Arthroscopic Treatment of Popliteal Cyst

Review Article:
Arthroscopic Treatment of Popliteal Cyst and Visualization of Its Cavity Through the Posterior Portal of the Knee

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Abstract: In regard to arthroscopic treatment of popliteal cysts, we explored the refuted pathology for popliteal cysts proposed by others. Here we introduce an arthroscopic technique using posterior portals to treat a popliteal cyst based on our observation that the opening of the cyst in the joint is a slit-like structure in the posterior wall of the capsule. By disrupting this slit-like structure with our procedure, the popliteal cyst ceased to be palpable and was no longer symptomatic. This technique also provides excellent arthroscopic visualization of the cavity of the popliteal cyst through the knee joint approach. After completion of the resection of the opening, we can easily insert an arthroscope into the cavity of the popliteal cyst from the posteromedial portal through the resected opening. Arthroscopic visualization of the cavity of the cyst showed that the inside wall of the cavity was smooth and had no synovitis. We believe that to disrupt this slit structure is the most pathologically reasonable procedure to treat popliteal cysts surgically.

Key Words: Arthroscopic surgery, Popliteal cyst, Baker’s cyst, Posterior portal, Knee.

INTRODUCTION: Popliteal cysts or Baker’s cysts are most frequently characterized by the enlargement of the gastrocnemius-semimembranosus bursa among several bursa around the knee. Pathogenesis depends on the connection between the joint and bursa, with a valve-like effect allowing the passage of fluid from the joint into the bursa with subsequent distention, producing these cysts.

The surgical treatment for popliteal cysts is usually an open resection. However, a high recurrence rate has been observed after surgical removal of the cyst.

Some surgeons have confronted this problem by posing a closure of the communication channel between the articulation and the cysts by a simple cap-sular suturing, or its reinforcement, using the tendons of the gastrocnemius and semimembranosus muscles, or with a pedicle graft from the tendon of the medial head of the gastrocnemius.

An alternate surgical treatment for popliteal cysts is an arthroscopic treatment. It is based on the studies of the pathogenesis that the popliteal cyst is associated with intra-articular disorders.

Several investigators have reported that joint disorders are often associated with popliteal cysts. This has led to the concept that the underlying intra-articular lesions should also be treated, with the expectation that surgical correction of the intra-articular disorders would abolish the cyst. This treatment is supported by the hypothesis that popliteal cysts arise from fluid distension of a communicating gastrocnemius-semimembranosus bursa with the joint cavity, and the intra-articular disorders cause the inflammation and effusion of the joint cavity. The other hypothesis is that intra-articular disorders play a role as a valve-like structure in the communication between the joint and cyst, e.g., the meniscal body and the posterior horn that extend to an opening of the cyst in the articular capsule.

However, in our experience in arthroscopic treatment of popliteal cysts, we explored the refuted pathology for popliteal cysts proposed by others. Here, we introduce an arthroscopic technique to treat a popliteal cyst and explain our observation of the slit-like structure between the joint and the bursa. This technique provides excellent arthroscopic...
visualization of the cavity of the popliteal cyst through the knee joint approach.

**SURGICAL TECHNIQUE:** Patients are placed in the supine position and the affected knee joint is flexed 90° under general anesthesia. Routine arthroscopic examination of the knee joint is performed using standard anterolateral and anteromedial portals. The first step in the arthroscopic treatment of a popliteal cyst is to establish a posteromedial portal. We make a posteromedial portal by the methods described by Ahn and Ha. Briefly, a 30° arthroscope is inserted through the anterolateral portal into the space between the medial femoral condyle and the posterior cruciate ligament, and is pushed through the intercondylar notch to the posteromedial compartment with the knee flexed 60° to 90°. If this passage is difficult, the arthroscope can be inserted through the anteromedial portal rather than the anterolateral portal, and passed between the medial femoral condyle and the posterior cruciate ligament.

A spinal needle is inserted percutaneously from the medial posterior side of the knee into the posteromedial compartment with the knee flexed 90° under direct arthroscopic visualization of the tip of the needle from inside of the joint. A small longitudinal stab wound is made with a blade at the puncture site. The posteromedial portal is enlarged and kept open with a switching rod.

It is usually not easy to find an opening in a popliteal cyst in the posteromedial compartment of the knee joint even when using a posterior portal. To facilitate this step, we percutaneously inject a contrast dye (indigo blue) into the palpated popliteal cyst. The arthroscope is inserted into the posteromedial compartment through the posteromedial portal to view the wall of the posterior capsule. When we push through the skin of the popliteal cyst, the infiltrating dye from the opening of the cyst into the joint space is visualized. Once the opening is located, the capsular tissue around the opening is resected with a motorized shaver (Fig 1).

Routinely, a motorized shaver is inserted from the anterolateral or anteromedial portal through the passage between the medial femoral condyle and the posterior cruciate ligament, which was the route used to establish the posteromedial portal. If reaching the opening through this approach is difficult, we use a posterolateral portal to insert the shaver.

A posterolateral portal is established by the posterior trans-septal portal methods described by Ahn and Ha. It is easier to perform a resection of the opening through the posterolateral portal than by the anterior portals, but it is more invasive.

After the completion of the resection of the opening (Fig 2), we can easily insert an arthroscope into the cavity of the popliteal cyst from the posteromedial portal through the opening. The wall of the cavity of the popliteal cyst is smooth inside the synovial capsule (Fig 3).

