

Articles

The MR appearance of cruciate ganglion cysts: a report of 16 cases

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Abstract. Intra-articular ganglion cysts arising from the cruciate ligaments are unusual lesions, there being only nine previously reported cases. We report 16 cases and describe their MR appearance. Nine ganglia originated from the posterior cruciate ligament, most often appearing as well-defined multilocular lesions. The seven ganglia arising from the anterior cruciate ligament most often appeared as fusiform cystic lesions extending along and interspersed within the fibers of the ligament. Although uncommon, intra-articular ganglion cysts arising from the knee appear to have a distinctive MR appearance which should allow their correct diagnosis.

Key words: Ganglion cyst – Cruciate ligaments – Magnetic resonance

Periarticular cystic lesions commonly are seen about the knee. The majority of these cysts are popliteal cysts, other frequent lesions being meniscal cysts and ganglion cysts [1]. Intra-articular ganglion cysts which arise from the cruciate ligaments are uncommon, there being only nine previously reported cases [2–10].

Although magnetic resonance (MR) imaging has been shown to be an effective method for the evaluation of cystic lesions of the knee, only two previous reports of the MR appearance of intra-articular ganglion cysts of the knee have been published [5, 8]. We present 16 such lesions and describe their MR appearance.

Materials and methods

Sixteen patients with the diagnosis of intra-articular ganglion cysts arising from the cruciate ligaments were collected from a review of MR studies at five different institutions. One of the patients included in this series has been reported previously [5].

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There were seven male and nine female patients with an average age of 36 years and an age range of 21–49 years.

All MR examinations were performed at 1.0 or 1.5 T using a dedicated knee coil. The examinations consisted of a combination of T1-weighted (TR = 600–1000, TE = 20) spin echo, multiecho T2-weighted (TR = 2000–2500, TE = 16–25, 60–90) spin echo, hybrid-RARE (TR = 4000–8000, TE = 85–105), gradient echo (TR = 350, TE = 20, flip angle = 30°), and STIR (TR = 2500, TE = 20, TI = 160) sequences performed in the sagittal, coronal, and planes. The field of view varied between 12 and 20 cm, slice thickness ranged from 3 to 5 mm, and the interslice gap was 0 to 2 mm. The number of acquisitions was one or two. The imaging matrix ranged from 256 × 192 to 512 × 256. All MR studies were evaluated for the presence of associated pathology such as meniscal tears, ligamentous disruptions, and joint effusions.

Arthroscopic data were available in four cases of anterior cruciate ligament (ACL) ganglia and in four cases of posterior cruciate ligament (PCL) ganglia. In the other eight cases, although no histologic data were available, the diagnosis of a cruciate ganglion cyst was made on the basis of the distinctive and near-identical MR appearance to the surgically proved cases. In addition, the site of origin of these eight ganglia was determined by comparing their appearance to that of the surgically proven cases, as well as their proximity to either the PCL or the ACL.

Unfortunately, because of the retrospective nature of this study, a detailed review of the clinical symptoms leading to the MR examination was not available. However, as for as clinical symptoms are known, pain was the most frequent symptom.

Results

Of the 16 intra-articular ganglion cysts, nine arose from the PCL and seven arose from the ACL. On T1- and proton-density-weighted images, the cysts varied from slightly hypointense to slightly hyperintense in relation to the signal intensity of skeletal muscle. On T2-weighted images, 15 of the 16 were homogeneously hyperintense to skeletal muscle. The remaining ganglion, which arose from the ACL, was heterogeneous in signal intensity on the T2-weighted images, and on histology demonstrated hemorrhagic debris within the cyst.

All nine cysts that originated from the PCL were well demarcated, and eight of the nine appeared multilocular (Figs. 1, 2). Seven of the nine cysts were located dorsal

