

Chester WH Lie 李威鴻  
TP Ng 吳子培

- Objective** To review the results of arthroscopic treatment of popliteal cysts in our centre and analyse outcomes including complications.
- Design** Retrospective study.
- Setting** University teaching hospital, Hong Kong.
- Patients** From July 2007 to July 2009, 11 patients with symptomatic popliteal cysts were treated arthroscopically. All of them had preoperative magnetic resonance imaging to confirm the diagnosis, identify the valvular opening, and the associated intra-articular pathology. We used the Rauschnig and Lindgren criteria for evaluation.
- Results** Intra-articular pathology like cartilage degeneration and meniscus tear were commonly associated with popliteal cysts. All patients achieved symptomatic improvement after treatment and the recurrence rate was low. No major complications were encountered. We failed to identify (and correct) any valvular opening in one patient.
- Conclusion** From our experience, we conclude that arthroscopic treatment of popliteal cyst with correction of the valvular opening and treatment of associated intra-articular pathology is effective and safe.



A video of arthroscopic treatment of popliteal cysts is available at <www.hkmj.org>.

## Introduction

Popliteal cysts (also termed Baker's cysts) are most frequently characterised by the enlargement of the gastrocnemius-semimembranosus bursa, which is one of several other bursae around the knee. It was first described over a century and a half ago by Adams<sup>1</sup> and later by Baker.<sup>2</sup> The pathogenesis includes a valvular opening between knee joint and the bursa (Fig 1), and associated intra-articular pathology may give rise to knee effusion.<sup>3</sup>

The mainstay of treatment is conservative. Since the cysts are often asymptomatic and resolve spontaneously, many are treated by observation alone. If symptomatic, analgesia, aspiration, and steroid injection therapy may be considered, but most recur rapidly. In the past open excision was an option if they remained symptomatic, but the associated recurrence rate was high (up to 63%).<sup>4</sup> One important reason was that the intra-articular pathology causing the knee effusion was not treated. Also, it was difficult to obtain a tight closure over the opening after open excision, and a large open wound appeared necessary (Fig 2).

In 1999, arthroscopic treatment of popliteal cysts was proposed by Sansone and De Ponti,<sup>5</sup> and similar techniques were published by others.<sup>6-8</sup> This approach has the merit of simultaneously correcting both the valvular opening (by re-establishing a normal bi-directional communication) and the associated intra-articular pathology responsible for the persistence of the cyst. Also, large open wounds can be avoided.

In this study, results of arthroscopic treatment of popliteal cysts in our centre were reviewed and outcomes (including complications) were analysed.

## Methods

Between July 2007 and July 2009, 11 patients (9 women and 2 men; mean age of 60 [range, 49-70] years) with symptomatic popliteal cysts were treated arthroscopically at Queen Mary Hospital, Hong Kong.

Chief complaints were posterior knee discomfort and swelling after activities or even at rest, and difficulty in deep knee flexion. All of them had been symptomatic

### Key words

Arthroscopy; Joint diseases; Knee joint; Popliteal cyst; Treatment outcome

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Department of Orthopaedics and Traumatology, Queen Mary Hospital, Pokfulam, Hong Kong

CWH Lie\*, FHKCOS, FHKAM (Orthopaedic Surgery)  
TP Ng, FHKCOS, FHKAM (Orthopaedic Surgery)

\* CWH Lie is now at Department of Orthopaedics and Traumatology, Kwong Wah Hospital, Hong Kong

Correspondence to: Dr CWH Lie  
Email: chesterliewh@gmail.com

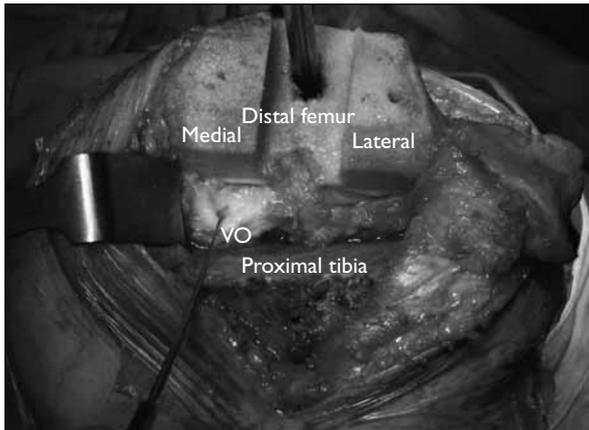


FIG 1. Intra-operative photo taken during total knee replacement, which shows the valvular opening (VO) between knee joint and the bursa

for more than 1 year. The diagnosis was based on physical examination and preoperative magnetic resonance imaging (MRI) to confirm the diagnosis, identify the valvular opening (Fig 3) and associated intra-articular pathology. For clinical evaluation, we followed the criteria proposed by Rauschnig and Lindgren<sup>4</sup> (Table). The mean follow-up period was 13 (range, 8-32) months.

