

Open Reduction Internal Fixation of a Traumatic Osteochondral Lesion of the Patella With Bioabsorbable Screw Fixation



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Abstract: Osteochondral injuries of the patella occur often in the setting of traumatic patellar dislocations. Early fixation of the displaced fragment(s) is paramount to maintaining the viability of the articular cartilage and the congruency of the patella. Multiple fixation techniques have been described to ensure stable fixation, including wires, screws, and all-suture techniques with both absorbable and nonabsorbable materials. We performed an open reduction and internal fixation of a large traumatic patellar osteochondral lesion using 3 bioabsorbable compression screws. The technique is straightforward and provides compression across the fragments, affording excellent stability, which allows early range of motion and ambulation.

Osteochondral injuries after a single lateral patellar dislocation have been reported to occur in between 38% and 95% of cases.¹⁻³ The dislocation can result in a small, shearing injury to the chondral surface alone or can result in a large osteochondral fracture fragment. The most common site of osteochondral fracture or isolated chondral injury is the medial facet of the patella, followed by the central facet of the patella, and finally the lateral femoral condyle.² These injuries are most common in children and adolescents, often in the setting of an unstable osteochondritis dissecans lesion, but can occur after a traumatic injury in the adult population as well.⁴⁻⁶ Early recognition and treatment is vital to maintaining

chondrocyte viability and restoring the articular congruity of the patella.

In the acute setting, patients often present with a large knee effusion and tenderness over the medial retinaculum.³ Associated injuries include medial patellofemoral ligament tears, bone contusions, and/or impaction injuries to the lateral femoral condyle.⁵ Standard anteroposterior, lateral, and merchant or sunrise radiographs should be obtained during the initial evaluation. Historically, first-time patellar dislocations were managed nonoperatively without any further imaging beyond plain radiographs.² Large osteochondral fragments or bony defects may be visualized on standard radiographs, but often the fragments may only contain a small bony portion and thus, are typically best visualized by using magnetic resonance imaging or computed tomography.^{5,6} For this reason, many authors recommend obtaining further imaging (magnetic resonance imaging or computed tomography) after an initial traumatic injury episode to ensure there are no osteochondral injuries and/or loose fragments present within the joint.²⁻⁴ Although many isolated patellar dislocations may be managed nonoperatively, the presence of an osteochondral fracture or an osteochondral loose body is an indication for prompt surgical intervention.

Small cartilage fragments (<5 mm) may be treated with removal and debridement, as they may enlarge over time or become abrasive loose bodies. Larger chondral and osteochondral fragments should be managed with surgical fixation.^{2,6} Adequate internal fixation is necessary to allow early joint mobilization

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Fig 1. Intraoperative image of a right knee. A medial parapatellar arthrotomy is made and the patella is everted 90°, exposing a full-thickness osteochondral lesion of the medial facet, with the superior pole oriented to the right in the image (blue arrow).

while preventing further chondral surface damage and early joint degeneration. Various fixation methods have been described, ranging from metal screw fixation to suture-only bridging techniques.⁷⁻¹² The choice of implant and technique is surgeon-specific, with each technique having relative risks and benefits. Metal screws can afford excellent fixation strength and compression but risk creating a new fracture and also can become prominent, requiring a second surgery for later removal.^{8,13} Suture-only techniques provide adequate strength with minimal prominence but do not create compression across the fracture fixation.¹² Small, bioabsorbable screws have been shown to be appropriate viable and alternative option for osteochondral fixation, as they afford both strong compression and fixation strength with the need for later surgical removal lessened.^{7,9,10}

Surgical Technique

The patient is positioned supine with or without a nonsterile tourniquet applied, as per surgeon preference. After standard skin preparation and draping, a diagnostic arthroscopy is performed to assess the extent of the injury and any other concomitant intra-articular injuries. It is imperative to visualize the medial and lateral gutters, as osteochondral fragments and loose bodies often are found in these locations. Loose bodies may be removed arthroscopically by enlarging the medial portal and then may be kept on the sterile back table. In this case, a large osteochondral fragment of the patella was easily visualized and removed. A midline skin incision is then made extending from just above to just below the superior and inferior poles of the patella. A minimally invasive approach may be used, as the patella does not typically need to be completely everted to complete the procedure. A medial parapatellar

arthrotomy is performed and the patella is everted only 90°, perpendicular to the joint, to expose the articular surface (Fig 1). The contour of the base of the defect is inspected relative to the loose fragment itself, as often the loose fragment may be in multiple pieces or may not conform exactly to the defect in the patella. The fragment is measured on the sterile back operative table (Fig 2) and then the posterior aspect is debrided with a rongeur to ensure the healing surface is smooth and free of hematoma and fibrotic tissue. The patella defect is also debrided with a curette to create clean, stable edges and to remove any remaining fibrotic debris.

