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Journal

Radiology, 189(2)

ISSN

0033-8419

Authors

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Publication Date

1993-11-01

DOI

10.1148/radiology.189.2.8210381

Peer reviewed

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Diagnosis of Low-Grade Chondrosarcoma¹

IN the March 1993 issue of *Radiology*, Geirnaerd and colleagues (1) reported the use of gadolinium-enhanced magnetic resonance (MR) imaging in diagnosing low- and high-grade chondrosarcomas. They concluded that "septal enhancement on MR images after intravenous administration of gadopentetate dimeglumine improves tissue characterization of cartilaginous tumors and may assist in identifying low-grade chondrosarcomas." The diagnosis of borderline cartilaginous tumors is a difficult problem histologically, and for that reason pathologists rely partly on clinical and radiographic findings (2-4). Because histologic diagnosis is difficult, the discovery of additional radiographic criteria capable of improving accuracy of diagnosis would be an important addition to the literature.

We find three flaws with the study. First, the authors fail to demonstrate that findings on contrast-enhanced MR images add to the accuracy of radiologic diagnosis based on plain radiographs, computed tomographic scans, and non-enhanced MR images. Did the pattern of gadolinium enhancement change

radiologic diagnosis in any case? We looked at this question by examining the three cases of chondrosarcoma that were illustrated in the article. All are readily recognizable as being malignant without the use of gadolinium. The two cases of central chondrosarcoma (Figs 1 and 3 in their article) demonstrate cortical breakthrough and a soft-tissue mass. The osteochondroma associated with dedifferentiation of the cartilage cap to chondrosarcoma (their Fig 2) demonstrates a thick cartilage cap that is considered indicative of malignant transformation, as well as erosion of the underlying bone.

Criteria for radiographic diagnosis of low-grade chondrosarcoma are well established and highly accurate (5, p 524). It is because of the accuracy of radiographic diagnosis that pathologists rely heavily on radiographic findings. To justify a new and highly expensive test, there must be evidence, which the authors do not provide, that it is superior to the existing diagnostic tests.

The second problem with the study of Geirnaerd et al lies in the selection of cases. Twenty-one of the cases examined were grade 2 chondrosarcomas, and only six were grade 1. Grade 2 chondrosarcomas are not considered low grade. Grade 1 chondrosarcomas are difficult to diagnose histologically, but grade 2 chondrosarcomas are not. Grade 2 tumors infiltrate between bone trabeculae, are hypercellular, and often contain fibrovascular septa (5, pp 502-508). The radiographic evidence of malignancy in these tumors is readily confirmed histologically, without the need for an additional test.

Six cases of grade 1 chondrosarcoma are not a sufficient number to conclude that septal enhancement with gadolinium is "specific for low-grade chondrosarcomas." The sensitivity of septal en-

hancement was not addressed, but one of the six cases showed peripheral rather than septal enhancement. The authors hypothesize that septal enhancement with gadolinium corresponds to fibrovascular septa seen histologically. Such septa are uncommon in grade 1 chondrosarcoma (5, p 524), so that if septal enhancement does correspond to fibrovascular septa it is likely that in a large series of grade 1 tumors few would show septal enhancement.

The third flaw in the study is that although three osteochondromas were studied, no enchondromas were included (because the enchondromas were not resected en bloc). Do some enchondromas show septal or peripheral gadolinium enhancement? We know that they may appear "hot" on bone scans. Until the enhancement pattern of enchondroma is characterized, any potential value of gadolinium enhancement to separate enchondromas from grade 1 chondrosarcomas cannot be determined.

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Index terms: Bone neoplasms, 40.3211 • Bone neoplasms, MR, 40.12143, 40.3211 • Cartilage, MR, 40.12143 • Devil's Advocate • Sarcoma, 40.3211

Radiology 1993; 189:503-504

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