Osteochondroma of the Thoracic Spine: An Unusual Cause of Spinal Cord Compression

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Summary: A 24-year-old man with hereditary multiple exostoses had numbness of the lower extremities and difficulty walking. CT displayed a calcified extradural mass lesion within the spinal canal at T-8 causing cord compression. MR imaging showed it to be contiguous with the upper endplate of T-8, suggesting the diagnosis of osteochondroma, a rare cause of cord compression, and distinguishing the lesion from a calcified disk fragment.

Index terms: Bones, neoplasms; Spinal cord, compression; Spine, neoplasms

Osteochondroma is a cartilaginous tumor, the most common benign tumor of bone. It is common in the appendicular skeleton but rare in the spine. Osteochondromas may be solitary or multiple when associated with hereditary multiple exostoses or osteochondromatosis, an autosomal dominant trait. Osteochondromas also may arise after radiation exposure. We report a case of spinal cord compression caused by an exostosis arising within the spinal canal.

Case Report

A previously healthy 24-year-old man came into the emergency department of our institution after a minor fall with symptoms of difficulty in walking and ascending numbness involving the lower extremities. He otherwise had no significant medical or surgical history.

Neurologic examination revealed hyperreflexia, sustained clonus, Babinski signs, and decreased pinprick response to the level of the thighs in both legs. Emergency magnetic resonance (MR) imaging was performed of the thoracolumbar spine to rule out spinal cord compression. Proton density–weighted, T2-weighted, and T1-weighted noncontrast and postcontrast sagittal and axial images were obtained. These revealed a 1-cm mass contiguous with the posterior superior endplate of the T-8 vertebral body. The upper aspect of the lesion abutted the posterior aspect of the T7-8 disk space, but was not contiguous with the disk. No significant disk space narrowing or dessication was noted at this level. The lesion was isointense with the adjacent vertebral body marrow on T2-weighted images and slightly hyperintense relative to normal marrow on T1-weighted images (Fig 1A, B, and C). Marked cord deformity/compression was noted at this level without cord signal abnormality. A thin hypointense rim surrounding the lesion posteriorly on T1-weighted images (Fig 1C) represented a thin shell of cortical bone surrounding the lesion. Widening of the epidural space superior and inferior to the lesion, with prominence of epidural veins and mild enhancement of the lesion, was seen on the postcontrast sagittal T1-weighted images (Fig 1D).

Computed tomography (CT) of the lower thoracic spine, performed to further characterize the lesion, showed an ovoid 1-cm mass at the superior endplate of T-8 with soft-tissue density centrally and a calcified rim. The lesion caused severe narrowing of the central spinal canal. A small cleft in the cortex of the posterior superior endplate of T-8 adjacent to the lesion was noted (Fig 1E and F).

A preoperative chest radiograph (Fig 1G) revealed two scapular osteochondromas, irregularity of the left proximal humerus, suggesting an osteochondroma, and an osteochondroma overlying the left fourth rib posteriorly, making multiple hereditary exostoses the most likely diagnosis.

At surgery, the lesion resembled a pearly brown marble and was adherent to the anterior aspect of the posterior longitudinal ligament; however, it was shelled out easily. The patient recovered fully without residual deficit. Pathologic specimens revealed the lesion to be an osteochondroma with a thin cartilaginous cap (Fig 1H and I).

Discussion

Some authors have suggested that osteochondromas constitute approximately 36% of all benign bone tumors (1). Lesions are often asymptomatic, and the actual occurrence rate is probably greater (1). Solitary lesions affect males more than females (1.5:1), and most patients are less than 20 years old (2–4). Multiple

