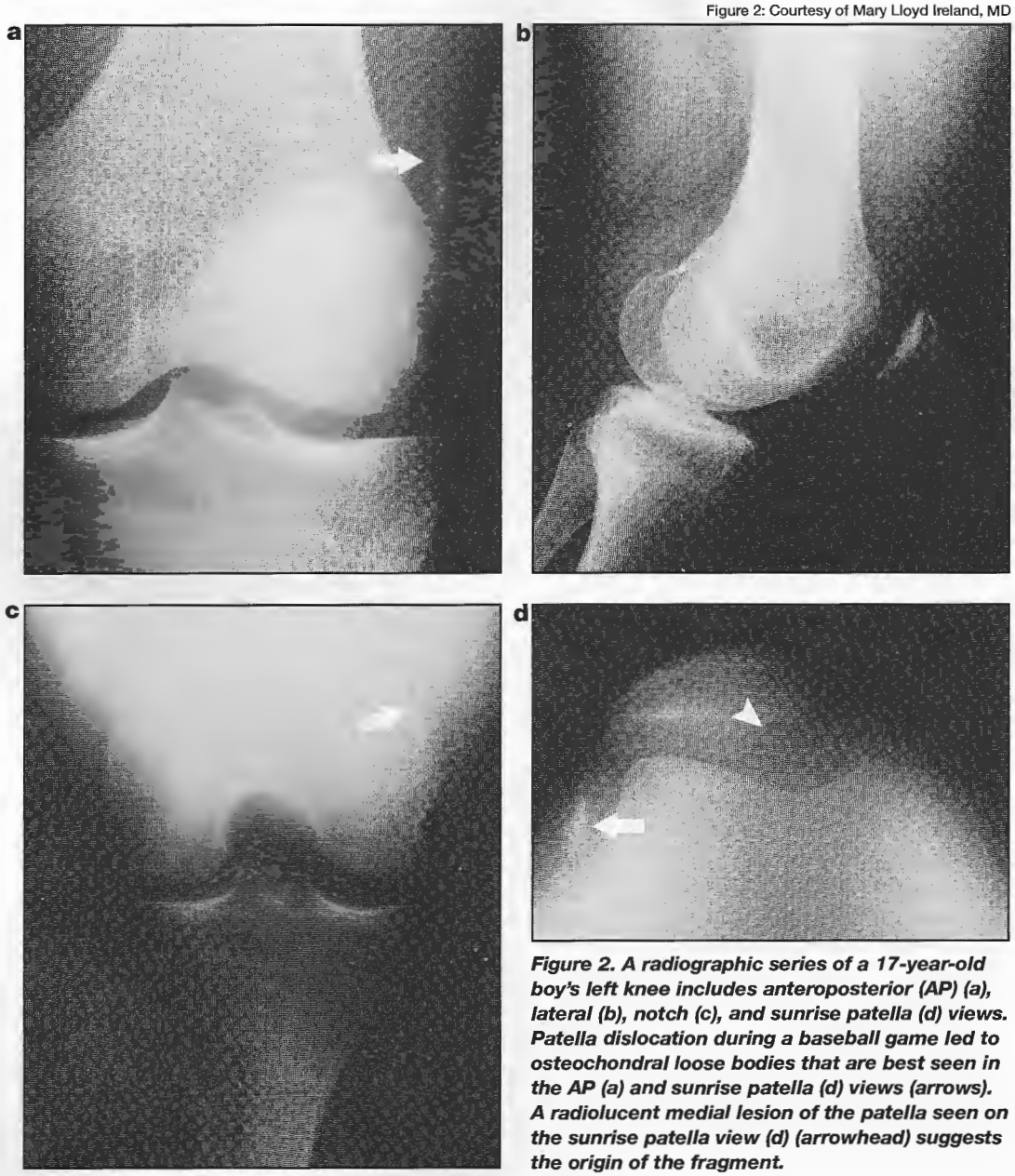

Figure 2. A radiographic series of a 17-year-old boy's left knee includes anteroposterior (AP) (a), lateral (b), notch (c), and sunrise patella (d) views. Patella dislocation during a baseball game led to osteochondral loose bodies that are best seen in the AP (a) and sunrise patella (d) views (arrows). A radiolucent medial lesion of the patella seen on the sunrise patella view (d) (arrowhead) suggests the origin of the fragment.

