

Popliteal Cysts: Historical Background and Current Knowledge

Walton W. Curl, MD

Abstract

Popliteal cysts were first described in 1840 by Adams, but it is from Baker's writing in 1877 that we derive the commonly used eponymic term "Baker's cyst." Associated intra-articular lesions are very common with popliteal cysts. Ultrasonography, arthrography, and magnetic resonance imaging have all proved useful in distinguishing popliteal cysts from other cysts and from soft-tissue tumors about the knee, as well as in identifying coexisting intra-articular lesions. Cysts in pediatric patients are generally self-limited and should be treated conservatively. In the adult population, treatment is primarily nonsurgical. Arthroscopic evaluation is indicated if an intra-articular lesion is causing mechanical symptoms or if there is no response to appropriate conservative treatment, such as use of nonsteroidal anti-inflammatory drugs and compression sleeves. Surgical excision is reserved for cases in which this approach has been unsuccessful.

J Am Acad Orthop Surg 1996;4:129-133

Popliteal cysts were first described over a century and a half ago. Despite our increasing knowledge of their etiology, pathology, and clinical course, they remain something of a clinical enigma.

Historical Background

A popliteal cyst was first described by Adams in 1840 as an "enlarged bursa that is normally situated beneath the inner head of the gastrocnemius and communicates with the joint by a species of valvular opening."¹ In 1856, Foucher described a recurrent cyst and noted that it became firm with full knee extension and soft with knee flexion. This pattern is now known as "Foucher's sign."²

In 1877, Baker further delineated the entity as being caused by trapping of fluid in a bursa related to the semi-

membranous tendon, which causes the bursa to distend. He asserted that the cyst communicates with the joint synovium and that fluid then leaks into the bursa but cannot flow in the reverse direction. He also described the occurrence of a ruptured bursa that simulated venous thrombosis. After his description, Baker's name became associated with the clinical entity of a popliteal cyst.¹

In the early part of the 20th century, a number of other important observations were made. The most notable was made by Wilson in 1938,¹ who noted in anatomic dissections that the bursa under the medial head of the gastrocnemius and the bursa under the semimembranosus often connect. He concluded that most popliteal cysts result from distention of this gastrocnemius-semimembranosus bursa.

In 1973, Taylor and Rana³ reported that postmortem dissections

of 50 knees showed a valvular communication between the medial gastrocnemius bursa and the joint. In 1977, Lindgren et al⁴ demonstrated that with age there is an increasing frequency of communication with the joint, attributable primarily to thinning of the posterior joint capsule and progressive degradation of the capsule.

Although popliteal cysts may occur on the lateral side of the knee, they typically arise from the bursa associated with the popliteus tendon. Therefore, the term "Baker's cyst" is more appropriately used to describe only those cysts that occur on the posteromedial aspect of the knee between the medial head of the gastrocnemius and the semimembranosus tendon. There is historically a high association of intra-articular lesions with popliteal cysts. All of Baker's cases were associated with either tuberculosis of the knee or a Charcot joint.¹ Rheumatoid arthritis, osteoarthritis,

Dr. Curl is Associate Professor, Department of Orthopaedic Surgery, Bowman Gray School of Medicine, Winston-Salem, NC.

Reprint requests: Dr. Curl, Bowman Gray School of Medicine, Orthopaedic Surgery and Rehabilitation, Medical Center Boulevard, Winston-Salem, NC 27157-1070.

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meniscal tears, and conditions that can cause synovitis have been reported to be associated with the formation of popliteal cysts.

Pathology

The pathologic findings in a popliteal cyst are quite similar to those found in a ganglion cyst. Popliteal cysts are generally lined with flattened, mesothelium-like cells surrounded by fibroblasts and lymphocytes. Hyaline and fibrocartilage elements may be found in parts of the wall. The fluid is generally viscous, with copious amounts of fibrin.

Burleson categorized cysts into three main types.⁵ Type 1 cysts are fibrous, have a wall measuring only 1 to 2 mm thick, and are lined with flattened, mesothelium-like cells. Type 2 cysts have less well-defined, thicker walls that blend with the surrounding connective tissue. There is generally more lobulation within the cyst, and the cells are more cuboid than in type 1 cysts. Type 3 cysts have walls that are as much as 8 mm thick and that have more lymphocytes, plasma cells, and histiocytes than the walls of type 1 and type 2 cysts. This inflammatory response is more pronounced in patients with rheumatoid arthritis.

