

## SPINAL CHONDROSARCOMA ARISING FROM A SOLITARY LUMBAR OSTEOCHONDROMA

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Chondrosarcoma is a primary malignant neoplasm of cartilage-forming cells that rarely involves the axial skeleton, typically affecting skeletally mature patients. It may arise as a primary bone tumour or as a secondary lesion from a pre-existing benign cartilaginous neoplasm such as an osteochondroma or enchondroma.

We report the case of a 68-year-old female who presented with a mildly painful paraspinal mass lesion as a result of malignant degeneration of a previously unknown solitary lumbar osteochondroma into a large chondrosarcoma. The characteristic imaging findings on cross-sectional imaging techniques are reviewed and illustrated, along with an outline of relevant clinical and therapeutic aspects.

**Key-word:** Chondroma.

Spinal chondrosarcomas are rare lesions, representing less than 10% of all chondrosarcomas (1-4). Most occur in the thoracic spine, and patients typically present in middle-age with back pain and/or neurological symptoms. Men are affected more often than women (2-5).

Secondary neoplasms arising from malignant transformation of previously existing cartilaginous lesions are seen more frequently in patients with hereditary multiple exostoses, and may be suspected when there is new onset pain, continued/rapid lesion growth, and a hyaline cartilage cap measuring more than 1.5 cm in thickness on MRI (6-8).

### Case report

A 68-year-old female presented with a mildly painful paraspinal swelling that she had recently become aware of. Her past medical history and laboratorial findings were noncontributory. Physical examination revealed a large, firm, tender lump over the right thoracolumbar paraspinal region, but was otherwise normal; in particular the neurological assessment showed no sensory-motor deficits.

Spinal radiographs centered on the thoracolumbar junction were obtained. On the lateral view, erosions of the spinous processes of T12-L2 and speckled soft-tissue calcifications were apparent (Fig. 1).

CT of the spine disclosed a large lobulated soft tissue mass located in the right posterior paraspinal region,

extending from the level of T9 to L3, measuring 14.5 cm in maximum craniocaudal length, with scarce areas of flocculent calcification within

it. The mass involved and disrupted the cortex of the spinous processes of T12-L3. At L1 a distinct exostosis with multiple osteolytic areas and cortical destruction was seen arising from the right aspect of the spinous process and ipsilateral lamina (Fig. 2).

On MRI, the mass showed peripheral and septal heterogeneous enhancement following gadolinium administration. At T12-L1 a lobule of the soft tissue mass extended into

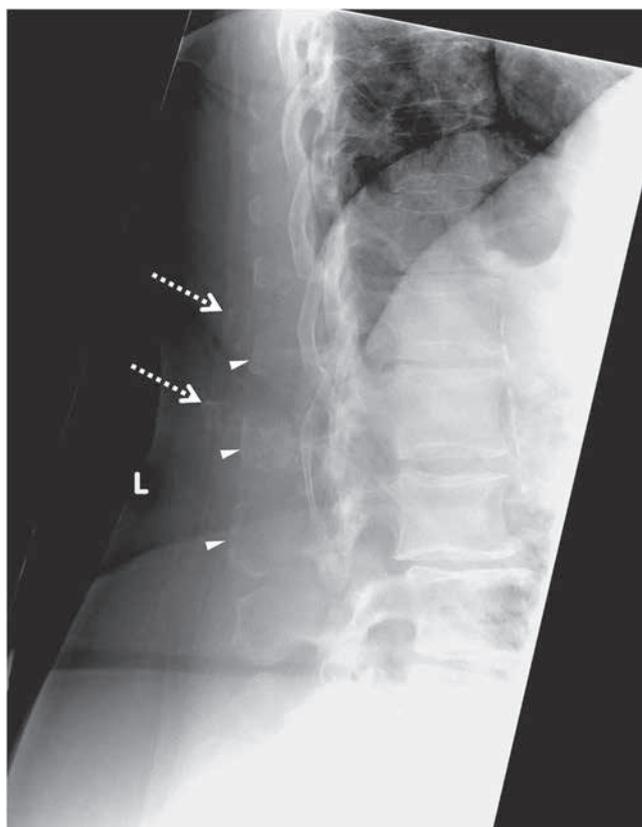


Fig. 1. — Lateral radiograph of the spine, centered at the thoracolumbar junction, with manual optimisation of the image parameters. Cortical irregularity and erosions of the spinous processes of T12-L2 (arrowheads) and small areas of flocculent soft-tissue calcification (dotted arrows) are seen.

