Orthopaedics & Traumatology: Surgery & Research 105 (2019) 125–128

Contents lists available at ScienceDirect

Orthopaedics & Traumatology: Surgery & Research

journal homepage: www.elsevier.com

Technical note

Extra-articular endoscopic excision of symptomatic popliteal cyst with failed initial conservative treatment: A novel technique

Yueh Chen [a], Pei-Yuan Lee [a], Ming-Chou Ku [a], Nai-Yuan Wu [b], Chien-Sheng Lo [a,*]

[a] Department of Orthopedic Surgery, Show Chwan Memorial Hospital, No. 542, Section 1, Chung-shan Road, Changhua City, Changhua County 500, Taiwan
[b] Institute of Biomedical Informatics, National Yang-Ming University, Taipei, Taiwan

ARTICLE INFO

Article history:
Received 15 March 2018
Accepted 18 September 2018

Keywords:
Knee
Arthroscopy
Extra-articular approach
Cystectomy
Popliteal cyst

ABSTRACT

To reduce the damage to posteromedial knee capsule, we developed a direct extra-articular arthroscopic approach for excision of symptomatic popliteal cysts. This study aimed to demonstrate the surgical technique and present the 2-year follow-up results. Cystectomy is performed by extra-articular surgical approach through a high posteromedial portal. Twenty-one consecutive patients diagnosed of symptomatic popliteal cysts with failed initial conservative treatments were included. At a median follow-up of 29.4 months, all knees had improved clinical function assessed by Rauschning and Lindgren knee classification ($p < 0.001$). The cysts were either disappeared (95.2%) or reduced in size (4.8%). Only one (4.8%) patient had recurrent cyst, which was solved after ultrasound-guided aspiration. This direct extra-articular arthroscopic technique could be a feasible alternative for treatment of symptomatic popliteal cysts.

1. Introduction

Arthroscopic procedures are the most common surgical treatment for symptomatic popliteal cysts [1]. Current principle is simultaneously to treat intra-articular pathologies and to correct the valvular system between gastrocnemio-semimembranosus bursa and knee joint in relation to the formation of cyst [1,2]. Ahn et al. introduced an arthroscopic technique to resect capsular fold and remove the valvular mechanism through a posteromedial portal and performed cystectomy through an additional posteromedial cystic portal. Ahn et al emphasized that the most important step was to locate the communication orifice between popliteal cyst and posteromedial capsule and they also identified the orifice in all 31 cases [3]. Jiang et al. presented a similar procedure to perform intra-articular drainage and cystectomy, and the author commented that the orifice of cyst is not easy to find but there is always capsular fold in front of the cyst [4]. However, the prevalence of the orifice has been reported to be between 30% to 71% depending on the evaluation tool [5]. Kim et al. arthroscopically evaluated the anatomy of posteromedial capsule and popliteal cyst. This study observed that the orifice could not be observed in 36% of popliteal cysts and even 12% of popliteal cysts had neither capsular fold nor orifice [6]. Because these intra-articular arthroscopic procedures aimed to decompress popliteal cyst by locating the orifice of cyst and then resecting the capsular fold, the process of finding the orifice may injure the posteromedial capsule. Once the orifice is not easily located, the damage to posteromedial capsule would be greater. However, posteromedial capsule provides important stability to the extended knee and the damaged posteromedial capsule may result in tibiofemoral joint laxity and increase the risk of degeneration of both menisci and joint surfaces [7,8]. Therefore, we have to balance the complete excision of cyst against the damage to posteromedial capsule. For this reason, we developed a direct extra-articular arthroscopic approach for excision of symptomatic popliteal cysts. This study aimed to demonstrate the surgical technique and to present the 2-year follow-up results.

1.1. Surgical technique

Patient is placed in supine position under general or spinal anesthesia. The first step is to create standard anterolateral and anteromedial portals and to perform routine arthroscopic examination and treatment of intra-articular lesions.

