

MRI of Ganglion Cysts in Uncommon Sites or with Atypical Appearance¹

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Ganglion cysts are common lesions which are most often found around the hands and feet. Magnetic resonance (MR) imaging is seldom performed; cysts are identified incidentally on MR images obtained for the purpose of evaluating other disorders. Clinically complicated ganglions are often confused with other more serious tumors, and MR examination is thus requested.

Ganglions arising from uncommon sites or showing unusual MR findings can lead to wrong diagnosis. Thus, a thorough knowledge of potential sites and of the MR findings of unusual ganglion cysts can prevent mistakes. We therefore describe the MR findings of unusual ganglion cysts, including complicated ganglions, cruciate ligament ganglion cysts, meniscal cysts, labral cysts, ganglions in shoulder notches and tarsal tunnels, and intermuscular ganglion cysts.

Index words : Ganglion
Soft tissues, diseases
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Magnetic resonance (MR) imaging of the musculoskeletal system has become a well recognized and useful diagnostic method, especially for soft tissue lesions, and its use has been increasing. Ganglion cysts are common lesions which can be easily diagnosed in a clinician office, and in most cases do not, therefore, require further sophisticated and costly evaluation. They can be identified incidentally during the evaluation of MR images obtained during the investigation of other disorders, though some unusual ganglions can be confused with other more serious lesions.

The typical MR imaging finding of a ganglion cyst is a well defined, relatively small, round-to-ovoid mass of intermediate signal intensity, as seen on T1-weighted

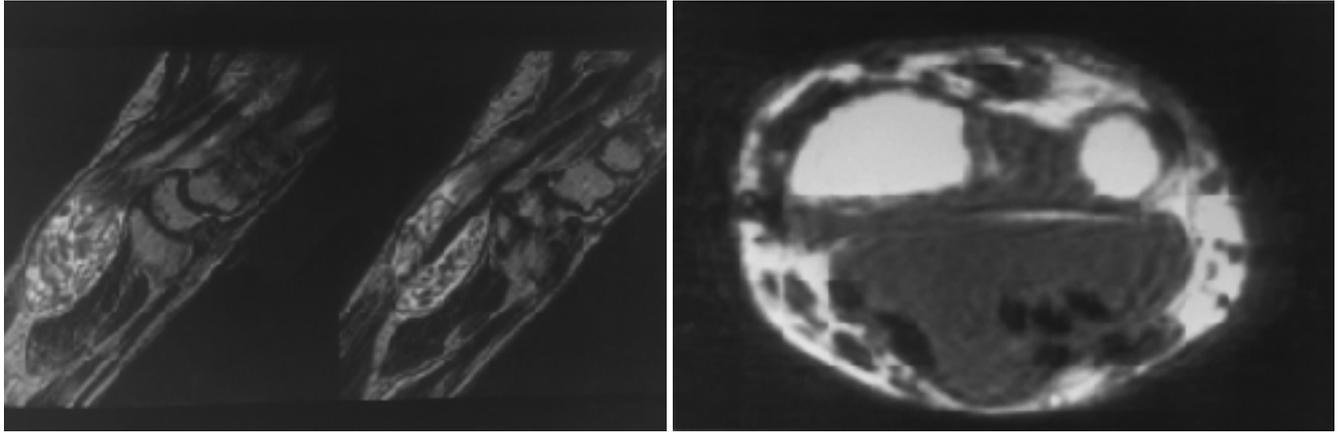
images, and of homogeneous high signal intensity, as seen on T2-weighted images, with non-enhancement or thin rim enhancement. The isointensity seen on T1-weighted images can be explained by the high protein content (1). The correct diagnosis of the ganglion cysts which develop at classical sites and show typical MR features is straightforward, but cysts either with unusual imaging characteristics or at uncommon sites often cause some diagnostic confusion.

