



Arthroscopic Bony Resection for Treatment of Symptomatic Bipartite Patella

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Abstract: Bipartite patella is a common pathology, affecting 2% to 3% of the population. Usually these cases are bilateral and asymptomatic. However, a patient with a bipartite patella may complain of pain, which is most likely related to fragment mobility. Conservative treatment with physiotherapy, immobilization, and nonsteroidal drugs are encouraged during the initial 6 months following diagnosis. This option is effective in most patients. For patients who do not improve with these conservative measures, surgical intervention is indicated. Many surgical treatment options have been described including excision of the fragment, as well as fixation. Fragment excision has demonstrated positive outcomes and is associated with an asymptomatic return to sport activities. The purpose of this Technical Note is to describe our preferred arthroscopic technique for the treatment of symptomatic bipartite patella.

Bipartite patella is a relatively common asymptomatic pathology, affecting males disproportionately in an estimated male-to female ratio of 3.4.¹ Saupé² described 3 types of bipartite patella, differentiated by the location of the fragment as follows: I, inferior pole; II, lateral; and III, superolateral. However, this classification has been met with some questioning given that the type I designation has been associated with other pathologies, not bipartite patella.¹ Therefore, Oohashi et al.¹ described a 4-part classification system, which excludes the inferior variant of bipartite patella and, instead, includes 2 types of tripartite patella. One of the tripartite variants corresponds when both fragments are

located in the superolateral aspect of the patella, whereas the other tripartite variant describes when one fragment is found in the superolateral aspect and the other in the lateral aspect. Although fragments are typically located in the lateral or superolateral aspect of the patella, fragments around the medial aspect have also been described.^{3,4} In the majority of cases, bipartite patella is asymptomatic. But in some patients, a bipartite patella may result in complaints of anterior knee pain.

For most symptomatic patients, the onset of pain typically occurs between 12 and 14 years of age as a result of sport participation.¹ Oohashi et al.¹ reported that all patients with symptomatic bipartite patella (50 knees) complained of pain during or after strenuous activities, whereas 34% had pain during knee flexion and extension, 22% noted pain while climbing stairs, and only 6% stated they experienced knee pain during walking. Given the limiting effect of bipartite patella in activities of daily living, this reflects the clinical significance of symptomatic bipartite patella regardless of its rarity.

Surgical treatment should be undertaken only following a thorough physical examination that eliminates the possibility of another source of anterior knee pain.⁵ A key hint that highly suggests likelihood of a symptomatic bipartite patella is tenderness to palpation directly over the site of bony division. In fact, Oohashi et al. found localized tenderness directly over the fragment site in 100% of all included patients. Nevertheless,

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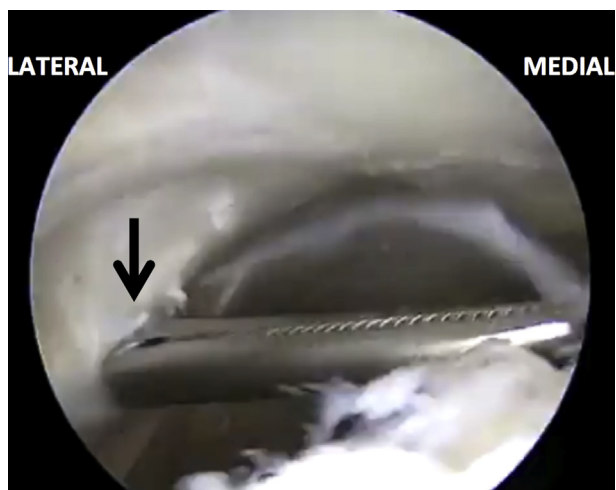


Fig 1. A superolateral accessory portal is created in the right knee under arthroscopic visualization using a 30° scope (Smith & Nephew) through the anterolateral portal. A Kocker clamp (black arrow) is used to bluntly dissect the subcutaneous tissue and facilitate the insertion of arthroscopic instruments to be used throughout the technique.

this same cohort revealed a bony prominence in only half of all knees. Oohashi et al.¹ also reported retro-patellar crepitation in 8% of all knees with symptomatic bipartite patella, with a 32% rate of quadriceps muscle atrophy. The purpose of this Technical Note is to describe our preferred arthroscopic technique for the treatment of symptomatic bipartite patella.