Usually, it takes one month for the swelling of a popliteal cyst to reduce along with the disappearance of inflammation and effusion of the joint. After a couple of months, the popliteal cyst is not palpable or symptomatic and a magnetic resonance imaging (MRI) scan of the area will be clear.

**DISCUSSION:** Popliteal cysts are connected to the knee joint by means of a valvular mechanism. The presence of such a valve, along with the existence of an effusion, creates a 1-directional flow of the synovial fluid from the articular cavity to the cyst, and is one of the factors responsible for the appearance and persistence of the cyst. Therefore, the pathogenesis of the retention of the fluid in the bursa has 2 factors, joint effusion and a 1-way valve-like mechanism. There are 2 methods of treating a symptomatic popliteal cyst. The first is to treat the intra-articular disorders, such as meniscal tears and chondral lesions, to reduce the joint effusion. The second is to disrupt the 1-way mechanism between the joint and bursa, and to establish an unobstructed freeway connection between them.
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**FIGURE 1.** (A) Opening at the wall of the posterior capsule in the posteromedial compartment of the knee joint. A 30° arthroscope is placed in the posteromedial compartment through the posteromedial portal. (B) Resection of the capsular tissue with a motorized shaver.

**FIGURE 2.** The disrupted opening after the capsular tissue that previously encircled the opening was resected by a motorized shaver.

**FIGURE 3.** Arthroscopic views of the inside of the cavity of a popliteal cyst. (A) The same popliteal cyst shown in Figs 1 and 2. (B) A popliteal cyst in a different patient.
There have been several reports on intra-articular disorders associated with popliteal cysts, and some authors have proposed that intra-articular disorders act as a valve at the communication between the joint and the bursa. Sansone and De Ponti\(^6\) noted 27 medial meniscal tears in 30 patients (90%) with popliteal cysts. They per-formed a selective meniscectomy of the medial me-niscus, and at the end of the procedure, in 27 of 30 cases, there appeared an oval opening located between the meniscal body and the posterior horn that extended to the articular capsule. They proposed that the tear of the posterior horn of the medial meniscus in all of the structures might act as a valve. However, we remain doubtful that the posterior horn of the medial meniscus in all of the structures might act as a valve. One reason for this doubt is that Rupp et al.\(^8\) studied the prevalence of popliteal cysts and the associated intra-articular lesions in 100 patients for arthroscopic sur-gery of the knee without removal of the cyst and they found that articular cartilage lesions were the intra-articular lesion most often associated with a popliteal cyst. They suggest that lesions of the articular cartilage have an important role in the pathogenesis of secondary popliteal cysts. The articular cartilage lesions can cause the joint effusion, but cannot act as a valve.

The second reason is that, in our experience, the arthroscopic visualization through the posterior portal showed that there is a significant wide space between the rim of the posterior horn of the medial meniscus and the opening of the bursa, and it is not likely that the structure of the intra-articular disorders can extend to the opening of the bursa located in the medial-posterior wall of the joint capsule. Therefore, the intra-articular disorders can cause the joint effusion leading to a secondary popliteal cyst through the communication between the bursa and the joint, but do not seem to be able to act as a valve for the communication.

There have been several reports about arthroscopic visualization of the opening of the bursa in the joint, and 2 reports on the direct arthroscopic visualization of the cavity of the popliteal cyst through the joint space. Sansone and De Ponti\(^6\) described that it was possible to introduce the arthroscope into the capsular orifice to inspect the cyst connection, which did not seem to have a wall of its own but appeared instead to give access to a cavity defined by the myoten-dinous structure of the popliteal region. Johnson et al.\(^10\) performed diagnostic arthroscopy to identify the presence of popliteal bursa in 195 knees; 37% of knees had a popliteal bursa identified by the communication with the posterior medial compartment from the routine anterolateral portal via the intercondylar notch or a posterior medial transcutaneous approach.

The method of evaluation used in their study provided direct visualization with magnification for identification of the posterior medial compartment for communication with the popliteal bursa. They described the entry in the cyst behind a capsular fold of the posterior wall of the medial compartment. In their observations, if there was synovitis in the knee joint, there was also synovitis in the posterior medial compartment and in the bursa. However, we are not sure whether the authors of these reports actually visualized the correct opening and the cavity of the popliteal cyst.

In our experience, the opening of the cyst in the joint is a slit-like structure in the posterior wall of the capsule. It is often impossible to observe the slit-like opening of the cyst from anterior portals because the opening is located in the far medial side of the posterior compartment of the joint. Furthermore, as the cysts extend from the opening downward in the distal direction, an arthroscope would need to be inserted in a more vertical direction to inspect the cyst deeply enough, which is impossible from the anterior portals. Arthroscopic visualization of the intracavity of the cyst showed that the inside wall of the cavity was smooth with no synovitis, which refutes the results reported by others concerning the myoten-dinous structure or the presence of synovitis inside of the cyst.
Some cysts have no communication to the joint, and thus no opening inside the joint. Therefore, we routinely confirm the communication between the joint and bursa using axial view MRI before surgery. If we do not confirm it by MRI, then we confirm it by arthrography by injecting a contrast dye into the joint. If there is no filling of the dye into the bursa, we do not perform this arthroscopic technique. In such a case, open surgery is necessary.

In summary, we found a slit structure at the communication between the joint and popliteal cyst. Although we have not yet firmly established whether this slit structure acts as a valve, we do believe that to disrupt this slit structure is the most pathologically reasonable procedure to treat a popliteal cyst surgically.

REFERENCES:

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