Most ganglion cysts, even though located at uncommon sites, usually demonstrate typical MR imaging features, namely a well-marginated cystic mass which is isointense and shows homogeneously high signal intensity on T1- and T2-weighted images, respectively. In addition, ganglion cysts arising at several specific sites, such as the cruciate ligament, meniscus, shoulder notches, or labrum possess certain characteristic imaging findings which are also a great help in diagnosis. Complicated or long-standing ganglion cysts can become quite large and multiseptated with a thick wall, or

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A

B



C

Fig. 1. 75-year old man with a large ganglion cyst with multiple debris who had a long-standing wrist mass and the past history of steroid injection into it.

A. Serial sagittal T2-weighted images show a large cyst extending along the flexor tendons and numerous rice bodies of iso signal intensity within the hyperintense fluid.

B. T1-weighted axial image does not disclose the debris due to the same intermediate signal intensity of debris and fluid.

C. Plain radiograph of the wrist only shows soft tissue mass (arrows) without calcification.

contain numerous rice bodies. The intermediate signal intensity of this internal debris, as seen during all pulse sequences, is the key point of distinction from hemorrhagic arthritis or synovial osteochondromatosis.

A knowledge of both uncommon but potential sites and the MR findings of these unusual ganglions facilitates correct diagnosis. We therefore describe the MR findings of several unusual but not rare ganglion cysts which do not show typical imaging findings, or occur at uncommon sites.

Complicated Ganglion Cysts

Long-standing ganglion cysts may become large, and if hemorrhage or inflammatory change develops, they may have thick enhanced walls, septations and/or internal debris. Because it consists mainly of fibrous nodules, this debris, aptly named rice bodies, usually appears on both T1- and T2-weighted images in the form of numerous isointense nodules (Fig. 1). Macroscopically, they resemble shiny rice grains and microscopically, consist of an inner amorphous core of acidophilic material surrounded by collagen and fibrin (2).

Owing to these signal characteristics, ganglion cysts with multiple fibrous debris can be differentiated from bursitis in pigmented villonodular synovitis or other he-

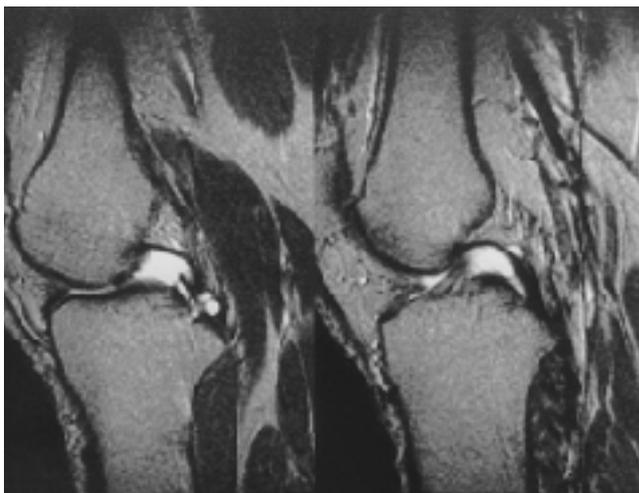


Fig. 2. 56-year old man with a large PCL cyst. These serial sagittal T2-weighted images reveal a large multiloculated PCL cyst. It is surrounding the PCL both dorsally and ventrally, and the PCL itself appears to be attenuated by the cyst.