The second step is to create a standard posteromedial portal. The scope is directed from anterolateral or anteromedial portal into the posteromedial compartment through intercondylar notch with 90° knee flexion. Then the posteromedial capsule is examined and the orifice of cyst is identified using a 30- or 70-degree scope. Under arthroscopic guidance, a standard posteromedial portal is created.

* Corresponding author.
E-mail address: johnlcs317@gmail.com (C.-S. Lo).

https://doi.org/10.1016/j.otsr.2018.09.022
1877-0568/

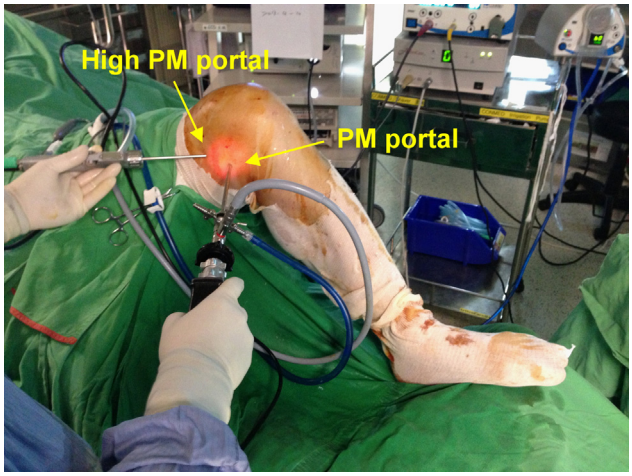

Fig. 1. The knee is 90° flexed and the scope is introduced through the posteromedial portal and high posteromedial portal. PM, posteromedial.

A shaver is inserted through the posteromedial portal to enlarge the cyst's orifice by resecting the capsular fold if the orifice can be found (Video 1).

The third step is to create an extra-articular surgical field. The scope is shifted to the posteromedial portal to reach the posteromedial compartment. The scope is kept in the posteromedial portal but is slightly drawn back into the extra-capsular area. Then the scope is used to bluntly dissect the nearby subcutaneous tissue and create an extra-articular space. Using a #16 needle as a guiding probe under visualization, a high posteromedial portal is carried out 4–5 cm proximal to the posteromedial portal (Fig. 1). Taking the posteromedial portal as visual portal and the high posteromedial portal as working portal, an extra-articular surgical field is created (Video 2).

The fourth step is to find the cyst by extra-articular approach. The extra-articular surgical field is posterior to the joint capsule. Gastrocnemius medial head and semimembranosus tendon are identified after careful resectionl of the soft tissue behind the posteromedial capsule by shaving through the high posteromedial portal. Using gastrocnemius medial head and semimembranosus tendon as landmarks, the cystic wall is identified. The cyst is palpated by shaver and its flimsy membrane is a character (Fig. 2, Video 3).

The fifth step is to perform cystectomy by extra-articular approach. After creating a hole on the cystic wall, the cyst is entered (Fig. 3). Using shaver through the high posteromedial portal, all the loose fragments, septum and cystic wall are resected from inside the cyst (Fig. 4, Video 4). Then the scope is switched to the high posteromedial portal and the posteromedial portal is taken as working portal. The remnant cystic wall between gastrocnemius medial head and semimembranosus tendon is resected (Fig. 5, Video 5).

1.2. The series

From 2008/1 to 2012/7, 21 consecutive patients (11 male and 10 female) with a median age of 61 years (interquartile range [IQR], 48 to 80 years) were included with the following criteria: (1) popliteal cyst diagnosed by ultrasonography and magnetic resonance imaging, (2) failed conservative treatment with aspiration (Table 1).