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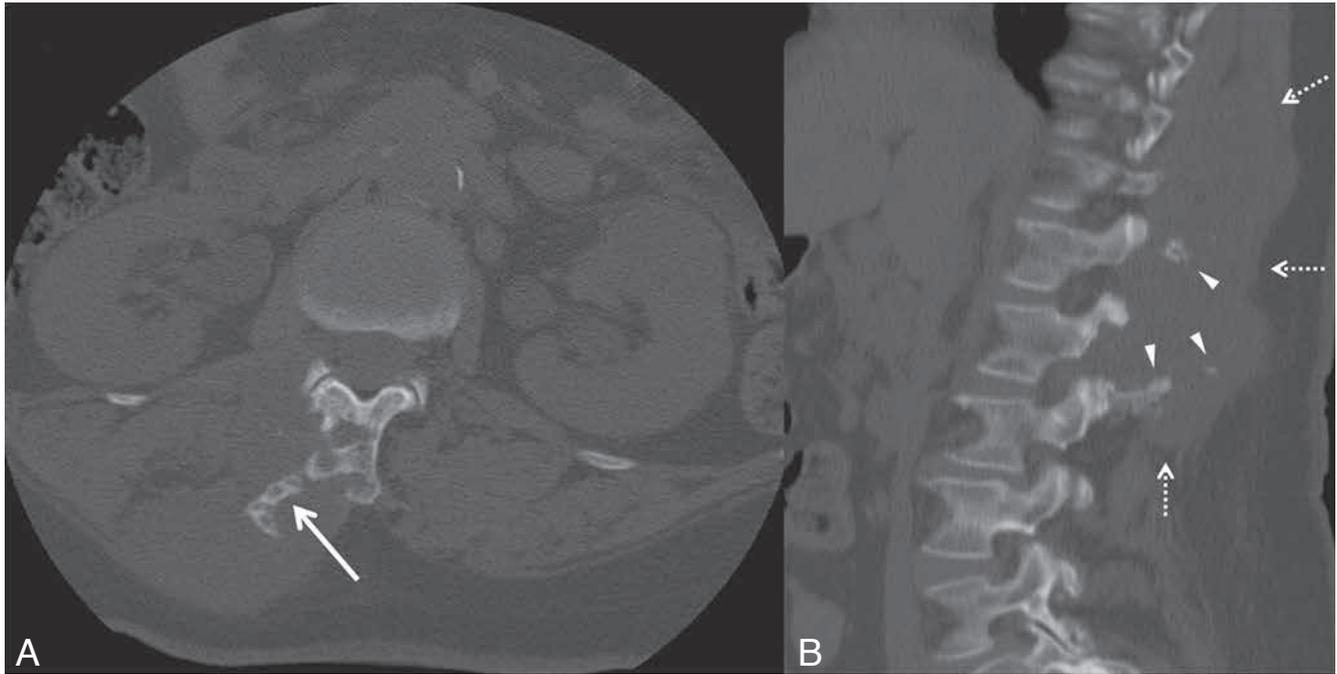


Fig. 2. — Axial non-contrast-enhanced CT scan image on bone window setting (A) shows a pedunculated osteochondroma with multiple osteolytic areas and cortical disruption arising from the right aspect of the spinous process and ipsilateral lamina of the L1 vertebra (arrow). The sagittal reformatted CT image (B) shows a large soft-tissue low-attenuating mass (dotted arrows) with scarce areas of speckled calcification (consistent with chondroid mineralisation – arrowheads).

the spinal canal, mildly indenting the dura (Fig. 3).

The imaging findings were very suggestive of spinal chondrosarcoma arising from a lumbar osteochondroma. A CT-guided core biopsy of the paraspinal mass was performed, and the histopathological study revealed features consistent with a low-grade malignant cartilaginous neoplasm.

The patient underwent tumour resection and right laminectomy of T11-L1. The histopathological examination of the surgical specimen confirmed the lesion to be a grade 1 chondrosarcoma. Follow-up MR imaging disclosed significant tumour debulking with removal of the intraspinal component but residual small tumour deposits were still seen, which increased in size in subsequent examinations. The patient was therefore reoperated on and received adjuvant radiotherapy to the tumour bed (T9-L3; 70.2 Gy in 39 sessions). She has had stable disease on 14-month follow-up.

