Global Journal of Life Sciences
2021; 2(1): 20-27.
ISSN Online: 0000-0000; ISSN Print: 0000-0000
Website: http://natureschol ars.com
Email: Glo_J_Ls@126.com
Publisher: Scholars Publishing, LLC

Review

The Research Progress of Treatment for Popliteal Cyst

Jia-Cai Dong[1], Cheng Xu[2], Zhong-Gui Zhang[2], Rui Xia[3,✉]

[1]Medical School of Yangtze University, Jingzhou, 434023, China. [2]Department of Pain, the First Affiliated Hospital of Yangtze University, Jingzhou, 434023, China. [3]Department of Anesthesiology, the First Affiliated Hospital of Yangtze University, Jingzhou, 434023, China.

✉ **Correspondence**
Rui Xia, Department of Anesthesiology, the First Affiliated Hospital of Yangtze University, Jingzhou, Hubei 434000, China. Phone: +86-13477416348. E-mail: 798496564@qq.com.
Received: April 3, 2020. Accepted: December 3, 2020. Published online: January 18, 2021.
Cite this paper: Jia-Cai Dong, Cheng Xu , Zhong-Gui Zhang, Rui Xia (2021) The Research Progress of Treatment for Popliteal Cyst. *Global Journal of Life Sciences*, 1(2):20-27. http://natureschol ars.com/gjls.020103.
https://doi.org/10.46633/gjls.020103.

Abstract

Popliteal cysts are synovial cysts located in the popliteal fossa, mostly occurring in the gastrocnemius semimembranosus bursa and communicating with the knee joint through the capsular opening of slit-like structures behind the medial femoral condyle. The symptoms caused by it, such as posterior knee soreness, pain, and joint flexion and extension dysfunction, have a serious impact on the patient's daily life and work. There are also many clinical treatments for popliteal cysts, and this article reviews the treatment of popliteal cysts in recent years.

Key words: Popliteal Cyst; Treatment; Arthroscopy; Ultrasound.

Introduction

Popliteal cyst is the most common cystic disease of knee, and the link between popliteal cysts and joint space pathology was first discussed by William Baker in 1877 (1), and later popliteal cysts were also known as Baker cysts. In the knee joint, due to primary and secondary factors, the fluid in the joint cavity increases, the pressure increases, and the effusion enters the gastrocnemius-semimembranosus bursa (GSB) to form a cyst, which causes discomfort symptoms in the popliteal fossa area.

1 Anatomy of popliteal cyst

Popliteal fossa cyst mostly occurs in the posterior medial side of the knee joint, which is closely related to the anatomical structure of the popliteal fossa in the posterior region of the knee. The popliteal fossa forms a diamond-shaped depression in the posterior area of the knee, and the

muscles and tendons whose boundaries can be easily recognized by the naked eye are also easy to touch. When extending the knee, the deep fascia here is tense and relaxed when bending the knee.

The outer upper boundary of popliteal fossa is biceps femoris tendon, the inner upper boundary is semitendinosus muscle and semimembranous muscle, the inner lower boundary is the medial head of gastrocnemius muscle, the outer lower boundary is lateral head of gastrocnemius muscle (2), and the top of popliteal fossa is popliteal fascia, which is the continuation of broad fascia of thigh. The popliteal fossa is the popliteal surface of the femur, the posterior part of the knee capsule, the popliteal oblique ligament, the popliteal muscle and its fascia. The popliteal fossa contains important neurovascular structures, which are tibial nerve, popliteal nerve, popliteal artery and common peroneal nerve from superficial to deep. When a popliteal cyst is oppressed by the popliteal fascia, the cyst can cause pain by pressing the nerves and blood vessels behind the cephalic gastrocnemius muscle (3).

