Pictorial review

Intra-articular ganglion cysts of the cruciate ligaments

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Abstract. Intra-articular ganglion cysts of the cruciate ligaments are associated with non-specific clinical signs and symptoms. Familiarity with the MR appearances in particular is important to make an accurate diagnosis, exclude associated abnormalities, and avoid misdiagnosis.

Key words: MRI – Knee – Cruciate – Ligament – Ganglion

Introduction

Ganglion cysts of the cruciate ligaments are rare lesions first described in 1924 by Caan in a cadaveric specimen [1]. There have been sporadic reports of their occurrence at arthroscopy [2, 3, 4] and arthroscopy [5, 6, 7], but their description in the radiology literature was negligible before the advent of MRI [8, 9, 10, 11, 12, 13, 14].

Anatomical considerations

The cruciate ligaments are extra-synovial structures with the synovial membrane covering the medial and lateral aspects of the posterior cruciate ligament (PCL) before it is reflected on the femoral condyles and the posterior joint capsule. This anatomical arrangement eliminates any intra-synovial space between the posterior surface of the PCL and the capsule. A triangular space containing fat and loose connective tissue is formed by the anterior and posterior cruciate ligaments (ACL and PCL) and the tibial plateau, but there is no intervening synovial membrane between the ACL and the PCL or in the triangular space [15].

Aetiology

The precise aetiology of ganglion cysts is unknown. Various theories have been put forward including herniation of synovial into surrounding tissues, degeneration of connective tissue after trauma, displacement of synovial tissue during embryogenesis and proliferation of pluripotential mesenchymal cells [16, 17, 18].

Clinical features

Although their frequency of detection on MRI is between 0.2 and 1.2% [14, 19], the clinical significance is variable depending on size and location. They can be asymptomatic, present with non-specific pain, cause swelling in the popliteal fossa or produce locking and interference in the extremes of flexion or extension [6, 8], mimicking other forms of internal derangement of the knee. A history of preceding trauma is found in 20% of cases [14], but there is no association with joint instability. They occur in isolation in 78% of MR examinations, but other internal derangements of the knee may be encountered [14]. They have not been shown to be specifically associated with other pathology but are difficult to diagnose in the presence of an effusion. The MRI distinction between a true cruciate ligament cyst from a meniscal cyst in a peri-cruciate location is necessary because the latter is associated invariably with a meniscal tear and treatment strategies consequently differ [20].

MR features

At MRI, ganglia demonstrate fluid characteristics with intermediate signal intensity on T1-weighted images, and increased signal on T2-weighted spin-echo (SE) or gradient-recalled-echo (GRE) images (Fig. 1). They are well-delineated structures which can have a low intensity periphery or septae, best identified on the T2-weighted images (Fig. 1b). Cruciate ganglion cysts can be in-

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form in shape as they tend to align along the ACL fibres and are usually unilocular. They may, however, be more complex and multilocular extending anteriorly into Hoffa’s fat (Fig. 3) along the synovial recess at this site. The axial plane best demonstrates this anterior extension. However, in this situation it may be exceedingly difficult to differentiate a cyst arising from the ACL from one arising from the alar folds of synovium covering the infrapatellar (Hoffa’s) fat pad and extending posteriorly into the joint [21]. The precise origin of the cyst may only then be determined by direct visualisation at surgery. Lektrakul and colleagues [21] have recently described pericruciate meniscal cysts which can be confused with a true cruciate ganglion cyst. They occur in association with a meniscal tear and on close inspection a communication between the cyst and the torn meniscus can be identified.

The signal from a cyst is usually homogeneous but also may be inhomogeneous, the latter signal reflecting a degree of fibrous/myxoid change (Fig. 4). Occasionally, a ganglion cyst may be associated with a degree of osseous excavation of the immediately adjacent femoral condyle, demarcated by a fine sclerotic (low-signal) margin. The coronal and axial images optimally demonstrate this feature (Fig. 4b,c). A ganglion cyst of the ACL can also occur within the actual substance of the ligament, intermingling with the fibres yielding an intra-ligamentous cyst. On MR imaging, the ligament then may appear swollen but the individual ligamentous fibres are well visualised within the high-signal cyst (Fig. 5).

Enhancement of ganglia following intravenous gadopentetate does not usually occur. On occasion, however, there may be enhancement of the periphery of, or septae within, the cyst suggesting the presence of a partly vascularised wall or more likely the presence of synovial cells possibly as a result of invagination of synovial tissue. This enhancement, when it occurs, may indeed be a reflection of the origin of the cyst (Fig. 6). Intravenous gadopentetate is not indicated routinely in these instances of cysts but can be valuable where a lesion is in-

traligamentous, be directly adjacent to the ligaments or be some distance away. Those arising from the PCL and adjacent to it are often multi-locular, and are at least in part posterior to the ligament. A cyst in such a location can be differentiated from a loculated effusion since there is no synovial space directly posterior to the ligament (Fig. 1). Such cysts can also extend anteriorly, intertwine between the two ligaments, or colonise the triangular space (Fig. 2). When a cyst occurs within the triangular space, determining its precise site of origin can be difficult (Fig. 2). The sagittal plane optimally delineates the longitudinal location of a cyst relative to the ligament, but the coronal plane more effectively demonstrates the course of the cyst relative to the two cruciate ligaments, particularly when it extends between the two. Those cysts arising from the ACL and lying adjacent to it are often anterior to the ligament, are fusi-