Cartilage Lesions of the Patella: Management After Acute Patellar Dislocation

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Abstract: Articular cartilage injuries to the patella are frequent after patellar dislocation. The management of these acute cartilage injuries in the acute setting can be challenging. It is well documented that acute fixation is the optimal choice for treatment of osteochondral injuries. This article discusses the challenges and potential treatment options for acute chondral/osteochondral injuries to the patella after acute patellar dislocation. [Orthopedics. 2015; 38(5):310-314.]

Patellar dislocations are common knee injuries, and in patients younger than 16 years, the annual incidence is 43/100,000.1 Risk factors for patellar dislocation include patella alta, family history, previous dislocation, trochlear dysplasia, and high Q-angle.2 Fithian et al3 reported a 17% redislocation rate after a first-time patellar dislocation and a 50% rate after a second dislocation. The main concern with each dislocation is the repetitive trauma to the articular cartilage of the patellofemoral joint potentially leading to early osteoarthritis.

In the setting of an acute patellar dislocation, most authors would suggest nonsurgical treatment for first-time dislocations. Exceptions to this include osteochondral fracture, substantial disruption of the medial patellar stabilizers, a laterally subluxed patella with normal alignment of the contralateral patella, a second dislocation, or a patient who is not improving with appropriate rehabilitation.4 When comparing medial patellofemoral ligament (MPFL) reconstruction with repair, a recent systematic review showed that there was a statistically significantly higher failure rate among those who underwent MPFL repair (26.9%) than those who underwent reconstruction (6.6%) or medial retinacular repair/plication (16.5%).5

Common sequelae of acute patellar dislocations are chondral and osteochondral injuries to the patella or the lateral femoral condyle. The reported rate of chondral injury after patellar dislocation has been reported to be as high as 95%.6,7 Nomura et al7 reported that, after acute patellar dislocations in 39 patients, 17% of patellar lesions had chondral or osteochondral fracturing, 23% had cracks (fissures), and 54% had lesions with both fracturing and cracks (fissures).7 These chondral lesions may cause swelling, pain, mechanical symptoms, and functional impairment. The complexity of the patellofemoral joint and high shear forces, in addition to the avascularity of articular cartilage, makes treatment challenging.8,9 This article discusses the challenges faced when attempting to treat acute chondral/osteochondral injuries after acute patellar dislocations.

Case Report

A 16-year-old starting high school football player sustained a valgus load to his left knee from another player’s helmet. He had no previous history of patellar instability or knee injury. He presented with a diffusely swollen knee and significant lateral patellar apprehension. Radiographs showed a well-centered pa-
tella in the trochlea (Figure 1). Lateral radiographs showed a Caton ratio of 1.05 (Figure 2). Emergent magnetic resonance imaging (MRI) showed a significant chondral injury to the medial patellar facet consistent with an acute patellar dislocation and multiple loose chondral fragments (Figure 3). It appeared that the MPFL was torn in multiple locations. The tibial tubercle-trochlear groove distance was 16 mm. The patient was scheduled for emergent MPFL reconstruction and possible chondral fixation. Arthroscopic evaluation showed multiple macerated and ground-up loose bodies, with the largest piece being approximately 2x1.5 cm, in addition to multiple smaller fragments (Figure 4). The full extent of the cartilage injury was not fully appreciated until the patella was everted via a medial parapatellar arthrotomy (Figure 5). There was no bone on the backside of any of the cartilaginous pieces, and the larger pieces were macerated.

Preoperatively, an extensive conversation was had with the family regarding treatment plans. The goal was to acutely repair the chondral injury (if able) and perform an MPFL reconstruction. The family was made aware that the chondral fragments may not be repairable and were given options for this scenario. In the setting of the inability to repair the chondral fragments, the following options were discussed: (1) microfracture with allograft cartilage augmentation (BioCartilage; Arthrex, Naples, Florida) and MPFL reconstruction as a single-stage procedure; (2) osteochondral autograft plus MPFL reconstruction as a single-stage procedure; (3) autologous chondrocyte implantation (ACI) with MPFL reconstruction in 2 stages; and (4) minced juvenile cartilage implantation (DeNovo NT; Zimmer, Warsaw, Indiana) in addition to MPFL reconstruction in 2 stages. The literature was discussed with the family in detail, and in this case the family elected for a single-stage procedure. The athlete was entering into his senior year of football.

Once it was determined that the chondral injury was unable to be fixed with screw/pin fixation due to the extent of the chondral injury, the family was notified, and they wished to proceed with microfracture with supplemental BioCartilage in a single-stage procedure. A medial parapatellar arthrotomy was performed; the patella was everted (Figure 5) and extensive chondral fissure was noted with significant instability of the surrounding fissured cartilage. The unstable cartilage was debrided back to a stable base, creating vertical walls, and the basic principles of a microfracture were followed (Figures 6-7). To augment the microfracture, a novel composite graft consisting of platelet-rich plasma and micronized allogeneous cartilage fragments (BioCartilage) was used (Figures 8-9). The MPFL reconstruction was performed using a gracilis tendon allograft, and the patient was placed in a continuous passive motion machine postoperatively.