The sunrise patella view also showed increased patella tilt and lateral subluxation on the affected side compared to the normal side. There was no genu valgum or patella alta.

The diagnosis of patella dislocation with osteochondral loose bodies was made. Arthroscopic findings are diagrammatically shown in figure 3a. Arthroscopy was performed to remove two loose bodies and to locate and saucerize (debride) the origin of the osteochondral fracture fragment on the medial patellar facet (figure 3b). One osteochondral fragment was seen in front of the ACL (figure 3c).

The second fragment, from an impaction le-

Figure 3a:Rich Pennell; Figures 3b-3d: Courtesy of Mary Lloyd Ireland, MD

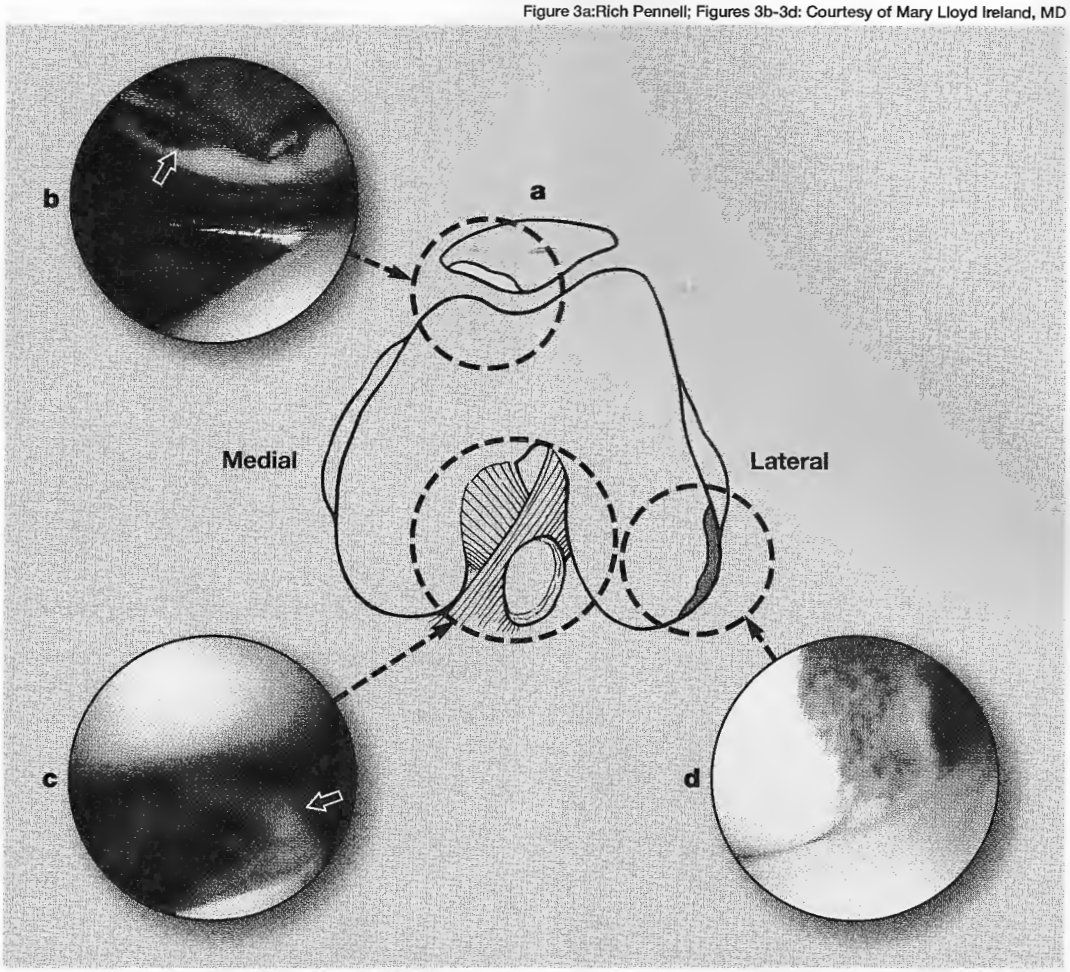

Figure 3. A diagram of injuries a 17-year-old boy sustained when his patella dislocated during a baseball game (a) demonstrates the location of osteochondral fractures involving the patella and lateral femoral gutter. On arthroscopy, the source of the loose body (b), a 3 × 3-cm defect in the medial patellar facet (arrow), was located and debrided. Note the thickness of the cartilage on the patella. On an arthroscopic view of the anterior cruciate ligament (ACL) (c), a large osteochondral fragment (arrow) was found in the intercondylar notch in front of the ACL. On a view of a 2 × 2-cm lateral impaction lesion (d) on the lateral aspect of the lateral nonarticulating part of the femoral condyle in the lateral gutter, shallow impaction of the bone and shearing of the periosteal covering are noted along with associated smaller loose bodies.