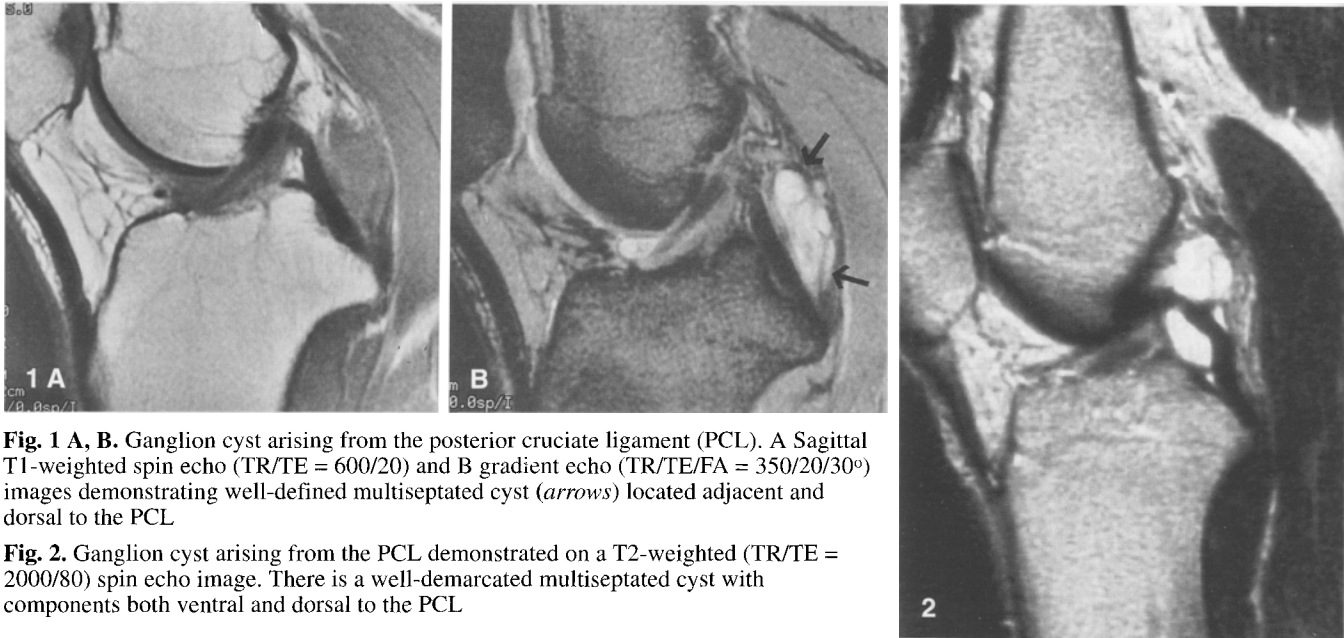


Fig. 1 A, B. Ganglion cyst arising from the posterior cruciate ligament (PCL). A Sagittal T1-weighted spin echo (TR/TE = 600/20) and B gradient echo (TR/TE/FA = 350/20/30°) images demonstrating well-defined multiseptated cyst (*arrows*) located adjacent and dorsal to the PCL

Fig. 2. Ganglion cyst arising from the PCL demonstrated on a T2-weighted (TR/TE = 2000/80) spin echo image. There is a well-demarcated multiseptated cyst with components both ventral and dorsal to the PCL

to the PCL, while two cysts had components both ventral and dorsal to the ligament. One of the cysts extended intraosseously, and one of the cysts extended through the medial joint capsule, presenting as a palpable mass (Fig. 3).

Six of the seven ganglion cysts that originated from the ACL were fusiform in shape, extending along the course of and interspersed within the fibers of the ACL (Fig. 4). One cyst was multilocular, located dorsal to the tibial attachment site of the ACL. None of the ACL ganglia extended intraosseously.

Associated findings on the MR scans included four torn medial menisci, one torn lateral meniscus, one torn ACL, and two popliteal cysts. Only one patient had an associated joint effusion.

Discussion

Ganglia are cystic, tumor-like lesions that most often are found near or attached to tendon sheaths and joint capsules. They also occasionally may occur within tendons and muscles [11]. The cysts are filled with a clear mucinous fluid. They may have a continuous or discontinuous lining of cells that are not true synovial cells. The histogenesis and pathogenesis of ganglia are uncertain, and multiple theories including herniation of the synovium into surrounding tissue, displacement of synovial tissue during embryogenesis, post-traumatic degeneration of connective tissue, and origination from proliferating pluripotential mesenchymal cells have all been postulated [12].

Although the most common location for ganglia is about the wrist, ganglia about the knee also are well known [13]. Intra-articular ganglia arising from the cruciate ligaments, however, are uncommon lesions. Because of the retrospective nature of our review, details of

clinical symptomatology were not available for our patients. However, in the previously reported cases, symptoms associated with cruciate ganglia included pain and limitation of movement.

The appearance of the cruciate ganglia on MR was distinctive, but was different depending whether the site of origin was the PCL or ACL. Ganglia associated with the PCL most often appeared as well-defined multilocular cysts along the surface of the ligament, while those associated with the ACL most often had a fusiform appearance extending along the course of and interspersed within the fibers of the ligament. The reason for this difference is uncertain.