Next, a drill bit is used to perform marrow stimulation of the base of the defect to create a bleeding bed. The microfracture holes should be made perpendicular to the bone bed and oriented 2 to 3 mm apart (Fig 3). Irrigation should be used during the drilling to prevent heat-related necrosis. The osteochondral fragment is then reduced to the patella and provisionally held in place with 0.062 Kirshner wires placed perpendicular to the fragment (Fig 4). A 2.0-mm drill bit may then be used to drill a small pilot hole, followed by a tap to engage the subchondral bone and create a small path for the compression screw. Then, an appropriately sized 3.0-mm solid, tapered, bioabsorbable compression screw (Arthrex, Naples, FL) is placed (Fig 5). The screw is composed of a poly-L-lactic acid polymer and is headless to prevent screw prominence. The length of the screw should be dictated by the depth of the fragment and the size (depth) of the patella itself. It is

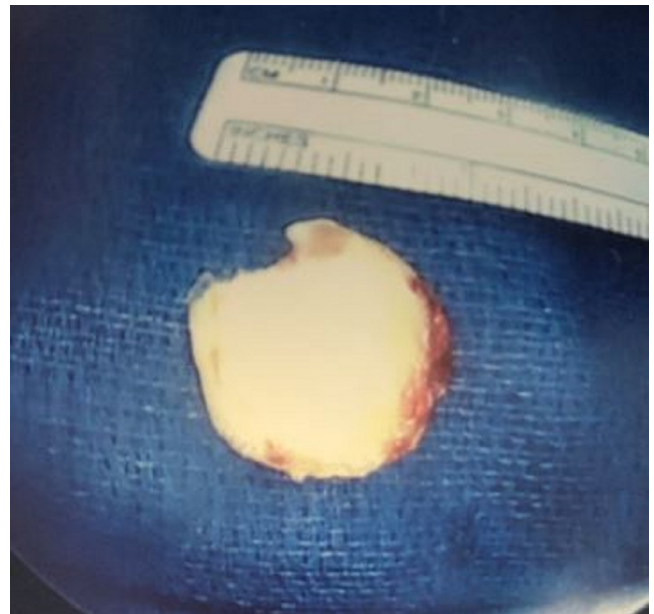


Fig 2. Intraoperative image of the fractured osteochondral fragment from the medial facet of the patella shown on the operative table next to a measurement ruler. The articular surface is facing up, with the size of the fragment measuring 2.8 cm in length, 2.5 cm in width, and 1 cm in depth.

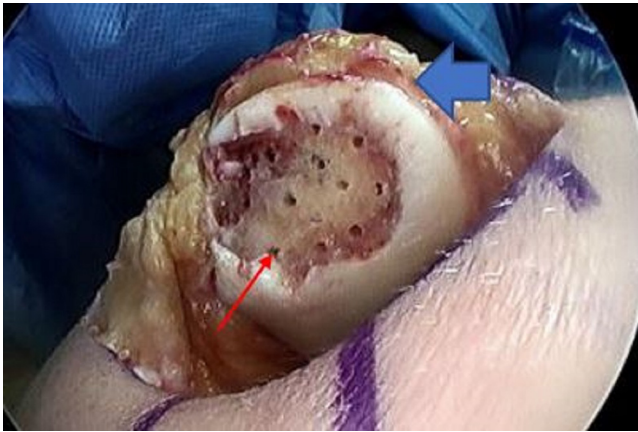


Fig 3. Intraoperative image of a right knee with the superior pole of the patella to the right (blue arrow). Microfracture of the patella osteochondral defect base has been completed (red arrow).

imperative to have enough screw length to get strong fixation across the fragment, but also not have the screw be prominent on either the articular surface or the anterior aspect of the patella.

