Fibrous dysplasia is a developmental anomaly that can affect any bone in the body. The skull and facial bones are the affected sites in 10–25% of patients with monostotic fibrous dysplasia and in 50% of patients with polyostotic fibrous dysplasia. Conventional radiographic findings reveal characteristics of fibrous dysplasia. CT findings also show characteristics of fibrous dysplasia and consist of the following three varieties: the ground-glass pattern (56%), the homogeneously dense pattern (23%), and the cystic variety (21%) [1]. Unfortunately, the MR imaging characteristics of fibrous dysplasia do not share the distinctive features seen on radiography and CT. In fact, the MR imaging appearances of fibrous dysplasia often resemble that of tumors. The intent of this pictorial essay is to highlight the MR imaging features of fibrous dysplasia involving the base of the skull. An awareness of this potential diagnostic

**Fig. 1.—** 36-year-old man with fibrous dysplasia involving floor of anterior cranial fossa. 
A, Coronal CT scan shows expanding lesion in floor of left anterior cranial fossa (arrow). Note typical ground-glass appearance. 
B, Coronal contrast-enhanced T1-weighted MR image shows enhancing mass mimicking tumor. 
C, Axial unenhanced T1-weighted MR image shows low-signal-intensity lesion protruding into left anterior cranial fossa (arrow). 
D, Axial contrast-enhanced T1-weighted MR image shows areas with and without contrast enhancement. 
E, Axial T2-weighted MR image shows low signal intensity in lesion.
pitfall can help to reduce the possibility of misdiagnosing fibrous dysplasia of the skull base for neoplastic disease.

Radiologic Findings

The most common appearance of fibrous dysplasia on CT is an expanded bone showing a ground-glass appearance (Fig. 1). The diagnosis of fibrous dysplasia on CT is usually straightforward [2, 3]. However, localized fibrous dysplasia on MR imaging often mimics a tumor because fibrous tissue can enhance brilliantly after the injection of contrast material. The signal intensity of fibrous dysplasia has been reported to be low on T1-weighted images [4]. However, the signal intensity of fibrous dysplasia on T1-weighted images may be intermediate, thus resembling that of a soft-tissue tumor (Figs. 2 and 3). The patient illustrated in Figure 2 was diagnosed with a soft-tissue tumor involving the left ethmoid sinus and anterior skull base, and he subsequently underwent a biopsy that showed fibrous dysplasia. This pathologically proven case of fi-
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Fig. 4.—49-year-old man with fibrous dysplasia of sphenoid bone.
A, Axial CT scan shows fibrous dysplasia involving body of sphenoid bone. Note expanded right pterygoid process (black arrow) and inflammatory changes in left sphenoid sinus (white arrow) and left maxillary sinus. B, Axial contrast-enhanced T1-weighted MR image with fat-saturation technique shows enhancement of lesion mimicking tumor. C, Axial T2-weighted MR image shows scattered areas of high signal intensities. D, Coronal T1-weighted MR image shows sphenoid sinus floor expansion (straight arrows) and areas of fat signal intensity presumably due to presence of marrow (curved arrow). E, Coronal contrast-enhanced T1-weighted MR image with fat-saturation technique shows enhancement in lesion. Note areas of suppressed marrow (arrow).

Fibrous dysplasia showed strong contrast enhancement, but the T2-weighted images exhibited relatively low signal intensities.

The signal intensity of fibrous dysplasia on T2-weighted images is often variable, ranging from low to high signals in some patients [5, 6] (Fig. 4). These high signal intensities on T2-weighted images correspond to nonmineralized areas and regions of cystic changes seen on CT. In some areas within the bone affected by fibrous dysplasia, there may be collections of bone marrow to produce high signal intensities on T1-weighted images. These high-signal-intensity regions show corresponding low signals in fat-suppressed contrast-enhanced images, thus verifying the presence of fatty marrow.

When T2-weighted images show high signal intensities, the differential diagnosis should include an inflammatory lesion or a neoplastic process (Fig. 5). A destructive pattern is not a feature of uncomplicated fibrous dysplasia. Because fibrous dysplasia is typically a painless anomaly, the presence of pain should also alert the radiologist to a more sinister process.

Discussion

MR imaging is likely to be the modality of choice in patients with skull base lesions. Alternatively, fibrous dysplasia involving the base of the skull may be detected as an incidental finding on MR imaging performed for an indication unrelated to the skull base. Hence, a radiologist should have a high index of suspicion to diagnose fibrous dysplasia of the base of the skull because this lesion often resembles a tumor on MR imaging [7]. When fibrous dysplasia shows bone expansion that conforms to the general shape of the bone of origin, the diagnosis is relatively easy to recognize. However, fibrous dysplasia with localized involvement is potentially a diagnostic pitfall.

Histologically, fibrous dysplasia consists of varying amounts of spindle cell bundles and trabeculae of immature woven bone. On T1-weighted images, the signal intensity is usually low to intermediate depending on the ratio of fibrous tissue to mineralized matrix. Lesions with high fibrous tissue content tend to have intermediate signal intensities, whereas lesions with highly mineralized stroma tend to show lower signal intensities. On T2-weighted images, the MR signal intensities are more variable. Some lesions with a highly mineralized matrix show correspondingly low signal intensities, whereas lesions with high fibrous tissue content and cystic spaces return high signal intensities. Unlike mature scar tissues that show low signal intensities on all imaging sequences, the fibrous tissues in fibrous dysplasia are metabolically active, thus accounting for the high signal intensities on T2-weighted images. The fibrous tissues in fibrous dysplasia are well vascularized and often show numerous small vessels in the center and large peripheral sinuses. These histologic features explain why fibrous dysplasia enhances intensely after the injection of contrast material [8].

The confidence in making a correct MR imaging diagnosis of fibrous dysplasia is high when the signal intensities on both T1- and T2-weighted images are low in spite of enhancement after the injection of contrast material. Confusion arises when fibrous dysplasia shows intermediate signal intensities on T1-weighted images and high signal intensities on T2-weighted images and enhances vividly after the injection of contrast material. Under such circumstances, CT should be performed to resolve the problem.

In summary, as more MR imaging studies are performed for suspected skull base lesions, it becomes increasingly important for radiologists to be familiar with the MR imaging features of fibrous dysplasia. Fibrous dysplasia shows characteristic radiographic and CT findings, but on MR imaging it can be easily confused with neoplastic disease.
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Fig. 5.—51-year-old man with biopsy proven sarcomatous degeneration in fibrous dysplasia.
A, Axial CT scan shows destructive lesion involving greater wing of left sphenoid bone (asterisk). Note fibrous dysplasia involving right greater wing of sphenoid bone (arrow).
B, Axial unenhanced T1-weighted MR image shows intermediate signal intensity involving left greater wing of sphenoid bone (S). Ill-defined foci of high signal intensity probably reflecting hemorrhage are present. Note high signal intensities in right greater wing (straight arrow) of sphenoid presumably due to marrow. Fibrous dysplasia in left ethmoid appears low in signal intensity (curved arrow).
C, Axial T2-weighted MR image shows heterogeneous high signal intensity in lesion. Note low signal intensity corresponding to nonneoplastic fibrous dysplasia on contralateral side.
D, Coronal CT scan shows gross destruction involving left greater wing (asterisk) and sphenoid sinus. Note typical features of fibrous dysplasia involving left alveolar ridge (curved arrow) and cranial vault (straight arrow).
E, Coronal T2-weighted MR image shows high signal intensity in area of sarcomatous degeneration. Compare low signal intensity of left alveolar ridge (arrow) with CT features in D.

References