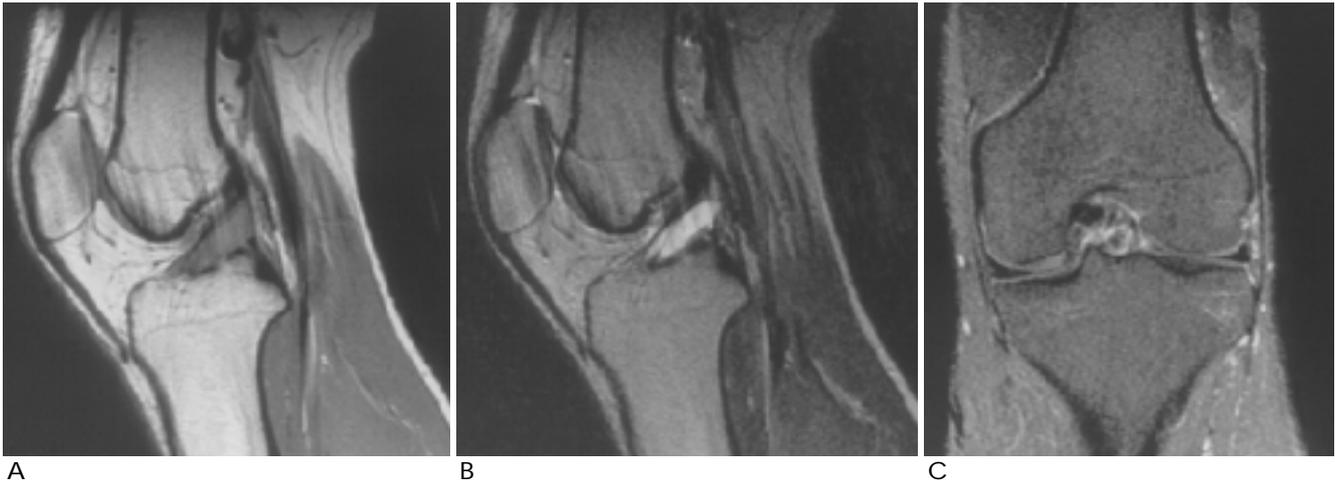


Fig. 3. 29-year old man with an ACL cyst.
 A,B. Proton- and T2-weighted midsagittal images respectively. The fusiform ACL cyst courses through the ligament. It is intermediate to hyperintense on proton density-weighted image and hyperintense on T2-weighted image.
 C. On post-enhancement coronal image with fat-suppression, the cyst widening the space between the ACL bundles shows thin peripheral enhancement.

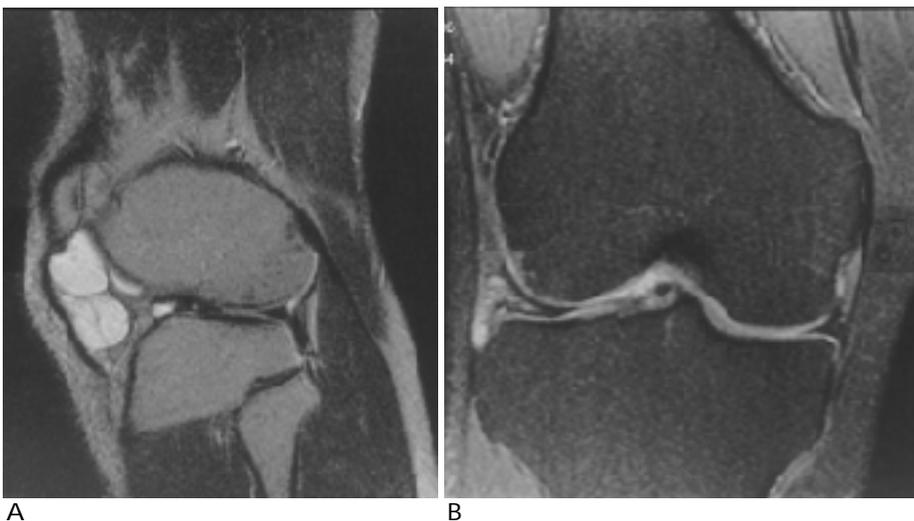


Fig. 4. 29-year old man with a lateral meniscal cyst who suffered from fullness of the knee.
 A. Sagittal T2-weighted image shows a large septated cyst with its main portion located anterior to the meniscus.
 B. Fat-suppressed coronal T2-weighted image discloses the related horizontal tear of the meniscus.

morrhagic arthritis which usually show very low signal intensity on T2-weighted image due to hemosiderin deposition. Confusion between ganglion cysts and synovial osteochondromatosis can be resolved if it is remembered that in most cases of synovial osteochondromatosis, plain radiographs reveal typical calcifications. Even in a case in which there are only non-calcified cartilaginous nodules, the signal intensity seen on T2-weighted images is high because the main constituent is hyaline cartilage.

