

# Arthroscopic Debridement, Facetectomy, and Synovectomy for Isolated Patellofemoral Osteoarthritis

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**Abstract:** Isolated patellofemoral osteoarthritis (PFOA) is a condition that affects climbing, squatting, and standing up movements in daily life and sports. Various surgical methods have been developed to address the various causes, different degrees of cartilage degeneration, and combined lesions. We describe an arthroscopic patellofemoral arthroplasty technique, with the main purpose to decrease the pain originating from the patellofemoral joint and related structures. The critical points of this technique are patellofemoral denervation and partial patellar facetectomy. Our clinical experience indicates that this technique is effective to address all kinds of PFOA. We consider that the introduction of this technique will provide a feasible choice when surgical treatment of PFOA is indicated.

Patellofemoral osteoarthritis (PFOA) quite often precedes tibial femoral arthritis and occurs in an isolated status.<sup>1</sup> In most cases, conservative treatment is effective through changing sports styles and lifestyles. However, in recalcitrant cases not responding to conservative treatment, operative treatment is an option. There are many types of PFOA, including primary, patellar instability, traumatic, and chondrocalcification types. In our clinical practice, except for the patellar instability type of PFOA that needs medial patellofemoral ligament reconstruction, we choose a similar procedure, which we named arthroscopic patellofemoral arthroplasty (APFA), for all types. Standardized APFA includes patella-plasty and femoral trochlea-plasty, with removal of the extra lateral facet of the patella as the main part, lateral retinacular release, and denervation of the femoral trochlea and the patella. Our clinical experience indicates that this

technique is effective to obtain satisfactory long-term results.

## Surgical Technique

Preoperatively, routine anteroposterior- and lateral-view radiographs of the knee are taken to rule out tibiofemoral arthritis and to evaluate whether a high patella and hyperplasia of the upper and lower poles of the patella are present. Computed tomography examination is performed to investigate the dysplasia of the patella and the femoral trochlea, the matching degree of the patellofemoral joint, and the lateral deviation of the patella and the tibial tubercle. Magnetic resonance imaging examination is performed to evaluate the extent of cartilage wear in the patella and femoral trochlea, as well as the extent of bone edema in subchondral bone.<sup>2,3</sup>

The patient is placed in the supine position. The anteromedial, anterolateral, and supralateral patellar portals are established routinely and are used alternately as observation and operation portals.

## Femoral Trochlear Denervation

With the arthroscope placed through the anterolateral portal and the instruments placed through the supralateral patellar portal, the synovium, subsynovial fat, and periosteum are removed from the anterior side of the distal femur to skeletonize it with a shaver (ConMed Linvatec, Largo, FL) and a radiofrequency probe (Smith & Nephew, Andover, MA) (Fig 1, Table 1, Video 1). The hyperplastic synovium in the other part

