Imaging Sciences Interesting Cases

CASE 49

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CLINICAL PRESENTATION: Patient is an 11-year-old male with left knee pain and swelling.

IMAGING FINDINGS: An ultrasound was obtained to evaluate for DVT which did demonstrate partially occlusive thrombus within the distal femoral and popliteal veins (not shown). However the finding of note was that of a vascular structure with "to and fro" motion and a narrow neck arising from the popliteal artery or one of its branches (**Figure 1A**). An associated hypoechoic collection was also identified (**Fig. 1B**).

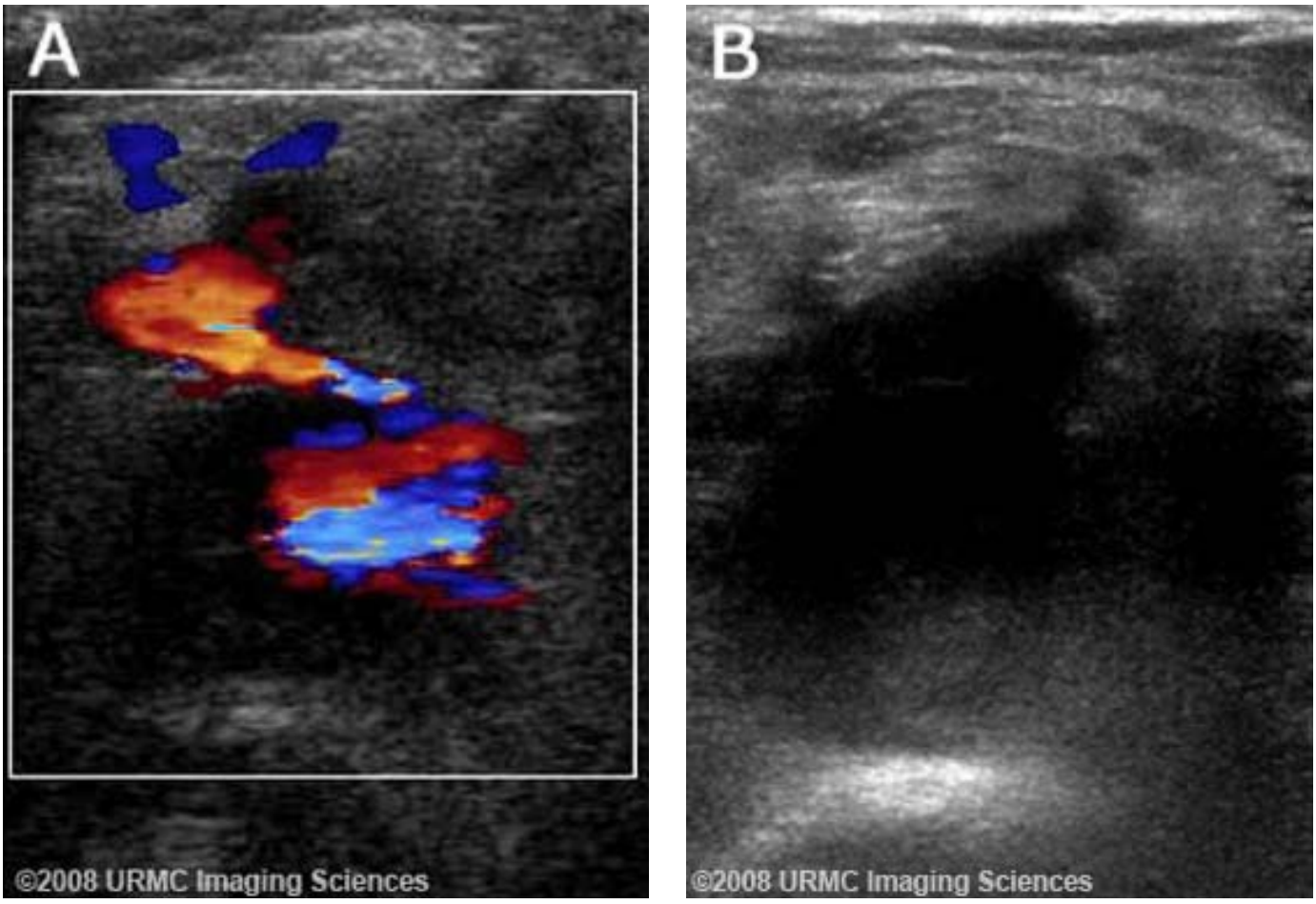


Figure 1: Color Doppler (**A**) and B-mode US (**B**).

CTA was performed for treatment planning. Again identified is a vascular abnormality arising from a geniculate branch of the popliteal artery (**Figs. 2A and B**); however, immediately adjacent to this is an osseous lesion along the distal aspect of the posterior femur (**Figs. 2C and D**).