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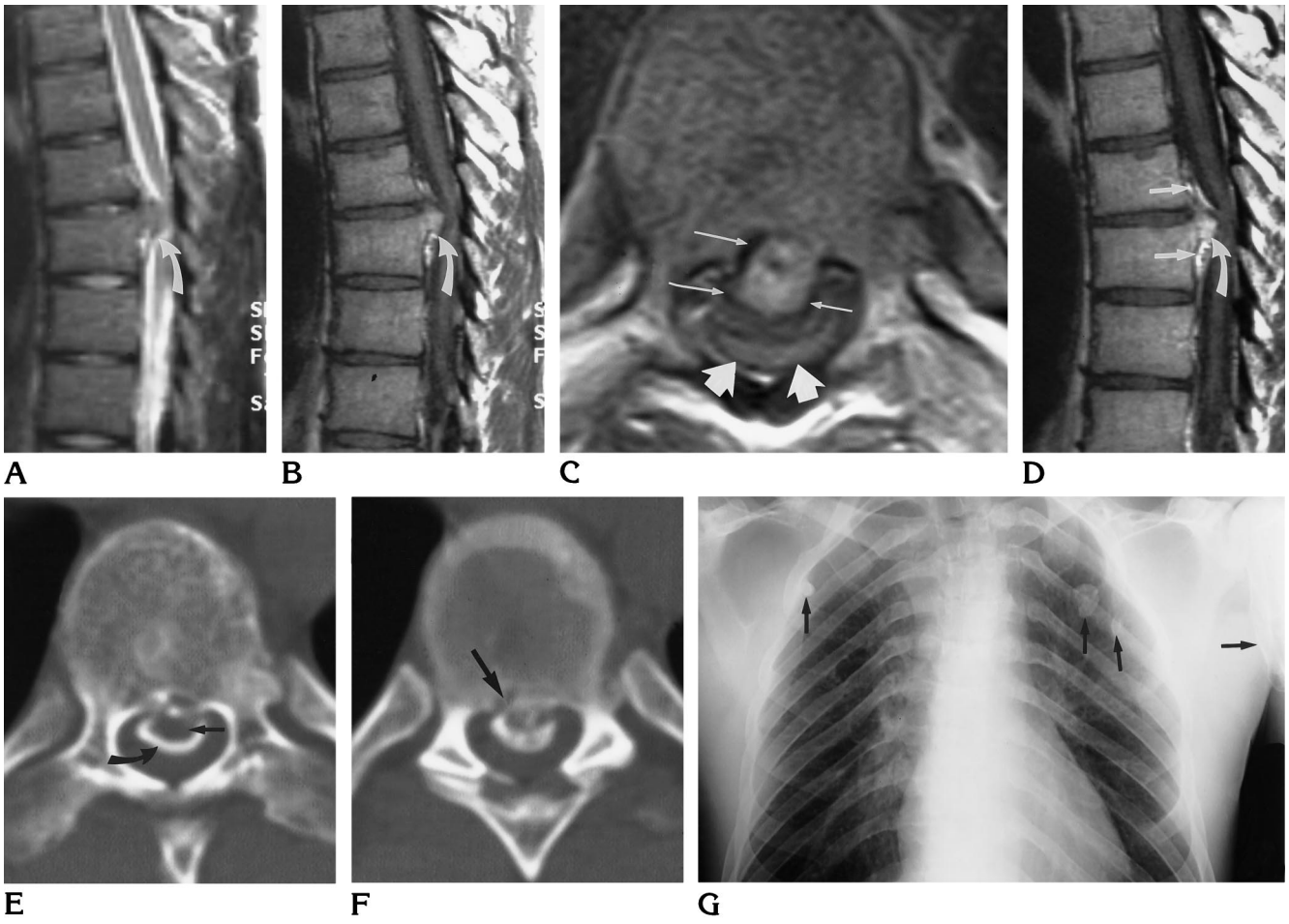

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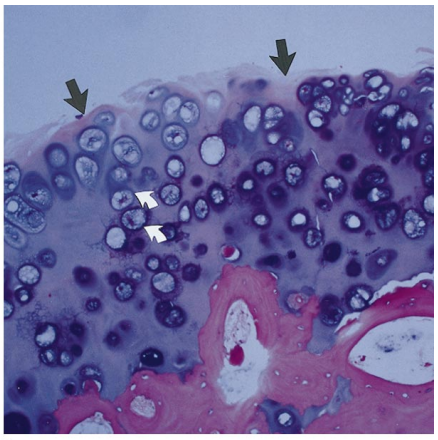

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Fig 1. Twenty-four-year-old man with hereditary multiple exostoses.

