



Case report

Direct posterior endoscopic excision of atypical popliteal cyst: A case report

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ABSTRACT

Certain types of popliteal cysts do not possess the common pathophysiology of Baker's cysts, such as location or the presence of a one-way valve lesion. The traditional arthroscopic approach and excision of such atypical popliteal cysts are difficult because they do not communicate with the knee joint, especially when located behind the popliteal neurovascular structure. In this case report, we introduce a direct posterior endoscopic technique for the excision of atypical popliteal cysts when accessing them through the traditional arthroscopic approach is unfeasible. In this case, the popliteal cyst was not located between the gastrocnemius medial head and the semi-membranosus muscle and did not communicate with the knee joint. Passage of the popliteal artery was observed running on the anteromedial side of the popliteal cyst. Therefore, a direct posterior endoscopic approach was decided for the surgical treatment of the popliteal cyst, and the atypical popliteal cyst was successfully excised without any complications. We also describe the possible advantages and pitfalls of the direct posterior endoscopic approach.

Clinical relevance: Direct posterior endoscopic excision using an intra-cystic portal in the prone position is considered a safe and effective treatment method for atypical popliteal cysts.

1. Introduction

The most common form of Baker's cyst, also known as popliteal cyst, is primarily found between the semimembranosus muscle and the medial head of the gastrocnemius muscle [1]. While the cause and pathophysiology of Baker's cysts are not fully understood, a series of studies have revealed that the valve-shaped orifice allows unidirectional flow of knee effusions into the bursa through a valvular opening [2]. This valvular mechanism also serves as an important landmark for assessing cysts during arthroscopic surgery [3]. Previous studies have introduced arthroscopic techniques for the excision of Baker's cysts [4,5]. In these studies, the anterolateral or posteromedial portal was used to access the cyst, and the arthroscope was advanced into the cyst via an enlarged one-way valve lesion.

However, certain types of popliteal cysts do not possess the common pathophysiology of Baker's cysts, such as location and presence of a one-way valve lesion. These atypical popliteal cysts have no communication with the knee joint. The arthroscopic

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approach and excision of such atypical popliteal cysts using traditional anterolateral or posteromedial portals are difficult, particularly when the popliteal cyst is located behind the popliteal neurovascular structure. Therefore, posterior open excision has been used for treating atypical popliteal cysts [6,7].

In this case report, we introduce a direct posterior endoscopic technique for the excision of atypical popliteal cysts when it is impossible to access them using the traditional arthroscopic approach. We also described the possible advantages and pitfalls of the direct posterior endoscopic approach in the Discussion section.

2. Case presentation

A 53-year-old woman presented with a 3-year history of a lump on the posterior aspect of a right knee joint. The patient had no underlying diseases. She complained of a lump growing at the posterior aspect of her right knee joint, along with pain and discomfort while walking or standing with the knee joint extended. On physical examination, her range of right knee range of motion (ROM) was identified at 10–130°. No internal swelling of the knee joint or tenderness of the medial or lateral joint line was observed. No unusual findings were observed in either the Lachman test or the valgus and varus stress tests. However, it revealed a 3 × 3 cm sized palpable lump at the posterior aspect of the right knee joint. According to the radiographic results, her knee joint and lower limb alignments were normal, although there was mild osteoarthritis (Kellgren-Lawrence grade 1) in both knee joints. Magnetic resonance imaging (MRI) of her right knee joint revealed a multi-lobulated popliteal cyst with a size of 3.3 cm × 3.0 cm × 3.9 cm at the popliteal fossa (Fig. 1A). Passage of the popliteal artery running through the anteromedial side of the popliteal cyst was also observed (Fig. 1B–D). Besides the finding of the popliteal cyst, no additional unusual findings were observed from the analysis of the ligament, cartilage, and meniscus of her knee joint. The patient's subjective symptoms were identified as Rauschnig–Lindgren Grade 2 [8]. Considering that the symptoms have been aggravating with the increasing lump size since the onset of the symptoms, which was approximately 3 years ago, and that it was abutting the popliteal artery, as observed on MRI, it was determined that there is a high risk of future negative effects on the neurovascular structure. Therefore, surgical treatment was decided.