All the ganglia except one had the typical MR appearance of soft tissue ganglion cysts [14], exhibiting homogeneously hyperintense signal in relation to skeletal muscle on T2-weighted images. On T1-weighted images, the cysts were relatively isointense to skeletal muscle, and this is believed to be secondary to the high protein concentration within the cyst fluid which results in a relative shortening of T1 [13]. The one ganglion cyst that did not have these signal characteristics demonstrated heterogeneity on T2-weighted images and at arthroscopy was found to contain hemorrhagic debris.

A recent article on the prevalence and significance of intraosseous cyst-like changes at the cruciate ligament attachments in the knee reported one cruciate ligament ganglion cyst that demonstrated intraosseous extension [8]. Our series also included one PCL ganglion cyst that extended intraosseously. Although the significance of this finding is uncertain, it is tempting to postulate that it may relate to the size and age of the cruciate ligament ganglion.

The differential diagnosis for cruciate ganglia is limited. Joint fluid trapped adjacent to the cruciate ligaments usually can be eliminated because of the well-defined multilocular nature of the PCL ganglia and the fu-

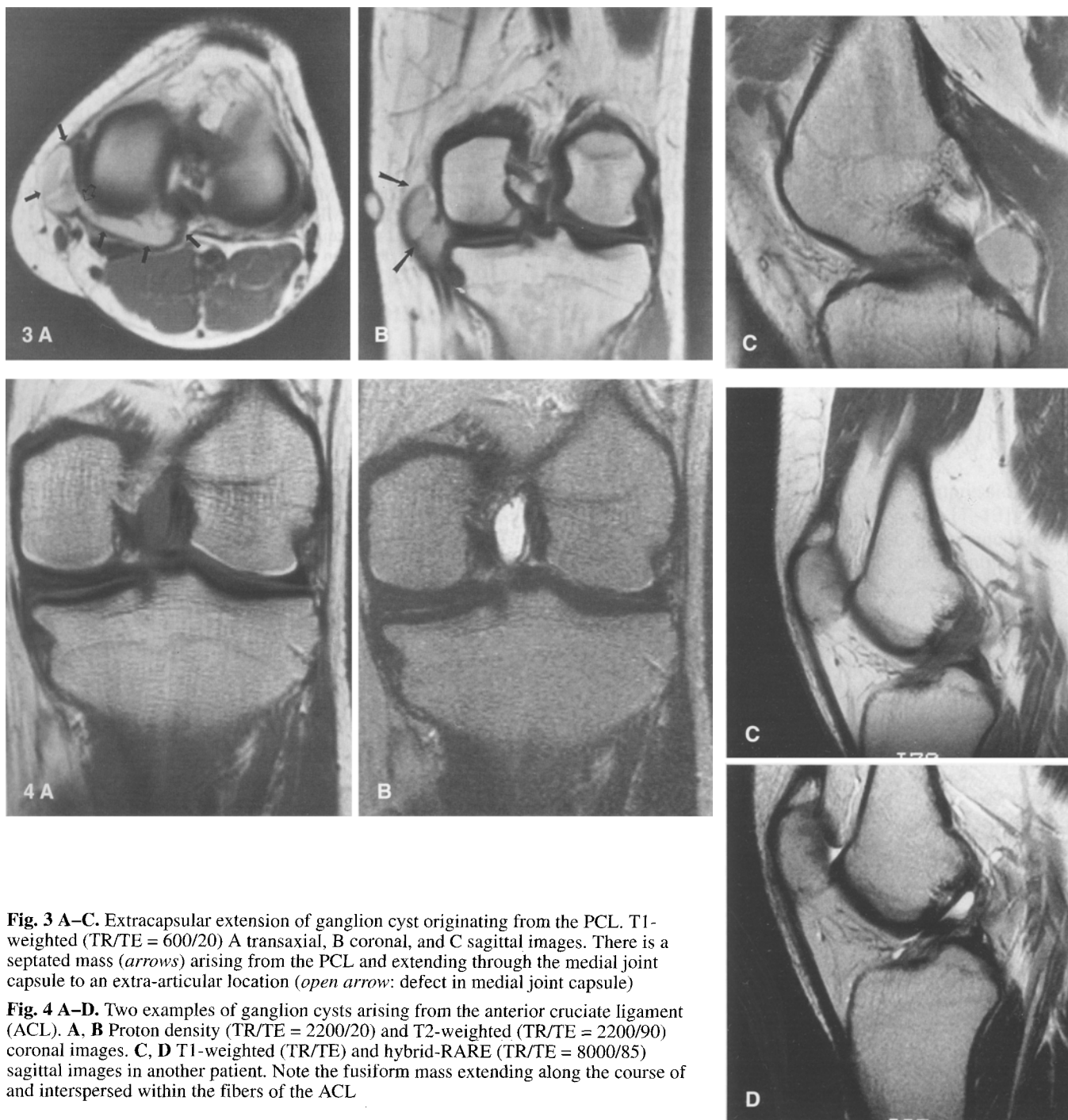


Fig. 3 A-C. Extracapsular extension of ganglion cyst originating from the PCL. T1-weighted (TR/TE = 600/20) A transaxial, B coronal, and C sagittal images. There is a septated mass (arrows) arising from the PCL and extending through the medial joint capsule to an extra-articular location (open arrow: defect in medial joint capsule)

Fig. 4 A-D. Two examples of ganglion cysts arising from the anterior cruciate ligament (ACL). A, B Proton density (TR/TE = 2200/20) and T2-weighted (TR/TE = 2200/90) coronal images. C, D T1-weighted (TR/TE) and hybrid-RARE (TR/TE = 8000/85) sagittal images in another patient. Note the fusiform mass extending along the course of and interspersed within the fibers of the ACL

siform shape of the ACL ganglia. Furthermore, the vast majority (15 of 16) of cysts in our study were not associated with large joint effusions.

