

Arthroscopic Resection for Extra-articular Ganglion Cysts of Gastrocnemius Near Vessels



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Abstract: Extra-articular ganglion cysts arising from the gastrocnemius tendon near popliteal vessels can cause pain and claudication. Open resection of this kind of cyst has been described frequently because the vessels can be well protected with a retractor. However, it's a challenge to remove cysts that are near vessels under arthroscopy, because a retractor cannot be used in arthroscopic surgery. This article will report a method of arthroscopic resection for extra-articular ganglion cysts near popliteal vessels.

Ganglion cysts around the knee joint are classified as intra-articular, extra-articular soft tissue, periosteal, and intra-osseous ganglion cysts. The most common extra-articular ganglion cyst in the popliteal fossa is Baker's cyst, which connects to intra-articular pathologies.¹ Another kind of popliteal cyst comes from the gastrocnemius tendon but is rare and has no relationship with the intra-articular pathologies. The above 2 kinds of cysts can both lead to vessel compression. Large ganglion cysts near vessels could cause pain and claudication. Previously, extra-articular cysts near vessels are removed by open excision, and the vessels can be well protected by use of a retractor. Endoscopic resection for extra-articular cysts has been seen recently.^{2,3} Protecting vessels when removing cysts near vessels under arthroscopy is challenging.⁴ This article will report a method of arthroscopic resection for extra-articular ganglion cysts near popliteal vessels.

Patient Evaluation, Imaging, and Indications

Patient evaluation begins with a thorough history. The most common symptom of a popliteal ganglion cyst

of the gastrocnemius is popliteal pain with tightness. Most patients complain of a mass in the popliteal fossa. If the mass is big enough to press the vessels, claudication can be found in those patients, and they cannot squat or walk for very long. During physical examination, a round, hard mass can be palpated in the popliteal fossa. Almost all patients have pain when they bend their knee hyperflexion. Magnetic resonance imaging of the knee shows a cyst with single or multiple cavities near popliteal vessels (Fig 1). Ultrasound evaluation can be applied to differentiate cystic adventitial disease and hemangioma.⁵ If the pain of the knee affects the knee function obviously and the symptom cannot be attributed to other disease, then surgery is required.

Surgical Technique (With Video Illustration)

The patient is placed in the supine position. Surgery is performed with the application of a tourniquet. The knee is placed with 45° to 60° flexion, and the hip joint is in the position of external rotation and 45° flexion. The ankle and foot are placed on the operation bed. The surgeon stands beside the operation bed, distal to the knee joint.

Two posteromedial portals are made for surgery. The 2 portals are placed in the triangle area among posterior femoral cortex, medial gastrocnemius, and semi-membranosus tendon (Fig 2). Portal A should be made just posterior to the femoral cortex. A subcutaneous space will be made by a trocar through portal A. Then a standard 30° arthroscope (Smith & Nephew, London, UK) is placed into the trocar, and the subcutaneous space is filled with saline solution. Portal B is then made about 3 cm distal to portal A (Fig 2). A straight forceps can expand the portal and make a tunnel to the

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Fig 1. Magnetic resonance imaging of the right knee. The cysts (white arrow) is located beside the insertion of medial gastrocnemius and is near to the popliteal vessels (blue arrow).

subcutaneous space in front of the arthroscope. A soft tissue shaver (Smith & Nephew) is inserted into the triangle area through portal B. The semimembranosus tendon can be found after debridement of the soft tissue (Fig 3). After debridement of the soft tissue near the medial gastrocnemius, the muscle fiber of the

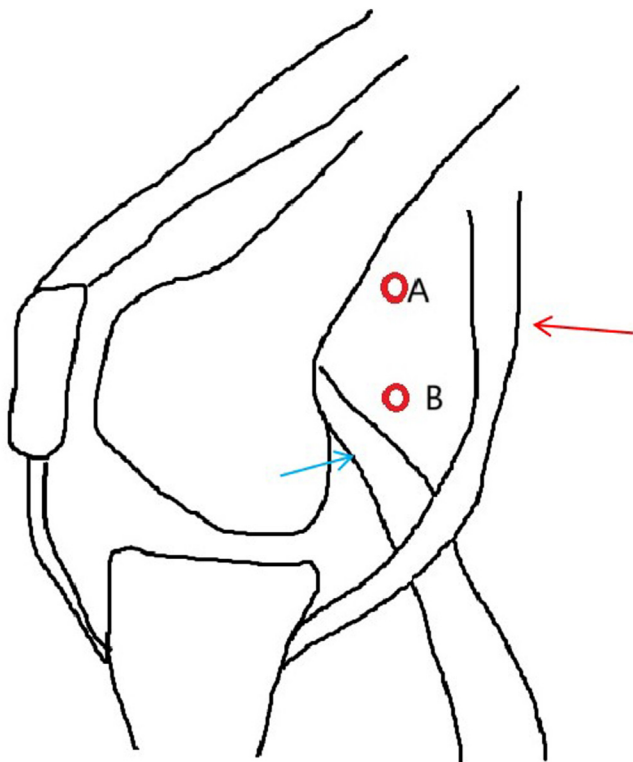


Fig 2. Two posteromedial portals of the right knee. The proximal portal is for arthroscope (A), and the distal portal is for shaver and radiofrequency (B). Medial gastrocnemius is indicated by a blue arrow, and the semimembranosus tendon is indicated by a red arrow.

gastrocnemius is seen under arthroscopy (Fig 4). There is fat tissue on the surface of proximal tendon of medial gastrocnemius, and the cyst is surrounded by the soft tissue. A probe is used to touch the cyst, which is a hard object in the soft popliteal fossa. The cyst can be seen after the soft tissue is separated by the probe (Fig 5). The soft tissue debridement is done with a shaver, and the medial wall of the cyst is well seen under arthroscopy.