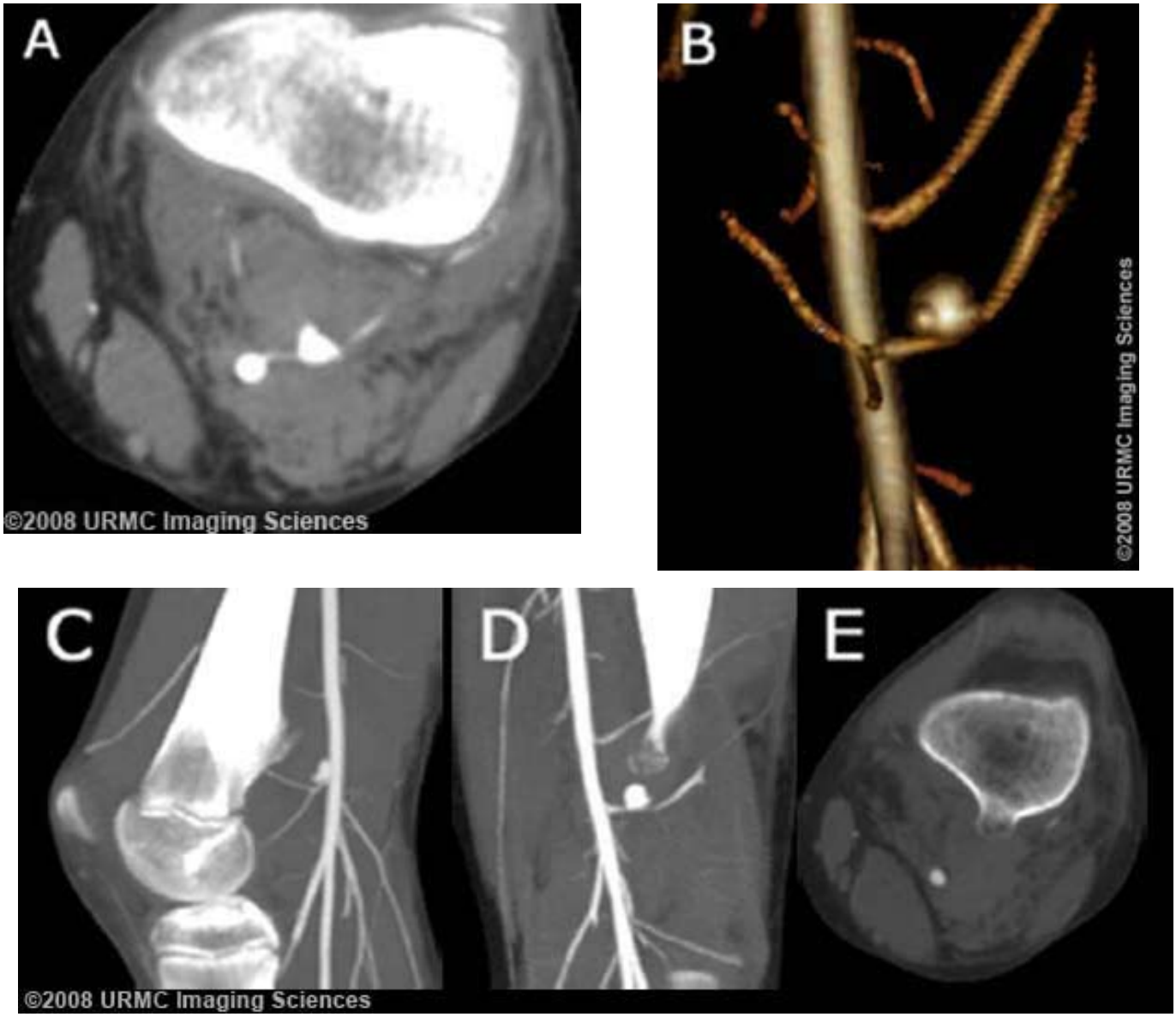
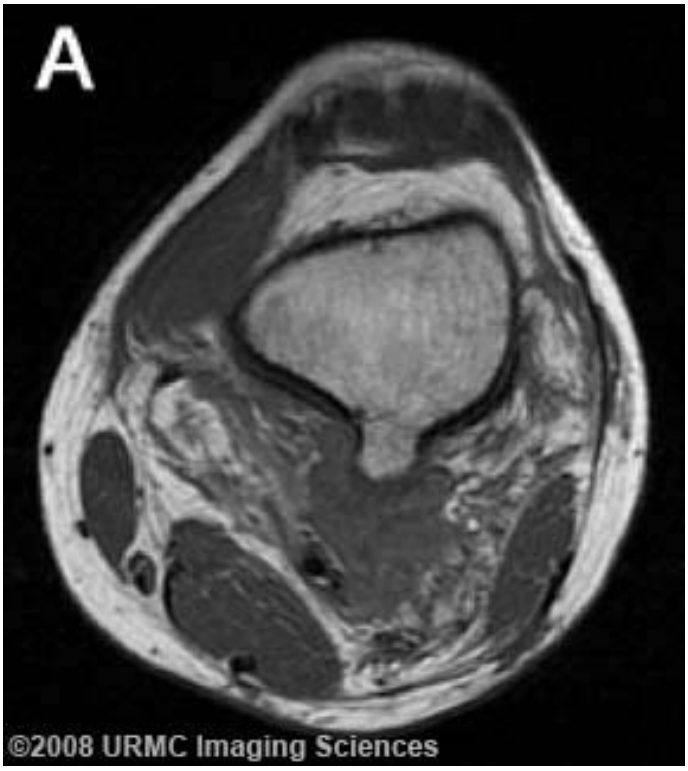