A total of 17 patients (81.0%) had associated intra-articular pathologies, including meniscal and chondral lesions. Ten (47.6%) patients had osteoarthritis (all medial lesion; eight stage 1 and two stage 2), four (19.0%) medial meniscus tear, two (9.5%) medial plica syndrome with abrasion of medial condylar bone, and one (4.8%) anterior cruciate ligament injury. Meniscectomy was performed for

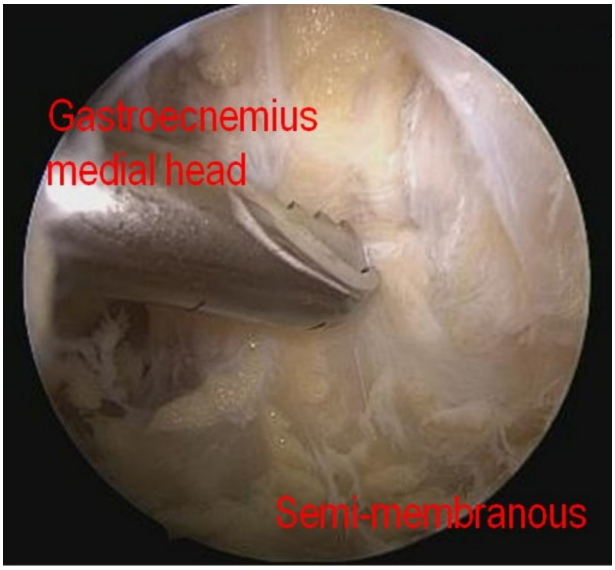

Fig. 2. Blunt dissection under arthroscopic control using gastrocnemius medial head and semimembranosus tendon as landmarks.

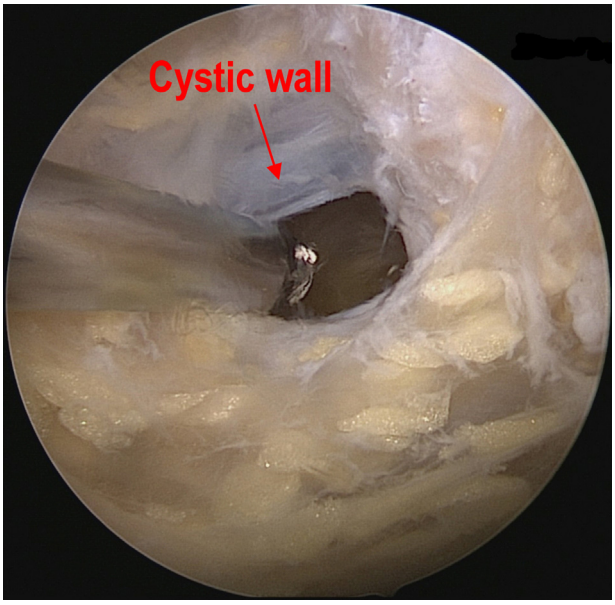

Fig. 3. The cyst wall is identified and the cyst is entered after creating an entrance hole on the wall.

Table 1
Pre and postoperative Rauschning and Lindgren knee classification and the size of popliteal cyst.

	Preop ($n=21$)	The last follow-up ($n=21$)	p
Rauschning and Lindgren knee classification			<0.001
Grade 0	0 (0)	11 (52.3%)	
Grade 1	0 (0)	9 (42.9%)	
Grade 2	2 (9.5%)	1 (4.8%)	
Grade 3	19 (90.5%)	0 (0)	
Size of cyst (cm)[a]	5.0 (3.0–6.5)	0.7[b]	<0.001

[a] Data were presented as count (percentage) or median (interquartile range).
[b] Postoperatively, twenty patients had disappeared cysts and only one patient had remaining cyst which was reduced in size.

