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DETECTING BAKER'S CYST: VENOUS DUPLEX SCANNING IN AMBULATORY SETTING

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SUMMARY – Popliteal cyst, also called Baker's cyst, is a popliteal fossa enlargement filled with synovial fluid. Baker's cysts can be symptomatic and cause considerable pathologies such as thrombophlebitis, compartment syndrome and even nerve entrapment. It is the most common nonvascular pathology seen in the popliteal fossa but clinically indistinguishable from deep vein thrombosis. The aim of the present study was to evaluate venous duplex scanning in detecting and distinguishing complicated Baker's cyst and deep vein thrombosis in outpatient setting. Medical records of all patients undergoing venous duplex scanning during 2008 and 2009 to rule out deep vein thrombosis were reviewed. Ten patients having undergone ultrasonography examination were found to have complicated Baker's cyst. Baker's cysts are a rather common condition. When presenting with swollen and painful calf, it is impossible to differentiate it from deep vein thrombosis by simple clinical examination. Venous duplex scanning of lower extremity was found to be a useful imaging modality for detection of Baker's cysts, deep vein thrombosis and associated pathology.

Key words: *Popliteal cyst – diagnosis; Popliteal cyst – ultrasonography; Venous thrombosis – diagnosis; Venous thrombosis – ultrasonography*

Introduction

The first paper describing a popliteal cyst was published in 1840 by Adams[1] who associated this abnormality to chronic rheumatoid arthritis of the knee joint; however, the true nature of popliteal cyst was discovered by Baker, who attributed the etiology of this condition to a disease of the knee joint[2]. Baker stated that the increased volume of synovial fluid was breaking through the zone of the least resistance, either through the duct by which normal bursa communicates to the joint or by creating a herniation of the synovial membrane.

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Malghem classified the cysts into synovial, meniscal and ganglion cysts[3]. A synovial popliteal cyst is considered to be a preexisting distended synovial bursa mostly located beneath the medial head of the gastrocnemius muscle; it can occasionally be found under the common tendon of the semimembranous muscle. They usually communicate with each other by creating the gastrocnemio-semimembranous bursa, and with the knee joint at the level of medial femoral condyle[4,5].

A cyst can be classified as primary or secondary depending on the existing communication to the joint and knee derangement. Unlike primary, secondary cyst communicates with the knee joint and is associated with articular pathology such as meniscal tears, anterior cruciate ligament (ACL) injury, and osteoarthritis[6]. Primary cysts are isolated sac formations and they are not associated with intrinsic knee pathology. In most cases, the latter cysts are found in pediatric and teenage patients.

Popliteal cyst is a common nonvascular asymptomatic or symptomatic abnormality located in the popliteal fossa. Occasionally it can cause serious disorders by compressing adjacent structures. There are numerous studies reporting on complications such as tibial nerve entrapment, pseudothrombophlebitis or compartment syndrome caused by ruptured cyst[7-9]. These cysts are known to simulate the symptoms of acute deep vein thrombosis (DVT) of lower extremity and these two conditions are clinically indistinguishable, particularly when rupture is presented.

The aim of the present study was to determine the incidence of Baker's cysts, their characteristics and associated abnormalities, and to evaluate the role of venous duplex scanning (VDS) in detecting this condition in outpatient setting.

Material and Methods

Medical records of all patients undergoing VDS in 2008-2009 to rule out DVT were reviewed. All patients with clinical suspicion of lower extremity DVT were referred to vascular laboratory for duplex ultrasonography. Thorough patient history was obtained, with special attention paid to prior episodes of DVT, pulmonary embolism, post-thrombotic syndrome, superficial phlebitis, pregnancy and chronic diseases such as heart failure and renal failure, which may cause leg swelling within systemic edema. Such patients were considered ineligible for the present study.

Diagnostic criteria used to confirm or exclude DVT depended on the vein compressibility and presence of endoluminal clots. VDS was considered negative if the veins were entirely compressible without endoluminal material. The examination was considered equivocal or inconclusive if the vein compressibility had a restriction to less than 2 cm without endoluminal clots.