There are two weaknesses in this study. First, only 8 of the 16 cases had arthroscopic proof. The near-identical appearance of the remaining eight cases to the proven cases, however, was felt to justify their inclusion in this review. Secondly, there was a lack of detailed clinical information on the patients because of the retrospective and multi-institutional nature of this review.

Although not a common lesion, intra-articular ganglion arising from a cruciate ligament should be considered

in the presence of a cystic, loculated mass associated with a cruciate ligament. The MR appearance of such ganglia is distinctive and should allow the correct diagnosis to be made.

References

1. Lee KR, Cox GG, Neff JR, Arnett GR, Murphey MD. Cystic masses of the knee: arthrographic and CT evaluation. *AJR* 1987; 148: 329-334.
2. Bromley JW, Cohen P. Ganglion of the posterior cruciate ligament. Report of a case. *J Bone Joint Surg [Am]* 1965; 47: 1247.

3. Caan P. Cyst formation (ganglion) in an anterior cruciate ligament of the knee. *Dtsch Z Chir* 1924; 186: 403.
4. Chang W, Rose DJ. Ganglion cysts of the anterior cruciate ligament. A case report. *Bull Hosp Jt Dis Orthop Inst* 48: 182.
5. Garcia A, Hodler J, Vaughn L, Haghghi P, Resnick D. Case Report 677. *Skeletal Radiol* 1991; 20: 373–375.
6. Kaempffe F, D'Amato C. An unusual intra-articular ganglion of the knee with interosseous extension. *J Bone Joint Surg [Am]* 1989; 71: 5.
7. Levine J. A ganglion of the anterior cruciate ligament. *Surgery* 1948; 24: 836.
8. McLaren DB, Buckwalter KA, Vahey TN. The prevalence and significance of cyst-like changes at the cruciate ligament attachments in the knee. *Skeletal Radiol* 1992; 21: 365–369.
9. Sjoval H. A case of ganglion in a ruptured posterior cruciate ligament of the knee. *Acta Chir Scand* 1943; 87: 331.
10. Yasuda K, Majima T. Intra-articular ganglion blocking extension of the knee: Brief report. *J Bone Joint Surg [Br]* 1988; 70-B: 837.
11. Lattes R. *Tumors of the soft tissues*. Washington DC: Armed Forces Institute of Pathology, 1982.
12. Kissane JM. *Anderson's pathology*, vol 2, 8th edn. St Louis: Mosby, 1985: 1842
13. Burk DL, Dalinka MK, Kanal E, et al. Meniscal and ganglion cysts of the knee: MR evaluation. *AJR* 1988; 150: 331–336.
14. Binkovitz LA, Berquist TH, McLeod RA. Masses of the hand and wrist: detection and characterization with MR imaging. *AJR* 1990; 154: 323–326.