A Novel Posterior Arthrotomy Approach for the Treatment of a Large Osteochondral Defect of the Posterior Aspect of the Lateral Femoral Condyle of the Knee

A Case Report and Technical Note

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Symptomatic osteochondral lesions of the knee pose a considerable treatment challenge to orthopaedic surgeons, particularly when they occur in young active patients[1,2]. The prognosis of osteochondral defects is worse when the defect is sizable, when it is located in a weight-bearing portion of the knee, and when there is considerable bone loss[3,4]. Hyaline cartilage is unable to heal spontaneously because of its unique structure and distinctive properties. As a result, many chondral resurfacing techniques have been employed for the treatment of osteochondral injuries[5-7].

Osteochondral autograft transplantation is successful in covering relatively small defects, but has considerable technical limitations and has been associated with increased donor-site morbidity for larger defects (>2 × 2 cm)[8,9]. Therefore, allografts have been proposed for the management of larger defects[10,11]. One of the critical issues regarding surgical technique is the perpendicular placement of the bone plug[3]. Incongruency, resulting from proud graft placement, can give rise to a "kissing lesion" on the contralateral surface[12].

We report the case of a patient with a large osteochondral lesion of the posterior aspect of the lateral femoral condyle of

Fig. 1

Butterfly position used by goalies in ice hockey.

Disclosure: None of the authors received payments or services, either directly or indirectly (i.e., via his or her institution), from a third party in support of any aspect of this work. One or more of the authors, or his or her institution, has had a financial relationship, in the thirty-six months prior to submission of this work, with an entity in the biomedical arena that could be perceived to influence or have the potential to influence what is written in this work. No author has had any other relationships, or has engaged in any other activities, that could be perceived to influence or have the potential to influence what is written in this work. The complete **Disclosures of Potential Conflicts of Interest** submitted by authors are always provided with the online version of the article.