The screws should be slightly recessed below the level of the articular cartilage to prevent any potential abrasion of the articular surface. Depending on the size of the lesion, 1 to 3 more screws may be placed to secure fragment fixation. A minimum of 2 screws, and ideally 3, are necessary to establish secure fixation and prevent rotation of the fragment. An inverted triangle or 3 screws in a vertical line will control rotation and provide strong fixation across the fragment (Fig 6). The

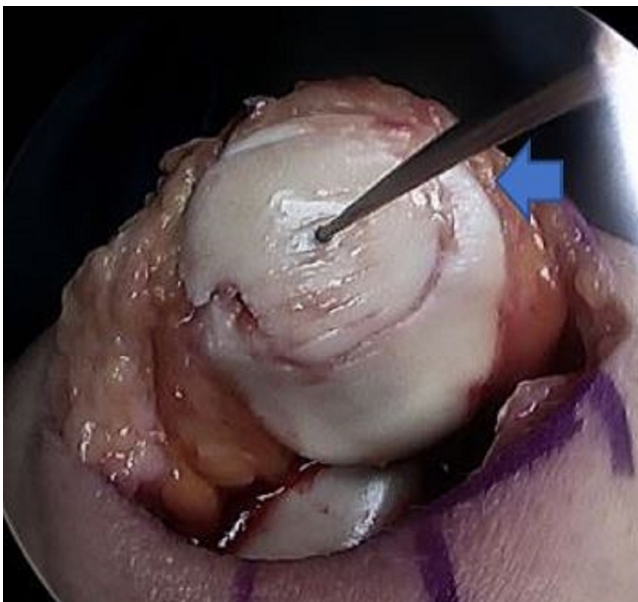


Fig 4. Intraoperative image of a right knee with the superior pole of the patella to the right (blue arrow). The osteochondral fragment has been reduced to the patella and is held in place with a Kirshner wire.

patella may then be returned to its resting position and the knee should be taken through gentle range of motion to ensure there is no catching and the patella tracks well centrally in the groove (Video 1). The arthrotomy and incision are then closed in layers. Any concurrent ligament or soft-tissue injuries may then also be addressed during the same procedure.

Rehabilitation

The patient is placed in a hinged knee brace locked in extension immediately postoperatively and during ambulation, but the brace is unlocked for therapy and range of motion from 0° to 30° for the first 2 weeks, followed by gradual increase in range of motion to 90° flexion from weeks 2 to 6. Full weight-bearing with the brace locked in extension is allowed immediately postoperatively. The brace is then discontinued when the patient has regained adequate quadriceps strength and control, typically at 6 weeks.

Discussion

Fixation of osteochondral fractures of the patella can be accomplished in a variety of ways, with a number of successful techniques documented in the literature.⁶⁻¹² Standard and headless metal screws provide excellent fixation strength and compression across the fracture fragment but often require a second surgery for removal. In addition, screw migration and even patella fracture have been documented.¹³ Suture-only techniques have been developed to avoid secondary implant

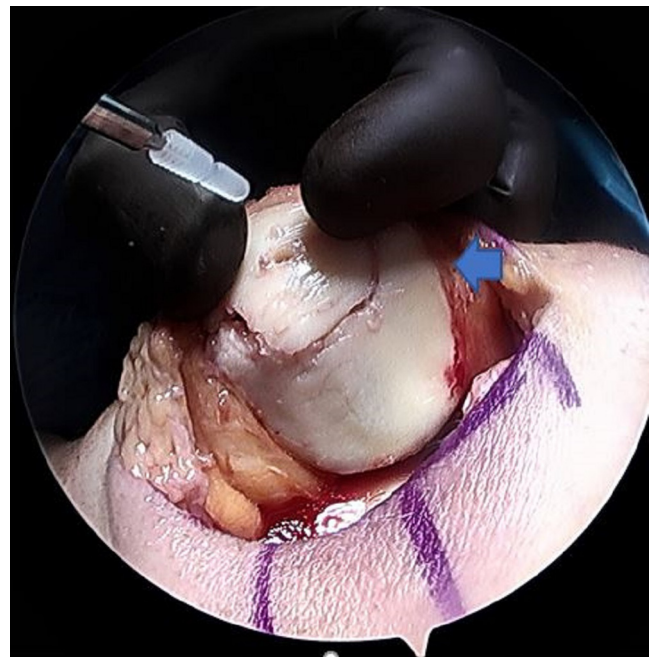


Fig 5. Intraoperative image of a right knee with the superior pole of the patella to the right (blue arrow). A tapered bioabsorbable screw is shown to the left of the patella before being placed to secure osteochondral fragment fixation.



