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Pictorial Review

Osteochondromas of the spine

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Osteochondromas are common developmental benign bone lesions, which rarely involve the spine. In a narrow space, such as the spinal canal, they may potentially lead to serious complications. Moreover, because this condition is fairly rare in the spine, it may be confused with other entities. The objective of this review is to describe the typical imaging findings of this rare, but occasionally significant condition of the spine.

Introduction

Osteochondromas, also commonly referred to as exostosis, are developmental lesions that are thought to form when fragments of epiphyseal growth plates or cartilage herniate through the periosteal covering of bones. As these cartilaginous fragments develop, they undergo ossification and maturation, during which these lesions expand.[1] Although the majority of osteochondromas occur spontaneously, cases of osteochondromas arising many years following radiation treatment, as in cases of Wilms' tumour or neuroblastoma, have been described.[2]

While osteochondromas of the long bones are common, osteochondromas of the spine are a relatively rare phenomenon, making up only 1–4% of all osteochondromas. The most common location of spinal osteochondromas is the cervical region (50–58%) followed by thoracic spine.[3–5] Osteochondromas more commonly occur in the posterior elements than in the vertebral bodies. Exostosis involving the spinal canal and the neural foramina typically present early with neurological involvement.[1]

Clinical presentations of these lesions vary from an incidental finding, physical deformity, radiculopathy, and spinal cord compression. The lesions may be solitary, or multiple, as part of a multiple exostosis syndrome.

In the course of this review, we will discuss the imaging findings associated with spine osteochondromas across radiographs, CT and MRI, the most common clinical presentations of these lesions, and potential complications including malignant degeneration. Illustrated are cases comprised of osteochondromas identified based on pathognomonic imaging appearance as well as pathologically proven cases from excised lesions.

Imaging findings

The pathognomonic imaging finding of osteochondromas across most imaging techniques, is the direct continuity of the lesion with the cortex and medullary cavity of bone.[1,3,4] Osteochondromas have a varying structure and may appear in sessile forms, with a broad base of attachment or present as a pedunculate mass, with a narrow attachment.[3,6]

Osteochondromas are commonly imaged using multiple techniques including radiographs, CT, and MRI. For spinal osteochondromas (SOC), radiographs are typically of low diagnostic yield.[3,4] Radiographs may detect large, heavily calcified lesions, but smaller lesions may be easily missed

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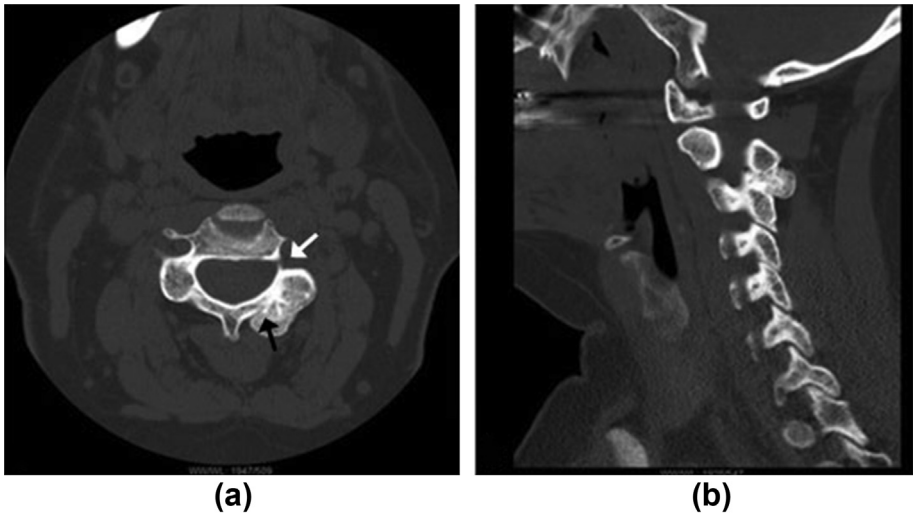

Figure 1 Cervical spine osteochondroma, arising from the left lateral mass of C3. (a) Axial CT image shows direct continuity of cortex (white arrow) and medullary cavity (black arrow) of the lesion with C3. (b) Sagittal CT image.