Surgical Technique

Patient Position and Preparation

The patient is placed in a supine position on the operating table (Video 1). Following induction of general anesthesia, a physical examination of the knee joint is performed. Our physical examination to examine symptomatic bipartite patella consists of the following: palpation of the patellar margin, patellar tracking during passive knee range of motion, patellar

mobility in the lateral-medial plane, patellar crepitus during passive and active knee range of motion, and pressing of the patella directly against the trochlear groove during knee extension. Once the physical examination is complete, a well-padded thigh tourniquet is placed on the upper thigh of the operative leg to minimize blood loss. Both legs are positioned in extension on the table without use of a leg-holder. The surgical leg is then prepped and draped in sterile fashion. The leg is exsanguinated, and then the tourniquet is inflated to 250 mmHg.

Arthroscopic Procedure

The lateral and medial femorotibial joints are palpated and a standard anterolateral portal is made. A 30° scope (Smith & Nephew, Andover, MA) is inserted first through the anterolateral portal, and then the anteromedial portal is made under arthroscopic visualization. Following this, an arthroscopic shaver (Smith & Nephew) is placed through the anteromedial portal and any and all adhesions, synovitis, and loose bodies are removed. Using a probe, the meniscus and ligaments are evaluated. A thorough diagnostic arthroscopy of all the compartments of the knee is completed. If any concomitant lesion is identified, they are addressed at this time.

Patellar Resection Procedure

Following the diagnostic arthroscopy of all knee compartments, attention is turned to the patellofemoral joint. The trochlear and patellar cartilages are evaluated using a probe to identify any softening or loose bodies. We then perform an arthroscopic evaluation of contact between the patella and trochlea during full range of motion while viewing from the 30° scope (Smith & Nephew) placed in the anterolateral portal. With the knee in 20° of flexion, we create a superolateral accessory portal 1 cm from the lateral patellar border (Fig 1). In this case, the fragment was located at the superolateral aspect of the patella. Using a

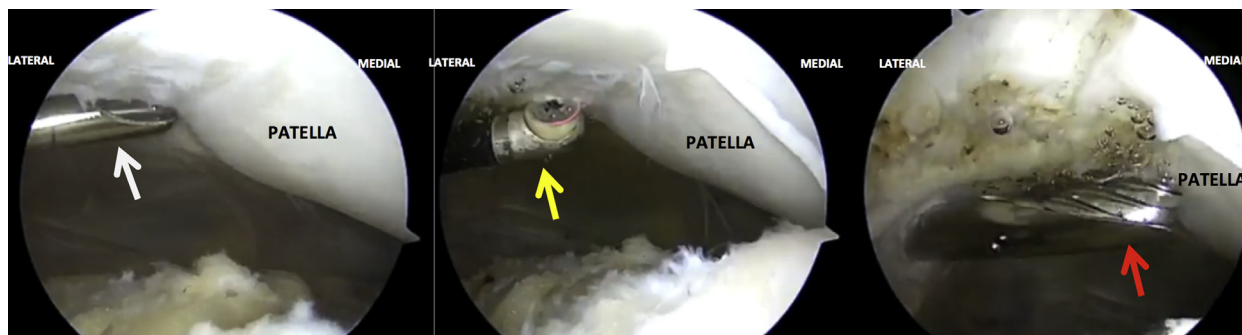


Fig 2. Following the identification of the fragment through arthroscopy in the right knee, a combination of a radiofrequency wand (yellow arrow), a 4.0-mm burr (Smith & Nephew) (red arrow), and arthroscopic shaver (Smith & Nephew) (white arrow) are used to delineate the margins of the fragment through the superolateral accessory portal to reduce the risk of over-resection and damage to surrounding soft tissue.

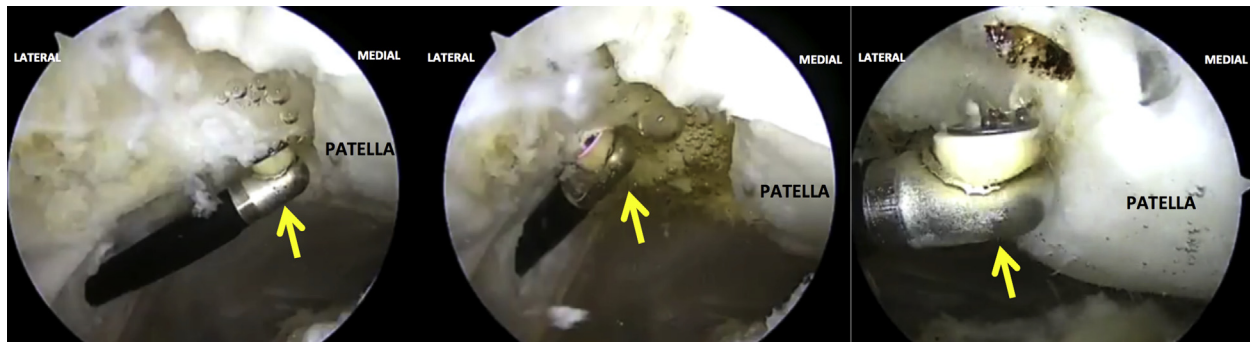


Fig 3. Using a 30° scope (Smith & Nephew) through the anterolateral portal, the fragment of the symptomatic bipartite patella is resected in the right knee. The radiofrequency wand (yellow arrow) is used through the superolateral accessory portal to remove all soft tissue adhering to the fragment. Of note, care must be taken to avoid damage to the cartilage surface of the body of the patella.

