

Arthroscopic Excision of Bipartite Patella

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Abstract: A bipartite patella usually presents as an incidental finding on radiographs because most cases are asymptomatic. However, some patients may present with pain and functional limitations. Conservative treatment is sufficient to resolve symptoms in most cases; however, a small minority of patients may require surgical management. Recent studies have reported excellent results with an arthroscopic approach. This Technical Note details our procedure for treating a symptomatic bipartite patella that has not resolved with conservative care.

It is estimated that a bipartite patella is present in approximately 1% to 2% of the population¹⁻³ (Fig 1). The bipartite patella is a result of the emergence of a secondary ossification center that does not fully fuse with the primary ossification center, resulting in a nonunion or malunion. Fibrocartilage tissue may separate the patella and the bipartite fragment.² The Saupe classification system divides bipartite patellae into 3 groups based on the location of the accessory fragment. Type 3 occurs over the superolateral aspect and represents most cases⁴ (Fig 2). A bipartite patella is usually asymptomatic and found incidentally. However, a small subset of patients are symptomatic around the malunion of the bipartite fragment. These patients may experience pain with activity and tenderness on

palpation directly over the fragment and its demarcation.⁴ The initial approach to symptomatic patients includes conservative management, first with activity modification, nonsteroidal anti-inflammatory medications, immobilization, and physical therapy.¹ Surgery is indicated when conservative treatment fails to resolve symptoms. Both arthroscopic and open surgical techniques have been described. The less invasive arthroscopic approach is favored by the senior author (R.F.L.) over the open procedure owing to fewer complications and faster recovery.^{1,5,6} This Technical Note describes an arthroscopic approach to treating cases of persistent symptomatic bipartite patella.

Surgical Technique

The patient is brought into the operating room and placed in the supine position. General anesthesia is induced, and a well-padded high thigh tourniquet is placed on the operative leg. Range of motion and patellar tracking, as well as the Lachman, posterior drawer, posterolateral drawer, varus stress, and valgus stress tests, are assessed under anesthesia. The patient is given 2 g of cefazolin for prophylaxis against infection and then undergoes preparation and draping in a sterile manner.

The surgical technique is shown in Video 1. An anteromedial arthroscopic portal is made, the lateral parapatellar tissues are visualized, and a spinal needle is used to place the anterolateral portal.

The surgeon should now be able to visualize the entire joint. A diagnostic arthroscopy is performed to assess the bipartite patella area, medial and lateral gutters, articular surfaces, medial and lateral menisci (including capsular and root attachments), popliteus

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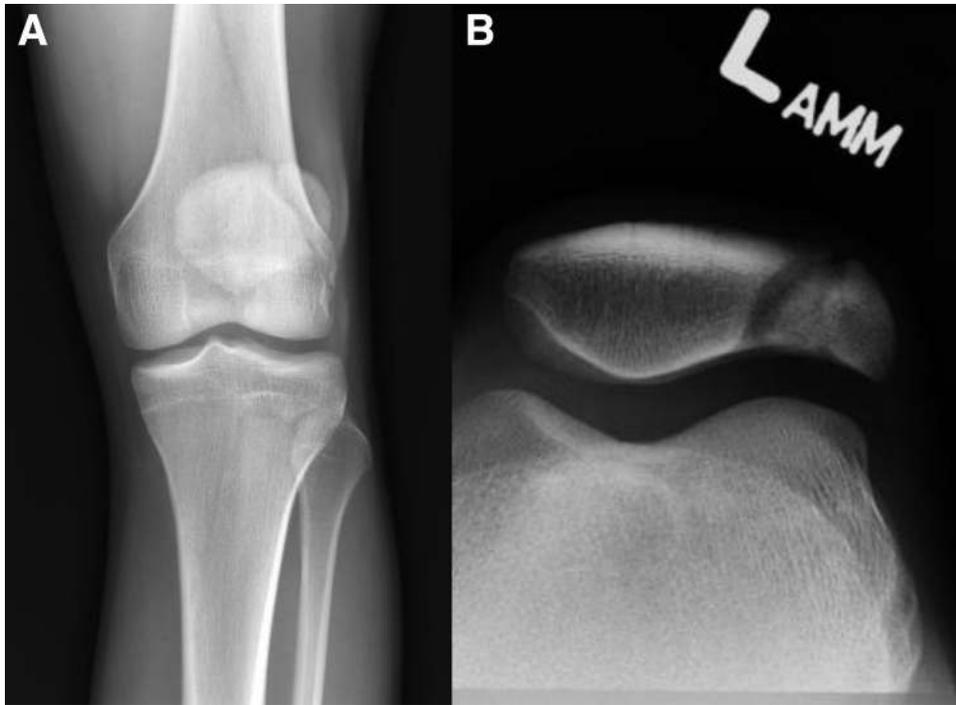