Unenhanced sagittal spin-echo T2-weighted (4000/90 [repetition time/echo time]) (*A*) and T1-weighted (600/12) (*B*) MR images show a 1-cm extradural lesion (*arrow*) arising from the superior endplate of T-8 and compressing the spinal cord. The lesion is isointense with adjacent vertebral body marrow on the T2-weighted image and hyperintense relative to marrow on the T1-weighted image.

C, Precontrast axial T1-weighted MR image (600/12) shows the lesion to be slightly hyperintense relative to normal marrow. Note marked cord deformity (*large arrows*) and the thin hypointense rim surrounding the lesion (*small arrows*).

D, Postcontrast sagittal T1-weighted MR image shows mild enhancement of the lesion (*curved arrow*) as well as enhancement of the epidural veins (*straight arrows*) superior and inferior to the lesion.

E and *F*, Axial CT scans at bone window level show the peripheral ossification better (*curved arrow* in *E*) and the low-density central marrow space (*straight arrow* in *E*). A small cleft (*arrow* in *E*) in the posterior superior endplate of T-8 raises the possibility of calcified disk herniation and associated endplate avulsion fracture. Again note the severe central canal stenosis.

G, Preoperative chest radiograph shows several mineralized lesions (*arrows*) associated with the left proximal humerus, the left fourth posterior rib, and the scapulas bilaterally, consistent with multiple exostoses.

H, Photograph of sectioned gross specimen clearly shows the central marrow cavity.

I, Photomicrograph shows a thin, well-formed hyaline cartilage cap (*black arrows*) with normal-appearing chondrocytes (*white arrows*) underlying the bone and marrow space, diagnostic of osteochondroma (hematoxylin-eosin stain).

exostoses account for approximately 12% of all symptomatic lesions. The multiple form has no sex predilection.

Osteochondroma of the spine is a rare cause of cord compression. Our case is atypical in that the lesion arose from the vertebral body endplate. The distribution of osteochondromas greatly favors the extremities. While only 1.3% to 4.1% of solitary osteochondromas arise within the spine, approximately 9% of patients with multiple osteochondromas have spinal lesions (2). Within the spine, lesions almost always occur in the posterior elements. Solitary lesions affect the cervical spine most commonly with a predilection for the atlantoaxial area, followed by the thoracic spine, then the lumbar spine (2, 4, 5). In cases of multiple exostoses, the thoracic and lumbar spine are more commonly involved (6).

Osteochondromas are thought to arise in a peripheral portion of the growth plate. A focus of metaplastic cartilage forms and grows through progressive endochondral ossification, as a consequence of trauma or a congenital perichondral deficiency (2, 7). The predominance of cervical lesions is thought to be related to greater mobility and stress of the cervical spine, with microtrauma leading to displacement and subsequent growth of a small cartilaginous rest (2). Lesions may be radiation induced, in which case, they are thought to be caused by a failure of the reserve cell layer in the epiphyseal growth zone (8). Radiation-induced osteochondromas constitute from 12% to 15% of lesions, and occur more often when more than 25 Gy is given, or when radiation is given to the very young (less than 2 years old). Radiation-induced osteochondromas occur within or at the periphery of the radiation field, and are usually solitary. The average latency period between radiation and development of osteochondroma is 8 years (8, 9). As with other osteochondromas, growth stops with skeletal maturity. Isolated cases arising in adulthood have been reported.

After the diagnosis of osteochondroma is made, characteristics distinguishing benign from malignant lesions must be sought. Malignant degeneration into chondrosarcoma is rare, reported as 1% to 5% of solitary lesions. The risk of malignant degeneration is 10% to 25% in those with multiple hereditary exostoses (1, 2, 7, 10).