radiofrequency wand, 4.0-mm burr (Smith & Nephew), and arthroscopic shaver (Smith & Nephew), the borders of the bone fragment to be resected is marked (Fig 2). The defect is then palpated and an 18-gauge needle is inserted through the skin to arthroscopically identify the area that must be removed while preserving as much as possible of the remaining cartilage. Care must be taken to ensure that all fragments are correctly identified to minimize resection of the patella. While maintaining the knee at 20° of flexion and using the 30° arthroscope (Smith & Nephew) through the anterolateral portal, a combination of a radiofrequency wand, Freer elevator, and a high-speed 4.0-mm burr are employed through the accessory arthroscopic portals to carefully resect the superolateral fragment. We alternate the use of these 3 instruments according to

the needed visualization and overall accessibility of the area to be resected during the course of the procedure. The radiofrequency wand is used to remove fibrotic tissue (Fig 3), whereas the high-speed 4.0-mm burr allows for removal of cartilage and subchondral bone. Furthermore, the Freer elevator (Fig 4) is used to identify the point of division between the fragment and rest of the patella. The described procedure is applicable across all types of symptomatic bipartite or tripartite patella. In the case of a medial fragment, although rare, we recommend that the accessory portal be made at the medial side. For the entirety of the procedure, we use a 30° scope. However, a 70° scope can be used to achieve a more perpendicular visualization of the resection, and can be helpful to correctly identify the point where the fragment meets the body of the patella. Although osteotomes are typically used in the setting of bone resection, we advise sole use of the 3 aforementioned

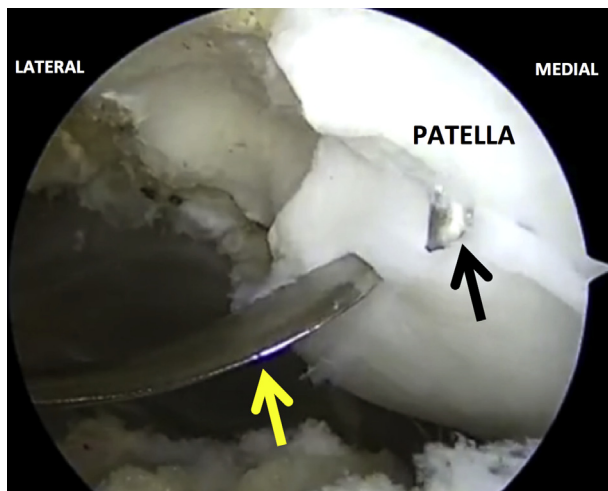


Fig 4. Using a 30° scope (Smith & Nephew) through the anterolateral portal, a Freer elevator (yellow arrow) through the superolateral accessory portal is used to identify the point of division between the fragment and rest of the patella in the right knee. An 18-gauge needle (black arrow) is inserted through the skin to arthroscopically identify the area that must be resected with care to preserve the remaining patellar cartilage.



Fig 5. Using a 30° scope (Smith & Nephew) through the anterolateral portal, an arthroscopic basket (yellow arrow) through the superolateral accessory portal is used to fully resect the area near the cartilage of the patellar body in the right knee while avoiding thermal damage.

Table 1. Advantages and Disadvantages

Advantages	Disadvantages
Minimal soft tissue damage Related to less hospitalization time, blood loss, postoperative pain, and infection rates Provides a great visualization of the fragment borders, thereby avoiding damage to the body of the patella A diagnostic arthroscopy prior to resection will eliminate the possibility of other pathology No need for hardware Allows for initiation of rehabilitation protocol immediately after surgery	Lack of long-term outcomes following surgery Requires arthroscopic proficiency Need of tools such as a high-speed burr and radiofrequency wand, which may result in a higher cost of treatment vs other treatment options

instruments to ensure a smooth surface following resection. Following resection of the bony fragment, an arthroscopic basket is employed to fully resect the area near the cartilage of the patellar body, while avoiding thermal damage (Fig 5). Once the resection is complete, we dynamically and arthroscopically evaluate patellar tracking. Following this, complete absence of any fragments is verified once resection is complete. The tourniquet is released at this time, and then hemostasis is meticulously obtained using a radiofrequency probe to decrease the risk of excessive postoperative bleeding while avoiding iatrogenic damage of the surrounding cartilage. The portal openings are then closed using 3-0 Monocryl (Ethicon, Somerville, NJ) and, lastly, sterile compressive draping is applied. In the United States, standard billing for this procedure is done via billing code 29,999 as an arthroscopic hemipatellectomy. Advantages and disadvantages as well as the pearls and pitfalls associated with our described technique are listed in Tables 1 and 2, respectively.