Fig 1. Anteroposterior (A) and sunrise (B) radiographs showing a bipartite patella in a right knee. The bipartite patella develops from an accessory ossification center in the patella—sometimes more than one. Typically, this developmental abnormality is asymptomatic and is discovered incidentally. However, in a minority of patients, pain over the superolateral, lateral, or inferior aspect of the patella and pain with activity may be caused by irritation. (A) Anteroposterior radiograph showing a patella with a superolateral fragment connected to the main body of the patella by a radiolucent band. (B) Sunrise view of same knee. The accessory patellar fragment can be seen extending far laterally, with a projection extending over the lateral femoral condyle. The arrows indicate the accessory portion of the bipartite patella. L, left.

tendon attachment on the femur, and fascicle attachments to the lateral meniscus (Fig 3).

Next, an arthroscopic shaver is used to perform a chondroplasty at the margin of the bipartite patella. The demarcation between the bipartite and main portions of the patella should be visualized. A burr is then used to remove the bipartite patella distally, tracking proximally and superiorly along the demarcation of the bipartite patella until the accessory portion is removed (Fig 4). It may be helpful to have an assistant hold the arthroscope or apply pressure to the patella during this portion of the operation (Table 1, Fig 5).

Fluoroscopic imaging is used to confirm that the main portion of the bipartite patella is removed (Fig 6). A spinal needle, under fluoroscopic guidance, is used to better visualize the patellar border and confirm removal of accessory fragments. A burr, shaver, and pituitary grasper are used to remove the remaining portion.

Tracking of the patella and range of motion are reassessed. The tourniquet is let down. The portals are closed with Vicryl sutures (Johnson & Johnson, New Brunswick, NJ), and sterile dressings should be placed before transfer to the recovery room.

Postoperatively, the patient is allowed to bear weight as tolerated for daily walking but should initially use the nonsurgical leg to negotiate stairs to avoid elevated patellofemoral compartment compression in the early postoperative period. Physical therapy should be started

on postoperative day 1, focusing on quadriceps activation, initially in full extension to minimize patellofemoral compartment loading, along with edema control, patellar mobilization, and passive range of motion. There are no limitations on knee motion; however, progression into deeper knee flexion angles should occur gradually and take into consideration symptoms associated with increasing soft-tissue tension and patellofemoral compression as the knee moves into deeper angles of flexion. Progression into multi-joint lower-extremity strengthening during weight bearing with squatting, stepping, and lunging should be gradual, with modifications incorporated as needed, to manage patellofemoral compression and allow the joint to gradually acclimate to increased loading, as well as support the patient's return to the desired level of activity and lifestyle.^{7,8} Anteroposterior and lateral radiographs should be obtained (Fig 3). Deep venous thrombosis prophylaxis is achieved with the use of aspirin and thrombo-embolus deterrent (TED) stockings for 2 weeks after surgery.

Discussion

This article describes our arthroscopic approach to surgically managing a persistent symptomatic bipartite patella. Arthroscopy is favored because multiple case studies have reported a quicker recovery time and fewer complications with this approach in comparison

Fig 2. Magnetic resonance imaging (MRI) showing bipartite patella. (A) Axial MRI of the left knee shows an accessory patellar fragment (circle). (B) Coronal MRI of the same knee shows a deeper lateral portion of the accessory part of the bipartite patella (circle). (C) A more superficial cut on coronal MRI of the same knee shows a large superolateral patellar fragment (arrow). (D) T1 coronal MRI of the left knee with clearly delineated outline of the patellar fragment with malunion (arrow). The bipartite patella is a developmental abnormality that is often asymptomatic. Most cases of symptomatic bipartite patella are amenable to conservative management, but in a minority of these patients, surgical intervention is needed.

