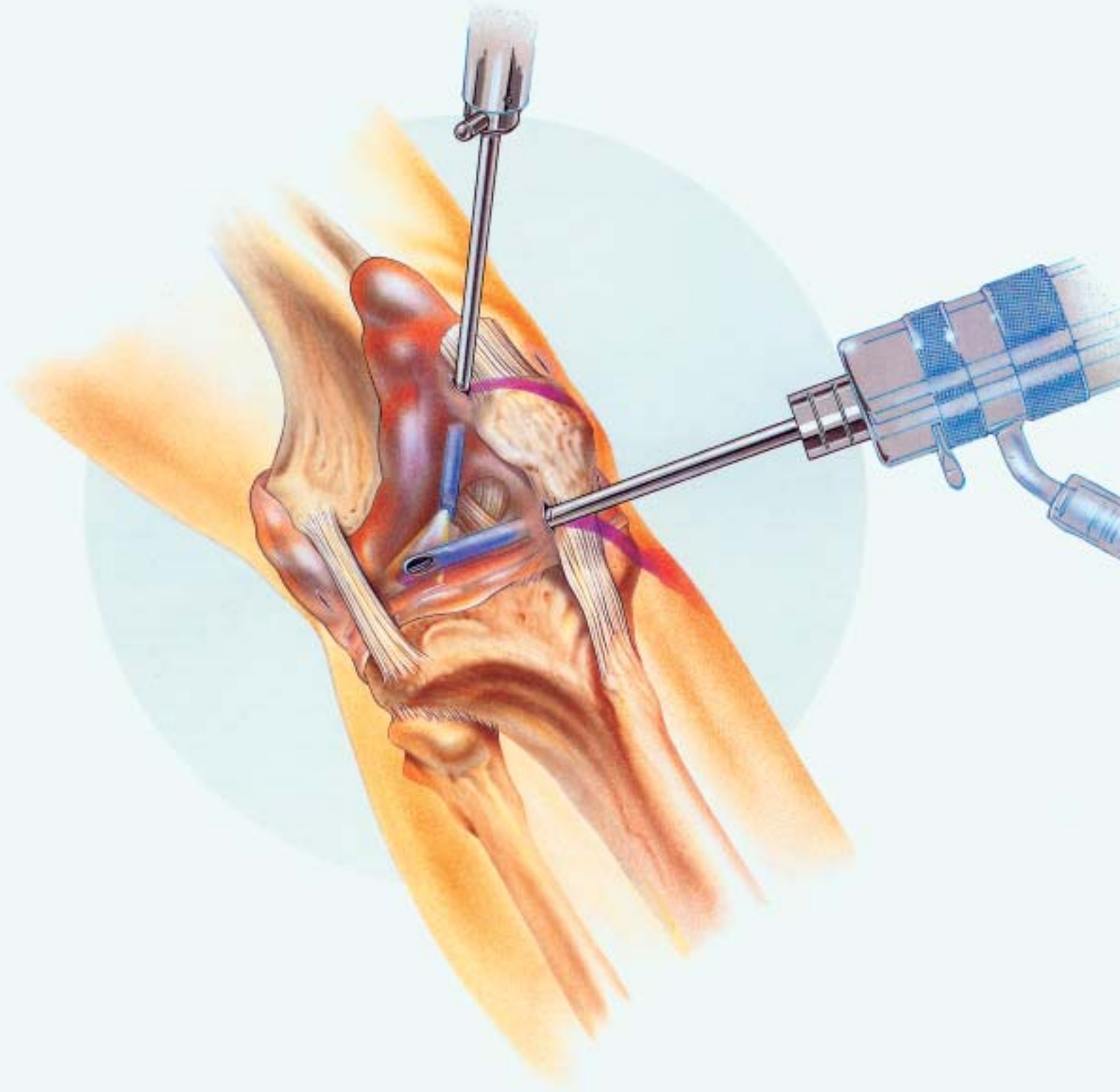


# An Illustrated Guide to Arthroscopic Synovectomy of the Knee



Arthroscopic Synovectomy of the Knee as described by Thomas D. Rosenberg, M.D.

# Arthroscopic Synovectomy of the Knee

## Improving on Past Experience

Past experience with open synovectomy of the knee has shown that the procedure, while benefiting some primary synovial diseases, is necessarily incomplete, thus inviting recurrence; requires prolonged hospitalization; and, in many cases, results in permanent loss of motion, even after manipulation. The procedure, like any open surgery, also presents the risk of wound complications. The severity and frequency of the problems associated with traditional synovectomy have made many physicians reluctant to suggest the procedure to their patients. When synovectomy is undertaken, the orthopaedic surgeon must have misgivings as to the risk/benefit relationship.