A hypoechoic or anechoic mass filled with fluid and located in popliteal fossa was considered a Baker's cyst, with special attention to rupture or dissection of fluid into the adjacent proximal gastrocnemius muscle belly, hemorrhage into the cyst, posterior compartment syndrome, or compression of adjacent structures. All VDS studies were performed by experienced operators trained for daily practice of VDS.

The analysis included patient age and sex and clinical data on all DVT and symptomatic Baker's cysts cases, size of the cyst, border characteristics, rupture, extension into the calf and compression of adjacent structures.

During the two-year period, 95 patients were examined to rule out DVT. Thirty-one patients were excluded on the basis of exclusion criteria. The reasons for exclusion were prior DVT episodes (n=12), suspicion of pulmonary embolism (n=1), known post-thrombotic syndrome (n=6), renal failure (n=1), heart failure (n=2), superficial phlebitis (n=8), and pregnancy (n=1). Thus, the study cohort comprised 64 patients, 34 female and 30 male, age range 19-89.

Results

Deep vein thrombosis was the most common finding on VDS, recorded in 75% of patients. Ten (15.6%) patients had complicated Baker's cyst (Table 1). The vast majority of patients with Baker's cyst presented with unilateral painful and swollen leg (n=7), and three of them had swollen leg.

The majority of detected cysts were not clearly bordered. There were 6 ruptured Baker's cysts (one of them caused posterior compartment syndrome, previously misdiagnosed as DVT and treated with anticoagulants that led to worsening of the symptoms), 2 cases with clearly compressed popliteal vein without coexisting DVT, and 2 cases of massive cysts extending to the calf.

During the follow up period, most of the study patients underwent magnetic resonance imaging of the knee, which revealed consecutive inner lesions: degenerative cartilage lesion was found in four patients, and meniscal tears, chondromalacia with meniscal tears and ACL rupture in two patients each.

Table 1. Causes of clinical manifestations observed on venous duplex scanning

Diagnosis	Number of patients
Deep vein thrombosis	48
Complicated Baker's cyst	10
Muscle rupture	3
Lymphedema	1
Popliteal artery aneurysm	1
Total	64

Two patients were immediately treated with cyst excision because of evident popliteal vein compression, whereas five patients underwent arthroscopy with proper arthroscopic procedure (meniscectomy, chondroplasty with microfracture and ACL reconstruction). Three patients refused any further examination and arthroscopy, and were treated conservatively with repeat aspirations, rest and analgesics. There was no recurrence and all cysts resolved spontaneously, even in patients treated conservatively. In some cases it took 6 months.

Discussion

Baker's cyst is an enlarged gastrocnemio-semimembranous bursa that is associated to inflammatory joint process or mechanical intra-articular derangements[6,10]. The pathogenesis of the cyst depends on the communication duct between the joint and the bursa, with a valve-like effect allowing for fluid passage from the joint into the bursa. The communication duct between the joint and the cyst is open during knee flexion and closed during knee extension. For this reason, Baker's cyst becomes more obvious and solid with knee extension, the latter phenomenon being called Foucher's sign[11]. However, Baker's cyst can mimic DVT as an important differential diagnosis, particularly in the presence of extension or rupture into the calf[12]. Clinical manifestations of popliteal cyst like popliteal pain and tenderness, palpable mass and leg swelling can be equivalent to those seen in DVT positive patients. There are different imaging modalities for evaluation of Baker's cysts, all with some diagnostic advantages and limitations. VDS is inexpensive and noninvasive and it seems to be an efficient tool for assessment of Baker's cysts and their relations with adjacent structures, especially on ruling out coexisting DVT. In our patient cohort with suspected DVT, the overall incidence of complicated popliteal cysts of 15.6% was comparable to the incidence reported elsewhere and confirmed the rates stated in the literature[13-15].

In their study, Langsfeld *et al.*[16] found seven cases of Baker's cysts coexisting with DVT and considered it one of the most advantageous features of VDS evaluation in patients with popliteal cysts. We recorded two cases of popliteal cysts that clearly compressed popliteal vein, but without consecutive DVT development.