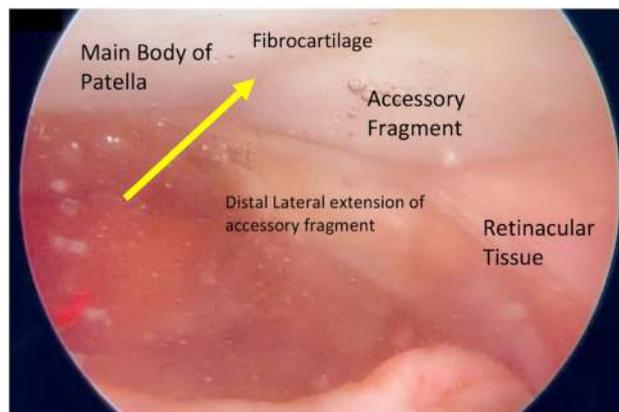
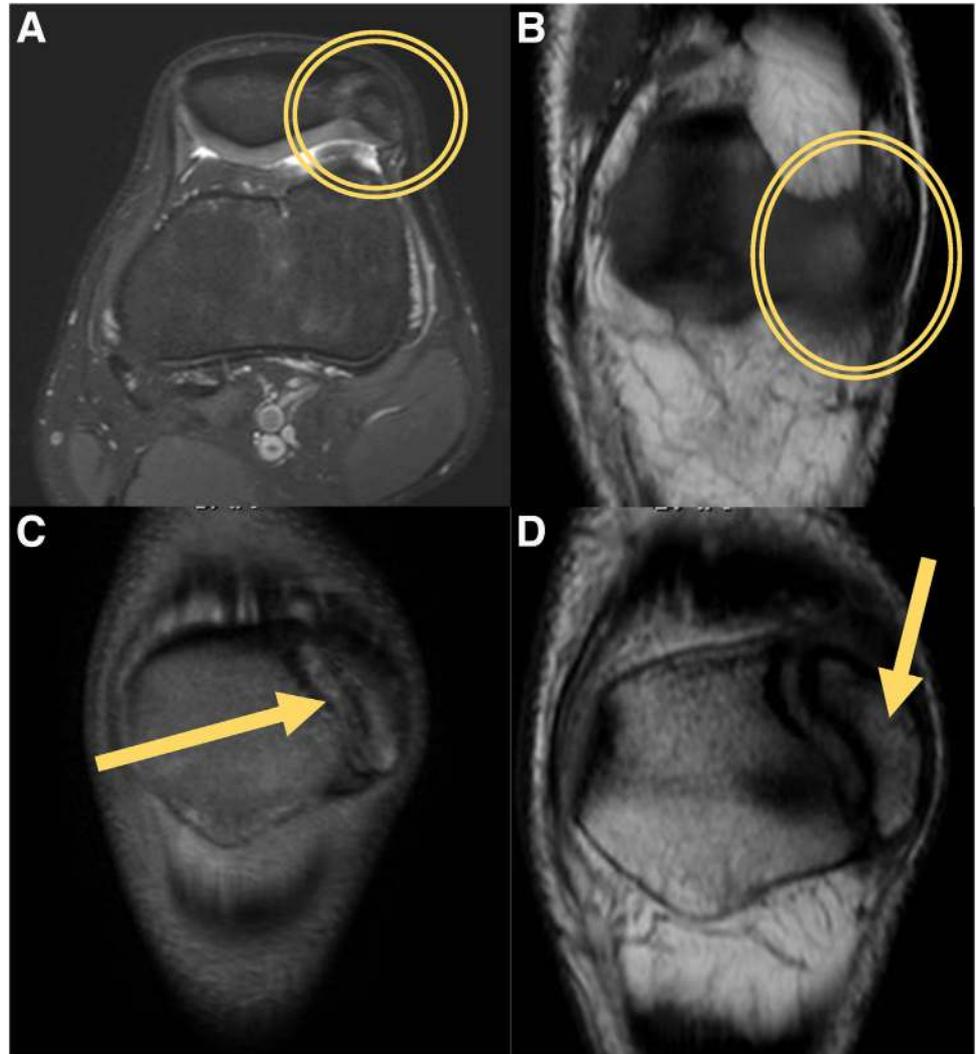


Fig 3. Diagnostic arthroscopy: view of bipartite patella. This arthroscopic view is through the anteromedial portal, looking at the lateral undersurface of the patella. Visible are the main body of the patella, the unfused accessory portion, and the lateral retinacular structures. The fibrocartilaginous seam (arrow) between the main body of the patella and the non-unionized fragment(s) will be the line of excision.

