Chapter 21
Popliteal Cyst

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Anatomy

The popliteal fossa is bounded superomedially by the semimembranosus and semitendinosus and superolaterally by the biceps femoris. The two heads of the gastrocnemius create the inferior border. The popliteal fascia forms the roof of the fossa, and the floor is formed by the posterior aspect of the distal femur [1, 2]. Popliteal cysts, also known as the eponymously named Baker's cyst, originate from the bursa between the medial head of the gastrocnemius and the semimembranosus. There may be occasional involvement of the subgastrocnemius bursa, as well [3].

In children, the majority of these cysts have no communication with the joint capsule, may arise spontaneously, and may be referred to as primary popliteal cysts [3–5]. In the adult population, popliteal cysts are frequently associated with a joint effusion and internal derangement, and 70% of cysts communicate with the knee joint [1, 6]. Popliteal cysts in children with communication to the joint via associated effusions from trauma or inflammatory conditions resemble those seen in adults and may be termed secondary popliteal cysts [5].

Epidemiology

Popliteal cysts occur approximately twice as often in males compared to females [4, 7]. The peak prevalence is 4–7 years of age, but they have been reported in children as young as 2 [8, 9]. On retrospective review of pediatric knee MRIs, the

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N. Coleman (ed.), *Common Pediatric Knee Injuries*,
https://doi.org/10.1007/978-3-030-55870-3_21

prevalence of popliteal cysts has been estimated at 6.3%, considerably lower than the adult population [10].

Associated Conditions

The majority of popliteal cysts in children arise spontaneously and are usually an incidental finding on exam. There has been speculation that, in some cases, repeated trauma to the popliteal fossa, such as swinging legs against the front a chair, may lead to inflammation and bursal distension [5]. In most instances, however, there is no clear precipitating event.

Intraarticular pathology, such as meniscal or ligamentous tears, chondral lesions, or osteochondritis dissecans, may result in effusions; thus, popliteal cysts may be observed with these conditions.

Children with juvenile idiopathic arthritis (JIA) may develop popliteal cysts, which can become symptomatic. These are typically associated with underlying joint effusions. Popliteal cysts may be noted in up to 61% of children with JIA [11].

Infectious causes of popliteal cysts are rare. There have been reports of Lyme arthritis causing popliteal cyst development. Additionally, brucellosis, tuberculosis, candidiasis, and aspergillosis have been implicated [12].

Rupture of a popliteal cyst may create inflammation and swelling of surrounding soft tissues, mimicking thrombophlebitis. If swelling extends beyond the popliteal fossa, consideration should be given to the diagnosis of deep venous thrombosis [13].

Other conditions rarely associated with popliteal cysts include connective tissue disorders, such as Ehlers Danlos [4]. There has been one case report in the literature of a ruptured popliteal cyst in a child with hemophilia A [14]. Additionally, there has been one case of synovial sarcoma in a 13-year-old girl with bilateral popliteal cysts [15].

Diagnosis

The majority of popliteal cysts will present with a history of fullness or mass in the popliteal fossa without associated pain. Primary popliteal cysts may rarely be observed bilaterally. If a history of trauma is elicited, a thorough examination of the knee to evaluate for internal derangement should be undertaken. If other systemic symptoms or additional joint involvement is suggested (i.e. effusion), a workup for an underlying inflammatory condition should be considered.

On exam, the clinician will notice a fullness or mass arising behind the knee in the popliteal fossa, typically involving the posteromedial aspect [5]. Physical exam alone may be sufficient for diagnosis in many cases. For secondary popliteal cysts, Foucher's sign may be present as follows: when the knee is in full extension, the gastrocnemius and semimembranosus muscles occlude passage of fluid from the cyst into the intraarticular space, making the cyst more prominent and firm; when

the knee is partially flexed, the cyst becomes more compressible and softer [16]. Transillumination has been described as one technique to investigate this area further, as well [4].

Radiographs are frequently normal, when obtained in the workup of popliteal cysts, although soft tissue swelling may be observed on the lateral view. The addition of a tunnel view may reveal irregularity of the chondral surface of the femoral condyles that can be seen with osteochondritis dissecans. This condition may produce an effusion, causing a secondary popliteal cyst.

With the increasing availability of ultrasound, this modality may be considered an excellent option for evaluating popliteal cysts. Serial exams may be conducted to monitor changes in the appearance of the cyst. Ultrasound is also helpful for differentiating a cyst from other soft tissue masses, such as soft tissue tumors [4]. Additionally, Doppler may be utilized to confirm the absence of blood flow to the cyst, which may be seen with a popliteal artery aneurysm [13]. Ultrasound has also been used to observe Foucher's sign, in secondary popliteal cysts in the adult population [16].

Under ultrasound, popliteal cysts will appear as a well-defined anechoic mass. Occasionally, septations and synovial proliferation and thickening may be present. Debris may be identified within the cyst, as well. With hemarthrosis, seen with trauma or hemophilia, it may be possible to identify layering of the components with ultrasound. Hemarthrosis may also produce synovial hypertrophy, secondary to associated irritation. As previously mentioned, popliteal cysts may rupture, and, in these cases, ultrasound will reveal a fluid collection with indistinct margins [13].