There are six synovial bursae in the popliteal fossa, in which the GSB is located on the medial side of the popliteal fossa, between the medial head of the gastrocnemius and the semimembranous muscle, and the superficial bursa of the semimembranous muscle is located between the semimembranous muscle and the medial head of the gastrocnemius muscle. The medial head deep bursa separates the tendon of the medial head of the gastrocnemius muscle from the joint capsule (4). The two bursae hold liquid expansion respectively and are not connected to each other. With the increase of age, the number of gastrocnemius semimembranous muscle sac and knee joint increased. Robert et al. (5) studied the anatomy of 20 fresh frozen knee joints and found that 90% of the specimens had capsule defects between the straight arm of the semimembranous muscle and the medial head of the gastrocnemius muscle, which led to the popliteal cyst. In children, the gastrocnemius flap capsule is completely separated from the posterior knee joint cavity (6). In adults, some studies have found that there is a horizontal fissure structure between the medial head of the semimembranous muscle and the gastrocnemius muscle and the articular cavity, and the gastrocnemius semimembranous sac communicates with the articular cavity through this channel (3). Handy (7) reported that GSB was connected to the articular cavity in 30% to 50% of autopsies, 55% of open surgical excisions, 37% of knee diagnostic arthroscopy, and 50% of normal knee arthrography (even without popliteal cysts). From an anatomical point of view, the gastrocnemius semimembranous sac consists of three parts: the base, the neck, and the body. The base is in the front and communicates with the articular cavity, the neck is the narrow band between the semimembranous tendon and the medial head of the gastrocnemius muscle, and the back is the body, the largest part of the synovial bursa, located on the dorsal side of the gastrocnemius muscle (8). The synovial bursa neck has a unidirectional valvular effect. When the pressure in the articular cavity increases, synovial fluid can only flow into the synovial sac but not from GSB to the articular cavity, resulting in the formation and persistence of cysts (9). Rauschning et al. (3) found that the contrast medium passed easily from the joint cavity to the cyst by knee arthrography, but the contrast medium could not flow back into the joint cavity when the cyst was squeezed manually, thus verifying the existence of this one-way valvular channel. It is this one-way flow that makes popliteal cysts increase with the development of the disease and rarely disappear naturally. Since the gastrocnemius semimembranous sac communicates with the knee joint at the rear, allowing synovial fluid to move between the two spaces, popliteal cysts usually occur posterior and rarely on the lateral side.

2 Pathological mechanism

The mechanism of popliteal cysts is generally recognized by most scholars as the "unidirectional valve" mechanism. The bursa between the medial gastrocnemius tendon and the semimembranosus tendon communicates with the knee joint cavity or

there is a weak area associated with the synovial cavity of the knee joint. Therefore, the anatomical basis for the formation of popliteal cysts is that the synovial layer around the knee joint communicates with the bursa formed by the surrounding tendons. When the effusion in the knee joint cavity increases, the synovium encapsulating the effusion herniates into the bursa through the slit or weak area. When there is a unidirectional valve-like structure at the hernia outlet, the synovial fluid cannot return to the joint cavity and continues to increase, accumulate, and concentrate in the popliteal fossa, stimulating the proliferation and thickening of the surrounding tissues, forming a capsule wall, and finally forming a popliteal cyst. Over time, the cyst became larger and larger. Balik et al. (10) found that the size of popliteal fossa cyst is closely related to knee cartilage degeneration. due to cartilage degeneration and increased intra-articular effusion, resulting in increased cyst volume. It has also been found that in patients with rheumatoid arthritis, synovial tissue in the knee joint cavity thickens and joint effusion increases, followed by popliteal cysts. Patients with severe osteoarthritis have a much higher risk of popliteal cysts than the average person (11) . Popliteal cysts are often caused by pathological changes of the knee joint, including osteoarthritis, rheumatoid arthritis, meniscus injury and so on.