Because there is no significant solid component, differentiation between ganglion cysts and various necrotic tumors such as neurogenic tumors and sarcomas is usually possible, though differentiation from chronic synovial or bursal inflammation with rice bodies is still

difficult.

Cruciate Ligament Ganglion Cysts

Intra-articular ganglion cysts arising from cruciate ligaments are uncommon, though not rare. Small ganglion cysts associated with the posterior cruciate ligament (PCL) most often appear as well-defined unilocular cysts along the dorsal surface of these ligaments, while those that are larger appear to be multilocular, surrounding and running along the course of the ligaments (Fig. 2). On the other hand, anterior cruciate ligament (ACL) ganglion cysts most often have a fusiform appearance, extending along the course of the ligament and interspersed within its bundles (3) (Fig. 3).

Joint fluid trapped adjacent to the cruciate ligament can usually be differentiated because of the characteristic MR findings of cruciate ligament cysts.

Meniscal Cysts

Meniscal cysts are accumulations of synovial fluid that collect within the menisci or parameniscal soft tissues as a result of meniscal tear. Although it is not always possible to classify them as ganglion cysts, these cysts are also referred to as ganglion cysts or juxta-articular myxomas (4). All meniscal cysts are associated with adjacent meniscal tears, most of which are horizontal, and the successful treatment of these cysts requires treatment of the meniscal pathology.

The cyst usually develops from the lateral menis-

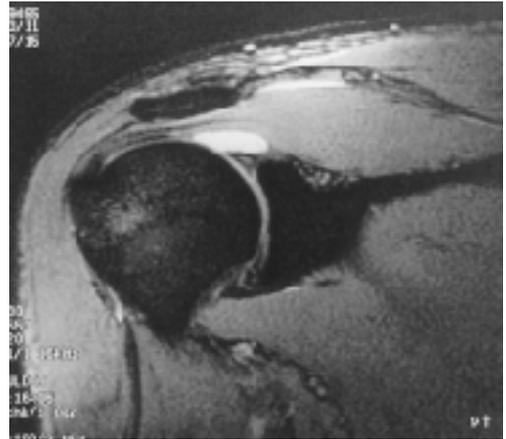
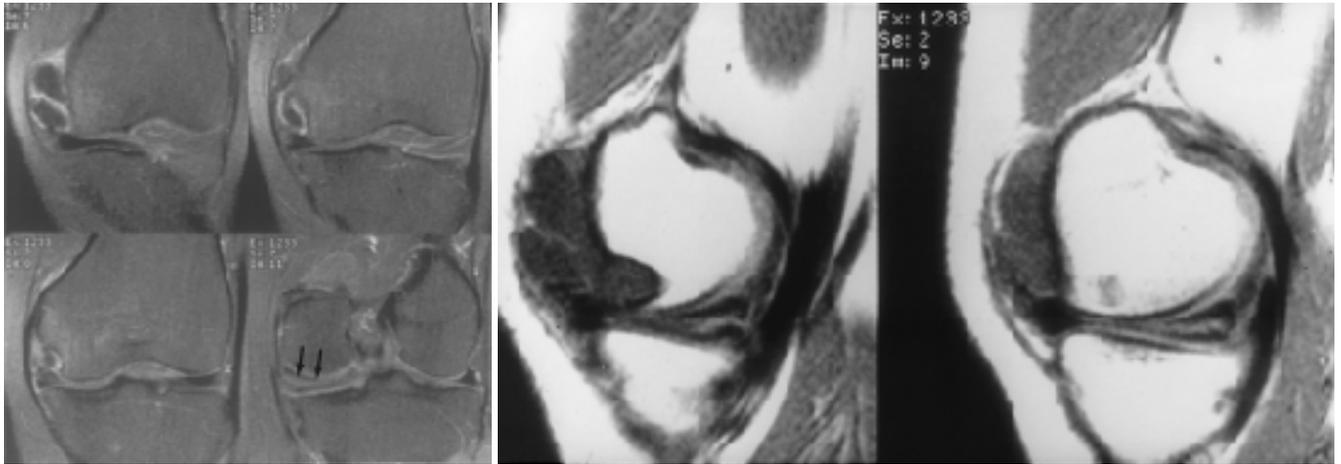
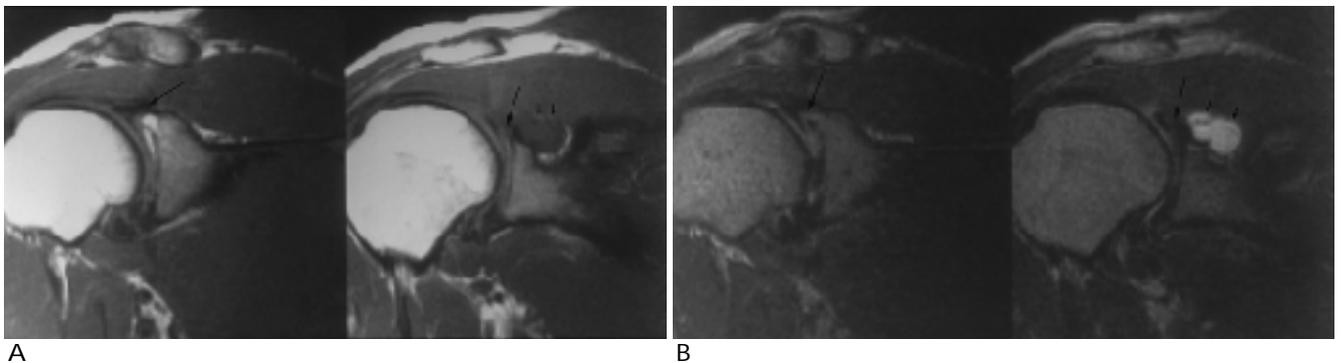