Clinical Presentation

A popliteal cyst typically presents as a mass in the posteromedial aspect of the knee. In pediatric patients, masses are usually asymptomatic and are often brought to the physician's attention by a parent concerned about a bulge in the region of the posterior popliteal fossa. In older patients, attention is often drawn to the mass because of an achy sensation in the posterior portion of the knee during exercise and a fullness noted in the knee on flexion and extension. These symptoms can be isolated but

are more commonly combined with symptoms related to underlying pathologic conditions, such as degenerative joint disease, patellofemoral arthrosis, meniscal disease, or torn anterior cruciate ligament.⁶ Symptoms often include pain along the medial joint line and a sensation of giving way, especially when walking for long periods of time or when going up or down stairs.

Rupture of a popliteal cyst can occur suddenly, causing severe pain behind the knee and considerable swelling in the calf region. This combination has been called "pseudothrombophlebitis syndrome," because the signs and symptoms are often indistinguishable from those of thrombophlebitis, even presenting with a positive Homan's sign and tenderness over the posterior aspect of the calf.⁷ A ruptured cyst can sometimes be differentiated from thrombophlebitis clinically. In patients with thrombophlebitis, there may be a hard, palpable cord corresponding to the thrombosed vein, which is not present with a ruptured popliteal cyst.

Because a chronic dissection or leakage of a popliteal cyst can form a symmetrical, cylindrical swelling in the posterior region of the calf, which can extend all the way to the ankle, confusion with deep vein thrombosis is common. The definitive diagnosis of deep vein thrombosis requires confirmation with venous Doppler sonography or venography.

Malignant lesions of the popliteal fossa are rare. However, there are reports in the literature of fibrosarcoma, synovial sarcoma, or malignant fibrous histiocytoma being mistaken for a popliteal cyst.⁸

Diagnosis

Because popliteal cysts can be mimicked by other conditions, careful clinical evaluation is essential. Plain

radiographs are frequently normal, although soft-tissue swelling can sometimes be detected. Arthrography often demonstrates a communication between the joint and the popliteal cyst and has been used to correctly identify popliteal cysts in 10% to 41% of patients.⁸ False-positive diagnoses may occur if the bursa is distended by the arthrographic dye. Arthrographic studies have also confirmed that the incidence of these cysts increases with age.

Ultrasonography has long been used as a noninvasive technique for evaluation of popliteal cysts, with reliability comparable to that of arthrography and magnetic resonance (MR) imaging.⁹⁻¹¹ Although ultrasonography has been superseded in frequency of use (but not necessarily in usefulness and accuracy) by MR imaging, it continues to have a role in diagnosis. The ultrasound study can be useful in distinguishing cystic lesions from solid masses in the posterior fossa of the knee.¹²

Since the introduction of MR imaging, the reported incidences of true popliteal cysts have been much lower than previously estimated. In a recent study, Fielding et al⁶ reviewed 1,127 MR imaging examinations and found that the prevalence of popliteal cysts was 5% overall and that it increased with age. They also found that 82% of popliteal cysts were associated with a meniscal tear, most commonly a tear of the posterior portion of the medial meniscus; only 38% of the tears involved the lateral meniscus. An anterior cruciate ligament tear was present in 13% of the subjects. A low prevalence of popliteal cysts was found in the pediatric age group; however, the study was retrospective and included only five patients younger than 10 years of age.

Magnetic resonance imaging has enhanced our ability to distinguish popliteal cysts from solid lesions and

tumors in the popliteal region. Although generally more expensive than other radiologic techniques, it is certainly being used increasingly for assessing cystic lesions about the knee. Because of the high content of free water, the MR imaging features of a popliteal cyst are low signal intensity on T1-weighted images and high signal intensity on T2-weighted images (Fig. 1). There are often septa within popliteal cysts. Hemorrhage, loose bodies, and debris may also be found.¹³

A popliteal cyst can usually be easily differentiated from a cyst of either the lateral or the medial meniscus. Meniscal cysts typically demonstrate a communicating tear in the periphery of the meniscus, and the cyst is usually more medial or more lateral than a true popliteal cyst, which occurs between the medial head of the gastrocnemius and the semimembranosus tendon.¹⁴

Treatment

In the adult population, popliteal cysts are often associated with intra-articular lesions.¹⁵ Ultrasonography, arthrography, and MR imaging have all proved useful in diagnosis. Aspira-

tion of the cyst may also be performed for both diagnostic purposes and treatment. Some authors¹ advocate injecting corticosteroids into a popliteal cyst. In my experience, however, neither cyst aspiration nor corticosteroid injection is more than a temporizing measure; the cyst generally recurs unless the intra-articular disorder associated with it is addressed. If no intra-articular lesion is present, the cyst can be treated symptomatically and followed conservatively.