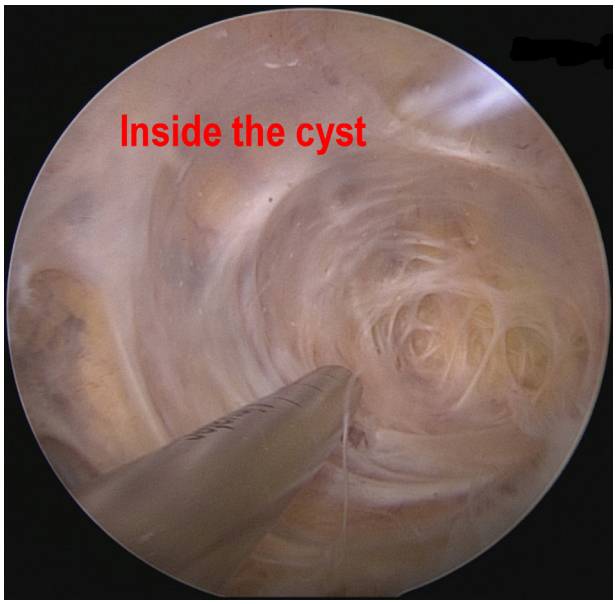

Fig. 4. Gently removing the entire cystic wall using shaver and coagulator.

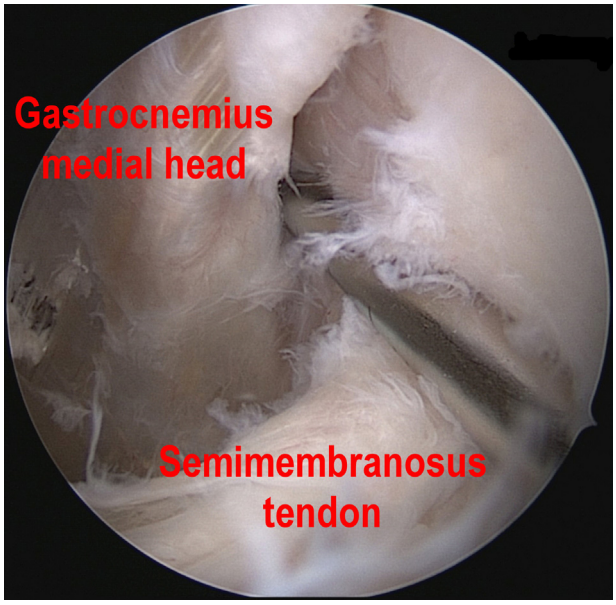

Fig. 5. The total cystectomy is performed using extra-articular approach under direct vision of the cyst.

the four (19.0%) patients with medial meniscus tear. The other 17 (61.9%) patients did not receive any additional procedures for the intra-articular pathologies.

Functional outcomes were assessed by Rauschning and Lindgren knee classification preoperatively and at the last follow-up [9]. Ultrasonography was used preoperatively, 1-year and 2-year postoperatively. Preoperative and postoperative outcomes were compared by Wilcoxon signed-rank test.

One recurrence (4.8%) was noted 3 months after surgery. Ultrasonography revealed a recurrent 3 cm cyst, which was resolved by ultrasound-guided aspiration.

At a median follow-up of 29.4 months (12 to 55 months), all the 21 (100%) knees had improved clinical function ($p < 0.001$). Twenty (95.2%) patients had completely disappeared cysts and one (4.8%) patient had remaining cyst, which was reduced in size from 4.5 cm to 0.7 cm. No patients had intraoperative complications. All patients achieved full range of motion postoperatively and also have relieved symptoms, such as posterior knee pain, and swelling. No patients needed secondary surgery. No further recurrence occurred.

2. Discussion

As Ko and Ahn reported, to enlarge the communication orifice between cyst and posteromedial capsule over 5 mm could convert the unidirectional flow to bidirectional flow [10,11]. Thus, the most important step of Ahn's technique was to locate the orifice of cyst and then the cyst could be decompressed by partially resecting capsular fold [3,12]. Several arthroscopic procedures have been proposed with the similar principle. Jiang et al. performed internal drainage of cyst by resecting capsular fold until medial gastrocnemius tendon was clearly revealed [4]. Cho et al. used a 70-degree arthroscope through standard anterolateral portal to obtain a wider operative field and then performed cystectomy through standard posteromedial portal [13]. All these techniques emphasized the correction of orifice and performed cystectomy by intra-articular approach with advancing the arthroscope into popliteal cyst through the orifice. But Jiang et al. enlarged the orifice much greater than what Ahn et al. did and the damage to posteromedial capsule would be also greater [3,4].