The size of the cartilaginous cap is the best indicator of malignancy; however, exact criteria for determining tumor grade on the basis of cap thickness do not exist. Work by Kenney et al (12) suggests that caps less than 3 cm thick (average thickness, 0.6 cm) and largely mineralized caps are benign, whereas those more than 3 cm thick are malignant. In the adult, a benign cartilaginous cap is usually only several millimeters thick and not seen on CT scans, but it may be considerably thicker (7, 11). Malignant degeneration should be suspected in larger lesions with bulky cartilaginous caps, in lesions that recur after resection, and in those that continue to grow after skeletal maturity (2, 7, 10, 12). A chondroid tumor matrix in the cap may show increased signal intensity on T2-weighted images, but if the cap is thin or highly cellular, distinctive signal characteristics may be absent.

The lack of a discernible cartilaginous cap, the location of the lesion, and the small defect in the cortex of the superior endplate of T-8 make calcified disk herniation and associated endplate avulsion fracture a differential diagnostic consideration. The presence of multiple exostoses on preoperative chest radiographs, the contiguous marrow signal intensity extending from the vertebral body into the lesion seen on T1-weighted and T2-images, and the dense mineralization of the lesion on CT scans are the strongest clues to the diagnosis of spinal osteochondroma.

This case demonstrates the usefulness of MR imaging for the diagnosis of spinal osteochondroma with symptomatic compression of the spinal cord. Early identification of spinal osteochondromas might be facilitated by using MR imaging to examine the entire spine in patients with multiple hereditary exostoses. MR imaging has been shown to be useful in screening asymptomatic lesions in other hereditary disorders such as neurofibromatosis (13). Early diagnosis and therapy would most likely reduce the chance of permanent neurologic deficit from a spinal osteochondroma. Further studies with this patient population are necessary before MR imaging could be justified for use as a routine screening test.

References

1. Dahlin DC, Unni KK, Osteochondroma (osteocartilaginous exostosis). In: Dahlin DC, Unni KK, eds. *Bone Tumors: General Aspects and Data on 8542 Cases.* 4th ed. Springfield, Ill: Charles C Thomas; 1986:18–32

2. Albrecht S, Crutchfield JS, SeGall GK. On spinal osteochondromas. *J Neurosurg* 1992;77:247–252
3. Emanuelson I, Kyllerman M, Roos A. Hereditary multiple exostoses with spinal cord compression in a 13 year-old boy (letter). *J Neurol Neurosurg Psychiatry* 1994;56:238–239
4. Roblot P, Alcalay M, Cazenaave-Roblot F, Levy P, Bontoux D. Osteochondroma of the thoracic spine: report of a case and review of the literature. *Spine* 1990;15:240–243
5. Calhoun JM, Chadduck WM, Smith JL. Single cervical exostosis: report of a case and review of the literature. *Surg Neurol* 1992; 37:26–29
6. Sundaresan N. *Tumors of the Spine: Diagnosis and Clinical Management*. Philadelphia, Pa: Saunders; 1990:280–281
7. Moser RP, Gilkey FW, Kransdorf MJ. Osteochondroma. In: Moser RP, ed. *Cartilaginous Tumors of the Skeleton: AFIP Atlas of Radiologic-Pathologic Correlations, Fascicle II*. Philadelphia, Pa: Hanley & Belfus, 1990:35–73
8. Cree AK, Hadlow AT, Taylor TK, Chapman GK. Radiation osteochondroma in the lumbar spine. *Spine* 1994;19:376–379
9. Libshitz H, Cohen M. Radiation induced osteochondromas. *Radiology* 1982;142:643–647
10. Russell EJ, Levy JM, Breit R, McMahan JT. Osteocartilaginous tumors in the parapharyngeal space arising from exostoses. *AJNR Am J Neuroradiol* 1990;11:993–997
11. Hudson TM, Springfield DS, Spanier SS, Enneking WF, Hamlin DJ. Benign exostoses and exostotic chondrosarcomas: evaluation of cartilage cap thickness by CT. *Radiology* 1984;152:595–599
12. Kenney PJ, Gilula LA, Murphy WA. The use of computed tomography to distinguish osteochondroma from chondrosarcoma. *Radiology* 1981;139:129–137
13. Mautner VF, Tatagiba M, Lindenau M, et al. Spinal tumors in patients with neurofibromatosis type 2: MR imaging study of frequency, multiplicity, and variety. *AJR Am J Roentgenol* 1995; 165:951–955