## Discussion

Although chondrosarcoma is the third most common primary malignant bone tumour (after osteosarcoma and myeloma), chondrosarcoma of the spine is a relatively uncom-

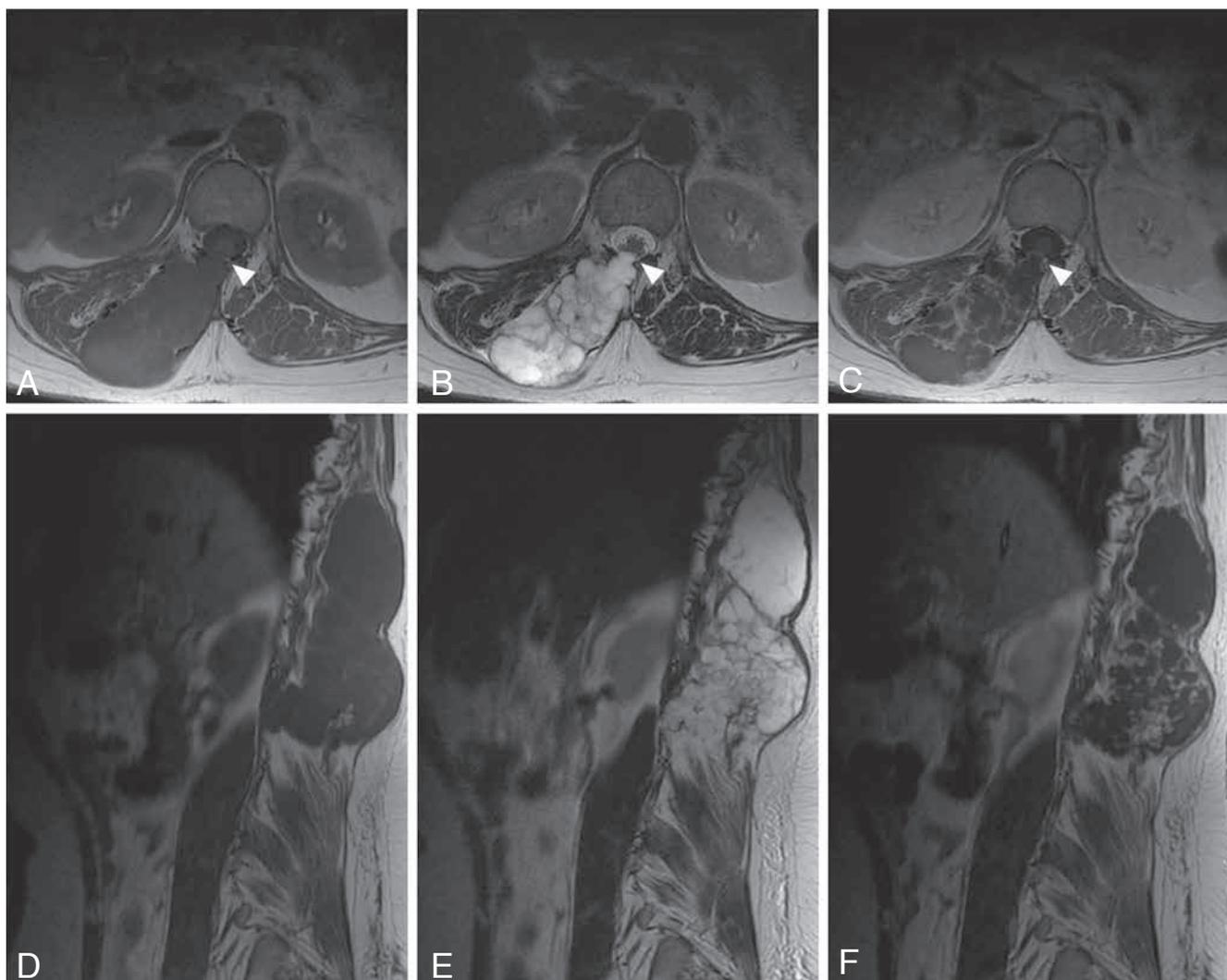
mon neoplasm, representing 4-10% of all chondrosarcomas and 12% of all malignant tumours of the spine. Peak prevalence occurs between 30 and 70 years of age, and men are affected two to four times more frequently than women (1-5, 9, 10). It can be found within all regions of the spine but it occurs most frequently in the thoracic region (1-4, 10). Within the vertebra, lesions may arise in the posterior elements (40%), the vertebral body (5%), or both (45%), with lesions located in the posterior elements typically arising from an underlying benign chondral lesion, as in this case (2, 3, 10).

Pain, swelling and sensory or motor deficits resulting from spinal cord compression are the main presenting symptoms, particularly when the neoplasm arises from the posterior arch (2-5, 9). Clinical symptoms sometimes develop over a long period of time (weeks to years), since most tumours are low-grade slow-growing lesions (1, 2, 10).