For surgical treatment, extra-articular endoscopic cyst removal with arthroscopy was performed via a direct posterior approach. The surgery was performed with the patient in the prone position under general anesthesia. A tourniquet was applied, but elastic bandage squeezing was carefully done not to burst the cystic mass. To make the portal skin incision safely, the location of the cyst and



Fig. 1. Preoperative MRI showing multi-lobulated popliteal cyst from sagittal view (arrow) (A) located next to the posterior aspect of popliteal artery (*) (B). Axial view of the popliteal cyst (arrow) and popliteal artery (*) (C), coronal view of the popliteal cyst (arrow) and popliteal artery (*) (D).

the relationship with the popliteal neurovascular structure was carefully reviewed just before the surgery using preoperative MRI. To make the first skin incision (portal), the location of the cyst was palpated with the patient's knee in full extension position. A 1-cm transverse skin incision was made using a No. 11 blade just below the distal border of the cyst. The incision was then dilated with a straight mosquito, and a trocar was injected with a 70° arthroscope to visualize the intra-cystic structure. Using an arthroscope light, the proximal border of the cyst was checked again using the transillumination technique, and a second portal was made. During the operation, the water pressure of the arthroscopic pump was maintained at 20 mmHg to minimize extravasation and surrounding soft tissue, and the swelling of the cyst was checked frequently. A shaver was inserted through the proximal portal to resect the cyst wall (Fig. 2A and B). Once the resection was complete (Fig. 2C), negative suction was applied to excavate any remaining fluid, and wound closure was performed for the endoscopic instrument insertion area. A long-leg splint with compression pad was applied for 1 week to prevent the dead space formation in the surgical area and promote healing.

Two weeks after surgery, the patient did not complain of discomfort while walking, at the outpatient follow-up, but full extension was not possible because of the ROM of 10–130° of the right knee. Pain and edema at the surgical site persisted, and stich out was performed with no special findings of the surgical site wound (Fig. 3). Six weeks after surgery, the surgical site edema improved, according to the outpatient follow-up, and pain and discomfort were not reported by the patient. The ROM of the right knee was 0–130°, allowing for full extension of the knee 3 months postoperatively. The patient and her family were informed that data concerning the case would be submitted for publication, and they provided their consent.

3. Discussion

In the present study, direct posterior endoscopic cystectomy of an atypical popliteal cyst was successfully performed with no complications or adverse effects. In our case, the cyst was not located between the gastrocnemius medial head and the semi-membranosus muscle, and was not adjacent to the knee joint. Passage of the popliteal artery running on the anteromedial side of the popliteal cyst was observed; therefore, a direct posterior endoscopic approach was decided for surgical treatment of the popliteal cyst.

Previously, atypical popliteal cysts that did not communicate with the knee joint were treated with open cystectomy. Dhillon et al. reported a giant osteochondral body in a popliteal cyst with a significant mechanical block to flexion [6]. The popliteal cyst, including the giant osteochondral body, did not communicate with the knee joint on MRI. The lesion was excised using a posteromedial open approach in the semilateral position. The patient recovered uneventfully and regained full range of movement within 6 weeks.

Chen et al. demonstrated the surgical technique for extra-articular endoscopic excision of symptomatic popliteal cysts [9]. They performed cystectomy by making an additional extra-articular high posteromedial portal, and reported improved clinical function and low recurrence rate. This approach has advantages in performing intra-articular procedures together with the patient in supine position. However, this technique is difficult to access the popliteal cysts that is located lateral to the popliteal neurovascular structure and cysts descending low to the calf.

Malinowski et al. also introduced possible approaches for the endoscopic treatment of various popliteal cysts [10]. They demonstrated that a posterior endoscopic approach in the prone position is required for unrestricted maneuverability of the scope and instruments when the cyst is large, descends low to the calf, or is located close to the popliteal neurovascular bundle. To the best of our knowledge, this is the only study to report an endoscopic procedure for atypical popliteal cysts using a direct posterior approach in the prone position. However, their study only introduced surgical techniques and did not report on postoperative patient management or clinical outcomes.

Open posterior cystectomy has some disadvantages, such as a wide surgical approach, increased risk of wound infection, and delayed healing. Direct posterior endoscopic excision of atypical popliteal cysts has several advantages (Table 1). Direct posterior endoscopic approach requires only two small portals, which are helpful for wound healing and early postoperative recovery. Moreover, it allows the popliteal cyst to approach behind the popliteal neurovascular structure and for low-calf descending popliteal cysts.

