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The use of MR imaging in the evaluation of spinal tumors has been well documented [1–4]. Once a mass is recognized, images in multiple planes and multiple signal sequences are used for better definition, especially of its location. For the most part, the same neuroradiologic criteria used in CT, conventional myelography, and CT-myelography are used for this purpose. This report describes a new sign based on the ability of MR to show extradural fat as a bright signal on T1-weighted images. A tumor arising in the extradural space may splay the fat, causing it to have a capped appearance. This fat-cap sign indicates that the epicenter of the tumor is extradural.

Case Report

A 75-year-old man with a 1-year history of progressive weakness and numbness of both lower extremities had a neurologic evaluation. Physical examination revealed decreased sensation at the T4 and T5 dermatomes. MR of the spine was performed by using a 1.5-T unit* and T1-weighted (470/30/20) sagittal and axial images. A mass was seen on sagittal images adjacent to the spinal cord at T4 (Fig. 1). The spinal cord and subarachnoid space were displaced by the tumor, away from the vertebral column. The tumor splayed and appeared to widen the extradural fat, giving it a capped appearance. On the axial images (550/30/4), the subarachnoid space and spinal cord were displaced away from the vertebral column. A hypointense structure between tumor and spinal cord most likely represented dura mater. Because of its effect on the subarachnoid space and spinal cord and because of the visualization of displaced dura mater, the tumor was thought to be in the extradural space. The separation and capped appearance of the fat also showed that the epicenter and origin of the mass were in the extradural space. The patient had a T3 to T6 laminectomy for pathologically proved extradural meningioma.

Discussion

The differential diagnosis of a spinal cord tumor primarily depends on the tumor's origin at one of three classical spaces. Intramedullary tumors originate in and enlarge the spinal cord. Tumors are diagnosed as intradural or extramedullary primarily when they enlarge the subarachnoid space. Extradural tumors enlarge the extradural space, displacing the thecal sac and spinal cord. On myelography, an epidural lesion displaces the contrast-filled subarachnoid space away from the osseous contour of the spinal column. On CT-myelography, the displacement of the contrast-filled subarachnoid space may be seen both above and below the epidural tumor, leading to correct recognition of the origin of the mass. On MR, determining the epidural location of the tumor is much more difficult, particularly if no osseous lesion is present. On T1-weighted images, visualization of the displaced dura mater (Fig. 1) and replacement of fat by the mass are important adjunct signs for determining the origin of a lesion. Once the origin is recognized, then an appropriate differential diagnosis can be considered.

In this particular case, extradural neurofibroma meningioma, lymphoma, and metastasis were considered. The absence of osseous destruction and lack of history of a primary lesion made metastasis an untenable diagnosis. The lack of foraminal enlargement placed neurofibroma low on our list of considerations. Because a focal mass effect encompassing only one vertebral body segment was present, lymphoma was thought to be unlikely. Although extradural meningioma is a rare lesion, it became the most likely diagnosis once all other considerations were eliminated.

In conclusion, on MR, the fat in the extradural space can be visualized directly with T1-weighted imaging. Therefore, lesions arising in this space can splay the fat, giving it a capped appearance on sagittal or axial images. Thus, it appears that the presence of capped extradural fat surrounding a tumor may be a useful sign indicating that the origin of a mass lies in the extradural space.

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REFERENCES

1. Han JS, Kaufman B, El Yousef SJ, et al. NMR imaging of the spine. *AJR* **1983**;141:1137–1145
2. Hyman RA, Edwards JH, Vacirca SJ, Stein HL. 0.6 T MR imaging of the cervical spine: multislice and multiecho techniques. *AJNR* **1985**;6:229–236
3. Maravilla KR, Lesh P, Weinreb JC, Selby DK, Mooney V. Magnetic resonance imaging of the lumbar spine with CT correlation. *AJNR* **1985**;6:237–245
4. Modic MT, Weinstein MA, Pavlicek W, Boumphrey F, Starnes D, Duchesneau PM. Magnetic resonance imaging of the cervical spine: technical and clinical observations. *AJR* **1983**;141:1129–1136, *AJNR* **1984**;5:15–22

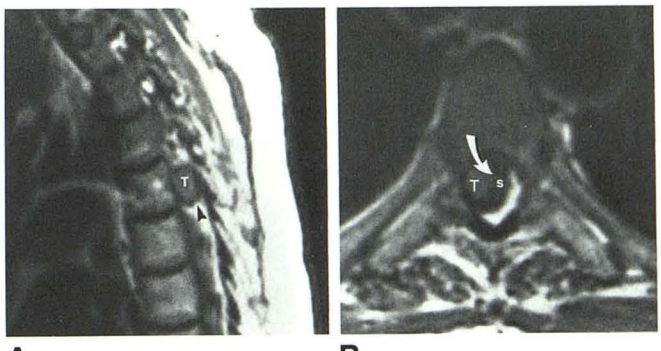

Fig. 1.—Fat-cap sign for extradural spinal tumors.
***A*, Sagittal T1-weighted MR image shows tumor (T) separating epidural fat, causing it to have a capped appearance (*arrow*) at fat-tumor interface.**
***B*, Axial T1-weighted image shows inferior aspect of tumor (T) displacing dura to right (*arrow*), with some early widening of epidural fat. S = compressed spinal cord.**

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