### Surgical technique

The surgical technique involved five steps:

- (1) A routine arthroscopic examination of the knee joint through standard anteromedial and anterolateral portals and treatment of associated intra-articular pathology (eg removal of loose body, partial meniscectomy, or chondroplasty).
- (2) Establishment of a posteromedial portal. A 70° arthroscope was inserted through the anteromedial portal into the posteromedial compartment, through the intercondylar notch between the medial femoral condyle and posterior cruciate ligament. The posteromedial portal was made with needle guidance.

TABLE. Summary of the clinical status according to Rauschnig and Lindgren<sup>4</sup> criteria

Criteria*	Before surgery	3 Months after surgery	Last follow-up
Grade 0	0	7	7
Grade 1	0	3	3
Grade 2	6	0	0
Grade 3	4	0	0

\* Grade 0 = no pain and swelling, no range limitation; Grade 1: pain and swelling after intense activity, minimal range limitation; Grade 2: pain and swelling after normal activity, <20° range limitation; Grade 3: pain and swelling even at rest, >20° range limitation

### 關節鏡下治療膕窩囊腫

**目的** 回顧分析本中心關節鏡下治療膕窩囊腫的結果以及其併發症。

**設計** 回顧研究。

**安排** 香港一所大學教學醫院。

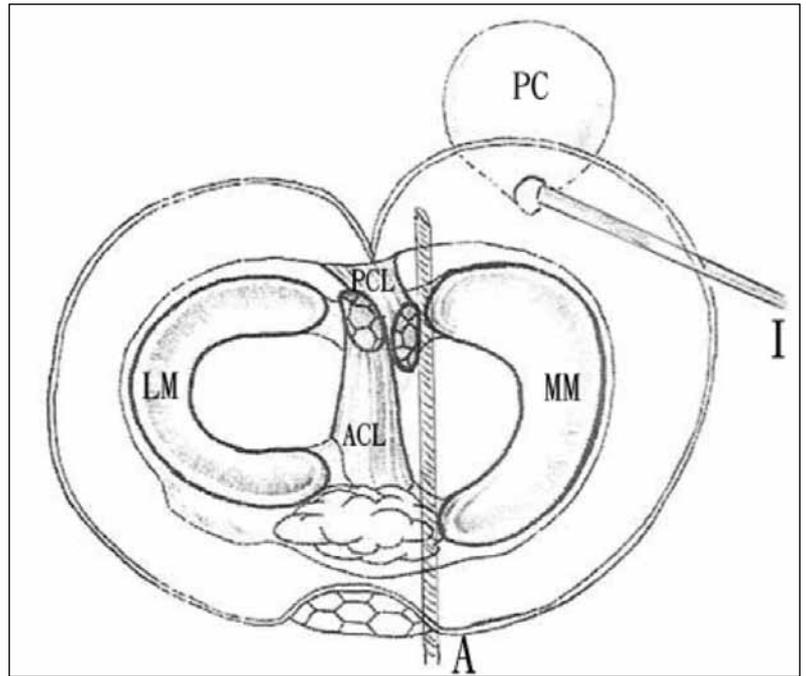
**患者** 2007年7月至2009年7月期間，11名患有膕窩囊腫症狀而接受關節鏡治療的病人，他們於術前均以磁力共振成像確診此症、其閥門開度及關節內病理。我們按照Rauschnig和Lindgren分級法對手術結果進行評估。