3 Clinical manifestation

Clinically, popliteal cysts in children are generally asymptomatic and are often found by their parents in physical examination or daily activities. Adult popliteal cysts can also be asymptomatic or have only slight local swelling and are often found in physical or imaging examinations (11). When the cyst is large, patients will have pain, swelling, limitation of flexion and extension and discomfort of the knee joint (12). When the cyst oppresses the peripheral neurovascular tissue structure, it will cause corresponding symptoms. For example, compression of tibial nerve or common peroneal nerve causes peripheral neuropathy, compression of popliteal vein leads to deep venous thrombosis and edema of lower extremities, compression of popliteal artery leads to lower limb tissue ischemia (13).

4 Treatment of popliteal cyst

Most of the popliteal cysts in children are primary, the cysts exist alone, do not communicate with the joint cavity, and do not need treatment (14). Akagi et al. (15) studied retrospectively of popliteal cysts of 17 knee joints in 15 male children and 3 knee joints in 2 female children who were followed up for at least 12 months and found that 85% of the cysts were naturally shrunk or disappeared without treatment. Most adult popliteal cysts are secondary, and most cases also show asymptomatic masses, but they can also cause serious clinical complications, such as thrombophlebitis, compartment syndrome and so on. most of them may require special treatment such as surgery (16). At present, the treatment of secondary popliteal cyst mainly includes conservative treatment and surgical treatment.

4.1 Conservative treatment

If there is no vascular or nerve compression for symptomatic popliteal cysts, the initial treatment can be conservatively treated within 6 weeks (17). The treatment methods include intracystic sclerosing agent injection, intra-articular steroid hormone injection and intracapsular steroid hormone injection. Sclerosing agent injection therapy uses anhydrous alcohol, phenol, sodium morrhuate and so on (12, 18, 19). It has been reported that 6 cases of popliteal fossa cysts were followed up for an average of 25 months after injection of sclerosing agent ethanol into the popliteal fossa cyst, and no recurrence was found in 5 rows of cysts (20). However, this method has the risk of complications caused by sclerosing agent leakage, and there is a lack of many clinical sample data to prove its effectiveness and safety. At present, many scholars use ultrasound-guided cyst fluid aspiration combined with steroid injection and achieved good results. Koroglu et al. (21) performed

ultrasound-guided puncture and aspiration of cyst fluid and intrathecal injection of betamethasone in 32 patients with knee osteoarthritis. After 6 months follow-up, the clinical symptoms of all patients were relieved, and the cyst volume decreased. This is consistent with the conclusion obtained by Di Sante et al. (22). Smith et al. (23) also found that the clinical symptoms of 47 patients with popliteal cysts older than 18 years old without acute ligament injury were significantly improved after ultrasound-guided lumbar puncture needle aspiration of cyst fluid, fenestration of cyst wall and injection of local anesthetic steroid mixture. Caglayan et al. (24) divided 52 patients with popliteal cyst into two groups averagely. All patients underwent ultrasound-guided cystic fluid aspiration. The patients in the experimental group were able to observe real-time ultrasound imaging and were informed the situation during the operation, but not in the control group. After treatment, it was found that the visual biofeedback of ultrasound imaging in the experimental group was helpful to improve the pain and knee joint function of the patients. Ultrasound-guided fluid extraction and intracapsular drug injection have the advantages of accurate location, high success rate, less complications and less glucocorticoid dosage (25). Moreover, ultrasound also shows its unique advantages in reexamination and dynamic observation, and the advantage of ultrasound interventional therapy in the treatment of popliteal cyst is becoming more and more prominent (26-28).

4.2 Surgical treatment

The surgical treatment of popliteal cyst is mainly aimed at the following aspects: (1) to deal with intra-articular pathological lesions. (2) dilate or close the communication between the articular cavity and popliteal cyst. (3) preserve or remove the cyst wall of the popliteal cyst. The main surgical methods are traditional open surgery and arthroscopic surgery.

