

Intra-articular Ganglionic Cysts of Knee: A Cause for Anterior Knee Pain

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Learning Point of the Article:

In patients with persistent unexplained anterior knee pain, intra-articular ganglion cysts should be considered, with MRI enabling accurate diagnosis and arthroscopic treatment providing excellent symptomatic relief in symptomatic cases.

Abstract

Introduction: Ganglionic cysts are mostly found around the wrists, but they can occur in any part of the body. They are also common around the knees as popliteal cysts and meniscal cysts. Intra-articular cysts of the knee, however, are much rarer, with only sporadic cases being reported till 1990. Most of these cysts are asymptomatic and detected during routine magnetic resonance imaging (MRI) and arthroscopy for other pathologies. Most of the time, they are reported in relation to the anterior cruciate ligament (ACL) and rarely in relation to the posterior cruciate ligament, menisci, and very rarely in relation to the anterior fat pad. These patients occasionally report with knee pain, mechanical locking, and restriction of terminal flexion/extension. The symptoms depend on the site and size of the cysts.

Materials and Methods: We report a case series of 10 patients with ganglionic cysts of the knee who were studied over a period of 4 years. The study included four males and six females with an average age of 34.8 years. All reported with persistent knee pain at the outset. Clinical examination, preliminary X-ray, and MRI were done in all patients. Seven patients were examined arthroscopically, and their findings were recorded. Of these, three patients were treated with radiofrequency ablation and four with arthroscopic debridement of the cyst. Histopathology examination was carried out for the specimen material taken out.

Results: Arthroscopic examination revealed two cystic masses originating from ACL, two from the anterolateral knee fat pad, one from the retropatellar fat pad, one from the anteromedial fat pad, and one from the anterior horn of the lateral meniscus. All were treated successfully with arthroscopic debridement or radiofrequency ablation. All were symptom-free at the latest follow-up. The mean follow-up duration for the surgically treated patients was 29 months (range, 24–34 months). Out of the three patients who did not undergo surgery, one had a spontaneous resorption of the cyst as evidenced by MRI taken at 3 years.

Conclusion: Although uncommon, intra-articular ganglion cysts should be considered in patients presenting with unexplained anterior knee pain. MRI facilitates early diagnosis, and arthroscopic management offers a safe and effective treatment with favorable clinical outcomes and low recurrence rates.

Keywords: Intra-articular ganglion cyst; Knee; Anterior knee pain; Magnetic resonance imaging; Arthroscopy; Anterior cruciate ligament.

Author's Photo Gallery



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Introduction

Ganglionic cysts are mostly found around the wrists, but they can occur in any part of the body. They are also common around the knees as popliteal cysts and meniscal cysts. In 1877, Baker described the association of popliteal cysts with intra-articular lesions. Several authors have reported that 41–83% of joint disorders have associated popliteal cysts [1,2,3,4].

Intra-articular cysts of the knee, however, are much rarer. First intra articular cyst of the anterior cruciate ligament (ACL) was reported by Caan 1924 in a cadaveric specimen [5]. Only sporadic cases of intra-articular cysts of the knees were reported till 1990. An increasing number of these cases have been reported in the last three decades with the advent of magnetic resonance imaging (MRI) and arthroscopy. Most of these cysts are asymptomatic and detected during routine MRI and arthroscopy for other pathologies [5]. Intra-articular ganglionic cysts, especially those arising from the cruciate ligaments, have a reported prevalence of 0.2–1.3% on MRI and 0.1–0.6% on knee arthroscopy. Most of the time, they are reported in relation to the ACL and rarely in relation to the posterior cruciate ligament (PCL), menisci, and very rarely in relation to the anterior fat pad. These patients occasionally report with knee pain, mechanical locking, and restriction of terminal flexion/extension. The symptoms depend on the site and size of the cysts [5,6].

We report a case series of 10 patients with ganglionic cysts and describe their clinical features, radiology, morphology, and location.