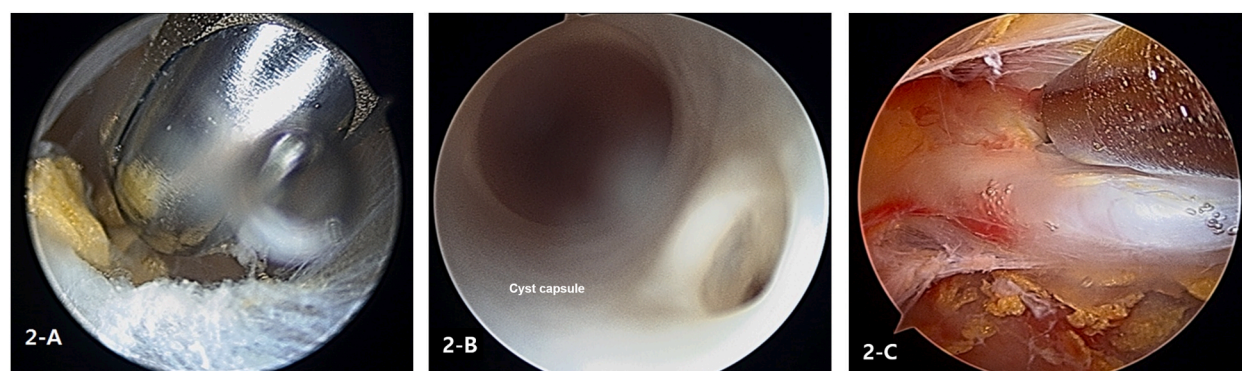


Fig. 2. Intraoperative endoscopic images of patient. After palpating the cyst, a posterior skin incision was made by inserting the endoscopic instrument (A). Then, the intra-cystic structures were observed, identifying the fibrous septum and communication passage between the cysts (B). The entire cystic wall was removed (C).



Fig. 3. Image of the surgical site of the patient 2 weeks after surgery. The 0.5-cm transverse skin incision was made at proximal and distal side of the popliteal mass.

Table 1

Advantages and pitfalls of direct posterior endoscopic excision of atypical popliteal cysts.

Advantages
Small skin incision (two posterior portals)
Can access the popliteal cysts that does not communicate with knee joint, especially, when it is located behind the popliteal neurovascular structure and cysts descending low to the calf
Unrestricted maneuverability of the endoscope and instruments when the cyst is large
Pitfalls
Difficulty to treat intra-articular pathology
Risk of injuring the neurovascular structure during endoscopic approach and procedure (e.g., cystectomy)
Risk of lower leg compartment syndrome

There are several pitfalls of the direct posterior endoscopic approach for the excision of popliteal cysts (Table 1). Pre- and intra-operatively, it is important to identify combined intra-articular pathologies and administer the necessary treatment. Previous studies have reported a high recurrence rate of approximately 63% when only cyst excision was performed without treatment of the intra-articular lesion [8]. Therefore, preoperative MRI findings should be carefully reviewed to verify the presence of intra-articular pathology. If present, traditional arthroscopic approach and treatment should be performed for the intra-articular pathology at the same time.

Extra care is necessary to prevent the neurovascular structures from abutting the cyst during the direct posterior endoscopic approach. It is necessary to clearly confirm the positional relationship between the cyst and the popliteal neurovascular structure using the preoperative MRI. It is recommended to create endoscopic portals far from the neurovascular structure when they are adjacent to the cyst. Moreover, neurovascular injury can be avoided by using a nonaggressive shaver tip for cyst wall excision and not directing the shaver tip toward the popliteal neurovascular bundle during surgery.

4. Clinical relevance

Direct posterior endoscopic excision using an intra-cystic portal with the patient in the prone position is considered safe and effective for atypical popliteal cysts. Prior to surgery, MRI should confirm the location of the lesion, surrounding neurovascular

structure, and presence of any combined intra-articular pathology.

Author contribution statement

All authors listed have significantly contributed to the investigation, development and writing of this article.

Data availability statement

No data was used for the research described in the article.

Additional information

No additional information is available for this paper.

Informed consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given consent for her images and other clinical information to be reported in the journal.

Declaration of interest's statement

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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