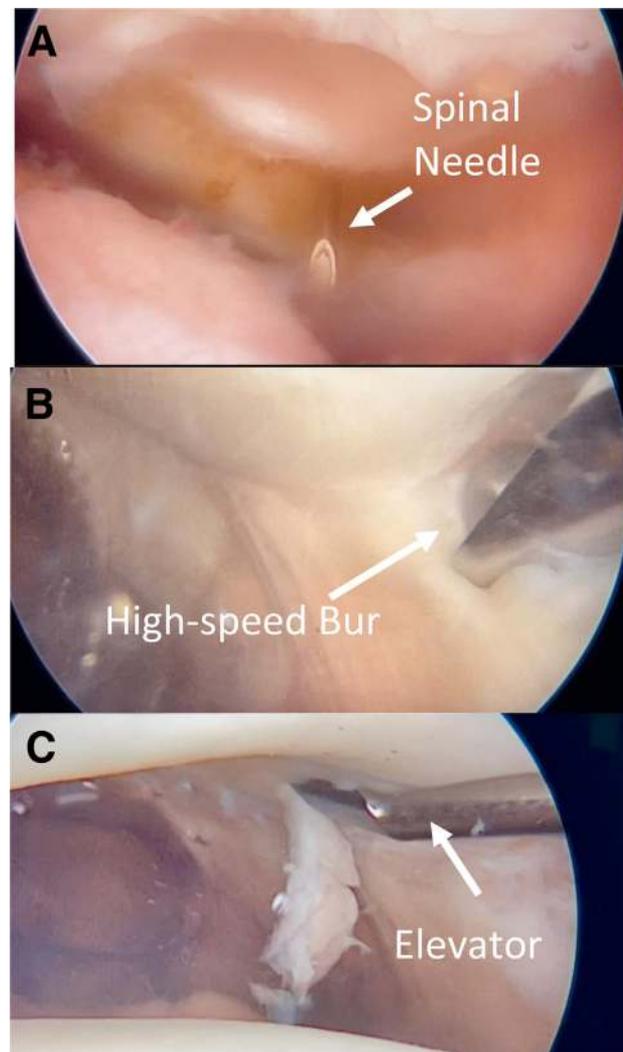


Fig 4. Bipartite patella fragment excision. Excision of a non-unionized patellar fragment is undertaken when the patient is symptomatic and resistant to conservative management with activity modification, physical therapy, and nonsteroidal anti-inflammatory drugs. In this patient, the working portal is the lateral portal; most cases of bipartite patella involve a superolateral fragment. These views are from the medial portal of the lateral undersurface of the patella. (A) A spinal needle is pushed through the fibrocartilaginous seam between the main body of the patella and the non-unionized fragment; this may make the resection easier. (B) A small high-speed burr is used to resect along the same line. (C) An elevator is used to remove part of the fragment. These implements, along with arthroscopic shavers and larger arthroscopic burrs, are used to either disintegrate the non-unionized fragment or cut along its connection with the main body of the patella. Pieces of the fragment are removed with arthroscopic graspers as able.

with an open approach to removal of the bipartite patella (Table 2).

A recent systematic review analyzed multiple approaches including open excision and arthroscopic procedures.¹ Open excision was used in most cases and resulted in more complications. Complications included the need for aspiration of the effusion, wound dehiscence, need for additional lateral release, synovitis, or superficial wound infection requiring antibiotics in approximately 19% of patients.¹ One study within the review reported 3 of the 16 patients were still experiencing occasional pain.^{1,9} In comparison, the use of arthroscopic management in 5 case studies within the

review resulted in all patients achieving resolution of symptoms with no complications.¹

One case study from 2017 described an elite hockey player who underwent arthroscopic management of a symptomatic bipartite patella.⁵ The patient was able to return to play pain free at 6 weeks, and at 31 months postoperatively, the patient continued to have an excellent outcome.

Another study concluded that arthroscopy is superior to the open approach for the bipartite patella because of minimal invasiveness, early symptomatic relief, and few complications.³ Seventeen patients with type 3 bipartite patellae were described; of these patients, 7



Fig 5. Exterior pressure on patella. Arthroscopic excision of non-unionized patellar fragments in patients with a symptomatic bipartite patella is sometimes difficult because of the thickness and durability of the tissue between the body of the patella and the malunion fragment. An arthroscopic approach is preferred to decrease the recovery time and minimize scarring and morbidity for the patient, but the limitations of an arthroscopic approach mean that this procedure can lead to a lengthy tourniquet time. Pressure from the exterior against the patella can be applied with the surgeon's thumb (arrow)—or with the aid of an assistant—to maximize the force of the burr and gain more purchase to resect the fragment.