Materials and Methods

Ten patients with ganglion cysts of the knee were studied over a 4-year period. The patients reported with persistent knee pain at the outset. Clinical examination was carried out to assess the knees for various correlative signs. MRI was carried out in all

cases to provide radiological assessment after a preliminary X-ray. Seven of the 10 patients agreed to undergo surgery. Their arthroscopic findings and the procedure carried out were recorded. Histopathology examination was carried out for the specimen material taken out. The findings were tabulated (Table 1).

Results

Ten patients with MRI-confirmed intra-articular cysts of the knee were included in the study. The mean age was 34.8 years (range, 25–51 years). There were four males and six females. Nine patients presented with anterior knee pain, whereas one reported generalized knee pain.

On clinical examination, four patients had no demonstrable physical signs. Two patients had a palpable swelling, one had joint line tenderness, three had restriction of knee extension, and one had a positive McMurray test.

Seven patients underwent arthroscopic treatment. In all cases, arthroscopic findings correlated with the preoperative MRI. Radiofrequency ablation was performed in three patients, while four underwent arthroscopic debridement of the cyst. Three patients were managed non-operatively. One of these demonstrated spontaneous complete resorption of the cyst on follow-up MRI obtained 3 years after the initial diagnosis. Representative clinical, MRI, and arthroscopic images are shown in Fig. 1–6.

The mean follow-up duration for the surgically treated patients was 29 months (range, 24–34 months). At final follow-up, all operated patients had complete resolution of pain, swelling, and mechanical symptoms, with no evidence of recurrence. No procedure-related complications were observed.

Discussion

Intra-articular cysts of the knee are mostly found around the ACL, but they have also been reported around the PCL, within the substance of the ACL, in relation to the medial or lateral menisci, within the infrapatellar fat pad, and as subchondral bone cysts [5,6,7,8,9,10,11,12,13,14,15,16,17].

They are mostly detected incidentally during MRI or arthroscopy performed for unrelated knee pathology. On MRI, the cysts appear as fluid-filled lobulated lesions with low signal intensity on T1-weighted images and high signal intensity on T2-weighted images [5,18]. They are mainly round or elliptical lobulated structures, and internal septa are visible in some cysts [17]. Ganglion cysts located anterior to the cruciate ligaments have been reported to restrict terminal knee extension, whereas cysts located posterior to the cruciate ligaments may restrict



Figure 1: Cyst arising from retropatellar fat pad reaching up to proximal tibia (black arrow).

Table 1: Clinico-radiological and arthroscopic findings in patients under study

S. No.	Age	Sex	Duration	Symptoms	Signs	MRI	Arthroscopy findings	Procedure	HPE
1	27	F	2 years	Anterior knee pain	Restricted extension	Multiloculated cyst in the ACL region	Multiloculated cyst in the ACL footprint	Radiofrequency ablation	Ganglion
2	33	M	1 year	Anterior knee pain	None	Cyst in the ACL region	Cyst in the ACL footprint	Radiofrequency ablation	Ganglion
3	35	F	1 year	Anterior knee pain	Swelling lateral to the patellar tendon (Fig. 1)	Cyst behind the patellar tendon (Figs. 2 and 3)	Cyst in the retropatellar fat pad	Radiofrequency ablation	Ganglion
4	48	F	1.5 years	Anterior knee pain	None	Multiloculated cyst in the ACL region; additional cyst behind the PCL tibial insertion	Patient did not agree to surgical intervention	Conservative management	NA
5	34	M	4 years	Pain knee	Recurrent locking; McMurray's test positive	Medial meniscal cystic involvement at the posterior horn extending to the body	Patient did not agree to surgical intervention	Conservative management	NA
6	27	F	1 year	Anterior knee pain	None	Cystic lesion in the anterolateral fat pad	Cyst in the anterolateral knee within the fat pad	Arthroscopic debridement	Ganglion
7	42	M	1 year	Anterior knee pain	Restriction of terminal extension	Cystic lesion in the anteromedial fat pad	Cyst in the anteromedial fat pad	Arthroscopic debridement	Ganglion
8	26	M	9 months	Anterior knee pain	Tender anterolateral joint line; restriction of knee extension	Discoid lateral meniscus with ganglionic cysts near the anterior horn, with a degenerative tear	Cyst in the anterior horn with a subchondral extension; unstable tear of the discoid meniscus	Cyst debridement with resection of the torn part of the meniscus	Ganglion
9	51	F	5 years	Anteromedial knee pain	Swelling in the anteromedial area	Multiloculated cyst in the anteromedial fat pad	Patient refused surgery. The cyst regressed spontaneously, but an MMT appeared at 3 years	Conservative management	NA
10	25	F	2 months	Anterior knee pain	None	Cystic lesion in the anterolateral knee fat pad with abutment of the meniscus	Cyst in the anterolateral knee fat pad	Arthroscopic debridement	Ganglion