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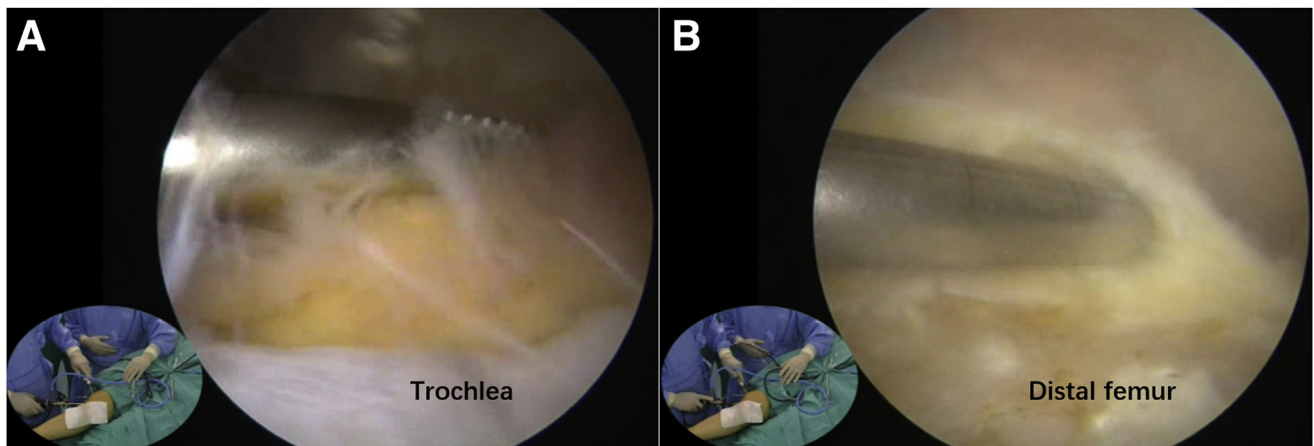
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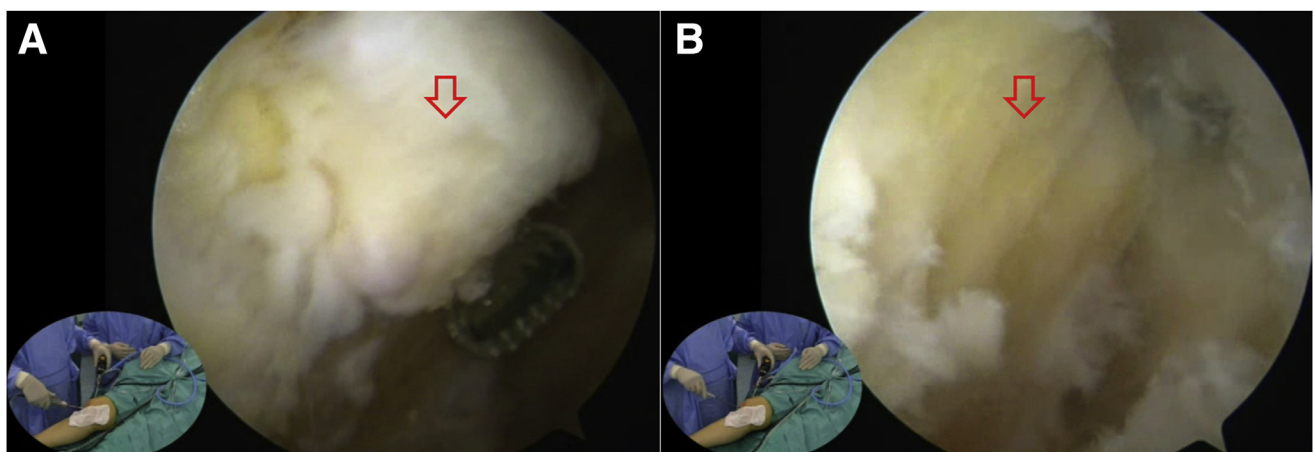
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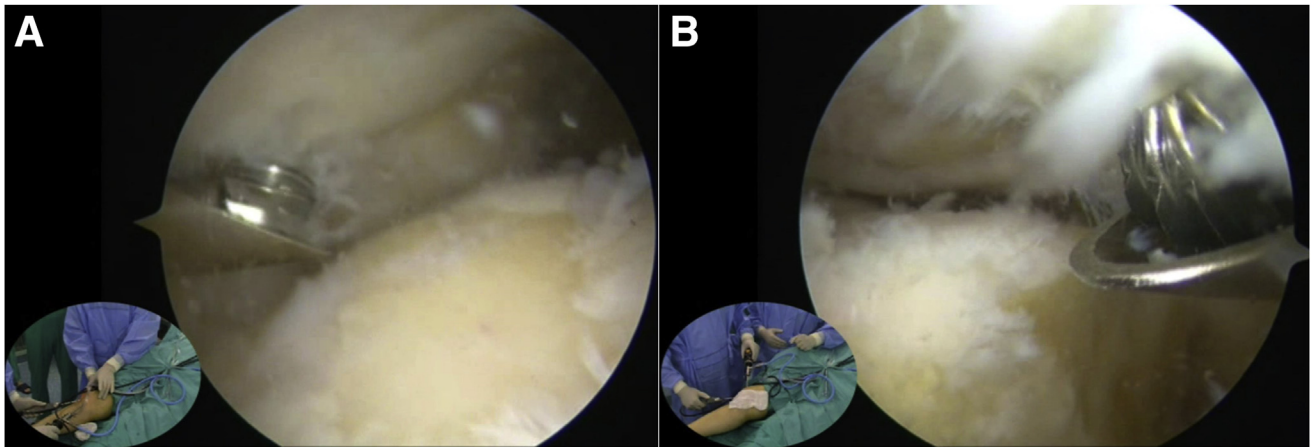
**Fig 1.** Arthroscopic view of suprapatellar pouch of right knee through anterolateral portal showing synovium and periosteal layer before (A) and after (B) removal.