Recent advances in arthroscopic technique and instrumentation permit visualization of all knee joint surfaces and the systematic removal of proliferative synovium from virtually any of these surfaces. The advanced technique recently developed permits a more thorough synovectomy without sacrificing the menisci, without requiring quadriceps division, with

diminished risk of hemarthrosis, and with minimal skin violation. Arthroscopic synovectomy is performed, often as an outpatient procedure, reducing both the costs and the disability period. The majority of patients have less pain than with the open procedure and quickly recover normal, or near-normal, range of motion without supervised physical therapy. Postoperative manipulation has not been necessary. Moreover, if synovitis recurs over the long term, for example in pigmented villonodular synovitis, arthroscopic synovectomy may be repeated since the joint has been only minimally disrupted.

### Patient Selection

The indication for synovectomy is generalized primary synovial disease. Candidates are patients with synovial disease who have been disabled for at least six months by pain and significant swelling of the knee, unresponsive to medical treatment. Their symptoms are caused by:

- Rheumatoid arthritis
- Rheumatoid variant diseases such as psoriatic arthritis or Reiter's syndrome
- Pigmented villonodular synovitis
- Synovial chondromatosis
- Chronic nonspecific monarticular synovitis

Preoperative evidence of significant narrowing of the articular cartilage space is a contraindication to arthroscopic synovectomy. In patients with advanced rheumatoid arthritis involving multiple joints, arthroscopic synovectomy may not be of enduring benefit.

### An Advanced Technique

Arthroscopic synovectomy is an advanced technique. It requires considerable experience in basic arthroscopic knee procedures as well as an opportunity to observe and master the specific, less familiar techniques used, such as operating in the posterior compartments. It should also be pointed out that proliferative synovium obstructs vision, increasing the difficulty of exposing and identifying structures.

The motorized instrumentation used was designed for maximum ability to reach all areas and to be sufficiently aggressive for effective performance. These desirable characteristics, however, also mandate discretion in the instruments' use. The surgeon must be particularly aware of the orientation of the instrument window, to avoid infringement on articular cartilage.

### Visual Control: A Six-Portal Approach

The basis of arthroscopic synovectomy of the knee is the use of 6 portals placed so that all areas, or compartments, can be visualized and systematically reached by operative instruments. This can be accomplished by appropriately interchanging the Arthroscope and resecting instruments under visual control with the use of a sterile television camera. Access to areas of synovial hypertrophy in the posterior compartments, inaccessible without significant morbidity in open synovectomy, is achieved with this technique. Synovial proliferation in the posterior compartments is generally severe, consistent with other areas of the joint.

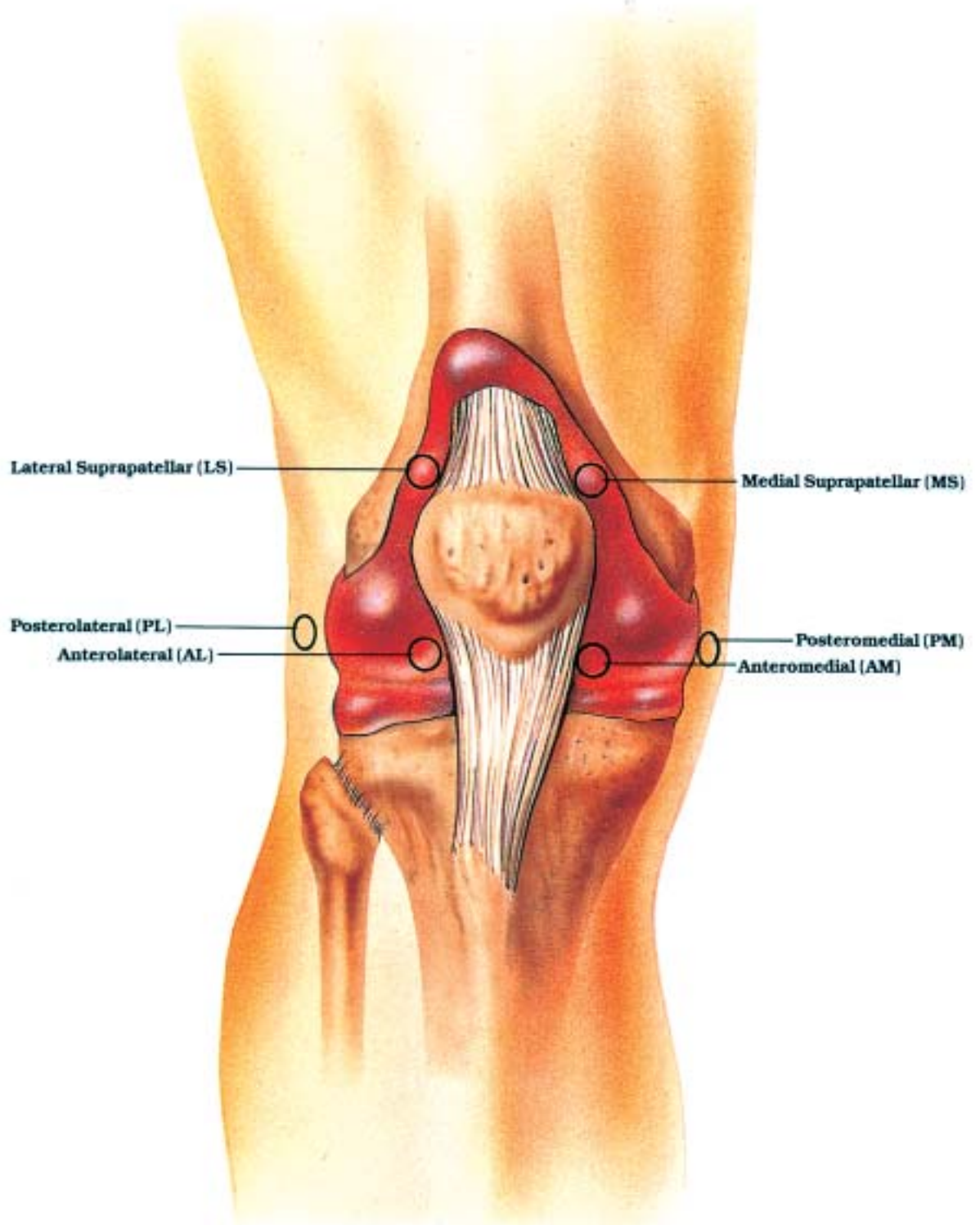
The six portals required are shown in Figure 1. Diagnostic procedures can be performed with two portals, and some surgical procedures, such as partial synovectomy, can be performed by triangulation through two or three portals in the knee. Successful, thorough synovectomy, however, mandates the use of six portals for complete visualization and near-complete debridement of all compartments involved in the diffuse synovitis typical of these conditions.