ACL: Anterior cruciate ligament, PCL: Posterior cruciate ligament, MMT: Medial meniscus tear, HPE: Histopathological examination, NA: Not applicable, MRI: Magnetic resonance imaging

terminal knee flexion [19]. In the present study, the intra-articular cyst arising from the anterior horn of the lateral meniscus and the cysts located anterior to the cruciate ligaments were also associated with restriction of terminal knee extension. Ganglion cysts originating from the ACL have been reported to occur approximately three times more frequently than those arising from the PCL [5]. Cysts arising from the infrapatellar fat pad are rarely large enough to present as a palpable swelling, as was also observed in one of our cases [7].

In symptomatic cases, these intra-articular cysts most commonly present with anterior knee pain [5,11,13,20,21,22,23], whereas locking has only rarely been reported. Similarly, the majority of patients in our series presented with anterior knee pain, while the cyst arising from the infrapatellar fat pad presented as a giant ganglion cyst measuring approximately 9 cm vertically and 5 cm horizontally. Only a few cases of giant intra-articular ganglion cysts have been reported in the literature [7,14].

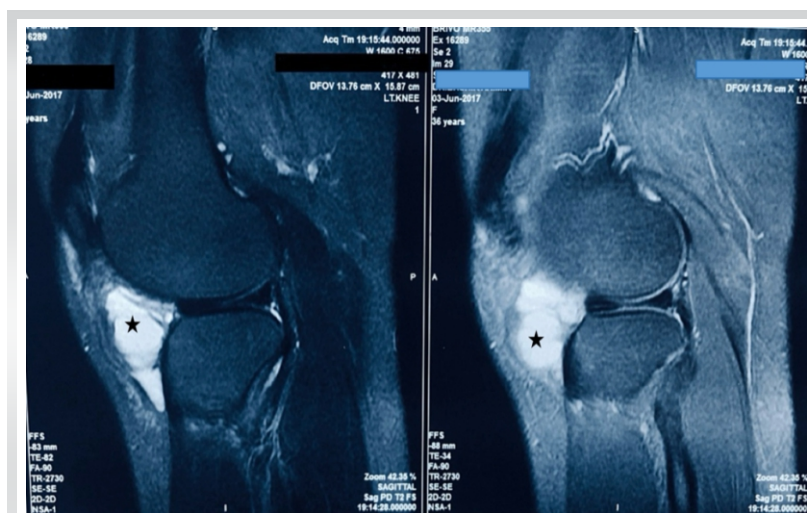


Figure 2: Ganglionic cyst in retropatellar fat pad (asterisk).

The pathogenesis of these intra-articular cysts still remains unclear. The proposed etiopathogenetic mechanisms include herniation of synovial tissue, post-traumatic connective tissue degeneration, mucinous degeneration of connective tissue, proliferation of pluripotent mesenchymal stem cells, and displacement of synovial tissue during embryogenesis [5,6,8,14]. The theory of cellular response to trauma involves liberation of mucin and hyaluronic acid, which become interspersed within the fibers of the ligament, causing fusiform dilatation. With joint movement, the mucinous material dissects between the ligament fibers and may subsequently be found at the ligament attachments or within the intercondylar notch of the knee [18,19].