**Table 1.** Step-by-Step Procedure of Arthroscopic Debridement, Facetectomy, and Synovectomy for Isolated Patellofemoral Osteoarthritis

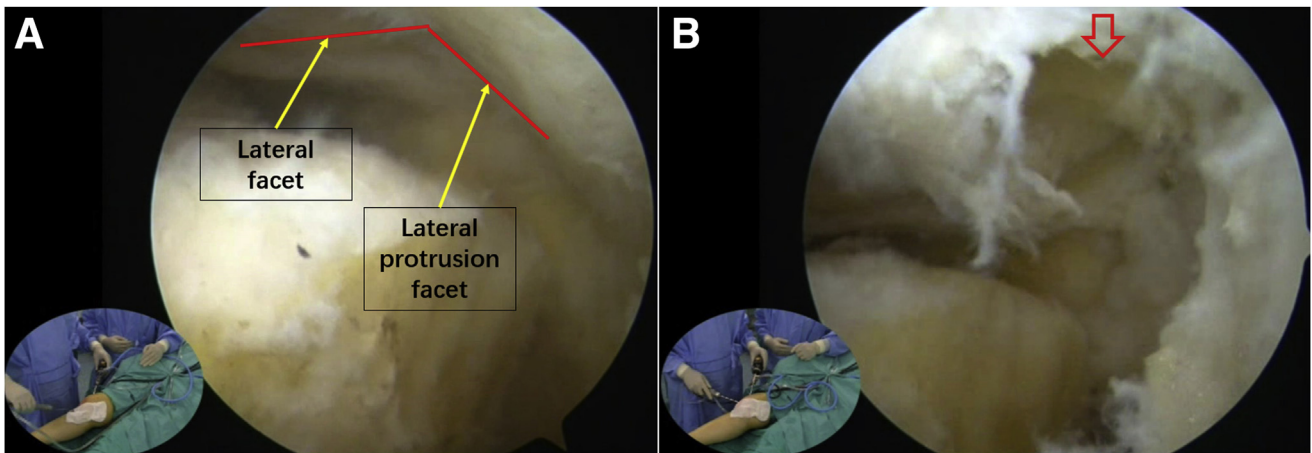
1. The synovium, subsynovial fat, and periosteum are removed from the anterior side of the distal femur to skeletonize it. The hyperplastic synovium in the other part of the suprapatellar pouch is removed.
2. The lateral side of the lateral femoral condyle is skeletonized by removal of the synovium, subsynovial fat, and periosteum. The hyperplastic synovium is removed from the lateral capsule of the lateral gutter.
3. The medial side of the medial femoral condyle is skeletonized by removal of the synovium, subsynovial fat, and periosteum. The hyperplastic synovium is removed from the medial capsule of the medial gutter.
4. Synovectomy is performed on the proximal, medial, and lateral sides of the patella.
5. The osteophyte on the lateral side of the lateral femoral condyle is removed.
6. The distal part of the lateral protrusion facet is removed.
7. An additional lateral patellar portal is created 1 cm lateral to the supralateral pole of the parallel.
8. The proximal and middle parts of the lateral protrusion facet are removed. The hyperplastic proximal patellar pole is removed partially.
9. The remaining part of the osteophyte at the proximal patellar pole is removed.
10. The infrapatellar pad is removed.
11. The conjunction of the vastus lateralis and iliotibial band is defined in an extracorporeal manner.
12. Lateral retinacular release is performed from the anterolateral portal, along the anterior edge of the iliotibial band, to the conjunction of the vastus lateralis and iliotibial band.