**結果** 與膕窩囊腫有關的關節內病理，以關節軟骨退化及內側半月板撕裂最為普遍。所有病人接受治療後症狀都得到改善，復發率低，且無明顯併發症發生。只有一名病人未能確認及治理其閥門開度。

**結論** 根據我們的經驗，以關節鏡治療膕窩囊腫及校正閥門開度，以至治療關節內病理都是有效及安全的。



FIG 2. Surgical scar after open excision of popliteal cyst



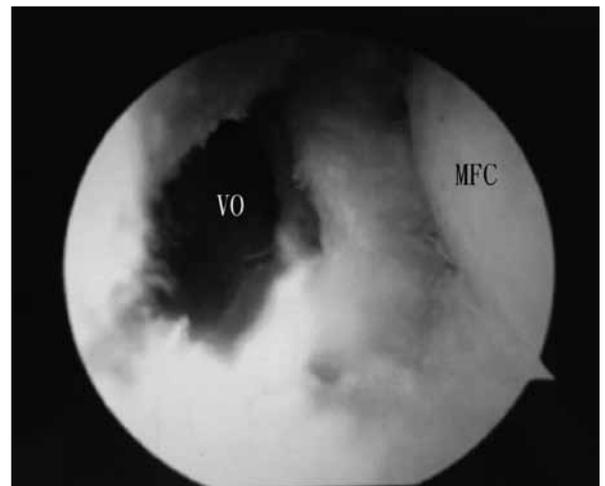
The 70° arthroscope (A) was inserted via the anteromedial portal into the posteromedial compartment, and the instruments (I) including shaver and basket forceps are inserted via the posteromedial portal to resect the valvular opening of the popliteal cyst (PC). MM denotes medial meniscus, LM lateral meniscus, ACL anterior cruciate ligament, and PCL posterior cruciate ligament

- (3) Identification of the valvular opening either by percutaneous injection of methylene blue into the cyst or by advancing the arthroscope into the cyst via the posteromedial portal.
- (4) Resection of the valvular opening using basket forceps or a shaver via the posteromedial portal (Figs 4 and 5).
- (5) Debridement of the septum via the transcystic portal, if there were multiple septa inside the cyst.

### Results

In all cases, there was at least one associated intra-articular pathology. Cartilage degeneration was the most common and affected eight (72%) of the patients, followed by medial meniscus tears (5 patients, 45%). Loose bodies were noted in two (18%) of the patients and a lateral meniscus tear in one (9%).

Information about the clinical status according to Rauschnig and Lindgren<sup>4</sup> criteria before surgery, 3 months after surgery, and at the last follow-up is summarised in the Table. We failed to identify the valvular opening in one of our patients, which was very likely related to the learning curve with this procedure. After surgery symptomatic improvement averaged 2 grades, and at least 1 grade in every patient, and the improvements were sustained till the last follow-up. All but one patient had clinical



resolution of the posterior knee swelling, and in the latter it was non-progressive.

No major complications were encountered. One patient developed a portal site infection, which was treated conservatively with antibiotics and wound dressings. One patient had mild posteromedial portal

resolution of the posterior knee swelling, and in the latter it was non-progressive.

site discomfort that improved with time. Till the last follow-up, no clinical recurrence was encountered, and none of our patients had any neurovascular complications, such as saphenous nerve injury.

## Discussion

Many different surgical techniques have been suggested for the treatment of popliteal cysts. The high frequency of recurrence after open excision<sup>4</sup> suggested the need for a change in therapeutic strategy. Therapy which prevails nowadays entails treating the associated intra-articular pathology as well, since it causes the knee effusion and is one of the reasons for popliteal cyst persistence after treatment. Our results echo the strong association reported between such cysts and intra-articular pathology.<sup>7</sup> In our series, the commonest pathology was cartilage degeneration, followed by medial meniscus tear.

Besides tackling the associated intra-articular pathology, elimination of the unidirectional flow of effusion from knee joint to the cyst was also a target. Some specialists try to achieve this by closing the valvular opening with a suture,<sup>9-11</sup> but the buildup of intra-articular fluid pressure during the normal knee flexion and extension is difficult to resist.<sup>12</sup> Also, closure of the valvular opening between the cyst and the knee joint is not necessary, since such communication actually exists in 50% of normal adults without any clinically evident popliteal cyst.<sup>13</sup> Thus, it is important to re-establish the normal bidirectional

communication between the cyst and the knee joint.

Concerning technical points, the primary neurovascular structure at risk during the procedure is the popliteal neurovascular bundle. This structure is usually lateral to the cyst and avoided by keeping the instruments in constant view and avoiding crossing the mid-line of the knee joint. As long as the instruments are kept medial to the midline, the neurovascular structures are safe, but careful reading of the MRI about the position of the neurovascular structure is also very important. It is also advisable to keep shaver suction on low side when working inside the posteromedial compartment in order to avoid pulling any unvisualised tissue into the instrument.

Besides, the superficial saphenous vein and nerve are also potentially at risk when we establish the posteromedial portal. When making the skin incision, it should therefore be limited to the skin only, and only blunt dissection is used to gain entry into the knee joint. The other way to avoid iatrogenic injury to saphenous vein and nerve is to dim down the lights of the operating theatre, as sometimes the saphenous vein will be shown up by the light source of the arthroscopy. Moreover, the saphenous nerve is usually just next to it, so we can make the portal away from the shadow of the saphenous vein.

We conclude that arthroscopic treatment of popliteal cyst with correction of the valvular opening and treatment of the associated intra-articular pathology is effective and safe. However, more long-term follow-up studies are needed.

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