Plain radiographs demonstrate spinal chondrosarcoma as a bone destructive lesion or a well-defined mass with internal irregularly mottled calcifications (1-3). Cross-sectional imaging techniques are particularly helpful in depicting lesions in areas with complex anatomy, such as the spinal elements (3, 10). Spinal

chondrosarcomas usually manifest as large lobulated masses with bone destruction. Calcification or true ossification may occur, corresponding to residual underlying osteochondroma, in cases of secondary chondrosarcoma. CT demonstrates chondroid matrix mineralization to a better advantage than radiographs or MR, and the nonmineralized areas of the tumour show low attenuation (2, 3, 10). On MR, chondrosarcomas show a low-intermediate signal intensity on T1, and very hyperintense on T2-weighted images, due to the presence of high water content hyaline cartilage; calcified chondroid matrix is identified as areas of signal void in any sequence (2, 3, 5, 10). Following the administration of intravenous gadolinium, tumours typically show septal and peripheral rim-like enhancement – the “ring-and-arc” pattern – corresponding to fibrovascular bundles surrounding lobules of hyaline cartilage. High-grade chondrosarcomas usually display a more homogeneous pattern of enhancement (3, 7).

Primary spinal tumours have a less favorable prognosis than lesions in the appendicular skeleton (1). Early and wide surgical tumour resection with tumour-free margins is the treatment of choice, providing the best chance of survival and the



*Fig. 3.* — Axial (A-C) and sagittal (D-E) MR images demonstrate a large lobulated heterogeneous mass predominantly intermediate in signal on T1-weighted (A and D) and high signal intensity on T2-weighted images (B and E). On contrast-enhanced T1-weighted images, the typical “ring-and-arc” pattern of enhancement is evident (C and F), reflecting the lobulated growth pattern of these cartilaginous tumours. Note the intra-spinal component at T12-L1 (arrowheads in A-C).

lowest local recurrence rate (1-4, 9, 10). It is fundamental that the biopsy path is also contained by the excision margins at the definite surgery to prevent seeding along the biopsy track (1, 3). However, total resection is not always feasible, due to lesion size and location, and risk of neurological deficits. Prognosis in this scenario is poor, since chondrosarcomas in the spine usually are not responsive to adjuvant measures such as chemotherapy or radiation. When complete en bloc resection is not possible, partial removal followed by radiotherapy may provide palliation of pain and improve eventual neurological deficits (4).

Chondrosarcomas are locally aggressive tumours but have limited potential for metastases. When these

occur, they usually appear late in the course of the disease, generally involving the lungs (2, 9). However, some authors have reported a higher rate of metastases in patients with spinal chondrosarcomas, even despite the fact that most lesions are low to intermediate grade, presumably due to incomplete resection (which is more frequent with lesions in this location) that leads to local recurrence and ultimately to pulmonary metastases (3, 4, 11).

Spinal osteochondromas represent only 1-4% of all osteochondromas, with the majority found in the cervical and lower thoracic levels. Malignant degeneration is their most concerning complication, occurring in 1% of solitary lesions (versus 10% of patients with hereditary multiple

exostoses), and it is almost invariably due to chondrosarcoma, which develops in the cartilage cap of the osteochondroma (2, 6-8, 10). Centrally located lesions (pelvis, hips and shoulders) are particularly prone to undergo malignant transformation (8). Patients with malignancies arising in solitary lesions are typically older (average age: 50-55 years) than those with hereditary multiple exostoses (average age: 25-30 years) (2, 8). Imaging findings that suggest malignancy arising in an osteochondroma include: (a) growth of an osteochondroma after skeletal maturity, (b) hyaline cartilage cap measuring more than 1.5 cm in thickness, (c) irregular or indistinct lesion cortical surface, (d) focal regions of radiolucency

within the lesion, (e) erosion or destruction of the adjacent bone, and (f) a significant soft-tissue mass particularly containing scattered or irregular calcification (6, 8, 10).

### Conclusion

Unlike chondrosarcomas of the appendicular skeleton, lesions arising in the elements of the spine may be particularly difficult to detect on plain films, and cross-sectional imaging is thus crucial to adequately evaluate them. Radiologically, these tumours appear as bone destructive lesions in the spine or as a paraspinal mass with calcification. While CT is optimal to detect the matrix mineralization, MRI depicts the high water content of these lesions as very high signal intensity with T2-weighting. Furthermore, both techniques are essential for purposes of staging and guiding surgical excision, which should be as wide as possible, in order to obtain tumour-free margins and thus prevent recurrent disease.

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