4.2.1 Traditional open surgery

Before the development of arthroscopy, the operation was mainly based on traditional open resection of popliteal cysts. The surgical incision is often S or Z shaped, and then the tissue structure around the cyst is separated in turn to identify the medial head of gastrocnemius muscle and semimembranosus muscle, completely visualize the cyst wall, find the internal orifice of the cyst along the cyst wall to the deep surface, completely remove the cyst wall, and ligate and suture the internal orifice. Yuan (29) et al. equally divided 60 patients with popliteal cyst into two groups and treated with open resection and total arthroscopic surgery, respectively. The patients were followed up for 6-30 months. The comparison of clinical efficacy between the two groups showed that the arthroscopic surgery group was significantly superior to the open group in terms of incision length, operation time and postoperative Lysholm score of knee joint function. Moreover, 1 case of incision infection, 2 cases of poor wound healing and 1 case of recurrence occurred in the open surgery group. Therefore, open surgery is simple, but it is more invasive and more likely to damage the vascular nerves around the cyst. It is easy to form skin scars and knee flexion contracture after surgery, affecting joint function.

4.2.2 Arthroscopic surgery

Sansone and De Ponti (30) first proposed arthroscopic treatment of popliteal cysts. They destroyed one-way valve structure, treated intra-articular lesions with arthroscopy and found that 95% of patients had improved symptoms at postoperative follow-up. With the development of minimally invasive techniques, arthroscopic surgery has become a trend in the treatment of popliteal cysts. At present, the unified view is to deal with intra-articular pathological lesions under arthroscopy, and what is controversial is whether to expand the traffic site, only deal with joint lesions, or suture the traffic site, and surgically remove the posterior cyst (31, 32). At present, the two surgical methods have achieved good clinical results. Jiang et al. (33) treated 58 patients with knee osteoarthritis complicated with

popliteal cyst by arthroscopic articular cavity treatment combined with valvular orifice dilatation, resulting in two-way synovial fluid flow between knee joint cavity and popliteal cyst. The average follow-up was 24 months. The postoperative VAS score was significantly lower than that before the operation, and the Lysholm score was significantly higher than that before the operation. There was no recurrence of cysts in all patients. Ohishi et al. (31) treated 29 cases of popliteal cyst aged 43 to 77 years by expanding one-way valve gap under arthroscope. The clinical score, MR image and osteoarthritis grade of Rauschning and Lindgren were evaluated before and after popliteal operation. 12 cases were completely disappeared, 16 cases were reduced, 1 case was increased, and the improvement rate of clinical score was 93.1%, which indicated that arthroscopic treatment of popliteal cavity was combined To enlarge the diameter of the valve is an effective way to treat symptomatic popliteal cavity. Calvisi et al. (34) retrospectively studied 22 patients with popliteal cysts treated by arthroscopic internal suture of valvular communication. During the follow-up 2 years after operation, 96% of the patients' clinical symptoms were improved, 64% of the cysts disappeared and 27% of the patients were reduced by MRI reexamination. the clinical symptoms of all patients with reduced cysts were improved. The surgical method of arthroscopic enlargement of valve orifice combined with cyst wall resection is also proposed, but there is a risk of neurovascular injury in the process of cyst wall resection (35). A retrospective systematic analysis of arthroscopic valvular orifice enlargement combined with cystectomy group and valvular orifice suture non-cystectomy group showed that there was no significant difference in the improvement of knee joint function between the two groups, and the results were satisfactory to the patients. however, the recurrence rate after cystectomy is lower, but the complications are higher (32). It is still controversial to expand the valve orifice under arthroscopy and not to remove the cyst wall, and whether removal of the cyst wall can improve the long-term effect is still controversial, which has yet to be confirmed by long-term follow-up study (36, 37).