due to the complexity of overlapping structures on a typical spine radiograph.[4,6] CT, on the other hand, given the large osseous component of the lesion, is the technique of choice for the evaluation of osteochondromas in the spine (Fig. 1). CT enables the identification of the precise location of the lesion and its precise relationship to the central canal and neural foramina of the spine. On CT, osteochondromas demonstrate classic cortical and medullary continuity with underlying bone. The calcified cartilage is high density at CT, with low-density yellow marrow and an intermediate-density cartilage cap.[4] Although, typically the cartilage cap is difficult to appreciate on CT.[1]

On MRI, osteochondromas can present with varying signal characteristics, depending on the size of the lesion, the amount of marrow, and degree of cartilage calcification (Fig. 2). The medullary and cortical components of the osteochondroma mimic normal bone on MRI. Marrow demonstrates high T1 signal intensity, and intermediate intensity on T2-weighted imaging. The cortex is typically low signal on all sequences.[6] Signal from the cartilage cap differs depending on degree of cap mineralization. Typically, low T2 signal is seen in densely calcified areas of the cartilage cap, and high T2 signal is observed in non-mineralized cartilage. T1 signal is intermediate to low intensity usually seen within non-mineralized portions of the cartilaginous cap.[1,4,6] MRI is well suited to evaluating the effect of an osteochondroma on surrounding structures, especially the spinal cord and nerve roots.[4] With intravenous contrast medium, peripheral and septal contrast enhancement is seen.

Other techniques that can be used to assess osteochondromas include nuclear medicine bone scintigraphy, which may highlight actively growing osteochondromas.[1,4] Additionally, ultrasound evaluation may be helpful in evaluating the thickness of the cartilaginous cap; however, most spine lesions are too deep to assess with this technique.[1,4]

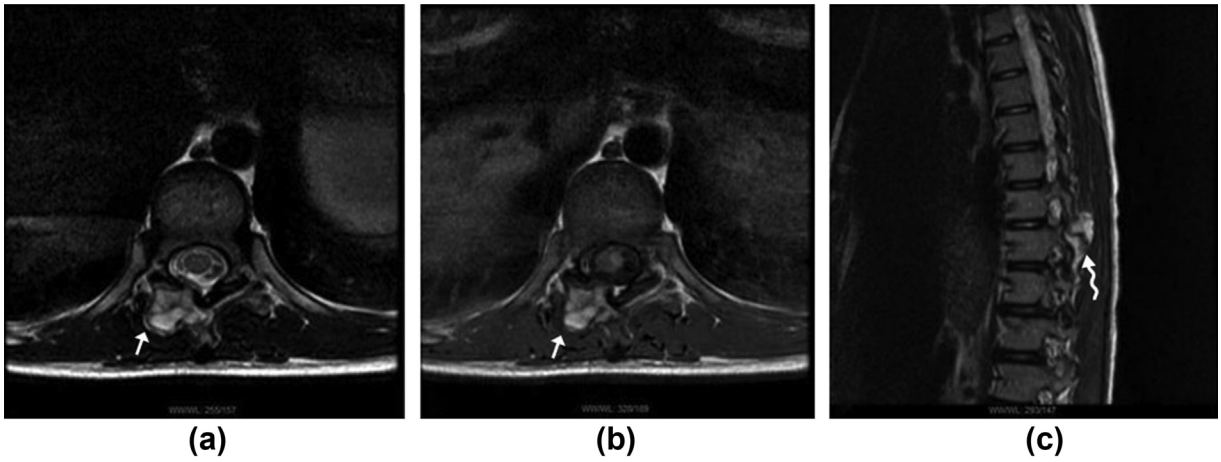

Figure 2 Thoracic spine osteochondroma, arising from the right lamina of T9. (a) Axial T2-weighted image demonstrates a thin, high T2 signal cartilage cap (white arrow). (b) Axial T1-weighted image shows a low T1 signal cartilage cap (white arrow). (c) Sagittal T2-weighted demonstrates low T2 signal areas of internal calcification (wavy arrow). In this case, the lesion is predominantly high signal on T1 and T2-weighted sequences.