Extra-articular Synovial Fluid Extravasation Following Operative Fixation of an Osteochondral Fracture of the Patella

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abstract

Osteochondral fracture of the patella following a lateral patellar dislocation can be treated with operative and nonoperative techniques that are dictated by the clinical presentation. In the presence of large fragments following acute fractures, arthroscopic retrieval and fixation are advocated, whereas smaller displaced fragments may be removed and discarded as loose bodies. Several methods of fixation exist for osteochondral fractures of the patella, including the use of cannulated and noncannulated screws.

This article describes a case of an elite competitive swimmer who sustained a lateral patellar dislocation with a large osteochondral fracture of the patella that was treated with open reduction and fixation using absorbable cannulated screws in an inside-out fashion. In the early postoperative period, the patient developed a symptomatic synovial fluid fistula through a cannulated screw to the prepatellar space. The diagnosis of this condition was made clinically and confirmed with noncontrast magnetic resonance imaging 6 weeks postoperatively. The symptoms of pain, skin erythema, and swelling were self-limited and eventually resolved with observation, allowing the athlete to return to his previous activity level. Magnetic resonance imaging 3 years postoperatively showed the complete resolution of the fluid extravasation.

Extra-articular synovial fluid extravasation is a rare complication following routine knee arthroscopy, accounting for 3.2% of the complications. This article describes a rare, self-limited complication following open fixation of an osteochondral fracture of the patella.

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Osteochondral injuries of the patella following acute lateral patellar dislocation are common in the young, active population and exist in 40% to 95% of patellar dislocations.\textsuperscript{1,2} Patellar articular cartilage injuries can range from minor cartilaginous fissures to large, displaced osteochondral fractures.\textsuperscript{1,3} When significant fractures of the medial patellar articular surface are present, fracture fixation with open reduction and internal fixation or loose body fragment removal is indicated.\textsuperscript{4,5} The critical fragment size that mandates fixation has not been established, but fragments that are large enough to accept fixation hardware can presumably be fixed. Methods of fixation include headed and headless cannulated or solid screws composed of absorbable material or metal. This article describes a case of a self-limited postoperative complication of extra-articular synovial fluid extravasation to the prepatellar space through an absorbable cannulated screw used for fixation of a patellar osteochondral fracture.

**Case Report**

An 18-year-old male Division I collegiate swimmer sustained an acute traumatic lateral dislocation of the patella and spontaneous reduction during horseplay. The patient reported immediately developing knee swelling and being unwilling to ambulate and bear weight secondary to pain. He was seen by his university’s athletic trainer 2 days after the injury and was immediately referred to the team orthopedic surgeon (K.M.M.) for further evaluation and definitive management. The patient presented to the current authors with spontaneous reduction during horseplay, an osteochondral fracture of the patella, and lateral patellar translation and apprehension along the lateral gutter and medial retinaculum of the knee. Furthermore, 3+ lateral patellar translation and apprehension was noted with lateral stress of the patellar soft tissues.

Radiographs revealed a small bony fragment lateral to the trochlea on Merchant view and lateral to the condyles on anteroposterior view. Noncontrast 1.5-T magnetic resonance imaging (MRI) was obtained to determine the cartilaginous composition of the patellar avulsion fragment (Figure 1). The MRI scan revealed a large osteochondral fracture of the medial facet encompassing approximately 50% of the patellar articular surface. In addition, an osteochondral compression injury to the lateral femoral trochlea consistent with a lateral patellar dislocation was present.

The patient underwent arthroscopic evaluation, loose body retrieval, and open reduction and internal fixation of the patellar osteochondral fracture. During arthroscopy, the medial facet of the patella was noted to be fractured, and a large osteochondral defect representing approximately 50% of the articular surface was present. The loose fracture fragment was removed from the lateral gutter and transferred to the medial gutter for later open removal.