Arthroscopic evaluation is indicated if an intra-articular lesion is causing mechanical symptoms and is not responding to nonsurgical treatment, such as nonsteroidal anti-inflammatory drugs, use of compression sleeves, and physical therapy, or if pain or persistent swelling interferes with function. Treatment of the intra-articular disorder often leads to resolution of the cyst as well. Jayson et al¹⁶ reported reliable results with anterior synovectomy in patients with rheumatoid arthritis.

If the popliteal cyst does not respond to conservative measures or arthroscopic intervention, an open excision may be necessary. A stalk leading from the cyst down to the joint can often be located and su-

tered over or cauterized, after which the cyst can be removed. The recurrence rate can be quite high, however, particularly when the articular lesion remains uncorrected. In the 1979 series of Rauschnig and Lindgren,¹⁷ a recurrent cyst was found in 63% of the 40 patients. The authors attributed this primarily to the difficulty of obtaining tight closure of the capsule, which allowed fluid to leak and re-form the cyst. In a later series, Rauschnig¹⁸ modified his technique to include arthroscopic evaluation and treatment of intra-articular lesions and use of a posteromedial approach for exposure. He emphasized closure of the communication and performed a partial gastrocnemius-pedicle graft to reinforce the capsular repair. There were no recurrences and no post-operative complications in this small series of eight patients.

Hughston et al¹⁹ described a similar surgical approach (Fig. 2) in their series of 30 patients, only 2 of whom had recurrences. A posteromedial approach is made through a medial hockey-stick incision with the knee flexed at a 90-degree angle. The capsular incision begins between the medial epicondyle and the adductor tubercle and is extended distally along the posterior edge of the tibial collateral ligament, anterior to the popliteal oblique ligament. The posterior oblique ligament is then retracted posteriorly. The cyst is usually found between the semimembranosus tendon and the medial head of the gastrocnemius. The capsular origin of the cyst is identified, and the cyst is dissected free of its surrounding adhesions and excised. The rent in the capsule is repaired with nonabsorbable sutures. The capsule can be reinforced with a pedicle flap from the medial head of the gastrocnemius as Rauschnig described,¹⁸ if the surgeon so chooses. The

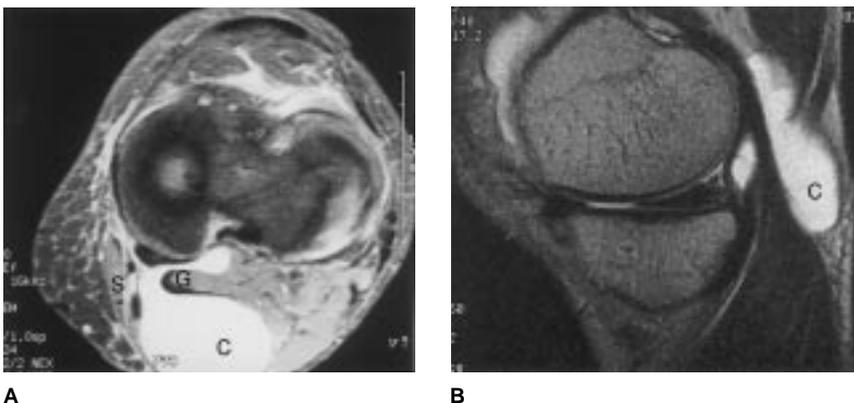
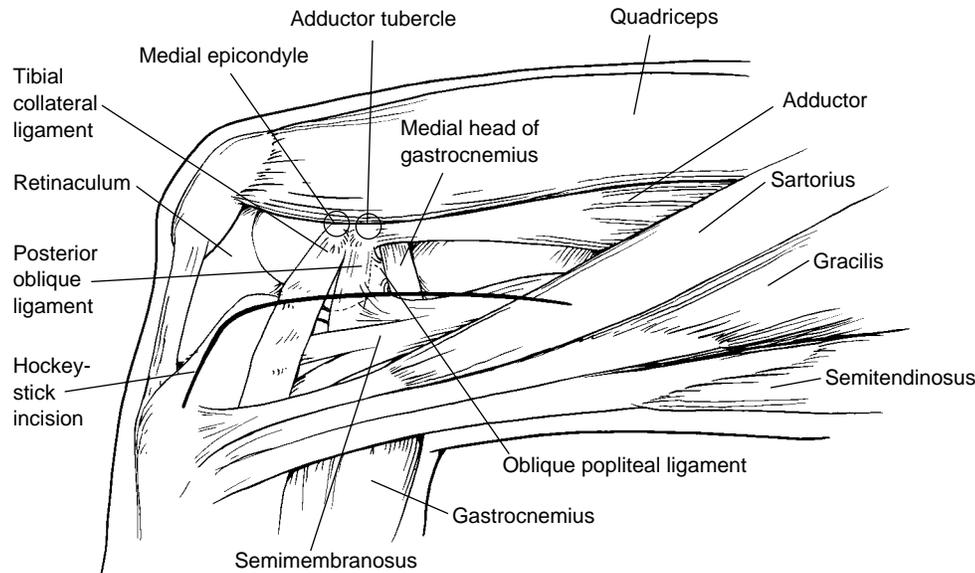
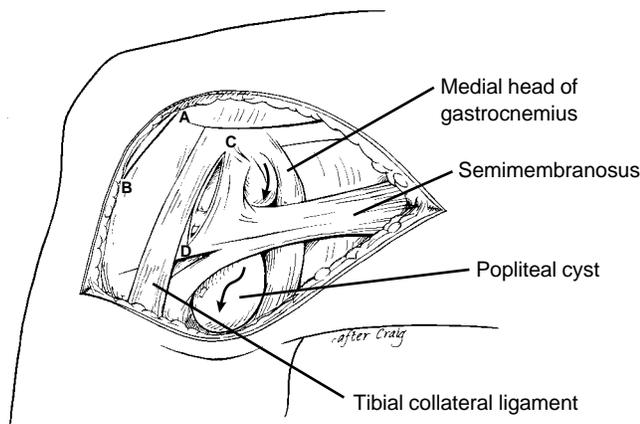