Different from these intra-articular approaches, our technique performed cystectomy by extra-articular approach. To locate the orifice of cyst was not the most important step. Kim et al. reported that the orifice and capsular fold were arthroscopically observed in 66.7% of popliteal cysts, [6] and Johnson et al. reported in only 37% of knees [14]. Once the orifice or capsular fold was not identified, the direct extra-articular approach could still allow an easier excision with lesser capsule destruction.

Good outcomes have been reported with the intra-articular approaches: 96.8% and 100% for Ahn and Cho respectively [12,13]. Our extra-articular technique also provided similar results. However, this study had a limited sample size and all patients came from a single-center.

3. Conclusion

The direct extra-articular arthroscopic excision of popliteal cyst has favorable functional outcomes and low recurrence rate. It could be a feasible alternative for treatment of symptomatic popliteal cysts and is a useful option in cases where there is difficulty in finding the communication orifice between cyst and posteromedial capsule.

Disclosure of interest

The authors declare that they have no competing interest.

Funding

There is no funding source.

Authors' contributions

Yueh Chen, Pei-Yuan Lee, Ming-Chou Ku interpreted the results, drafted the manuscript, and approved the final submission.

Yueh Chen, Pei-Yuan Lee, Nai-Yuan Wu coordinated the data collection process, reviewed the manuscript.

Yueh Chen, Nai-Yuan Wu carried out the initial analyses.

Chien-Sheng Lo designed the data collection process, supervised data collection, and critically reviewed the manuscript.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.otsr.2018.09.022.

References

[1] Herman AM, Marzo JM. Popliteal cysts: a current review. Orthopedics 2014;37:e678–84.
[2] 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.
[3] Ahn JH, Yoo JC, Lee SH, Lee YS. Arthroscopic cystectomy for popliteal cysts through the posteromedial cystic portal. Arthroscopy 2007;23 [559 e1-4].
[4] Jiang J, Ni L. Arthroscopic internal drainage and cystectomy of popliteal cyst in knee osteoarthritis. J Orthop Surg Res 2017;12:182.
[5] Handy JR. Popliteal cysts in adults: a review. Semin Arthritis Rheum 2001;31:108–18.
[6] Kim KI, Lee SH, Ahn JH, Kim JS. Arthroscopic anatomic study of posteromedial joint capsule in knee joint associated with popliteal cyst. Arch Orthop Trauma Surg 2014;134:979–84.
[7] Robinson JR, Bull AM, Thomas RR, Amis AA. The role of the medial collateral ligament and posteromedial capsule in controlling knee laxity. Am J Sports Med 2006;34:1815–23.
[8] Stephen JM, Halewood C, Kittl C, Bollen SR, Williams A, Amis AA. Posteromedial meniscocapsular lesions increase tibiofemoral joint laxity with anterior cruciate ligament deficiency, and their repair reduces laxity. Am J Sports Med 2016;44:400–8.
[9] Rauschning W, Lindgren PG. The clinical significance of the valve mechanism in communicating popliteal cysts. Arch Orthop Trauma Surg 1979;95:251–6.
[10] Ko S, Ahn J. Popliteal cystoscopic excisional debridement and removal of capsular fold of valvular mechanism of large recurrent popliteal cyst. Arthroscopy 2004;20:37–44.
[11] Ko SH, Ahn JH. Arthroscopic shaving cystectomy of popliteal cyst. J Korean Orthop Assoc 2002;37:364–8.
[12] Ahn JH, Lee SH, Yoo JC, Chang MJ, Park YS. Arthroscopic treatment of popliteal cysts: clinical and magnetic resonance imaging results. Arthroscopy 2010;26:1340–7.
[13] Cho JH. Clinical results of direct arthroscopic excision of popliteal cyst using a posteromedial portal. Knee Surg Relat Res 2012;24:235–40.
[14] 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;13:66–72.