### Operative Technique

#### Setup and Instrumentation

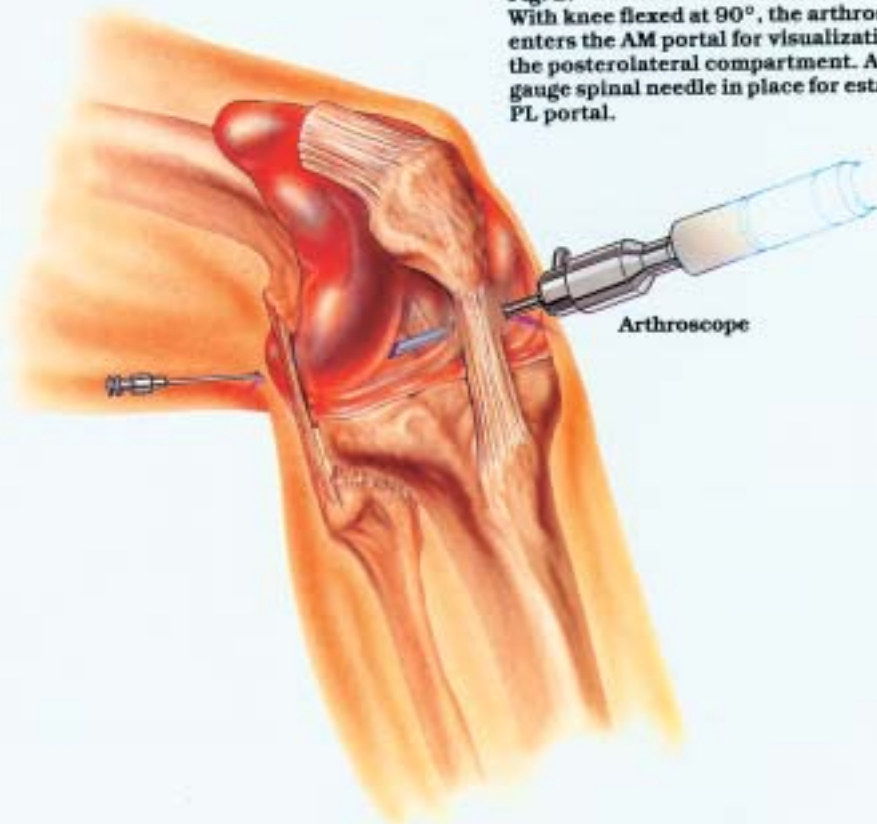
- General anesthesia is administered.
- Exsanguination is effected and a proximal thigh tourniquet is positioned and inflated.
- The table end is flexed; a thigh-holding device is applied approximately 8" above the patella. Sterile prepping and draping are performed.
- Throughout the procedure distension is maintained by a gravity flow system through a 5mm arthroscope. If a 4mm arthroscope is used, a high flow cannula is recommended.
- A sterile television camera is required. All viewing throughout this procedure is by monitor; direct viewing must be considered inappropriate for lengthy arthroscopic procedures.
- Meticulous sterile technique must be maintained. The procedure may be lengthy, requiring 1½ to 2 hours, particularly when the operator has limited experience.
- A 5.5mm Full Radius Synovectomy Blade designed for both side and end cutting is used in most areas; a 3.5mm Full Radius Synovectomy Blade or 4.5mm Synovial Resector is used in restricted areas such as under the menisci or in patients with small knees.