Fig. 1 A, Axial T2-weighted MR image of the knee demonstrates a posteromedial cyst (C) between the medial head of the gastrocnemius (G) and the semimembranosus tendon (S). B, Sagittal T2-weighted MR image depicts a large posterior popliteal cyst (C).

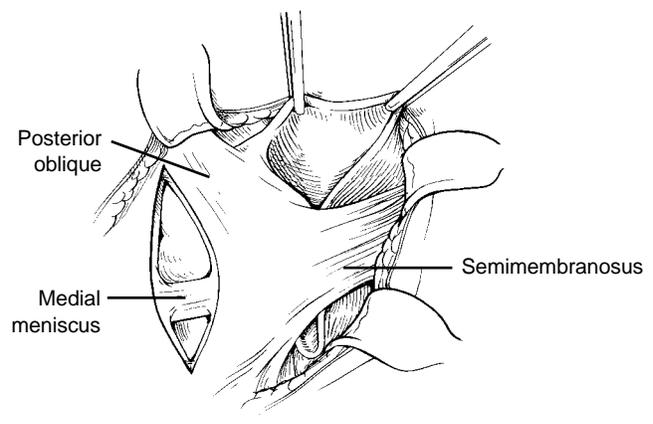


A

Fig. 2 A, Medial hockey-stick incision and underlying anatomic structures in right knee. B, Area exposed by incision. Skin and subcutaneous tissues have been removed to demonstrate relationship of popliteal cyst to anterior medial retinacular incision (A-B) and posterior capsular incision (C-D). Posterior oblique ligament can be retracted posteriorly for inspection of medial meniscus and intra-articular aspect of posterior capsule. C, Opening and retraction of cyst demonstrates adherence to surrounding tissues. Cyst can then be isolated and excised in its entirety.



B



C

wound is then closed, and the knee is immobilized for 48 hours, with weight-bearing as tolerated.

In the pediatric age group, popliteal cysts are generally benign and self-limited. They are rarely associated with intra-articular lesions and are often asymptomatic. If the diagnosis is in doubt, ultrasonography or MR imaging can be used to pinpoint the diagnosis and rule out soft-tissue tumors in the region. As previously pointed out, ultrasonography is generally considered very reliable and is less expensive

than MR imaging. Most pediatric cysts resolve spontaneously, and surgery is not indicated.²⁰

Summary

Popliteal cysts commonly occur between the gastrocnemius muscle and the semimembranosus tendon. They are generally associated with intra-articular lesions, such as osteoarthritis or a degenerative meniscal tear. They are also very common in association with rheumatoid

arthritis. Magnetic resonance imaging can easily distinguish a popliteal cyst from another mass about the knee, such as a meniscal cyst, ganglion, or soft-tissue tumor. Conservative management is the treatment of choice. Arthroscopy is indicated for intra-articular symptoms. If a cyst is resistant to conservative treatment or arthroscopy, excision may be necessary. In the pediatric age group, popliteal cysts are generally self-limited and should be treated conservatively.

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