Fig. 6. 21-year old man with a labral cyst who had a history of previous shoulder injury with resultant glenohumeral subluxation and acromioclavicular separation. A well-defined ovoid labral cyst overlying the torn superior labrum is clearly demonstrated on this oblique coronal gradient echo image.



A B
Fig. 5. 35-year old woman with a medial meniscal cyst who had a soft tissue mass along the anteromedial line of the knee joint.
A. Serial coronal postenhancement T1-weighted images with fat-suppression show a septated cyst with peripheral enhancement and related horizontal tear (arrows) in the body of the medial meniscus.
B. Sagittal proton density-weighted images disclose smooth pressure erosion of the medial femoral condyle by the cyst.



A B
Fig. 7. 29-year old woman with a ganglion cyst in the shoulder who had nonspecific pain and weakness of the shoulder and upper arm.
A,B. Serial proton density- and T2-weighted images respectively. A bilobed ganglion cyst (short arrows) is noted in the spinoglenoid notch with typical signal intensity. The labrum is torn (long arrows) and diagnosed as SLAP lesion on arthroscopy.

cus, and MRI which is capable of multiplanar imaging is quite helpful. Meniscal cysts appear as clearly-defined round or septated cysts directly communicating with the meniscal tear (Fig. 4), and long standing cysts can cause extrinsic smooth erosion in adjacent bones (Fig. 5).

Lateral meniscal cysts are usually located adjacent to the anterior horn or body, while those that are medial usually develop at the posterior horn or body. The lower incidence of posterolateral cysts relative to that of anterolateral cysts may be because posterior horn tears that extend through the capsular margin allow decompression of the synovial fluid into popliteus tendon sheaths rather than into parameniscal soft tissues (5).

Distinguishing meniscal cysts from other fluid collections can be facilitated by familiarity with normal bursal

and capsular anatomy and by defining the direct connection between a meniscal cyst and a meniscal tear.

Ganglion Cysts of the Shoulder

Certain tears of the labrum are accompanied by the development of perilabral cysts (Fig. 6). As seen in the pathogenesis of meniscal cysts, fluid derived from the joint might extend through the tear of the labrum into surrounding soft tissue leading to cyst formation (4).