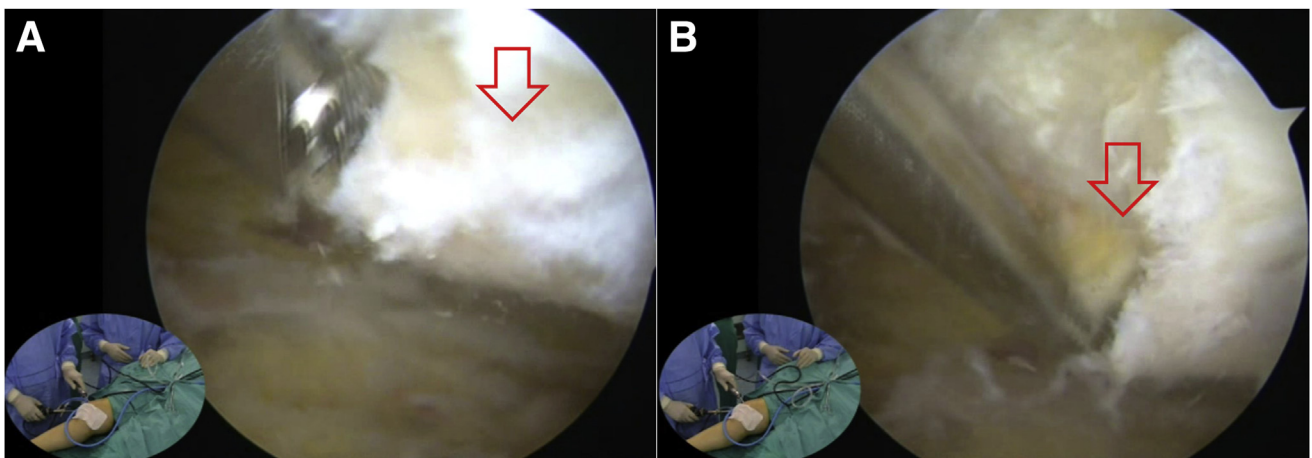
**Fig 2.** Arthroscopic view of lateral gutter of right knee through supralateral patellar portal. The osteophyte on the lateral side of the lateral femoral condyle (A) (arrow) is removed (B) (arrow).



**Fig 3.** Arthroscopic view of right knee through anteromedial portal (A) and through supralateral patellar portal (B). The lateral extrusion facet of the patella is removed from the anterolateral portal (A) and the lateral patellar portal (B).

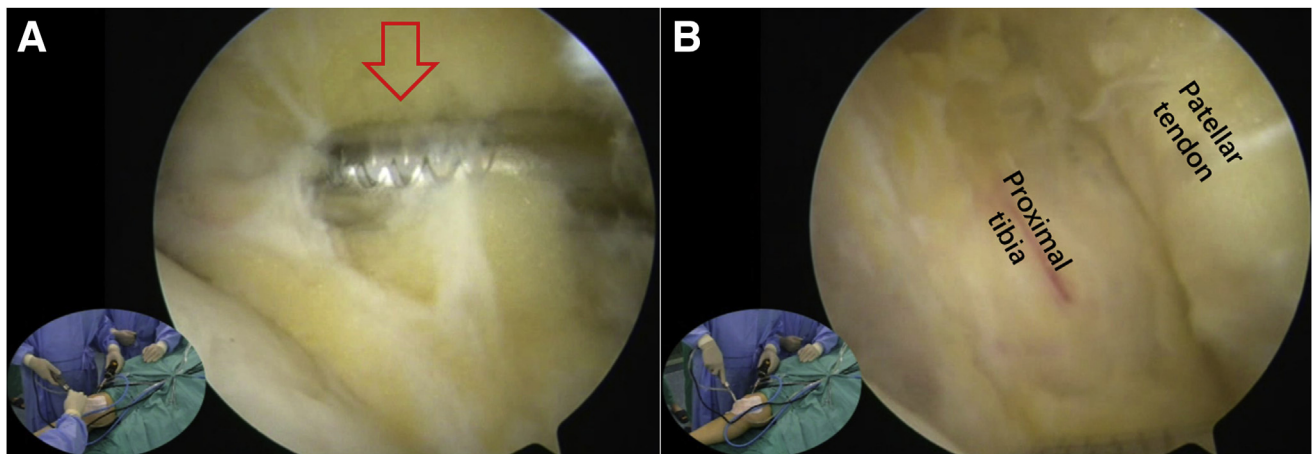


**Fig 4.** Arthroscopic view of right knee through supralateral patellar portal showing lateral protrusion facet before (A) and after (B) (arrow) removal.



**Fig 5.** Arthroscopic view of suprapatellar pouch of right knee through anterolateral portal. The osteophyte at the proximal pole of the patella (A) (arrow) is removed (B) (arrow).





**Fig 6.** Arthroscopic view of anterior compartment of right knee through supralateral patellar portal. The infrapatellar pad (A) (arrow) is removed (B) to cut the retrograde innervation of the patella.

of the suprapatellar pouch is removed with a shaver (ConMed Linvatec). The range of periosteal removal is 6 to 8 cm proximal to the proximal edge of the femoral trochlea. The goal of the distal femoral skeletonization is to cut off the innervation of the subchondral bone of the femoral trochlea through the periosteum (femoral trochlear denervation).

Then, the lateral side of the lateral femoral condyle is skeletonized by removal of the synovium, subsynovial fat, and periosteum. The hyperplastic synovium is removed from the lateral capsule of the lateral gutter.