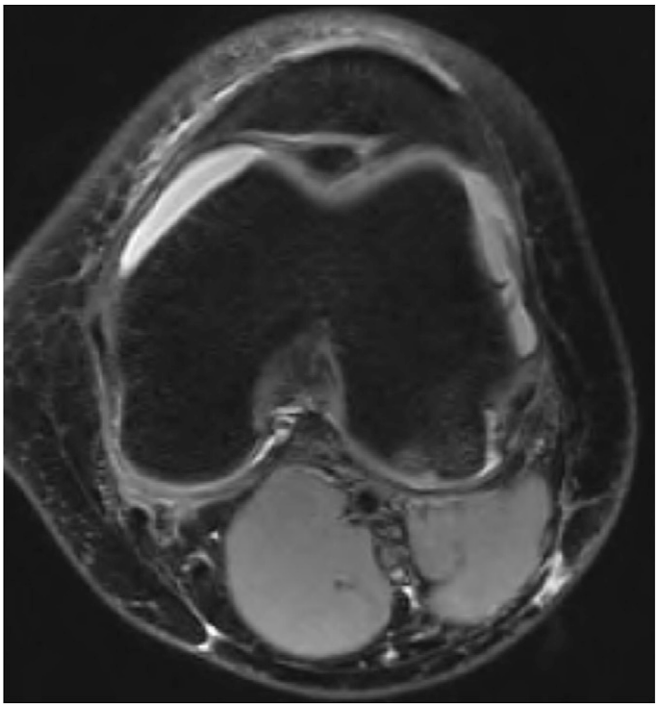

Fig. 2-A

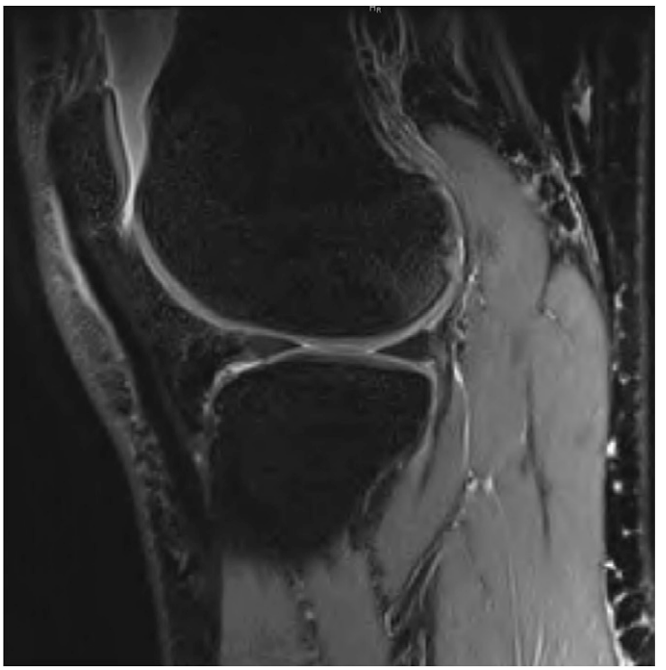

Fig. 2-B

Figs. 2-A and 2-B MRI of the left knee. **Fig. 2-A** T2-weighted axial image demonstrating an osteochondral lesion of the posterior aspect of the lateral femoral condyle. **Fig. 2-B** T2-weighted sagittal image of the lateral femoral condyle.

the knee. We also outline the surgical technique for a knee arthrotomy with a posterior approach to gain access to this difficult-to-reach area. The patient was informed that data concerning the case would be submitted for publication, and she provided consent.

Case Report

An eighteen-year-old female high-school elite-level ice hockey goalie presented with an eighteen-month history of left lateral knee pain, exacerbated by assuming the butterfly position (Fig. 1). There was no history of any specific injury, and the symptoms had increased gradually over time. The pain prevented her from effectively performing the role of goalie. Conservative measures, including rest for two months, anti-inflammatory medication, and physical therapy, achieved only moderate relief.

Clinical examination revealed no tenderness to palpation over the entirety of the left knee. She had no joint effusion and −3° to 135° of movement, without any signs of ligamentous laxity. Long-leg standing radiographs demonstrated normal physiological valgus. The joint spaces were well maintained without any evidence of osteoarthrosis of the lateral femoral condyle. Magnetic resonance imaging (MRI) demonstrated an osteochondral defect at the far posterior aspect of the lateral femoral condyle, measuring 12 mm in diameter (Figs. 2-A and 2-B). There was no evidence of any other intra-articular pathology.

Initial treatment consisted of rest for two months, followed by a gradual return to hockey. The symptoms returned with increasing activity levels. She also noted stiffness and swelling of the knee following on-ice activity. At the next follow-up three months later, she walked with an antalgic gait on the left. She had a 2+ effusion of the knee with restricted movement. At this time, we believed that conservative treatment had failed, and an arthroscopy was performed to evaluate the lesion.

Arthroscopic evaluation revealed a full-thickness cartilage defect on the posterior aspect of the lateral femoral condyle (Fig. 3). The lesion was larger than the MRI had demonstrated,

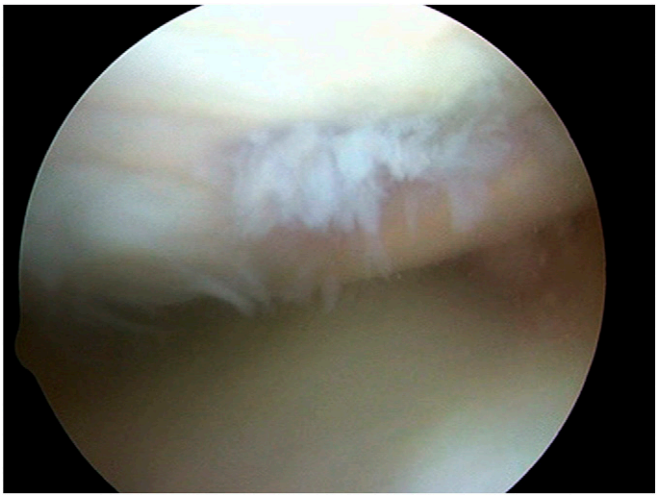

Fig. 3

An arthroscopic image of the defect demonstrating a full-thickness lesion involving the underlying bone.