In the shoulder, ganglion cysts may extend into the spinoglenoid notch (Fig. 7) and/or the suprascapular notch, leading to entrapment neuropathy. They can also develop de novo. Entrapment neuropathy of the suprascapular nerve by a ganglion cyst mainly affects young men involved in manual labor, or weightlifters, and can

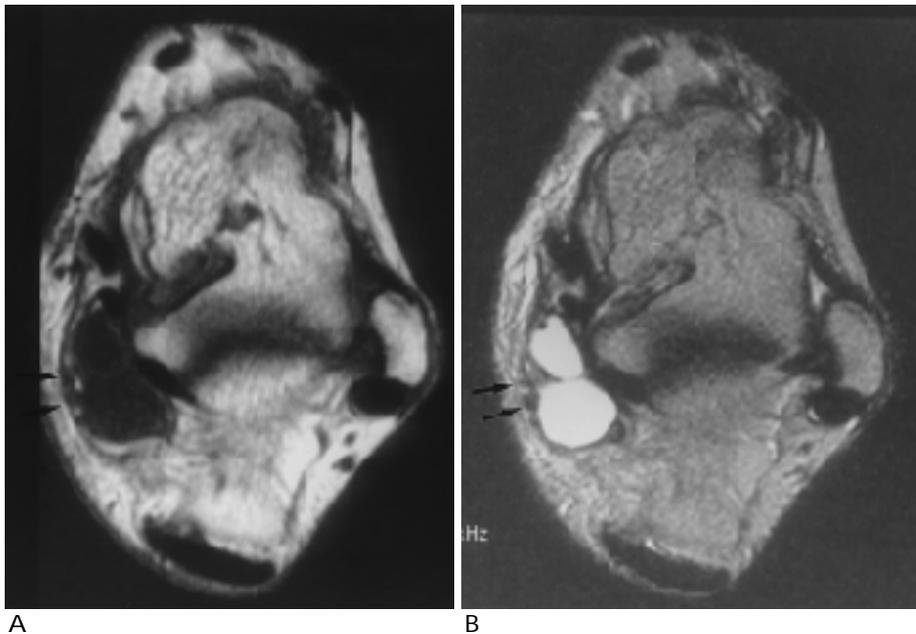


Fig. 8. 53-year old woman with a ganglion cyst in the left foot who had a movable hard soft tissue mass posteroinferior to the medial malleolus and intermittent nerve compressive symptom lasted for about one year. A. Axial T1-weighted image shows a mass of intermediate signal intensity. B. T2-weighted images disclose its septated cystic nature of homogeneously high signal intensity. It is located in the tarsal tunnel close to the branches of the posterior tibial nerve (arrows), causing tarsal tunnel syndrome.

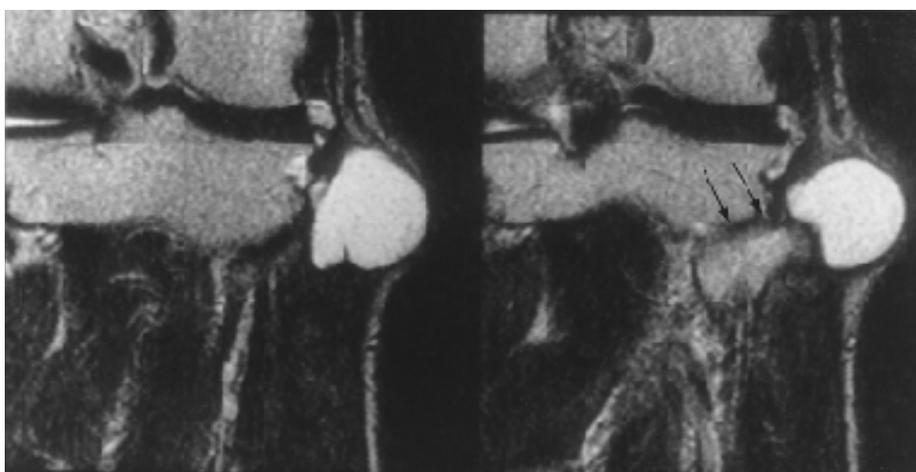


Fig. 9. 55-year old man with a ganglion cyst adjacent to the proximal tibiofibular joint who had a painless soft tissue mass. The serial coronal T2-weighted images show a lobulated and outward bulging cyst and its deep portion close to the proximal tibiofibular joint (arrows).