5 Discussion

Arthroscopic surgery and ultrasound intervention in the treatment of popliteal cyst have their own advantages. The former is more difficult in technology, which requires the operator to have a certain degree of surgical skills, and the patient's expense is higher; the latter is easy to operate, which can clearly show the cyst, the operation process is visualized, the risk of damage to blood vessels and nerves is small, and the cost is low (38-41). Van Nest (42) et al. systematically studied the surgical and non-surgical treatment of popliteal cysts and showed that the surgical treatment method using arthroscopic enlargement of the valve communication port achieved good results, while cyst fenestration and intra-cystic injection of glucocorticoids are currently the more recommended effective non-surgical treatment methods. However, there is no comparative report on which of the two treatments has better clinical efficacy. In the treatment of popliteal cyst with ultrasound intervention, the authors took a different approach by destroying unidirectional valve-like structures under ultrasound guidance in addition to aspiration of the cyst fluid with an epidural needle. The shape of the cyst is generally irregular, showing a deep extension of the tubular structure of the ingress, and the cyst may have mild deformation when the ultrasound probe is pressurized. During the operation, firstly perform puncture treatment at the unidirectional valve position, handle as many targets as possible, and destroy the unidirectional valve structure completely. It cannot be sucked at first during the operation. If the cystic fluid is sucked completely, the unidirectional valve structure is not easy to distinguish under ultrasound. During the treatment, it is noted that some popliteal cysts have multiple unidirectional valve-like structures, and each valve-like structure requires relevant treatment. Finally, when the epidural puncture needle aspirates the cyst

fluid, it needs to be aspirated from multiple puncture directions under ultrasound guidance. The assistant cooperates with the extrusion, so that all the cyst fluid in the popliteal cyst formed by the puncture needle is withdrawn. The patients are followed up for a short time, and the better clinical efficacy is obtained.

Arthroscopic surgery is less invasive and has a definite therapeutic effect than traditional open surgery. Ultrasound interventional therapy has low risk, and the method used by the authors can not only avoid the operation for the patients but also achieve the effect of surgical treatment. There is no report on the treatment, and it will take longer for more studies to further confirm.

Declarations

1) ***Consent to publication***
   We declare that all authors agreed to publish the manuscript at this journal based on the signed Copyright Transfer Agreement and followed publication ethics.
2) ***Ethical approval and consent to participants***
   Not applicable.
3) ***Disclosure of conflict of interests***
   We declare that no conflict of interest exists.
4) ***Funding***
   None
5) ***Availability of data and material***
   We declare that the data supporting the results reported in the article are available in the published article.
6) ***Authors' Contributions***
   Authors contributed to this paper with the design (JCD and CX), literature search (JCD), drafting (JCD and ZGZ), revision (CX and RX), editing (JCD and CX) and final approval (RX).
7) ***Acknowledgement***
   None
8) ***Authors' biography***
   None

References

1. Baker WM. On the formation of synovial cysts in the leg in connection with disease of the knee-joint. 1877. Clin Orthop Relat Res. 1994(299):2-10.
2. Shah A, James SL, Davies AM, Botchu R. A diagnostic approach to popliteal fossa masses. Clin Radiol. 2017;72(4):323-337.
3. Rauschning W. Popliteal cysts and their relation to the gastrocnemio-semimembranosus bursa. Studies on the surgical and functional anatomy. Acta Orthop Scand Suppl. 1979;179:1-43.
4. Ruangchaijatuporn T, Gaetke-Udager K, Jacobson JA, Yablon CM, Morag Y. Ultrasound evaluation of bursae: anatomy and pathological appearances. Skeletal Radiol. 2017;46(4):445-462.
5. LaPrade RF, Morgan PM, Wentorf FA, Johansen S, Engebretsen L. The anatomy of the posterior aspect of the knee. An anatomic study. J Bone Joint Surg Am. 2007;89(4):758-764.
6. Malloch JD. Popliteal cysts in children. Br J Surg. 1970;57(8):616-618.
7. Handy JR. Popliteal cysts in adults: a review. Semin Arthritis Rheum. 2001;31(2):108-118.
8. Alves TI, Girish G, Kalume Brigido M, Jacobson JA. US of the Knee: Scanning Techniques, Pitfalls, and Pathologic Conditions. Radiographics. 2016;36(6):1759-1775.
9. Herman AM, Marzo JM. Popliteal cysts: a current review. Orthopedics. 2014;37(8):e678-e684.
10. Balik MS, Turan A, Celik FB. Is There A Relationship Between Three-Dimensionally Measured Baker's Cyst Volume and Knee Pathologies? Eurasian J Med. 2019;51(1):64-69.
11. Picerno V, Filippou G, Bertoldi I, Adinolfi A, Di Sabatino V, Galeazzi M, et al. Prevalence of Baker's cyst in patients with knee pain: an ultrasonographic study. Reumatismo. 2014;65(6):264-270.
12. Chatzopoulos D, Moralidis E, Markou P, Makris V, Arsos G. Baker's cysts in knees with chronic osteoarthritic pain: a clinical, ultrasonographic, radiographic and scintigraphic evaluation. Rheumatol Int. 2008;29(2):141-146.
13. Kuntz S, Lejay A, Rouby AF, Georg Y, Thaveau F, Chakfe N. A Popliteal Cyst Responsible for Acute