**Fig. 1. Six Portals Required for Arthroscopic Synovectomy**

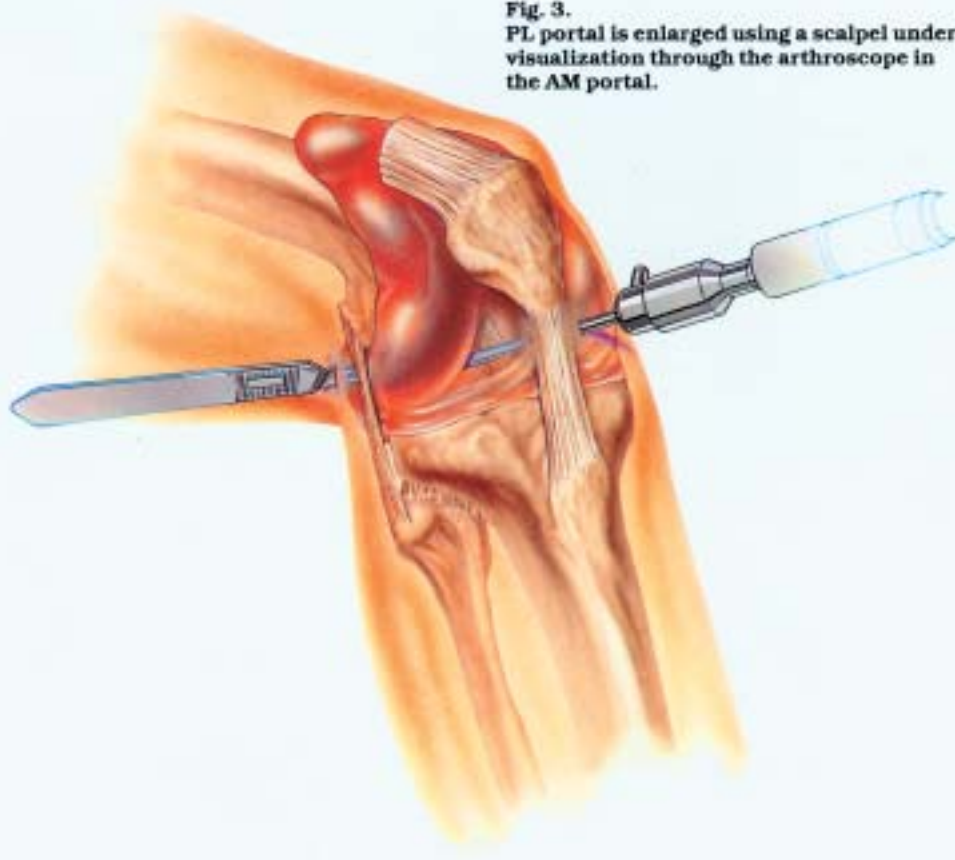




**Fig. 2.** With knee flexed at 90°, the arthroscope enters the AM portal for visualization of the posterolateral compartment. A 20 gauge spinal needle in place for establishing PL portal.