Postoperative Rehabilitation Protocol

Following arthroscopic excision of the patellar fragment, we encourage immediate flexion and extension exercises. No brace should be used following this procedure. Early patella, quadriceps, and patellar tendon mobilization is key for a successful rehabilitation following this procedure, with physiotherapy

performed as soon as possible. The patient should use crutches, but bearing weight is allowed as tolerated during the first postoperative week. Biking exercise with no resistance is encouraged until postoperative week 6. Then, following week 6, biking exercise with resistance is allowed. Toe and heel raises should start during week 1. Moreover, balancing exercises are initiated during week 4, depending on the amount of edema and pain. Single-plane, agility exercises should begin approximately between weeks 14 and 16. Following the initiation of single-plane exercises, multidirectional exercises should begin at postoperative week 20. The complete return to sport activity is patient-dependent and is individualized according to the patient's discretion.

Discussion

The recommended first line of treatment for symptomatic bipartite patella is conservative management consisting of rest, restriction of sport activity, physical therapy, and application of nonsteroidal drugs. Immobilization of the knee is also encouraged to minimize mobility of the fragment and decrease pain as much as possible.⁶ Extracorporeal shock wave therapy and viscosupplementation have also been reported as a form of conservative management in the literature.⁴ Conservative treatment is suggested for at least the first

Table 2. Pearls and Pitfalls

Pearls	Pitfalls
Use the lateral and superior lateral accessory portals to maximize visualization during surgery	Careful diagnosis is needed given that bipartite patella may be present but not the true source of the patient's pain and discomfort
If the fragment is medial, change the accessory portal toward the medial aspect of the patella	Avoid the use of an osteotome during removal of the fragment
Ensure that the margins of the fragment are properly identified prior to resection to minimize damage to the body of the patella	Although the anterolateral and anteromedial portals provide good visualization of the intercondylar notch and patellofemoral joint, it may be difficult to address other concomitant intra-articular lesions through sole use of these portals
Use a combination of a high-speed burr, radiofrequency probe, and Freer elevator to successfully and thoroughly remove the fragment	

6 months following initial presentation for most patients. However, if pain does worsen or more symptoms result during conservative management because of a traumatic event, then early intervention via surgery may be warranted.⁶

For treatment of symptomatic bipartite patella, surgical removal or fixation of the fragment has been described as an effective and successful treatment option.^{7,8} Furthermore, lateral release of the vastus lateralis muscle and the lateral retinaculum from the fragment may also be performed to ease the strength of forces caused from these adhesions, particularly in cases of lateral or superolateral fragments.⁶ A similar procedure was described by Ogata consisting of a subperiosteal detachment of the vastus lateralis muscle's insertion on the fragment.⁹

In a systematic review performed by Matic and Flanigan,⁸ 127 patients with symptomatic bipartite patella underwent surgical intervention for symptom relief. The most common procedure included open excision of the fragment in 85/127 patients, vastus lateralis release in 17/127 patients, and lateral retinacular release in 16/127 patients. Moreover, arthroscopic excision and fixation of the fragment were performed in 5 and 4 patients, respectively. Excellent outcomes with complete resolution of symptoms was reported in all patients who underwent arthroscopic excision of the fragment similarly to our described technique.⁸ A complete return to sport activity was reported in all arthroscopically treated patients, with advantages of the technique including decreased hospitalization time and recovery time as well as the possibility of early rehabilitation. Matic and Flanigan¹⁰ performed a systematic review concerning the rate of return to activity in athletes with a symptomatic bipartite patella. Of all procedures, the best results were associated with the excision of the fragment, which led to a 91% return to sport rate and relief of all symptoms. In addition, Weckstrom et al.¹¹

reported positive long-term outcomes in 25 young adults with symptomatic bipartite patella with a follow-up period of at least 10 years (mean of 15 years) following excision of the fragment. In all, we recommend our described arthroscopic technique for the treatment of symptomatic bipartite patella and encourage further studies to assess outcomes following our surgical technique.

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