If there is concern for internal derangement, magnetic resonance imaging (MRI) may be considered to evaluate further. Additionally, if atypical extension of the cyst is suspected, the high-resolution and multiplanar imaging with MRI can help to delineate the popliteal cyst further. For an isolated primary popliteal cyst, obtaining an MRI is likely unnecessary [4, 13].

Vascular lesions, ganglion cysts, parameniscal cysts, synovial chondromatosis, and soft tissue tumors should be considered in the differential diagnosis of popliteal cysts [5].

Management

Observation alone is typically recommended for primary popliteal cysts. The presence of an associated effusion should prompt the clinician to probe for other pathology. If underlying inflammatory disorders are identified, treatment may lead to eventual resolution of the cyst. Similarly, if underlying structural pathology is present, the cyst should resolve upon treatment of the causative condition.

There is no consensus in the literature regarding frequency of monitoring with serial ultrasounds. Mean time to resolution has been reported from 28 to 35 months with a wide range. Unless there is a change in clinical status, infrequent monitoring is sufficient. If the cyst is enlarging or long standing, consider workup of JIA [5].

Ultrasound can be used to guide aspiration of popliteal cysts, if more aggressive treatment is desired. This may be considered in those with discomfort or if the cyst is exerting mass effect on surrounding structures. There are no studies identified in the literature in the pediatric population regarding aspiration of primary popliteal cysts. Once again, if the popliteal cyst is secondary to underlying joint pathology, treatment should be directed at the primary condition. If aspirating, care should be taken to avoid the neurovascular structures within the popliteal fossa. Recurrence of the cyst may occur after aspiration.

It has been suggested that popliteal cysts with involvement of the subgastrocnemius bursa may be more likely to persist on serial exams than those exclusive to the gastrocnemio-semimembranosus bursa [3]. If asymptomatic, continued watchful waiting may be all that is required.

Surgical intervention for primary popliteal cyst may be considered for those patients with pain, restricted motion, or restricted activity after other secondary causes have been ruled out and a sufficient period of observation has been undertaken.

Demonstration Cases

Common Presentation

A 6-year-old male presents for evaluation of fullness in the right popliteal fossa. He denies pain. His parents noticed the fullness approximately 1 month ago. They have not observed a limp or other limitation in activity. There are no systemic symptoms.

On exam there is no evidence of effusion. There is fullness and the suggestion of swelling in the posteromedial aspect of the popliteal fossa, but there is no tenderness to palpation. The area of swelling is non-pulsatile. There is slightly restricted end range flexion on the affected knee, which is pain free. Extension is full. Strength is full bilaterally. There is a normal, non-antalgic gait.

Consideration could be given to ultrasound at this point to confirm the presence of primary popliteal cyst. If the clinician is confident in the diagnosis of a primary popliteal cyst, watchful waiting and observation until resolution of cyst would be recommended.

Uncommon Presentation

An 8-year-old male presents for evaluation of fullness in the right popliteal fossa. He notes occasional pain but has difficulty describing the quality of the pain. His parents noticed the fullness approximately 1 month ago. They feel as though there

may be some mild swelling of the knee and an occasional limp. Teachers and other caregivers have also noticed the limp. There is no history of witnessed trauma, and the child cannot recall any trauma. There is no significant family history for rheumatologic conditions.

On exam there is trace swelling and effusion. There is fullness and the suggestion of swelling in the posteromedial aspect of the popliteal fossa. The area of swelling is non-pulsatile. There is slightly restricted end range flexion on the affected knee, which is pain free. Extension is full, as is strength bilaterally. There is a mild limp appreciated, favoring the affected side.

Given the presence of an associated effusion, this is likely a secondary popliteal cyst. At this point, further investigation of underlying inflammatory condition would be warranted.

Pearls and Pitfalls

Most popliteal cysts in children are incidental, isolated findings that do not cause pain or disability and have an excellent prognosis. Typically unilateral and more frequently seen in males, primary popliteal cysts are expected to resolve spontaneously. Diagnosis is based upon history and physical exam, and may be supplemented by ultrasound or, occasionally, MRI. If a primary popliteal cyst is identified, reassurance may be provided and watchful waiting undertaken with repeat exams until resolution of the cyst is documented.

If other systemic symptoms are present or if there is associated joint effusion or a history of trauma, a more thorough investigation is required to identify the causative source of the popliteal cyst. Resolution of the cyst would be expected upon treatment of the underlying condition.

Condition	Popliteal cyst
Description	Primary—painless swelling over the posteromedial knee Secondary—due to intraarticular pathology, inflammatory, or infectious causes
Epidemiology	More commonly seen in males (2:1), typically observed in early school age years
Mechanism	Primary—usually no associated trauma or mechanism. Speculation that mild repetitive trauma may be implicated
History and exam findings	Primary popliteal cysts may be incidental findings or brought to attention by parents. Exam reveals fullness in the popliteal fossa. If other systemic symptoms are present or there is a history of trauma, suspect secondary popliteal cyst.
Management	Primary—reassurance, watchful waiting, consider serial ultrasound Secondary—treat the underlying condition

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