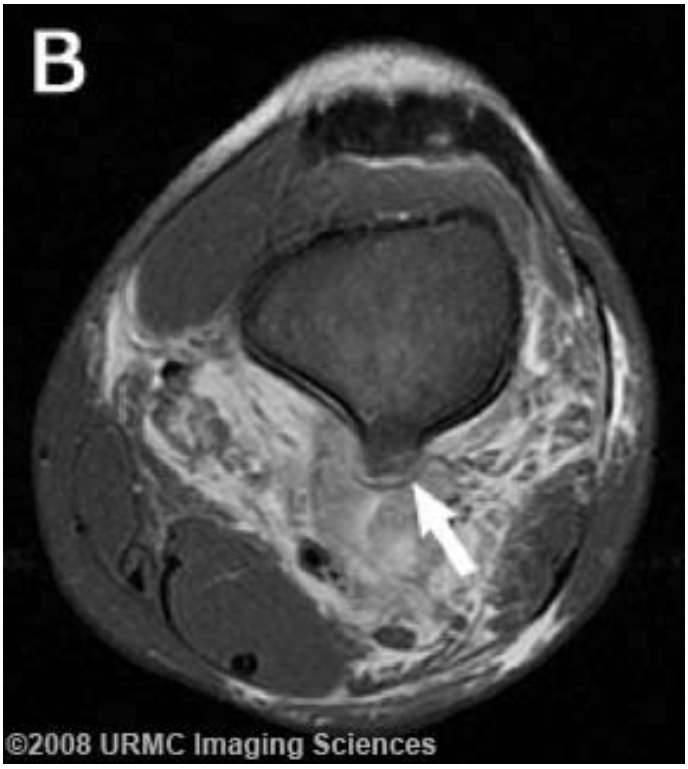
Figure 2. CT Angiography of the left lower extremity. Soft tissue window axial (A) and 3D (**B**) reconstructions demonstrate a vascular abnormality. Sagittal (**C**), coronal (**D**), and axial (**E**) images demonstrate an osseous lesion in proximity to the vascular finding.

Plain films were subsequently obtained. The lateral projection demonstrates a posterior distal femur cortical-based lesion which appears to be contiguous with the medullary space (**Fig. 3**). There is no significant sclerosis, periosteal reaction, or appreciable soft tissue component.

Figure 3. CR lateral projection of the left knee.

Axial and sagittal MR images reveal a 1.1 x 1.3 cm minimally pedunculated lesion along the posterior aspect of the distal femur which is contiguous with the medullary space (**Figs. 4A & B**). The lesion follows bone marrow signal on all sequences and does not enhance. There is a 2 mm cartilaginous cap (**Figs. 4B & C** arrows). Immediately posterior to the osseous lesion is a region of heterogeneous signal intensity. Note that this is not bright on T2 and therefore does not constitute a portion of the cartilaginous cap; rather this corresponds to the hypoechoic region seen by US and to an area of soft tissue density seen on the CTA most compatible with hematoma. Post contrast sequences demonstrate a focus of enhancement within the posterior soft tissues corresponding to the vascular abnormality identified on the companion studies (**Figs. 5A & B**).