Differentiation of Baker's cyst rupture and DVT is of utmost importance, especially in patients with complicated popliteal cysts that are susceptible to thrombotic events. In the present study, six patients had ruptured cysts resulting in swollen and painful calf, also called pseudothrombophlebitis, observed by many authors[12,17-19].

In their prospective study, Labropoulos *et al.* found a higher incidence of Baker's cyst in patients aged over 50 years[14].

When treating patients with symptomatic popliteal cysts, it is particularly important to identify the underlying disease of the knee joint. If the cyst is secondary to knee joint pathology, excision of the cyst will not reduce pain and the cyst is likely to recur. Although there are many reports of arthroscopic techniques that can efficiently treat both knee derangement and cyst at the same time[20], the vast majority of surgeons consider cyst excision as the last resort. Surgical treatment should not be the first option chosen and is not required in most instances. According to the European questionnaire replied by 400 European orthopedic surgeons (ESSKA members), a masterly neglect appears to be the general approach (37%), 25% would perform arthroscopy, aspiration of the cyst is the first choice for 16% and surgery for only 6% of responders[6]. Treatment plan should be tailored to each individual patient and the joint should be examined to exclude inflammation arthritis or internal derangement or any other underlying cause of the symptoms. Nonoperative treatment including rest and aspiration of the cyst and judicious use of corticosteroid injections to the knee joint is usually the treatment of choice. Hence, patients should be aware of the possible complications such as cyst rupture. If the cyst does rupture, rest and analgesics are all that is required. We rarely recommend excision of the cyst for our patients and consider it as an option in very selected instances such as very large popliteal cyst with severe pain and buckling of the knee causing restriction of daily activities, and rare cases when the intra-articular pathology has been corrected but the cyst continues to cause symptoms.

In conclusion, Baker's cyst is a rather common condition and may not be found on physical examination. When symptomatic, it can be misinterpreted as a different condition. The real goal of VDS examination

should be exclusion of vascular or expansible conditions, and detection and assessment of the relation between the cyst and adjacent structures in outpatients. On the basis of these prerequisites, VDS is considered the method of choice for assessment of patients with lower extremity symptoms in outpatient setting.