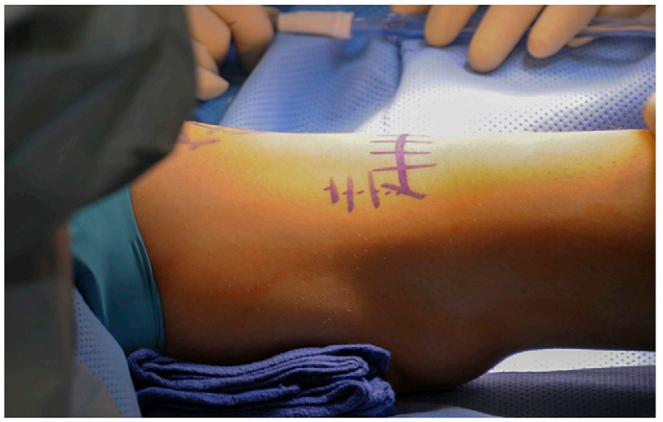

Fig. 4

Lateral view of the left knee in the prone position. The transverse incision and presumed course of the common peroneal nerve were marked. A proximal, vertical extensile incision also was marked, although this incision was not required.

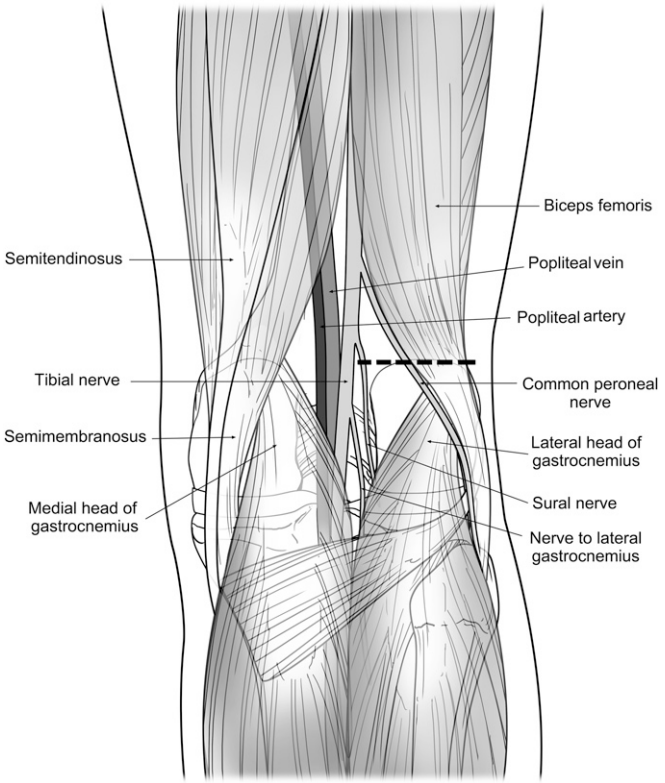

Fig. 5

Illustration of the posterior aspect of the knee, demonstrating the site of the incision (dashed line) and the location of the common peroneal nerve and the sural nerve.

measuring 15 mm in diameter. Additional visualization was achieved with use of a 70° arthroscope through a posterolateral portal. The defect was within 3 to 4 mm of the posterior aspect of the lateral condyle.

A microfracture procedure was considered, but because of the size of the lesion, the patient's age, and the depth of the underlying osseous defect, it was decided that an allograft would be a more appropriate treatment. Because of the position of the lesion, we believed that it would be very difficult, even with detachment of the anterior horn of the lateral meniscus, to place a fresh allograft orthogonally into the defect through an anterior approach.

In order to gain access to the lesion to perform an osteochondral transfer procedure, we decided that a posterior approach would be required. A key component to performing a successful osteochondral transfer is the ability to insert the donor osteochondral plug perpendicularly to the articular surface[12]. A donor graft from a nineteen year old was identified; after detailed consultation with the patient and the family, surgery was performed.

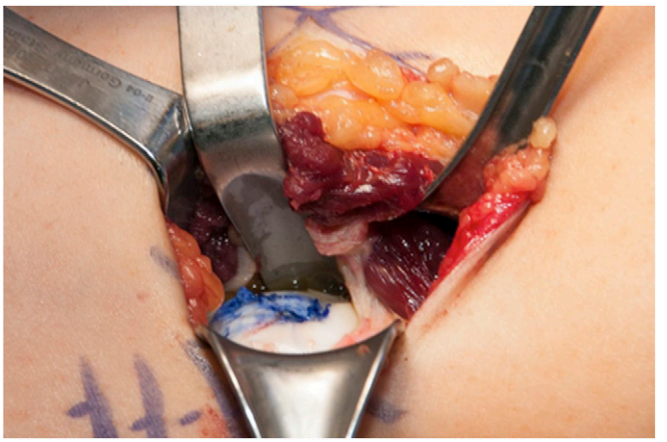

Fig. 6

Delineation of the defect with methylene blue ink.