With the instruments placed through the anteromedial portal, the medial side of the medial femoral condyle is skeletonized by removal of the synovium, subsynovial fat, and periosteum. The hyperplastic synovium is removed from the medial capsule of the medial gutter.

### Patellar Denervation

With the instruments placed through the supralateral patellar portal, synovectomy is performed on the proximal side of the patella. Then, the arthroscope is placed through the anterolateral portal and the instruments are placed through the anteromedial and

anterolateral portals, and synovectomy is performed respectively on the medial side and lateral side of the patella. The purpose of this peripatellar synovectomy is to form a 1-cm-wide synovectomy band around the patella to remove the synovium-derived innervation of the patella.

### Femoral Trochlea-plasty

With the arthroscope placed through the supralateral patellar portal and the instruments placed through the anterolateral portal, the osteophyte on the lateral side of the lateral femoral condyle is removed with an arthroscopic burr (ConMed Linvatec) (Fig 2).

### Patella-plasty

With the arthroscope placed through the anteromedial portal and the instruments placed through the anterolateral portal, the distal part of the lateral protrusion facet is removed (Fig 3A). Then, the arthroscope is placed through the suprapatellar portal, and an additional lateral patellar portal is created 1 cm lateral to the supralateral pole of the patella. With the instruments placed through the lateral patellar portal, the proximal and middle parts of the lateral protrusion

**Table 2.** Pearls and Pitfalls of Arthroscopic Debridement, Facetectomy, and Synovectomy for Isolated Patellofemoral Osteoarthritis

1. Patellofemoral osteoarthritis always involves synovial hypertrophy and inflammation; synovectomy is a direct way to address this condition. However, over-resection of the synovium is not proposed owing to its various normal functions to protect the knee.
2. During skeletonization of the medial and lateral femoral condyles, care should be taken not to release the medial collateral ligament and the posterolateral structure.
3. After removal of the osteophyte from the femoral condyle, the spongy bone surface should be cauterized to devitalize the surface layer to reduce the potential for osteophyte regeneration.
4. The target of patellar facet excision is the extra lateral facet that goes downward. It is easy to distinguish this from the true lateral patellar facet that goes upward. In general, the patellar part that stays lateral to the lateral surface of the lateral femoral condyle should be removed.
5. The osteophytes at the patellar poles should be removed to eliminate their irritation of the patellar tendon and quadriceps tendon.
6. Lateral retinacular release is performed along the anterior edge of the iliotibial band to the conjunction of the vastus lateralis and iliotibial band. The surgeon must not move in a direct proximal direction. Otherwise, the vastus lateralis may be released from the patella, resulting in its medial instability.

facet are removed (Figs 3B and 4). The hyperplastic proximal patellar pole is removed partially. With the arthroscope placed through the anterolateral portal and the instruments placed through the suprapatellar portal, the remaining part of the osteophyte at the proximal patellar pole is removed (Fig 5).

### Removal of Infrapatellar Pad

With the arthroscope placed through the supralateral patellar portal and the shaver placed through the anterolateral portal, the infrapatellar pad is removed to cut the retrograde innervation of the patella from the proximal tibia (Fig 6).

### Lateral Retinacular Release

The arthroscope is placed through the anteromedial portal and the radiofrequency probe is placed through the anterolateral portal. The conjunction of the vastus lateralis and iliotibial band is defined in an extracorporeal manner. Lateral retinacular release is performed from the anterolateral portal, along the anterior edge of the iliotibial band, to the conjunction of the vastus lateralis and iliotibial band.

### Discussion

To surgically address PFOA, various techniques have been reported, which include mainly partial lateral facetectomy,<sup>4,5</sup> tibial tubercle osteotomy,<sup>6</sup> and patellofemoral arthroplasty (replacement),<sup>7,8</sup> with different surgical results. The main features of the current technique are patellofemoral plasty, which includes partial lateral facetectomy, and patellofemoral denervation. It is named arthroscopic patellofemoral arthroplasty (APFA) because we hope to realize the pain-relieving mechanism of patellofemoral replacement with this arthroscopic procedure. Considering that pain originates mainly from the subchondral bone and the synovium, we perform patellofemoral denervation and synovectomy to eliminate the pain source. Compared with patellofemoral replacement, this procedure is simpler.

Pearls and pitfalls are listed in Table 2. Technically, this is a simple procedure. However, the patients should be carefully selected because most of the patients are female and in menopause and some patients may not be suitable for any surgical procedures because of psychological problems.<sup>9</sup>

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