A longitudinal medial patellar incision was created, and a medial arthrotomy was performed. The loose fracture fragment was removed from the joint. This fragment measured approximately 20 mm longitudinal×20 mm transverse and was comminuted into 2 segments. The most superior segment comprised delaminated articular cartilage with no identifiable subchondral bone. The inferior segment retained a 3-mm-deep segment of subchondral and cancellous bone. The superior segment was repaired to the inferior segment with 6-0 absorbable Vicryl suture material (Ethicon, Inc, Somerville, New Jersey), thus creating a single larger osteochondral fragment. Fibrin glue (Tissell; Baxter Healthcare, Deerfield, Illinois) was placed on the deep surface of the cartilaginous fragment to facilitate temporary fixation to subchondral bone. Two 22-mm bioabsorbable screws (Biotak; Acumed LLC, Hillsboro, Oregon) were directed through the articular surface of the inferior segment and into the native patella in an inside-out fashion. Good compression of the osteochondral fragment was visualized (Figure 2). The medial patellofemoral ligament at its femoral attachment was not separately dissected and was not directly repaired because it was intact without evidence of injury on the preoperative MRI. Disruption of the medial patellofemoral ligament was noted at the patellar insertion and incorporated into the medial arthrotomy. The vastus medialis obliquus tendon was not advanced as muscle atrophy, or insufficiency was not identified preoperatively. The arthrotomy and deep dermal tissue were repaired with absorbable suture, and the skin was closed with a nonabsorbable suture in a running subcuticular fashion.

A hinged knee brace (T-Scope; Breg, Inc, Carlsbad, California) locked in extension for ambulation and a cryotherapy device (Polar Care; Breg) were placed postoperatively. Continuous passive motion was initiated immediately postoperatively.

**Figure 1:** Initial coronal (A), sagittal (B), and axial (C, D) fat-saturated proton-density weighted magnetic resonance images of the knee showing a large osteochondral fracture of the patella with the fracture fragment situated in the lateral gutter of the knee and a smaller compression injury of the lateral femoral trochlea. Normal patellar height (Blackburne-Peel ratio, 0.86; normal range, 0.54-1.06) (B).
at 0° to 30° for 6 hours per day (2 hours per session, 3 sessions per day) for 2 weeks. Current evidence does not support the use of continuous passive motion in all cases of articular cartilage repair, but some payers allow coverage in the immediate (less than 3 weeks) postoperative rehabilitation period for conditions such as articular cartilage repair. The patient was allowed toe-touch bearing with crutches to minimize patellofemoral contact stresses and shear forces. He was prescribed an exercise program that included quadriceps sets, straight-leg raises, heel slides, prone hangs, and patellar mobilization.

At 8 weeks postoperatively, symptomatic prepatellar swelling and erythema developed. Noncontrast MRI was obtained to evaluate the swelling site and the cartilage repair integrity (Figure 3). The MRI revealed a fluid collection in the prepatellar space that communicated with the joint through the cannulated portion of one of the bioabsorbable screws. The cartilage repair appeared to be intact. The patient was treated with measures to control symptoms, including the local intermittent application of ice and the use of compression.

At 13 weeks postoperatively, the patient was asymptomatic and was swimming 5000 meters without pain. Prepatellar swelling and skin erythema had resolved, and mild intermittent swelling occurred occasionally after sustained strenuous exercise. At 6 months postoperatively, the patient was running at a reduced pace and distance and was not performing deep squats with weight. The patient was otherwise asymptomatic and had returned to his prior level of participation in Division I collegiate athletics.

Noncontrast MRI was obtained at 3.5 years postoperatively to review the integrity of the articular cartilage of the patella. The MRI revealed a partial-thickness chondral lesion of the medial facet of the patella, a healed medial retinaculum, and nearly absorbed bioabsorbable screws with no collection of fluid in the prepatellar space. The patient was asymptomatic and had been competing at an elite level for the previous 3 competition seasons (Figure 4).