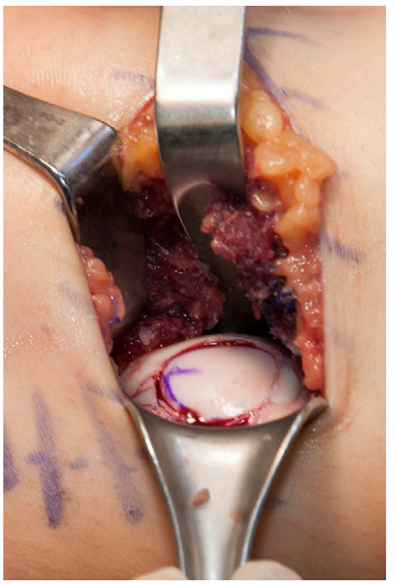

Fig. 7

Press-fit allograft in the posterior femoral condyle with restoration of the articular congruency.

Fig. 8-A

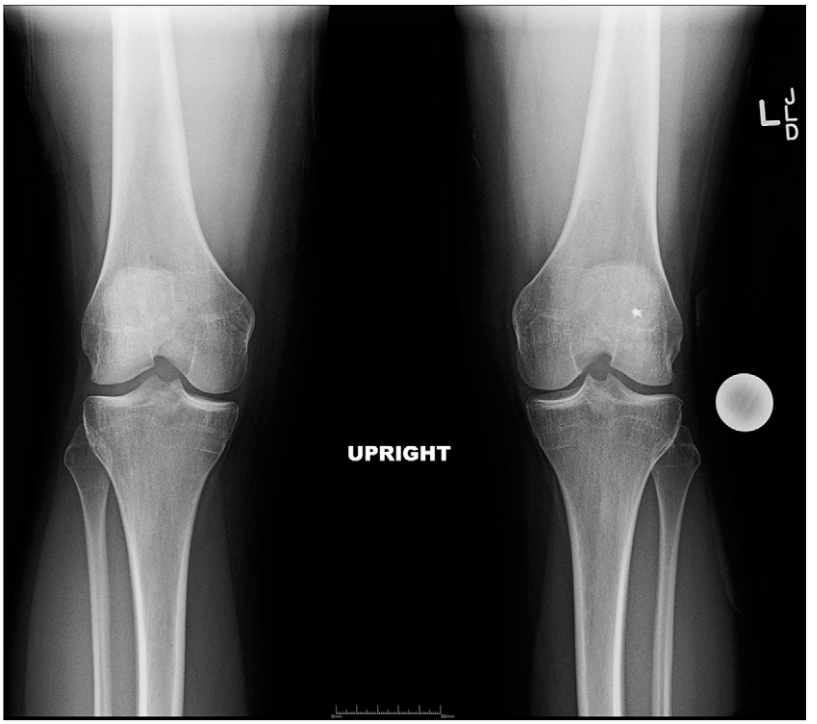

Fig. 8-B

Figs. 8-A and 8-B Postoperative radiographs. **Fig. 8-A** Lateral radiograph of the left knee demonstrating no loss of contour. **Fig. 8-B** Rosenberg posteroanterior radiograph of both knees showing no decrease in the joint space of the left lateral compartment

Surgical Technique

A high tourniquet was placed on the left thigh. The patient was placed in a prone position. Following sterile preparation and draping, an 8-cm transverse incision was made through the skin only at the posterior flexion crease laterally (Fig. 4). The underlying adipose tissue was very gently and meticulously dissected to expose the common peroneal and sciatic nerves and to avoid placing excess tension on the nerves during retraction (Fig. 5). The lateral gastrocnemius tendon was identified, and the space between the tendon and the soleus was entered. The common peroneal nerve was retracted laterally and the sciatic nerve was retracted medially. The lateral gastrocnemius tendon and capsule were incised by sharp dissection from the proximal edge of the posterior aspect of the condyle to expose the defect. A Z-retractor was placed posteriorly to allow additional visualization. The defect was marked with methylene blue ink to delineate the size and the extent of the lesion, which measured 18 mm in diameter (Fig. 6).