Table 1. Pearls and Pitfalls

Pearls	Pitfalls
The surgeon should track the patella through the range of motion with a finger on the nonunion part to feel for catching.	Patients initially successfully treated conservatively may later experience a return of symptoms.
An accessory superolateral portal can be helpful in patients with a Saupe type 2 or 3 bipartite patella.	The surgeon should ensure that the border of the main body of the patella is smooth; a jagged remainder may cause irritation and persistent symptoms.
Placing a spinal needle through the articulation of the malunion fragment and the main body of the patella may aid in breaking off the accessory fragment.	The surgeon should avoid leaving symptomatic portions by fluoroscopically verifying that the entire accessory patella has been removed.
It may be helpful for 2 assistants to apply pressure to the patella and hold the arthroscope.	Edema control will be important postoperatively owing to the large amount of bone exposed.

Fig 6. Intraoperative and postoperative imaging after arthroscopic bipartite patella excision. A symptomatic bipartite patella is rare and usually can be treated nonoperatively. In a small minority of patients, surgical excision is necessary; this is often performed arthroscopically. (A) Intraoperative fluoroscopy of a left knee verifies adequate resection of accessory patellar fragments (arrow). (B) Postoperative anteroposterior radiography of the same knee shows a resected bipartite patella (arrow).

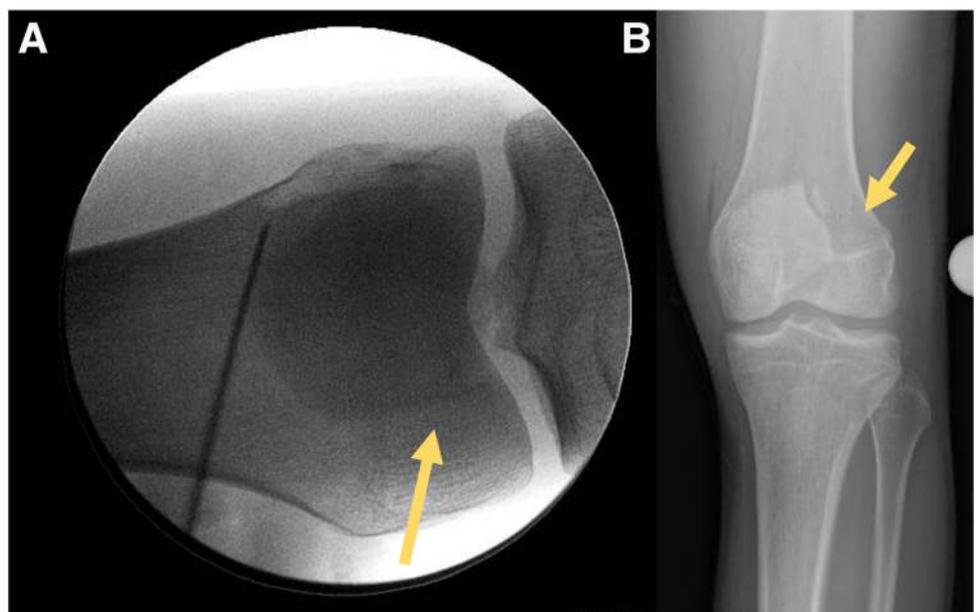


Table 2. Advantages and Disadvantages of Arthroscopic Management of Bipartite Patella

Advantages	Disadvantages
Fewer complications including effusion drainage and wound dehiscence with lower infection risk	Risk of missing small fragments of bipartite patella compared with open procedure
Can perform chondroplasty and easily visualize undersurface of patella	Much longer tourniquet time than open excision
Better preservation of lateral retinacular tissue; reduced risk of iatrogenic medial dislocation or maltracking	Technically may be more challenging in cases of malunion fragments with severely sclerotic bone or significant scar tissue
Faster return of quadriceps strength and return to play with aggressive rehabilitation	May be more difficult to view interface of bipartite patella posteriorly—a 70° scope may occasionally be needed

underwent open surgery and 10 underwent an arthroscopic procedure. All patients achieved symptomatic pain relief within 4 weeks. Most notably, the authors concluded that the patients who underwent the arthroscopic procedure showed a statistically quicker return of muscle strength and faster knee effusion resolution than the patients in the open procedure group.

Most of the outcomes reported for bipartite patella excision are from individual case studies. However, on the basis of the available evidence and systematic reviews, we favor arthroscopic management with the described technique to provide a minimally invasive procedure that results in few to no complications and a quicker recovery time.^{1-3,10}

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