sion of the femoral condyle, was seen in the nonarticulating femoral gutter (figure 3d). All other intra-articular structures were normal. Arthroscopically, the patella tracked centrally in the femoral groove.

The knee was splinted in extension with a felt pad placed over the lateral patella. The knee was immobilized for 3 weeks. Active, active assisted, and passive range of motion and patellar mobilization were then initiated. Closed kinetic chain squats and leg lifts limiting the terminal 20° of flexion were begun 4 weeks postoperatively. The patient attained 90° range of motion 2 months after surgery and regained full range of motion at 3 months. He was urged to wear a lateral padded knee sleeve during all lifting activities and running. The patient resumed swimming competitively 3 months after surgery.

How Do Fractures Occur?

The patella fracture may occur from the dislocation or the reduction. Most feel the chondral injury occurs as the patella dislocates. If the injury occurs with the knee flexed in forced inward rotation of the femur with a fixed externally rotated tibia, the fracture should occur during dislocation.[13,16] The patella or femoral condyle fractures as the patella dislocates over the prominence of the lateral condyle.

Muller,[1] however, argues that reduction creates the osteochondral fragment. He notes that if rotation was part of the dislocation mechanism, a meniscus tear would be present—yet none has ever been reported. Muller presented two cases of patellar dislocation secondary to isolated internal rotation of the tibia. He argued that the dislocation occurred in extension with contraction of the vastus lateralis. In this portion, the path of least resistance is above the lateral condyle, which would have no bony obstruction to cause an osteochondral fracture. The osteochondral fracture, he argued, would therefore occur with reduction as the patella pops back into place over the lateral condyle.

The lateral impaction lesion occurs when the patella is completely dislocated and the vastus medialis and quadriceps force the medial border of the patella into the lateral femoral condyle. Unlike a flake fracture of the anterior femoral condyle, the lateral impaction lesion does not involve the weight-bearing articular surface and is more posterior and nearer to the tibiofemoral joint line.

Examine for All Damage Sites

In an athlete who presents with an acute knee injury accompanied by a significant hemarthrosis, the two most common diagnoses are patella dislocation and ACL injury. Meniscus tears and intra-articular fractures may also develop an effusion; those from meniscus tears are usually of less volume and those from intra-articular fractures may contain fat droplets.

A thorough physical exam often confirms the diagnosis of patella dislocation. Consistent findings include a voluminous hemarthrosis, focal tenderness over the medial retinaculum and vastus medialis insertion, and apprehension on lateral subluxation of the patella. Tenderness to palpation on the middle to posterior lateral femoral condyle just above the tibiofemoral joint line but away from the patellofemoral articulation should raise suspicion. Pain on palpation of the lateral femoral gutter just above the joint line suggests a lateral impaction lesion. On examination, the ligaments are usually stable. Meniscus tears are rarely associated with patella dislocations.[1,2]

Table 1. Differential Diagnosis of Acute Knee Hemarthrosis

Anterior cruciate ligament rupture
Patella dislocation/subluxation
Osteochondral fracture (patella, femur, tibia)
Medial or lateral meniscus tear
Posterior cruciate ligament rupture
Isolated popliteal tendon rupture
Bleeding dyscrasias

An extended differential diagnosis (table 1) is considered if history and physical exam are not classic. If there was no traumatic episode, infection, bleeding disorder, or tumor should be considered.

Select the Best Radiographic Views

If patella subluxation or dislocation is suspected, four views of the knee (AP, lateral, notch, and sunrise patella view) are carefully reviewed. Radiopaque loose bodies should be searched for. The sunrise view may provide the only findings of lateral subluxation or loose bodies. Notch views may expose loose fragments that were hidden by overlapping shadows in routine AP views. Lateral views may visualize fragments or demonstrate patella alta, which predisposes the patient to patella subluxation. Oblique views may be added if suspicion of loose fragments is high but visualization has not been accomplished. It is helpful to look for subtle radiolucencies in all possible sites where osteochondral fragments may be missing.