Fig 6. Intraoperative image of a right knee with the superior pole of the patella to the right of the image (blue arrow). Three bioabsorbable compression screws have been placed in the central portion of the osteochondral fragment, securing it into place.

removal and avoid the use of metal screws.¹² A suture-only technique has been shown to have adequate fixation strength and also may be used for smaller osteochondral fragments that may not be large enough to hold multiple screws.¹² The disadvantages of this technique, however, are that there is minimal compression across the fracture fragment, the load to failure strength is not as strong as multiple screws, and

the suture material itself can be abrasive when it is placed across the articular cartilage. Multiple small, bioabsorbable screws are an alternative treatment option for a large, isolated osteochondral fracture fragment that mitigates these disadvantages while capitalizing on the advantages of bioabsorbable fixation (Table 1).

There are several advantages to this technique. First, it is straightforward and easy to learn. Second, the screws are bioabsorbable, minimizing the risk that they would need to be removed at a later date. Third, the screws are tapered, obviating the need to drill a large pilot hole through the cartilage and bone before placement, and the screw creates compression across the fragment as the larger diameter portion of the threads engage the bone. The screws are available in a multitude of lengths and diameters, which enables their use in osteochondral lesions of varying lengths, widths, and depths.

There are potential disadvantages to this technique, however. First, there have been reports of foreign body reaction with associated synovitis and joint abrasion from prominent screws.^{7,9} It is imperative to ensure the screws are adequately recessed below the level of the articular cartilage to prevent this complication. Second, it is ideal to be able to place 2 to 3 screws in a fracture fragment to prevent rotational instability. While small-diameter screws are available, very small or comminuted osteochondral fragments are not well suited to placing multiple screws. These cases may require fragment removal or suture-only fixation, when applicable. Finally, this technique is not able to be performed arthroscopically and requires a mini-open approach (Table 2).

Bioabsorbable screw fixation of traumatic osteochondral lesions of the patella is a reproducible, reliable, and straightforward surgical procedure. It enables

Table 1. Clinical Recommendations for Bioabsorbable Screw Fixation of a Patella Osteochondral Fracture

Pearls	Pitfalls
<ul style="list-style-type: none"> • Early recognition and intervention are vital. • Diagnostic arthroscopy is beneficial to treat any concomitant intra-articular pathologies. • Debride both the donor bed on the patella and the fracture fragment itself of any fibrinous tissue to ensure appropriate reduction. • For marrow stimulation of the patella, use small drill bits (<2 mm) or chondral picks and drill the holes perpendicular to the patella. • Drill and tap before screw placement to create an appropriate perpendicular track for the screw placement. • Use a minimum of 2, and typically 3, bioabsorbable compression screws for adequate fixation. • Measure the depth of the osteochondral fragment and the depth of the patella itself to select appropriate screw length. • Place the screws in an inverted triangle or vertical configuration to prevent rotational instability of the fragment. • Ensure the screws are slightly recessed below the chondral surface. 	<ul style="list-style-type: none"> • Delayed surgical intervention may result in fragmentation of fracture fragments and inability to perform adequate reduction. • Fracture fragment fixation must be performed through a mini-open approach. • Overdebridement can result in inadequate fill of the patella defect site. • Overdrilling of the patella increases the risk of fracture through the drill holes. • Using too many screws or screws that are too large can create large defects and fracture the osteochondral fragment. • Inadequate fragment reduction may result in prominence, which may lead to pain and mechanical symptoms. • Inadequate fixation can lead to repeat dislodgement of the osteochondral fragment. • Prominent screws may be abrasive to the chondral surfaces and cause reactive joint synovitis.

Table 2. Advantages and Disadvantages of the Bioabsorbable Screw Fixation Technique for Osteochondral Fractures of the Patella**Advantages**

- Straightforward and relatively simple to learn.
- No special equipment needed; standard fracture fixation instruments are adequate.
- Screws are bioabsorbable and do not require removal during a second surgery.
- Screws are tapered, resulting in compression across the fracture fragment.
- Provides stable fixation, allowing early joint mobilization and weight-bearing.
- The technique can be performed simultaneously with soft-tissue procedures, such as medial patellofemoral ligament repair or reconstruction

Disadvantages

- Not well suited for small, comminuted osteochondral fragments not amenable to holding >1 screw.
- The procedure cannot be performed arthroscopically and requires a mini-open approach.
- Bioabsorbable screws may take an extended period of time to undergo enzymatic breakdown and absorption.

compression across the fracture site while creating stable fixation, which allows for early joint mobilization and weight bearing while minimizing the need for subsequent screw removal. It is, therefore, a useful treatment option in the setting of medium-to-large patella osteochondral fractures.

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