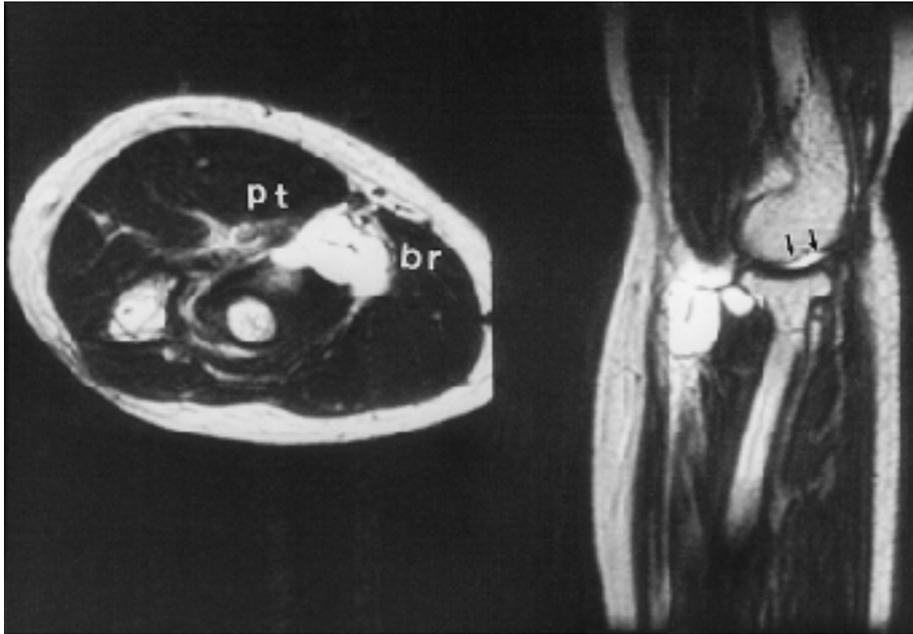


Fig. 10. 46-year old woman with a ganglion cyst located between the forearm muscles. Axial and sagittal T2-weighted images reveal a multiseptated ganglion cyst which was confirmed to be arising from the joint capsule and extending between brachioradialis(br) and pronator teres(pt) muscles. Note the fluid in the adjacent elbow joint space (arrows).

be accompanied by weakness or atrophy of the supraspinatus and infraspinatus muscles (6).

Ganglion Cysts in the Tarsal Tunnel

Though the leading cause of tarsal tunnel syndrome is trauma, a ganglion cyst arising in the tarsal tunnel can cause compression of the posterior tibial nerve. MR imaging in the coronal and axial planes is the best technique for documenting the characteristic finding of ganglion cysts and their topographic relationship with neurovascular bundles (Fig. 8).

Other Cysts

Other than popliteal cysts, cystic lesions around the knee are uncommon and ganglion cysts may occur in atypical locations, attached to the superior tibiofibular joints (Fig. 9) or within muscle bundles (7). Intra- or intermuscular ganglion cysts can also be found around other joints (Fig. 10). Predisposing factors are not clear, but some authors have suggested that trauma involving unusual forces may be responsible. They may start as synovial cysts herniating from adjacent joints, but if a synovial herniation becomes loculated, the lining mem-

brane can undergo metaplastic change. Mesothelium is formed, and the synovial lining is eventually lost.

The MR imaging features of these ganglion cysts are the same as those of other such cysts; the advantage of MR imaging is that it reveals the attachment of ganglion cysts to nearby joints (Fig. 9, 10).

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