Lateral impaction lesions may not be visualized on plain radiographs. Diagnosis, debride-

ment of the lesion, and loose body removal are performed arthroscopically.

Loose Bodies Guide Treatment Decisions

The treatment goal for any patient who has a patella dislocation is to restore normal knee function.[17]

In our practice, we base treatment for an acute patella dislocation without osteochondral fragments on predisposing factors for recurrent dislocation. A careful physical exam is necessary to identify the at-risk patient. Factors increasing the risk of recurrent dislocation include excessive genu valgum, increased Q angle, patella alta, generalized ligamentous laxity, a relatively low lateral femoral condylar height, a defect of the vastus medialis obliquus insertion onto the patella, vastus medialis obliquus dysplasia, or abnormal patella configuration.[18-20] If any of these conditions is present, a more aggressive surgical approach may be needed. Open patellar realignment procedures may be required if subsequent dislocations occur.

If no predisposing factors are present, a conservative approach may be attempted that consists of knee immobilization in extension for 3 weeks, a lateral pad or taping to maintain reduction of the patella, and aggressive quadriceps rehabilitation. Patients can generally return to play in 8 to 12 weeks. However, some authors[20-23] advocate surgical repair for most patients and for all athletes with an acute patella dislocation regardless of predisposing factors. Others[24] advocate diagnostic arthroscopy in all cases of acute hemarthrosis. In one series,[25] preoperative physical examination yielded the correct diagnosis of an osteochondral fracture in only 17% of the patients.

Chondral loose bodies are not seen radiographically. Therefore, if the patient experiences recurrent swelling, locking, or can feel or show the physician the loose fragments, arthroscopy is indicated.

Surgery is clearly indicated if osteochondral loose bodies are seen on radiographs and the history and physical exam suggest patella dislocation. Arthroscopy is a valuable tool for identifying intra-articular pathology and removing loose osteochondral fragments. If any predisposing factors for patella dislocation are present, an even more aggressive approach should be instituted. For mild to moderate predisposing factors in the proximal aspect of the extensor mechanism (such as a lax or torn medial quadriceps retinaculum, vastus medialis dysplasia, or retracted insertion of the vastus medialis obliquus on the patella), arthroscopy can be accompanied by a lateral retinaculum release and medial retinaculum repair or reefing through a small medial parapatellar incision. For significant predisposing factors involving bony alignment or severe soft-tissue imbalance (such as severe generalized ligamentous laxity, excessive Q angle, low lateral femoral condyle, or severe genu valgum) an open repair with bony osteotomy and realignment may be indicated. Fortunately, a large majority can be treated with arthroscopy with the occasional addition of a small medial parapatellar repair.

In comparison to open repair and realignment, arthroscopic treatment with or without the mini-medial repair reduces postoperative pain, allows an accelerated rehabilitation program, and facilitates an earlier return to sports participation.

Postoperatively, we generally splint the knee in extension and place a felt pad over the lateral aspect of the patella to maintain reduction. The knee is immobilized for 3 weeks, after which the patient wears a knee sleeve with a lateral pad and begins active, active assisted, and passive range of motion of the knee and patellar mobilization activities. At 4 weeks, closed-chain squats and leg press activities limiting the terminal 20° of extension are begun. Motion is progressed, and a range from 0° to 90° is expected by 6 to 8 weeks.

The quadriceps strengthening program involves closed-chain exercises through the painless arc, single or double legged squats or leg presses in an arc of 0° to 60°. Open-chain exercises such as straight-leg raising with ankle weights are best performed in near-full extension, when patellofemoral articulation forces are minimized.

Return to full functional activity should be

based on ability to perform a single-leg leg press at a level comparable to the opposite side, along with restoration of landing balance ability specific to the patient's sport. The knee sleeve should be worn during contact or vigorous stop-cut activities for at least the remainder of the season. As long as rehabilitation continues, weakness from dependence on the knee sleeve is not observed. The patient can usually return to sports in 3 months. The physician should urge the patient and coach to continue the patient's quadriceps strengthening exercises and to use a knee sleeve, acquire sports-specific skills, and employ proper knee biomechanics.