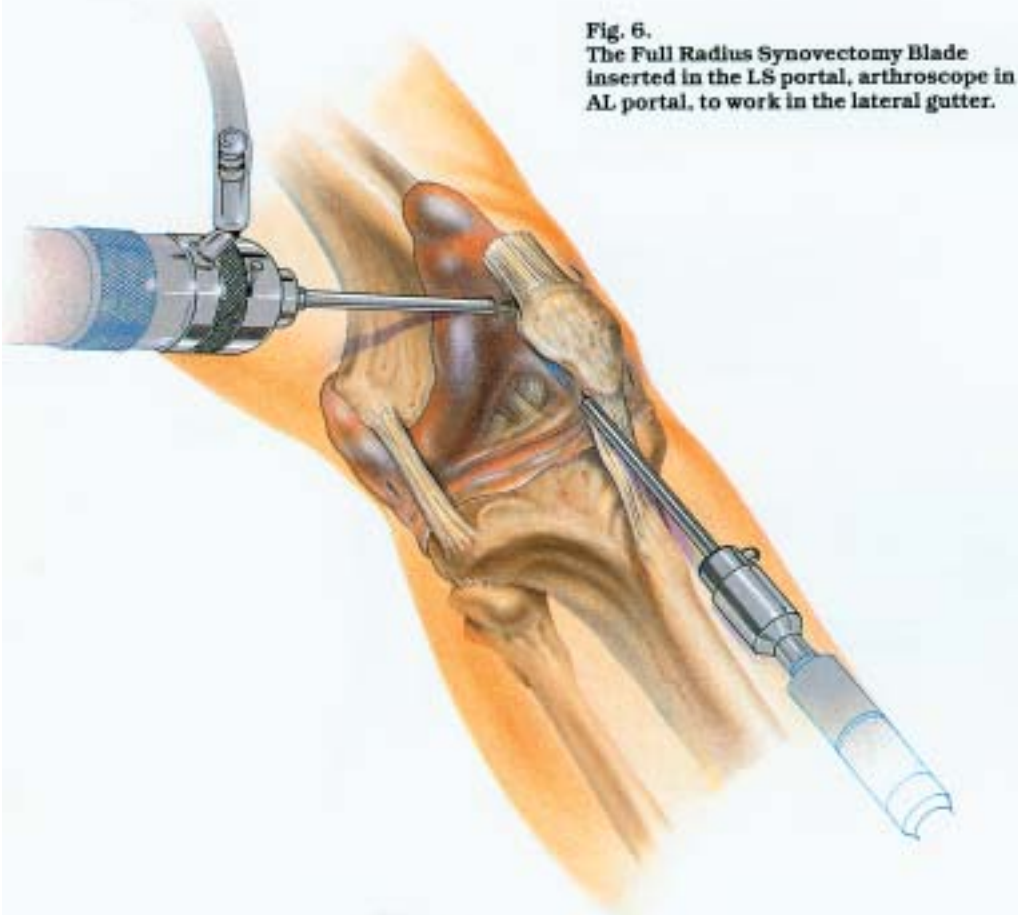
**Fig. 3.** PL portal is enlarged using a scalpel under visualization through the arthroscope in the AM portal.



## Procedure

The advanced technique described here for arthroscopic synovectomy requires constant visualization of synovium, other anatomical structures, and the resector. Failure to observe the orientation of the motorized resector can result in damage to adjacent tissue.

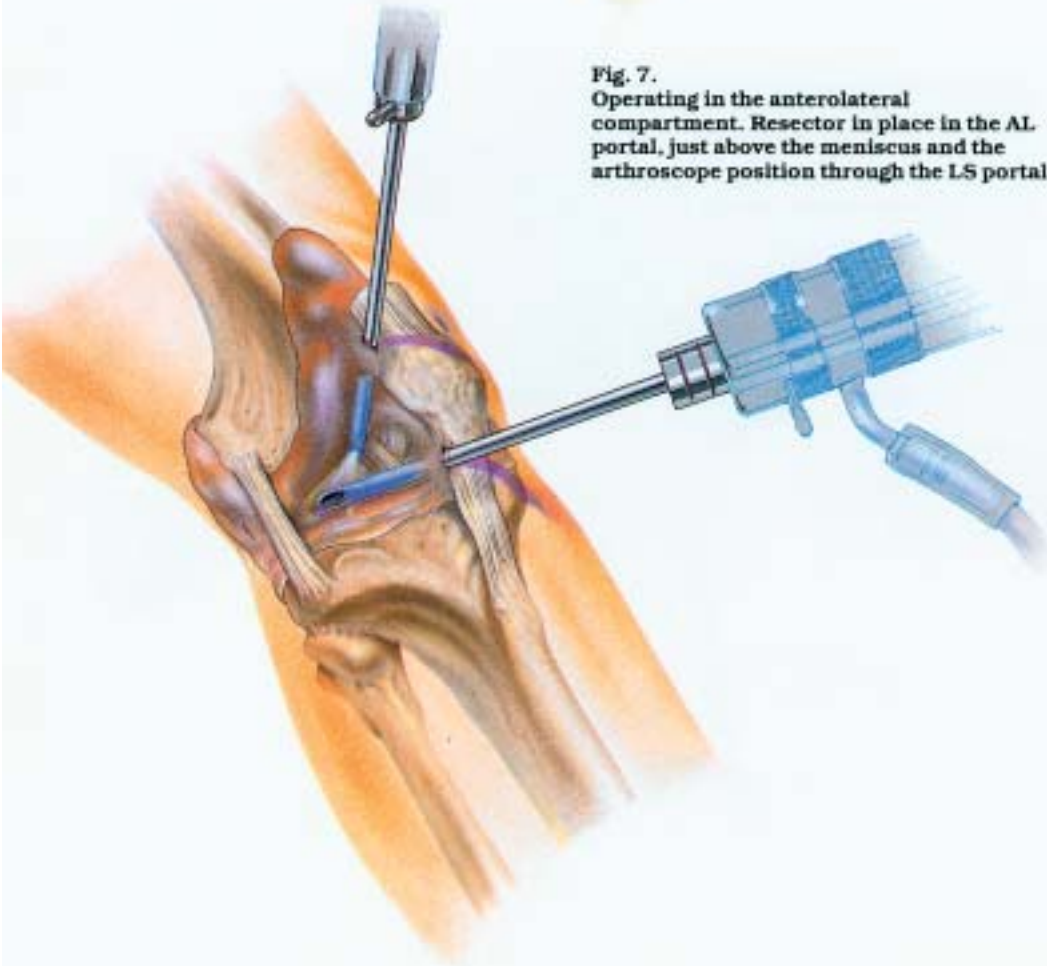
- The first portal, the standard AL portal, is created immediately adjacent to the infrapatellar tendon and 1cm above the jointline. A 4mm or 5mm 30° fore-oblique arthroscope is inserted and the sterile television camera is attached. Systematic arthroscopic examination is performed, proceeding from the suprapatellar pouch into the lateral and medial gutters, the patellofemoral articulation, intercondylar notch, and lateral and medial compartments.
- The AM portal mirrors the AL portal and is, likewise, placed immediately adjacent to the infrapatellar tendon and 1cm above the jointline. Correct placement of the AM and AL portals permits passage into the posterior compartment. During the diagnostic phase of the procedure, probing is done through the AM portal. The AM portal is also used for triangulation to obtain a biopsy specimen in an area of florid pathology. The ability to see the synovium clearly makes it possible to obtain a specimen characteristic of the disease.
- After completion of diagnostic arthroscopy and biopsy, a 4mm or 5mm 70° arthroscope is introduced through the AM portal and passed into the posterolateral compartment, using a modified Gillquist approach. Excellent distension and visualization are achieved by combining flexion of the knee (approximately 90°) and saline inflow through the arthroscope. Figure 2 shows the arthroscope inserted in the AM portal and passed into the posterolateral compartment.
- The PL portal is established by external palpation of the posterolateral corner of the knee and trial insertion of a 20 gauge spinal needle (Figure 2). With the knee flexed to 90°, the portal should lie approximately 1cm posterior to the femoral condyle and 1cm above the jointline. Since the relationship of these landmarks is altered as the knee is extended, care is needed to maintain the 90° flexed position. The portal is enlarged using a #11 scalpel (Figure 3).