Ultrasound-, computed tomography (CT)-, or

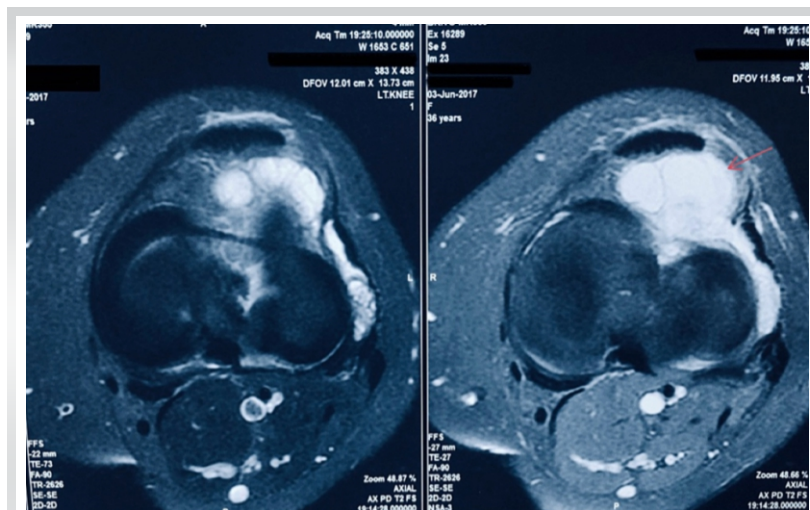


Figure 3: Retropatellar ganglionic cyst (arrow).

arthroscopic-guided needle aspiration has been associated with a higher rate of recurrence [5]. Management options for intra-articular ganglion cysts include observation, image-guided aspiration, arthroscopic excision or debridement, radiofrequency ablation, and open excision. Asymptomatic lesions may be managed conservatively with observation, as spontaneous regression has been reported in some cases. Ultrasound- or CT-guided aspiration is minimally invasive but is associated with a higher recurrence rate because the cyst wall may not be completely removed. Arthroscopic excision or debridement allows direct visualization of the lesion and associated intra-articular pathology, facilitates complete cyst removal, enables early rehabilitation, and has been associated with excellent clinical outcomes and low recurrence rates. Open excision is generally reserved for large cysts with extra-articular extension or lesions that are technically difficult to access arthroscopically, although it may be associated with greater surgical morbidity. Mostly large cysts have been excised through an open approach to reduce the chances of recurrence, but many cases have also been successfully managed arthroscopically without recurrence. Cysts arising from the infrapatellar fat pad may be difficult to reach arthroscopically, especially if they are large or associated with subcutaneous extension [16,22]; however, all operated cases in our series, including the large cyst arising from the infrapatellar fat pad, were successfully managed arthroscopically, as also reported by Yang et al. [9,10].

Recent reports continue to support the

importance of MRI in accurately diagnosing intra-articular ganglion cysts of the knee and delineating their relationship to surrounding structures, thereby facilitating appropriate surgical planning. These reports have also demonstrated excellent clinical outcomes following arthroscopic management of symptomatic lesions while emphasizing that giant ganglion cysts with extra-articular extension may still require an open approach in selected cases. Recent case reports of Hoffa's fat pad ganglion cysts further highlight the importance of individualized treatment based on cyst size, location, and symptomatology [2,3].

Histologically, ganglion cysts show a fibrous cyst wall containing myxoid viscous material without an epithelial lining [8]. Not all ganglion cysts of the knee require excision; only those associated with symptoms require surgical treatment [11,24].

Seven cysts in our study were managed arthroscopically, of which three underwent radiofrequency ablation, and four underwent arthroscopic decompression and debridement. The use of the radiofrequency probe minimized damage to adjacent structures and reduced post-operative hemarthrosis. At the latest follow-up, all surgically treated patients remained asymptomatic without recurrence of pain, swelling, or mechanical symptoms. Although a repeat MRI was not routinely performed, the absence of recurrent clinical symptoms suggests that no clinically significant recurrence occurred during the follow-up period.