The standard steps for an osteochondral transfer were followed (large Osteochondral Autograft Transfer System; Arthrex, Naples, Florida). The graft was inserted with the press-fit technique (Fig. 7). No additional fixation was required. Excellent reestablishment of articular congruency was achieved. A suture anchor was used to reattach the posterolateral capsule and the lateral gastrocnemius tendon.

Postoperatively, the knee was placed in an immobilizer in full extension. Continuous passive motion with a rotation of 0° to 90° was begun, and the patient was kept non-weight-bearing with crutches for eight weeks. At six months, following normal radiographs (Figs. 8-A and 8-B) and clinical examination, she was cleared to return to low-impact activities, including skating and goalie drills. At nine months, she returned to full participation with no adverse effects.

Discussion

This case report presents a novel surgical approach that was employed to access a large osteochondral lesion of the lateral aspect of the posterior condyle in a young patient. With a posterior approach, the knee arthrotomy allowed excellent access to a notoriously hard-to-reach area, permitting adequate exposure and facilitating orthogonal placement of the osteochondral bone plug.

This report details an injury sustained by an ice hockey goalie while performing a butterfly maneuver, which is used to block the puck along the ice[3]. In this position, the knee is forced into hyperflexion, thus engaging the articular surface of the posterior aspect of the condyle with the tibial plateau. Goalies are called upon to take this position frequently during the course of a game[13]. This position likely contributed to the development of the osteochondral defect and the symptoms that were associated with a far posterior lesion that may not have been symptomatic in most patients and is not commonly seen.

Berg has previously described a posterior approach to the popliteal fossa to facilitate the insertion of a posterior cruciate ligament inlay graft[14]. This approach closely follows Henry's classic description for exposure of the posterior aspect of the

knee[15]. After placing the patient in a lateral decubitus position, the described approach involves a medially based vertical incision proximally in line with the palpable semitendinosus tendon, which veers laterally in the popliteal crease and then distally in a vertical fashion over the posterior calf[14]. Because the focus of this approach is the posterior aspect of the proximal part of the tibia and the footprint of the posterior cruciate ligament, considerably more dissection is required, including ligation of the inferior medial genicular artery and vein along the posterior capsule and release of the medial head of the gastrocnemius. This approach allows better access to the medial aspect of the knee and midline structures, but limited access to the posterolateral aspect of the knee.

The surgical approach described in this case report offers excellent exposure to the posterior aspect of the lateral femoral condyle. Unlike Berg's approach, the patient was placed in a prone position because access to the anterior aspect of the knee was not required. The approach also would have been feasible if the patient had been in the lateral decubitus position. Adequate exposure was obtained through a transverse incision; there was no need for vertical extension of the incision. The incision through the posterior knee flexion crease was transverse, limiting the risk of contracture formation. The flexion crease leads directly down to the posterior aspect of the femoral condyle and the insertion of the gastrocnemius tendons, allowing release of the posterior part of the capsule at its femoral origin, thus gaining access to the posterior aspect of the knee without necessitating an extensile approach. Close attention must be paid to the location of the common peroneal nerve and its branches, located just posterior to the posterolateral edge of the long head of the biceps femoris tendon. Deutsch et al. have demonstrated that the course and branching patterns of the common peroneal nerve are variable in the region of the joint line[16]. They reported that branching of the peroneal nerve occurred proximal to the joint line in 10% of their specimens. In addition, a cutaneous branch was reported to be present that originated from the peroneal nerve 11 mm from the joint line in 30% of the cases[16]. In our patient, no cutaneous branches were encountered.

Once described by Henry as "no man's land," the posterior approach to the knee is often avoided by surgeons because it is perceived to be an extremely high risk and very complex approach[15]. The approach to the posterior aspect of the lateral femoral condyle described in this case report is minimally invasive, direct, and relatively straightforward. In conclusion, this approach provides excellent access and exposure to the posterior aspect of the lateral femoral condyle of the knee, and, in our patient, allowed anatomical placement of the osteochondral bone graft. ■

Note: The authors acknowledge the assistance of Tyler Cram and Brandon Kolodzek in the preparation of this manuscript.

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