**Discussion**

The incidence of lateral patellar dislocation is approximately 5.8 per 100,000 adults per year and 29 per 100,000 adolescents per year. The risk of redislocation after an initial event is approximately 15%, whereas the risk of redislocation after a second lateral patellar dislocation is approximately 50%. Persistent symptoms can include anterior knee pain, instability, and activity limitations in more than 50% of patients. Therefore, surgery for patellofemoral instability is often indicated for recurrent dislocation to prevent the morbidity of patellar instability and osteochondral injury associated with recurrent dislocation. The documented risk of redislocation following medial patellofemoral ligament repair for the treatment of recurrent patellofemoral instability has been reported at 28% to
46% and is considerably higher than that of medial patellofemoral ligament reconstruction with free tendon grafts.\textsuperscript{13-19} The incidence of osteochondral fracture of the patella following a patellar dislocation varies with reports. Recent estimates suggest that 40% to 95% of acute lateral patellar dislocations have concomitant osteochondral fractures, with the most common location being the medial patellar facet.\textsuperscript{1} For an osteochondral injury of the patella resulting in an intra-articular loose body, treatment may consist of loose body removal with internal fixation if the fracture fragment is large enough to allow reduction and secure stable fixation.\textsuperscript{4}

Operative fixation of a large osteochondral fracture of the patella uses a parapatellar arthrotomy, retrieval of the fracture fragment, and internal fixation of the fragment. A variety of fixation methods have been used. In the current case, the authors used 2 Biotrak cannulated absorbable headless compression screws with variable thread pitch to secure the fracture fragment. The use of headless screws may limit the necessity of bone removal in osteochondral fractures because standard screws require overdrilling and countersinking for compression. In addition, nonmetallic bioabsorbable screw options allow for postoperative advanced diagnostic imaging if required. Other options for fixation include an outside-in lag screw technique or solid (noncannulated) screw fixation, which is occasionally used for the fixation of large osteochondral shell allografts of the patella.\textsuperscript{20} Furthermore, a segment of articular cartilage in this fracture fragment was delaminated from the underlying subchondral bone, and fixation was supplemented with fibrin glue. This technique has been reported in the literature as a sealant to avoid the use of hardware in a small digital osteochondral injury.\textsuperscript{21}

Other reports of extra-articular synovial fluid extravasation resulting in symptoms around the knee have been presented as a rare complication following routine knee arthroscopy.\textsuperscript{22-25} The incidence of this complication is 6.1 per 1000 knee arthroscopies.\textsuperscript{24} In a national survey, the Committee on Complications of Arthroscopy Association of North America reported that a synovial fluid fistula arising from arthroscopy portals accounted for 3.2% of all complications following knee arthroscopy.\textsuperscript{26} All fistulae closed after an average of 9 days (range, 7-14 days) of immobilization.\textsuperscript{24}

One case report described an articular-to-prepatellar bursal synovial fluid fistula following a traumatic partial rupture of the vastus medialis in a collegiate football player.\textsuperscript{27} Symptoms included recurrent prepatellar swelling occurring within 5 minutes of strenuous activity. Magnetic resonance imaging was used to diagnose a partial vastus medialis obliquus tear resulting in the extravasation of synovial fluid and communication with the prepatellar bursa. The condition was treated with diagnostic arthroscopy with open multilayer repair, and the patient returned to normal activity within 10 weeks postoperatively. In contrast, the condition described in the current case was not a result of a specific soft tissue defect; therefore, a multilayer surgical closure was not indicated.

**Conclusion**

The current article describes a potential complication following cannulated screw fixation of an osteochondral fracture of the patella. In this case, a prepatellar extra-articular synovial fluid fistula was evident within 8 weeks postoperatively and was confirmed with MRI. When using cannulated screws, this complication can be avoided by selecting a shorter screw and avoiding penetration of the anterior cortex of the patella. The treatment consisted of local modalities and simple observation and did not require surgical intervention. The activity-related swelling, pain, and skin erythema resolved, and the patient returned to normal activities without long-term sequelae. Surgeons performing open reduction and internal fixation of an osteochondral fracture of the patella using an inside-out technique and cannulated screws should be aware of this self-limited complication.
REFERENCES