The strengths of the present study include preoperative MRI confirmation in all patients, arthroscopic correlation in surgically treated cases, and histopathological confirmation where tissue was obtained. The study is limited by its

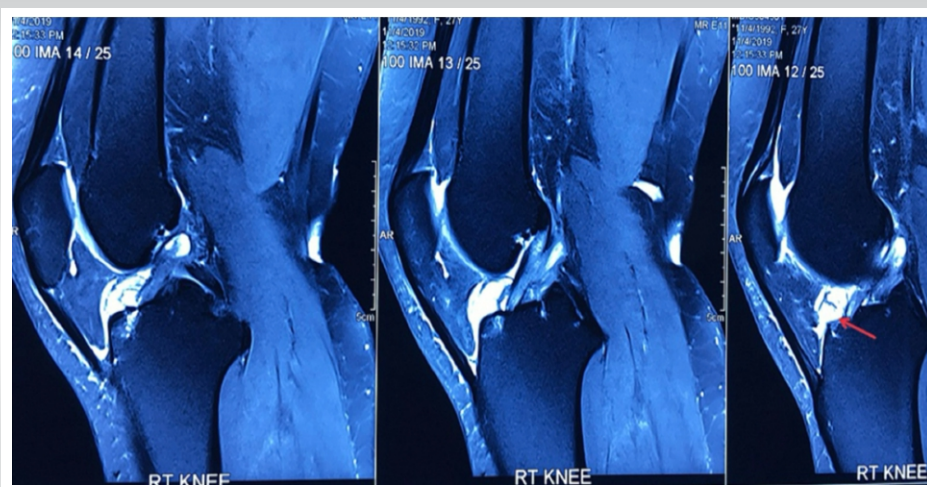


Figure 4: Intra-articular cyst of the knee at the base of the anterior cruciate ligament (arrow).

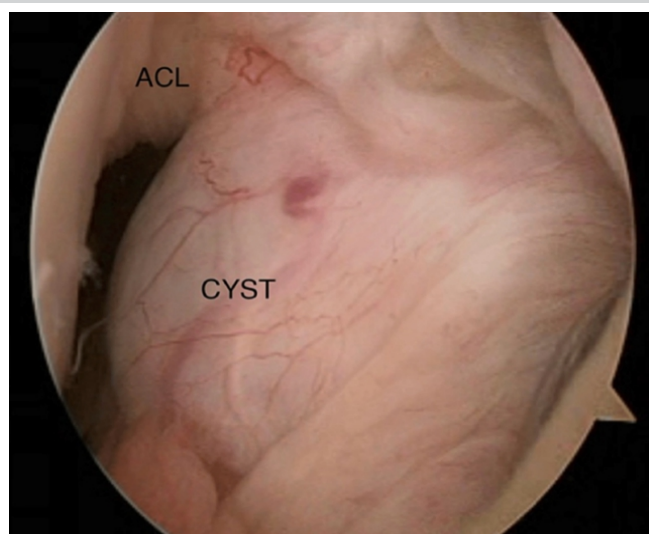


Figure 5: Arthroscopic image showing a ganglionic cyst at the base of the anterior cruciate ligament.



Figure 6: Post-radiofrequency ablation of cyst.

retrospective design, heterogeneous cyst locations, lack of standardized functional outcome scores, and absence of routine post-operative MRI to objectively assess recurrence.

Conclusion

Intra-articular ganglion cysts of the knee are uncommon but important causes of persistent anterior knee pain and mechanical symptoms. MRI is invaluable for the diagnosis and localization of these lesions. Arthroscopic debridement or radiofrequency ablation provides effective symptom relief with excellent clinical outcomes and low morbidity in symptomatic

patients, while selected asymptomatic lesions may be managed conservatively.

Clinical Message

Persistent anterior knee pain with inconclusive clinical examination should prompt consideration of an intra-articular ganglion cyst. MRI plays a pivotal role in diagnosis, and arthroscopic excision or radiofrequency ablation is a safe and effective treatment for symptomatic lesions, resulting in excellent functional outcomes and symptom resolution.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

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