Therapy included weight bearing as tolerated in a hinged brace locked at 0°, with range of motion from 0° to 45° for the first 4 weeks. After 4 weeks, the brace was unlocked for ambulation, and range of motion was progressed as tolerated. The patient returned to full competitive sports at 7 months postoperatively in a patella J brace. He had no pain with running, cutting, or football drills. Range of motion was 0° to 135°, and the patella was stable with no crepitance or apprehension on examination.

**DISCUSSION**

The management of acute focal chondral/osteochondral injuries after patellar dislocations can be challenging. Given its prevalence, these injuries should be suspected in all patellar dislocations, especially if the patient presents with a knee effusion. Radiographs, including a sunrise view or a Merchant view, should be obtained; however, chondral injuries may be missed, and an MRI should be considered if the patient has any signs of an intra-articular effusion or mechanical symptoms.\(^{10,11}\)

In the setting of a repairable chondral/osteochondral fragment, anatomic repair is advised using the most appropriate fixation principles, including the options of both absorbable and nonabsorbable implants that provide compression of the fragment.
Nonabsorbable screws may require removal and potentially takedown of the MPFL reconstruction to gain access to the hardware. Therefore, appropriate planning for removal is imperative before placement of nonabsorbable implants in the patellofemoral joint. Small defects (<1 cm²) may be asymptomatic and may be appropriate for loose body removal and limited chondroplasty. Microfracture may also be performed; however, the literature reports less favorable outcomes for larger lesions in the weight-bearing aspect of the patella.

Osteochondral autograft offers another intraoperative option that can be used in the acute setting; however, this depends on the size and location of the defect. With any osteochondral autograft, donor-site morbidity remains a concern. An osteochondral autograft transplantation to the patella is technically challenging given the contour of the patella and the depth that can be drilled.

For larger lesions (2-10 cm²), ACI has the most supportive literature for chronic patellar cartilage defects. Gillogly et al. reported an 83% good-to-excellent result after ACI with anteromedialization of the tibial tubercle for isolated patellar cartilage defects with 5- to 11-year follow-up. However, the study had an overall reoperation rate of 40%. Gemoll et al. performed a multicenter study looking at 110 patients with a minimum of 4 years’ follow-up who underwent ACI to the patella; they reported an 86% good-to-excellent result.

In addition to ACI, matrix-assisted autologous chondrocyte implantation (MACI) has also shown promise in the literature. However, although the results show good or very good results in 70% to 86% of patients treated with MACI or ACI to the patella, the results are still not as promising as the 90% good-to-excellent results seen with ACI to the femoral condyles. At the time of publication, ACI remains an off-label use in the patella, and prospective patients must be informed of this during the consent process.

Particulated juvenile cartilage implantation (DeNovo NT) can also be an option with the possibility of a single-stage procedure. Thompsons et al. performed a case series of 15 knee surgeries for grade 4 lesions of the patella treated with DeNovo NT. At an average follow-up of 28 months, mean fill was 89% and the International Cartilage Repair Society cartilage repair assessment score on MRI was nearly normal for all patients. Clinical outcomes scores for International Knee Documentation Committee and Knee Injury and Osteoarthritis Outcome Score scales were comparable with those published for ACI. One limitation is in the acute setting in which a patient is taken to the operating room for possible fixation of a chondral/osteochondral fragment; DeNovo NT is often not available acutely. In addition, if the MRI under- or overestimates the size of the defect compared with the intraoperative findings, then too little or too much implant may be ordered. The lack of long-term literature on DeNovo NT makes insurance approval a major obstacle. Currently in the authors’ practice, if DeNovo NT is used, it is done in a staged procedure so the chondral injury can be appropriately sized intraoperatively and the appropriate amount of DeNovo NT graft is ordered.

CONCLUSION

Osteochondral injuries to the patella are relatively common after lateral patellar dislocations. However, most of these defects are small and can simply be debrided. Management of acute, large cartilage injuries in the setting of an acute patellar dislocation can present many challenges to the surgeon. Accurate and quick diagnosis of patellar chondral injuries is imperative because the ideal situation is to directly fix all chondral injuries that are unstable. In some cases, the chondral injuries are not fixable, and other cartilage restoration techniques must be performed. The case presented in this article shows the complex decision making needed for such cases and the importance of shared decision making with the patient and fami-
ily. The surgeon should make every option available and should be comfortable with different cartilage restoration techniques.

Clinical data are available to support ACI or DeNovo NT for chronic patellar cartilage injuries; however, this cannot be done in an acute setting. There is a paucity of higher-level data for the acute management of chondral injuries associated with patellar dislocations. The literature currently supports nonsurgical management of first-time patellar dislocations, except in the setting of chondral injuries.4 Microfracture may be a viable option in the acute setting for smaller lesions but may have limited success with larger defects. The addition of graft substitutes to the microfracture, such as platelet-rich plasma or BioCartilage, may improve outcomes, as early basic science research shows. However, this still needs to be proven in clinical studies.

References

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