References

1. ADAMS R. Chronic rheumatic arthritis of the knee joint. Dublin J Med Sci 1840;17:520-2.
2. BAKER WM. On the formation of the synovial cysts in the leg in connection with disease of the knee joint. St Barth Hosp Rep 1877;13:245-61.
3. MALGHEM J. Ganglion cysts of the knee: articular communication by delayed radiography and CT after arthrography. Am J Roentgenol 1998;170:1579-83.
4. RAUSCHNING W, LINDGREN PG. Popliteal cysts (Baker's cysts) in adults: clinical and roentgenological results of operative excision. Acta Ortop Scand 1979;50:583-91.
5. RAUSCHNING W. Anatomy and function of the communication between knee joint and popliteal bursae. Ann Rheum Dis 1980;39:354-8.
6. FRITSCHY D, FASEL J, IMBERT JC, BIANCHI S, VERDONK R, WIRTH CJ. The popliteal cyst. Knee Surg Sports Traumatol Arthrosc 2006;14:623-8.
7. CANCELLIERI A, MARULLO M, QUERCI A, TRIMBOLI C, BALLARINO F, LEMMA F. Pseudo-thrombophlebitic syndrome of the leg caused by cyst in the inner popliteal hamstrings. A case report. 2001;22:29-32.
8. DUNLOP D, PARKER PJ, KEATING JF. Ruptured Baker's cyst causing posterior compartment syndrome. Injury 1997;28:561-2.
9. DANEYEMEZ M, BAYSEFER A, ACKA G, KIRDEMIR V, SEBER N. Nerve entrapment by a firmly wrapped Baker cyst. 1998;41:172-4.
10. RUPP S, SEIL R, JOCHUM P, KOHN D. Popliteal cysts in adults. Prevalence, associated intraarticular lesions, and results after arthroscopic treatment. Am J Sports Med 2002;30:112-5.
11. CANOSO JJ, GOLDSMITH MR, GERZOF SG, WOHLGETHAN JR. Foucher's sign of the Baker's cyst. Ann Rheum Dis 1987;46:228-32.
12. SATO O, KONDOH K, IYORI K, KIMURA H. Midcalf ultrasonography for the diagnosis of ruptured Baker's cysts. Surg Today 2001;31:410-3.
13. JOHNSON LL, van DYK GE, JOHNSON CA, BAYS BM, GULLY SM. The popliteal bursa (Baker's cyst): an arthroscopic perspective and the epidemiology. Arthroscopy 1997;1:66-72.
14. LABROPOULOS N, SHIFRIN DA, PAXINOS O. New insights into the development of popliteal cysts. Br J Surg 2004;10:1313-8.
15. HANDY JR. Popliteal cysts in adults: a review. Semin Arthritis Rheum 2001;31:108-18.
16. LANGSFELD M, MATTESON B, JOHNSON W, WASCHER D, GOODNOUGH J, WEINSTEIN E. Baker's cysts mimicking the symptoms of deep vein thrombosis: diagnosis with venous duplex scanning. J Vasc Surg 1997;4:658-62.
17. OZGOCMEN S, KOCAKOC E, KIRIS A, ARDICOGLU O. Pseudothrombophlebitis in a patient with Behçet's syndrome: Doppler ultrasound and magnetic resonance imaging findings. Clin Rheumatol 2002;1:60-2.
18. VILLALBA ALCALÁ F, ESPINO MONTORO A, MONTEAGUDO PARREÑO A, MARTÍNEZ SÁNCHEZ A. Pseudo-thrombophlebitic syndrome secondary to spontaneous rupture of Baker's popliteal cyst. Aten Primaria 2002;30:188-9.
19. OZGOCMEN S, KAYA A, KOCAKOC E, KAMANLI A, ARDICOGLU O, OZKURT-ZENGIN F. Rupture of Baker's cyst producing pseudothrombophlebitis in a patient with Reiter's syndrome. Kaohsiung J Med Sci 2004;20:600-3.
20. AHN JH, YOO JC, LEE SH, LEE YS. Arthroscopic cystectomy for popliteal cysts through the posteromedial cystic portal. Arthroscopy 2007;23:559.

Sažetak

OTKRIVANJE BAKEROVE CISTE: ULTRAZVUČNA DIJAGNOSTIKA (*DUPLEX SCAN*) U IZVANBOLNIČKIM UVJETIMA

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Poplitealna cista poznata i kao Bakerova cista je tvorba ispunjena sinovijskom tekućinom i smještena u poplitealnoj jami. Ona može biti simptomatska i prouzročiti ozbiljne poremećaje kao što su tromboflebitis, sindrom fascijalnih prostora i neuropatiju uslijed kompresije živca. To je najčešća nevaskularna tvorba u zakoljenoj jami i katkada ju je klinički nemoguće razlikovati od duboke venske tromboze. Cilj ove studije bio je procijeniti vrijednost ultrazvučne dijagnostike (*duplex scan*) u otkrivanju i razlikovanju kompliciranе Bakerove ciste i duboke venske tromboze u ambulantnim uvjetima. Analizirala se medicinska dokumentacija bolesnika koju su u posljednje dvije godine (2008. i 2009.) bili podvrgnuti *duplex* ultrasonogafiji kako bi se isključila duboka venska tromboza. Kompliciranа Bakerova cista je utvrđena u desetoro bolesnika. Bakerova cista je prilično česta tvorba i kada se očituje otečenom i bolnom potkoljenicom nemoguće ju je običnim kliničkim pregledom sa sigurnošću razlikovati od duboke venske tromboze. Ultrasonografija metodom *duplex scan* je koristan modalitetet za otkrivanje Bakerove ciste, duboke venske tromboze i pridružene patologije.

Ključne riječi: *Poplitealna cista – dijagnostika; Poplitealna cista – ultrazvuk; Venska tromboza – dijagnostika; Venska tromboza – ultrazvuk*