**Fig. 6.**  
**The Full Radius Synovectomy Blade inserted in the LS portal, arthroscope in AL portal, to work in the lateral gutter.**

- A 30° arthroscope is reinserted through the AL portal and passed into the suprapatellar pouch. The LS and MS portals are made and the synovial resector is inserted first in one, and then in the other portal, to excise synovium from the suprapatellar and gutter regions under visual control (Figure 6).

- To reach the lower portions of the medial and lateral gutters, instrumentation is reversed, with visualization achieved through the LS or MS portal and instrumentation through the AM or AL portal (Figure 7).

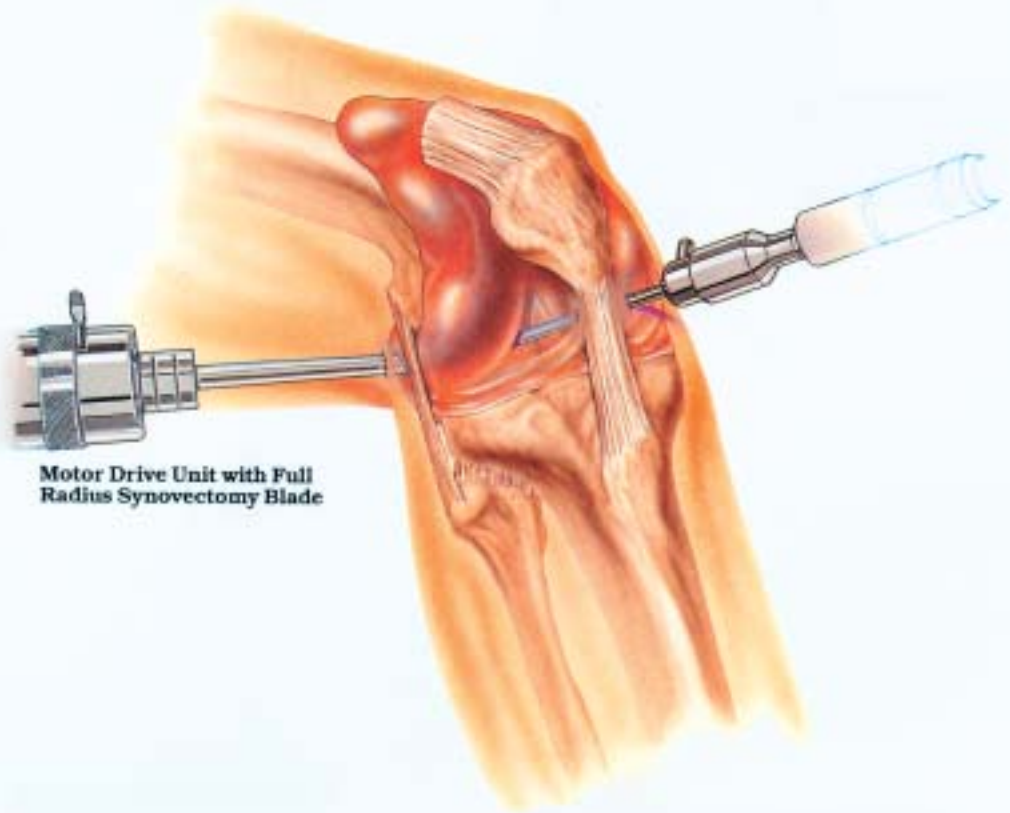


**Fig. 7.**  
**Operating in the anterolateral compartment. Resector in place in the AL portal, just above the meniscus and the arthroscope position through the LS portal.**



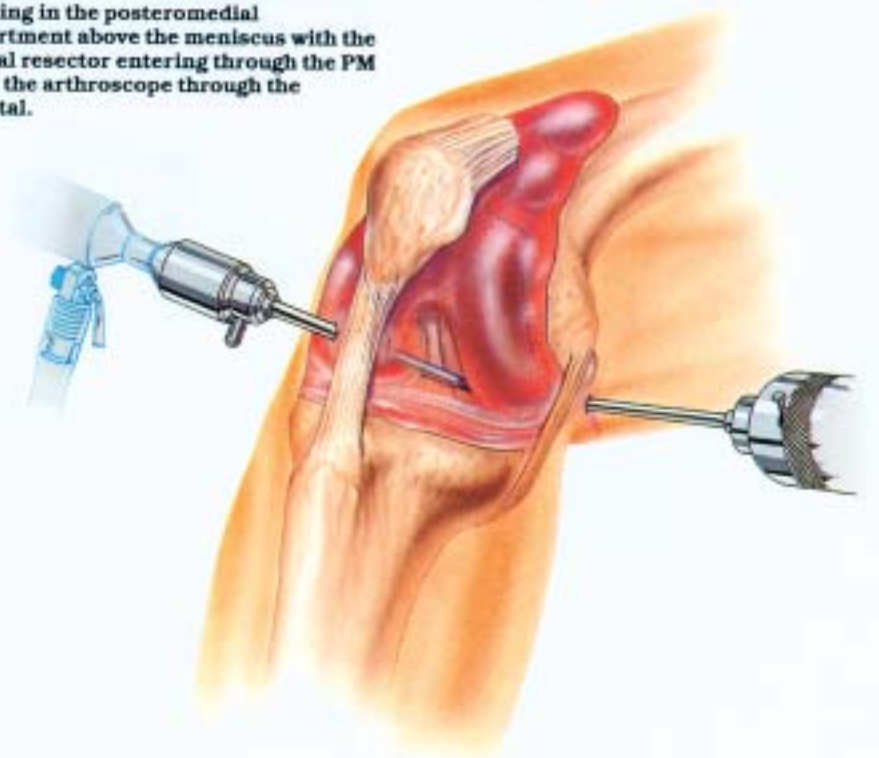
- The Full Radius Synovectomy Blade is then introduced into the PL portal (Figure 4). With the posterolateral compartment visualized on the monitor, synovial excision is begun. Excision proceeds systematically to encompass all areas of the posterolateral compartment, working from the excised edge into the diseased areas. Rotation of the 70° arthroscope permits complete visualization.
- The 70° arthroscope is then inserted through the AL portal into the posteromedial compartment. The PM portal is established in the same fashion as the PL portal and synovial excision in the posteromedial compartment is similarly undertaken, under visual control (Figure 5).

**Fig. 4.**  
**Full Radius Synovectomy Blade in place through the PL portal; the tip of the resector is in the posterolateral compartment.**