Lower Limb Ischemia. Ann Vasc Surg. 2019;60:479 e411-479 e415.
14. Harcke HT, Niedzielski A, Thacker MM. Popliteal cysts in children. Journal of Pediatric Orthopaedics B. 2016;25(6):539-542.
15. Akagi R, Saisu T, Segawa Y, Sasho T, Moriya H, Takahashi K, et al. Natural history of popliteal cysts in the pediatric population. J Pediatr Orthop. 2013;33(3):262-268.
16. Yang JH, Kwon HH, Lee JK, Bang SY, Lee HS. Successful arthroscopic treatment of refractory and complicated popliteal cyst associated with rheumatoid arthritis in combination with osteoarthritis: case series and literature review. Rheumatol Int. 2019;39(12):2177-2183.
17. Frush TJ, Noyes FR. Baker's Cyst: Diagnostic and Surgical Considerations. Sports Health. 2015;7(4):359-365.
18. Saylik M, Gokkus K. Treatment of baker cyst, by using open posterior cystectomy and supine arthroscopy on recalcitrant cases (103 knees). BMC Musculoskelet Disord. 2016;17(1):435.
19. Linetsky F. Sclerotherapy for Baker's Cyst. Pain Physician. 2008;11(3):375-376.
20. Fukumoto K, Kojima T, Tomonari H, Kontani K, Murai S, Tsujimoto F. Ethanol injection sclerotherapy for Baker's cyst, thyroglossal duct cyst, and branchial cleft cyst. Ann Plast Surg. 1994;33(6):615-619.
21. Koroglu M, Callioglu M, Eris HN, Kayan M, Cetin M, Yener M, et al. Ultrasound guided percutaneous treatment and follow-up of Baker's cyst in knee osteoarthritis. Eur J Radiol. 2012;81(11):3466-3471.
22. Di Sante L, Paoloni M, Ioppolo F, Dimaggio M, Di Renzo S, Santilli V. Ultrasound-guided aspiration and corticosteroid injection of Baker's cysts in knee osteoarthritis: a prospective observational study. Am J Phys Med Rehabil. 2010;89(12):970-975.
23. Smith MK, Lesniak B, Baraga MG, Kaplan L, Jose J. Treatment of Popliteal (Baker) Cysts With Ultrasound-Guided Aspiration, Fenestration, and Injection: Long-term Follow-up. Sports Health. 2015;7(5):409-414.
24. Caglayan G, Ozcakar L, Kaymak SU, Kaymak B, Tan AA. Effects of Sono-feedback during aspiration of Baker's cysts: A controlled clinical trial. J Rehabil Med. 2016;48(4):386-389.
25. Wu Y, Chen Q, Chen K, He F, Quan J, Chen S, et al. Clinical efficacy of ultrasound-guided injection in the treatment of olecranon subcutaneous bursitis. J Xray Sci Technol. 2019;27(6):1145-1153.
26. Jacobson JA, Ruangchaijatuporn T, Khoury V, Magerkurth O. Ultrasound of the Knee: Common Pathology Excluding Extensor Mechanism. Semin Musculoskelet Radiol. 2017;21(2):102-112.
27. Acebes JC, Sanchez-Pernaute O, Diaz-Oca A, Herrero-Beaumont G. Ultrasonographic assessment of Baker's cysts after intra-articular corticosteroid injection in knee osteoarthritis. J Clin Ultrasound. 2006;34(3):113-117.
28. Blome A, Harrigan R, Goett H, Costantino T, Gibbons R. Ultrasonographic Characteristics of Baker's Cysts: The Sonographic Foucher's Sign. The Journal of Emergency Medicine. 2017;53(5):753-755.
29. Yuan LL, Xu WD, Han GS, Geng CH, Zhu XB. Comparison of the efficacy of total arthroscopy and traditional surgical treatment for the treatment of popliteal cyst. Zhongguo Gu Shang. 2019;32(2):151-155.
30. Sansone V, Ponti AD. Arthroscopic Treatment of Popliteal Cyst and Associated Intra-articular Knee Disorders in Adults. Arthroscopy the Journal of Arthroscopic & Related Surgery. 1999;15(4):368-372.
31. Ohishi T, Takahashi M, Suzuki D, Fujita T, Yamamoto K, Ushirozako H, et al. Treatment of popliteal cysts via arthroscopic enlargement of unidirectional valvular slits. Mod Rheumatol. 2015;25(5):772-778.
32. Han JH, Bae JH, Nha KW, Shin YS, Lee DH, Sung HJ, et al. Arthroscopic Treatment of Popliteal Cysts with and without Cystectomy: A Systematic Review and Meta-Analysis. Knee Surg Relat Res. 2019;31(2):103-112.