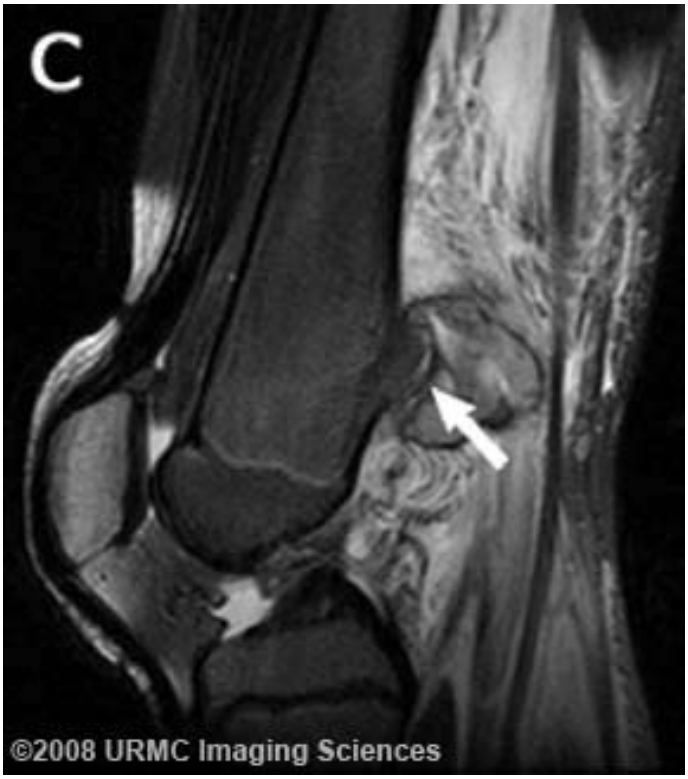


Figure 4. (A) Axial T1 illustrating marrow continuity within the lesion. Axial (**B**) and sagittal (**C**) T2-weighted images demonstrating the thin cartilaginous cap (arrows).

Figure 5. Axial (**A**) and sagittal (**B**) T1 fat suppressed images post-contrast administration.

DIFFERENTIAL: Based on plain film alone—cortical desmoid vs. osteochondroma

Based on MR—osteochondroma

US and CTA—pseudoaneurysm

DIAGNOSIS: Solitary osteochondroma of the posterior distal femur with secondary pseudoaneurysm formation of a branch of the popliteal artery complicated by hematoma and venous thrombosis.

DISCUSSION:

OSTEOCHONDROMA: Osteochondroma represents the most common bone tumor and is a developmental lesion rather than a true neoplasm. It constitutes 20%–50% of all benign bone tumors and 10%–15% of all bone tumors. These lesions result from the separation of a fragment of epiphyseal growth plate cartilage, which subsequently herniates through the periosteal bone cuff that normally surrounds the growth plate. Osteochondromas enlarge from growth at this cartilage cap, which functions as a normal physeal plate.

Osteochondromas are composed of cortical and medullary bone and must demonstrate continuity with the underlying parent bone cortex and medullary canal. This is best imaged by MR and is clearly demonstrated in this particular case (Fig. 4). The neck or stalk may be broad-based (sessile) or narrow (pedunculated). The lesions characteristically demonstrate growth away from the adjacent joint. Over time the cartilaginous cap may calcify. After adolescence and skeletal maturity, osteochondromas usually exhibit no further growth.

Osteochondromas may be solitary or multiple; the latter being associated with the autosomal dominant syndrome, hereditary multiple exostoses (HME). Clinically, the lesions are usually painless and found incidentally; however symptoms are often present in the setting of complications.

Complications associated with osteochondromas are more frequent with HME and include deformity, fracture, vascular compromise, neurologic sequelae, and malignant transformation. Malignant transformation

is seen in 1% of solitary osteochondromas and in 3%–5% of patients with HME. Continued lesion growth and a hyaline cartilage cap greater than 1.5 cm in thickness, after skeletal maturity, suggest malignant transformation.

PSEUDOANEURYSM: A pseudoaneurysm is an outpouching of a blood vessel, involving a defect in the two innermost layer (tunica intima and medial) with continuity of the outermost layer (adventia).

Pseudoaneurysm of the popliteal artery typically results from penetrating trauma rather than blunt trauma. Iatrogenic causes, such as arthroscopic surgery, knee arthroplasty, and osteotomy may also be implicated. A popliteal pseudoaneurysm can also result from changes in bone structure, such as exostosis, fracture, or, as in this case, a complication of osteochondroma.

A popliteal artery pseudoaneurysm, when large enough or superficially located, is generally palpable. Duplex ultrasound should be considered as the 1st method of investigation. This technique has been used successfully for the detection and follow-up of pseudoaneurysms. Computed tomographic scanning is particularly accurate in making the diagnosis. Arteriography supplements the diagnosis and allows better preoperative planning. The status of the runoff vessels, which can be seen on the arteriogram, is particularly useful for the examination of patients who have popliteal aneurysms.

The accepted methods of managing aneurysms of the popliteal artery are resection with interposition grafting or ligation accompanied by arterial bypass. Treatment by endovascular embolization may also be performed and is becoming a first-line therapy depending upon pseudoaneurysm location, surgical risk, patient age, and other factors. In this case, aneurysm clipping was performed at the time of orthopedic surgery for treatment of the osteochondroma.

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