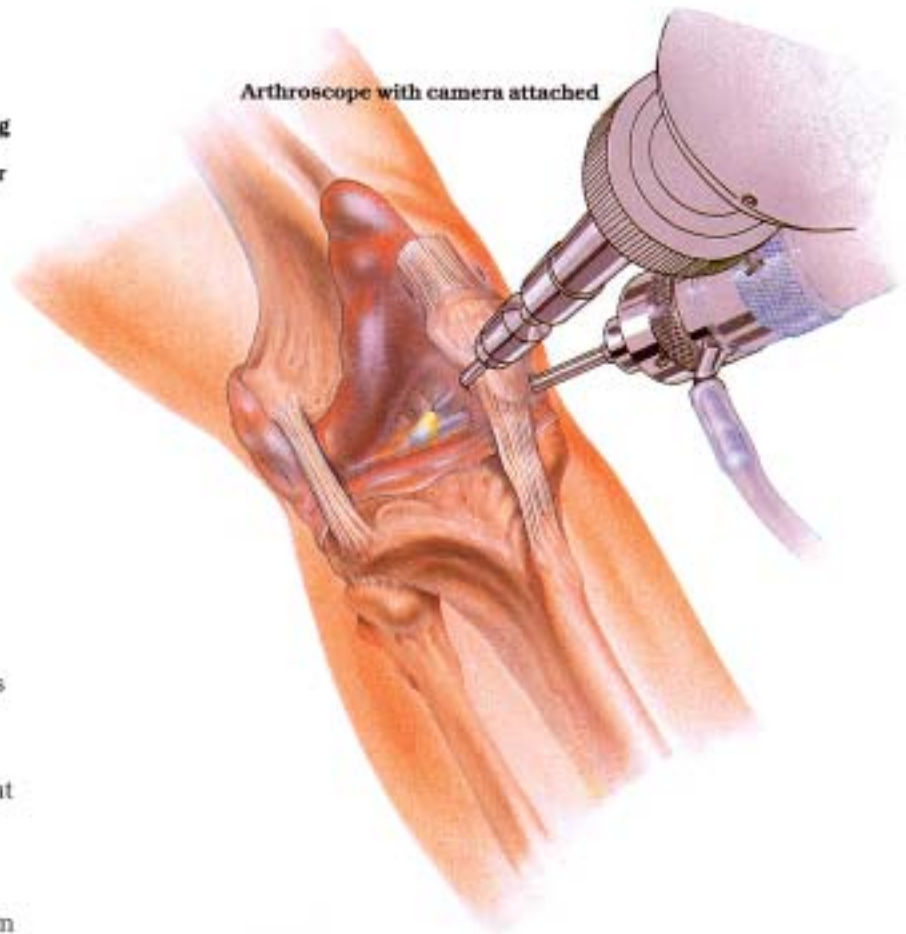


**Motor Drive Unit with Full Radius Synovectomy Blade**

**Fig. 5.**  
**Operating in the posteromedial compartment above the meniscus with the synovial resector entering through the PM portal, the arthroscope through the AL portal.**



**Fig. 8.** Arthroscope in position on lateral side, instrumentation on medial side for working in subpatellar area. Following this, operating can proceed to the intercondylar notch, working on either side of the cruciate ligaments.



- Anterior synovial excision and excision from the intercondylar notch is effected by triangulation through the AM and AL portals (Figure 8).
- Finally, parameniscal synovium is excised, with the respective compartment stressed open. Excision, with a 3.5 or 4.5mm synovial resector, is done through the AM or AL portal while viewing through the opposite anterior portal. This area of proliferative synovium is often most symptomatic and during open synovectomy would require sacrifice of the menisci for debridement. With arthroscopic synovectomy, even the submeniscal synovium is accessible without meniscectomy (Figure 9). Note that there is a submeniscal "blind spot"; the orientation of the resector's window is crucial and should be directed at the synovium and not up or down toward an articular surface.

### Postoperative Management

At the surgeon's discretion, a suction drain may be used. A compression bandage is applied.

Patients may return home on the day of surgery with crutches provided for partial weight bearing. Oral pain medication is prescribed.

On the third postoperative day, the dressing and drain, if used, are removed. The patient is instructed in progressive weight bearing and ROM exercises.

By the fourth postoperative week, the range of motion is expected to equal or exceed the preoperative range. If not, formal physical therapy may be instituted. Manipulation has not been necessary in the experience to date. The majority of patients are ready to be reintroduced to near normal activity and to quadriceps strengthening exercises at the fourth week.

### Results and Summary

The disadvantages of open synovectomy may be overcome by six-portal arthroscopic synovectomy. Good or excellent results were obtained in 87% of patients with range of motion maintained or improved over preoperative levels in all patients.

- Manipulation was not required
  - Supervised physical therapy is rarely required
  - The menisci are spared
  - Division of the quadriceps is unnecessary
  - Serious hemarthrosis did not occur
  - The economic advantages of outpatient surgery apply
  - Patients experience less pain
- Six-portal arthroscopic synovectomy does require considerable technical expertise and special instrumentation (including specialized synovial resectors, a 70° arthroscope and a sterile television system).

By meticulously following the procedure outlined, visualization and access to all knee compartments are accomplished so that the advantages of thorough synovectomy are obtained with minimal joint and skin disruption. Resolution or retardation of the disease process can be anticipated in most patients.

**Fig. 9.** Cross section with the 3.5mm Full Radius Synovectomy Blade operating through AM portal in space between the meniscus and the tibia. Open tip is removing synovium from under the meniscus, oriented away from articular surface of the tibia. The compartment is stressed open for this segment of the procedure.



Arthroscopic Synovectomy  
of the Knee as described  
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