33. Jiang J, Ni L. Arthroscopic internal drainage and cystectomy of popliteal cyst in knee osteoarthritis. J Orthop Surg Res. 2017;12(1):182.
34. Calvisi V, Lupparelli S, Giuliani P. Arthroscopic all-inside suture of symptomatic Baker's cysts: a technical option for surgical treatment in adults. Knee Surg Sports Traumatol Arthrosc. 2007;15(12):1452-1460.
35. Park GY, Kwon DR, Kwon DG. Clinical, Radiographic, and Ultrasound Findings Between Simple and Complicated Baker's Cysts. Am J Phys Med Rehabil. 2020;99(1):7-12.
36. Zhou XN, Li B, Wang JS, Bai LH. Surgical treatment of popliteal cyst: a systematic review and meta-analysis. J Orthop Surg Res. 2016;11:22.
37. Xinxian X, Yuezheng H, Jian L, Huachen Y. Clinical outcome of arthroscopic management of popliteal cysts with or without additional posterior open cystectomy. Orthopade. 2018;47(6):530-535.
38. Razek AA, El-Basyouni SR. Ultrasound of knee osteoarthritis: interobserver agreement and correlation with Western Ontario and McMaster Universities Osteoarthritis. Clin Rheumatol. 2016;35(4):997-1001.
39. Zeidenberg J, Aronowitz JG, Landy DC, Owens PW, Jose J. Ultrasound-guided aspiration of wrist ganglions: a follow-up survey of patient satisfaction and outcomes. Acta Radiol. 2016;57(4):481-486.
40. Rastogi AK, Davis KW, Ross A, Rosas HG. Fundamentals of Joint Injection. AJR Am J Roentgenol. 2016;207(3):484-494.
41. Fritschy D, Fasel J, Imbert J-C, Bianchi S, Verdonk R, Wirth CJ. The popliteal cyst. Knee Surgery, Sports Traumatology, Arthroscopy. 2005;14(7):623-628.
42. Van Nest DS, Tjoumakaris FP, Smith BJ, Beatty TM, Freedman KB. Popliteal Cysts: A Systematic Review of Nonoperative and Operative Treatment. JBJS Rev. 2020;8(3):e0139