Radiofrequency (Smith & Nephew) is used to cut the cyst, and fluid can be seen flowing out of the cyst. Then the medial cyst wall is removed with a shaver. If the cyst has several cavities, all the septa should be removed with a shaver. The shaver and radiofrequency must work in the cyst cavity, and the lateral wall of the cyst is preserved as a shield to the vessels (Fig 6). At last, a probe is used to explore the popliteal vessels on the lateral side of the gastrocnemius. Pearls for the described procedure are summarized in Table 1.



Fig 3. Semimembranosus tendon (arrow) from the posteromedial portal of the right knee.



Fig 4. Medial gastrocnemius (arrow) from the posteromedial portal of the right knee.

Rehabilitation

Immediately after resection of the cysts, a neurovascular examination should be conducted in the recovery unit. After surgery, the patient is allowed to walk with full weightbearing. Range of motion should not be limited at any time point to optimize recovery and maximize functionality.

Discussion

Popliteal cysts can be dependent or independent. If the popliteal cyst connects with intra-articular pathologies, intra-articular debridement should be done at the same time. If the popliteal cyst does not connect with intra-articular pathologies, extra-articular debridement is reasonable, and the intra-articular environment will not be bothered. Ganglion cysts rising from the medial gastrocnemius tendon are always dependent to intra-articular structure. Most extra-articular cysts are treated with open surgery, especially those cysts near the vessels. More recently, extra-articular cysts are removed using arthroscopic techniques, but there is little description about how to protect vessels.⁶

Selection of proper portals is important for the operation. We can choose portals according to the location of the cyst and neurovascular bundles.⁷ Most



Fig 5. The ganglion cyst (arrow) of the medial gastrocnemius tendon among the fat tissue of the popliteal fossa.

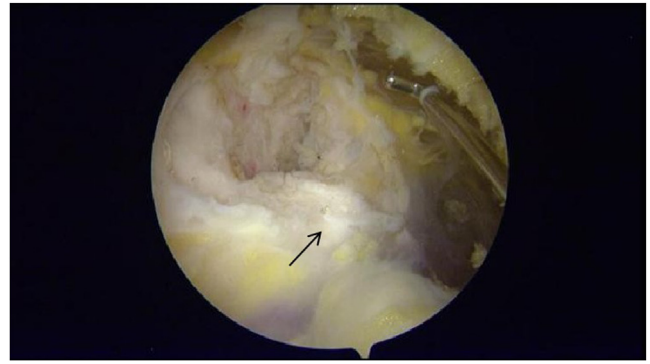


Fig 6. The medial gastrocnemius tendon (arrow) after the resection of the cysts.

ganglion cysts are on the medial side of the vascular structure. In this technique, the two portals are both posteromedial portals, similar to the technique of Christopher et al.⁸ This is the shortest path to reach the cyst, and it is safe.

The first aim is to find the cysts from the medial portals according to the location of medial gastrocnemius and semimembranosus tendon. There is a natural bursa between the medial gastrocnemius and semimembranosus tendon. There is no fat tissue in this bursa. We can start here under a clear visual field. After we see the medial gastrocnemius clearly, we can resect the soft tissue along with the direction of the muscle fiber and tendon toward the proximal part. Most ganglion cysts are surrounded by the fat tissue of the popliteal fossa. As we approach the center of the popliteal fossa, a probe can be used to touch the cysts. Too much suction by the shaver should be avoided during debridement of the surrounding soft tissue.

During resection of the cysts, the shaver and radiofrequency must work in the cyst cavity, and the lateral wall of the cyst should be preserved. If the medial part of the cyst wall is far from the vessels, then it is safe to remove it. If the lateral wall of the cyst is just beside the vessel, it should be preserved as a shield to the vessel. If a cyst consists of several small cavities, all septa should

Table 1. Pearls for Arthroscopic Resection of Cyst Near Popliteal Vessels

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| Exposure of semimembranosus and medial gastrocnemius helps locating the cyst. |
| Cyst is located in the soft tissue lateral to the medial gastrocnemius tendon. |
| Use a probe to separate the soft tissue before shaving. |
| Use radiofrequency to cut the cyst and release the fluid; the cyst wall will lose tension, which is beneficial to removing it by shaver. |
| Shaver and radiofrequency must work in the cyst, and the lateral wall of the cyst is preserved as a shield to the vessels. |
| When resecting the cyst wall with a shaver, half of the suction should be open, avoiding injuring the vessels by full suction force. |

Table 2. Advantages and Disadvantages of Arthroscopic Resection of Cysts Near Popliteal Vessels

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|---|
| Advantages |
| Minimal trauma compared with open surgery |
| Does not bother the intra-articular structure |
| No need for 70° arthroscope |
| Fast recovery |
| Disadvantages and risks |
| Cannot remove the lateral wall of the cyst |
| Recurrence of the cyst |
| Hematoma collection |

be open to get full internal drainage. When resecting cyst wall with shaver, half of the suction should be open, to avoid injuring vessels by full suction force. Advantages and disadvantages of the technique are summarized in [Table 2](#).

Disclosures

The authors report no conflicts of interest in the authorship and publication of this article. Full ICMJE author disclosure forms are available for this article online, as [supplementary material](#).

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