Minimize Down Time

Keeping in mind that multiple chondral or osteochondral defects may be present when a patient sustains a patella dislocation, a careful physical exam, an appropriate radiographic series, and arthroscopy when needed will guide treatment.

Structured rehabilitation for injuries without fragments or defects and prompt arthroscopic treatment for those with fragments or defects help accomplish the goal of restoring knee function and returning patients to their activities. **PSM**

Address correspondence to Mary Lloyd Ireland, MD, Kentucky Sports Medicine, 601 Perimeter Dr, Lexington, KY 40517.

References

1. Muller W: The Knee: Form, Function, and Ligament Reconstruction. New York City, Springer-Verlag New York Inc, 1983, pp 80-84
2. Morscher E: Cartilage-bone lesions of the knee joint following injury. Reconstr Surg Traumatol 1971; 12(0):2-26
3. Kroner M: Ein fall von flächenfraktur und luxation der patella. Deutsche Medizinische Wochenschrift 1905;31(24):996-997
4. Kleinberg S: Vertical fracture of the articular surface of the patella. JAMA 1923;81(14):1205-1206
5. Krida A: Osteochondral fracture of the knee joint. Surg Gyn Obstet 1924;39(6):791-795
6. Meekison DM: A hitherto undescribed fracture of the patella. Br J Surg 1937;25(97):64-65
7. Milgram JE: Tangential osteochondral fracture of the patella. J Bone Joint Surg 1943;25:271
8. Coleman HM: Recurrent osteochondral fracture of the patella. J Bone Joint Surg 1948;30B:153-157
9. Harmon PH: Intra-articular osteochondral fractures as a cause for internal derangement of the knee in adolescents. J Bone Joint Surg 1945;27(4):703-705
10. Ahstrom JP Jr: Osteochondral fracture in the knee joint associated with hypermobility and dislocation of the patella: report of eighteen cases. J Bone Joint Surg (Amer) 1965;47:1491-1502
11. McDougall A, Brown JD: Radiological sign of recurrent dislocation of the patella. J Bone Joint Surg (Br) 1968;50(4):841-843
12. Frandsen PA, Kristensen H: Osteochondral fracture associated with dislocation of the patella: another mechanism of injury. J Trauma 1979;19(3):195-197
13. Rorabeck CH, Bobechko WP: Acute dislocation of the patella with osteochondral fracture: a review of eighteen cases. J Bone Joint Surg (Br) 1976;58(2): 237-240
14. Hammerle CP, Jacob RP: Chondral and osteochondral fractures after luxation of the patella and their treatment. Arch Orthop Trauma Surg 1980;97(3): 207-211
15. Krodel A, Refior HJ: [Patellar dislocation as a cause of osteochondral fracture of the femoro-patellar joint] Unfallchirurgie 1990;16(1):12-17
16. Isaacs CL, Schreiber FC: Patellar osteochondral fracture: the unforeseen hazard of golf. Am J Sports Med 1992;20(5):613-614
17. Cash JD, Hughston JC: Treatment of acute patellar dislocation. Am J Sports Med 1980;16:224
18. Hawkins RJ, Bell RH, Anisette G: Acute patellar dislocations: the natural history. Am J Sports Med 1986; 14(2):117-120
19. Larsen E, Lauridsen F: Conservative treatment of patellar dislocations: influence of evident factors on the tendency to redislocation and the therapeutic result. Clin Orthop 1982;(171):131-136
20. Cofield RH, Bryan RS: Acute dislocation of the patella: results of conservative treatment. J Trauma 1977; 17(7):526-531
21. Bassett FH III: Acute dislocation of the patella, osteochondral fractures, and injuries to the extensor mechanism of the knee. AAOS Instructional Course Lectures 1976;25:40
22. Boring TH, O'Donoghue DH: Acute patellar dislocation: results of immediate surgical repair. Clin Orthop 1978;Oct(136):182-185
23. Vainionpaa S, Laasonen E, Silvennoinen T, et al: Acute dislocation of the patella: a prospective review of operative treatment. J Bone Joint Surg (Br) 1990; 72(3):366-369
24. Dainer RD, Barrack RL, Buckley SL, et al: Arthroscopic treatment of acute patellar dislocations. Arthroscopy 1988;4(4):267-271
25. Bomberg BC, McGinty JB: Acute hemarthrosis of the knee: indications for diagnostic arthroscopy. Arthroscopy 1990;6(3):221-225