Abstract This article discusses several critical nontraumatic emergencies that involve the spine. Metastatic disease, infection of the disc and epidural space, acute disc herniation, epidural hematoma, and epidural lipomatosis may all present with symptoms ranging from localized pain to more severe neurologic sequelae. Several of these entities may progress to irreversible myelopathy or death if the diagnosis is not made in a timely manner. Appropriate radiologic evaluation and accurate interpretation are required to guide necessary treatment for these entities. Clinical presentation, etiology, radiologic findings, and pitfalls of interpretation of these conditions and related entities will be presented.

Key words Spine, MRI – Spine, acute conditions – Epidural space – Spinal cord compression

Introduction

Emergent nontraumatic disorders that affect the spine and spinal cord may result from a variety of causes. Clinical findings and symptoms may be nonspecific for many of these disorders. An optimized imaging strategy is necessary for efficient and accurate diagnosis. Metastatic disease of the spine may cause localized pain for some time prior to extension to the epidural space, inciting more urgent myelopathic symptoms [1]. Spondylodiscitis may have an indolent, latent phase prior to objective findings [2, 3]. Epidural abscess may complicate discitis or result from primary seeding of the epidural space. Acute disc herniation may present with varying degrees of paraplegia [4]. Other extradural compressive lesions include epidural hematoma and epidural lipomatosis. Patients with ankylosing spondylitis present a unique susceptible group with respect to emergent nontraumatic myelopathy. Many of the above lesions have specific imaging characteristics on spinal MRI. The combination of diagnostic, anatomic, and prognostic information provided by magnetic resonance in these situations has made MRI a primary tool for evaluation of these disorders.

Neoplastic disease

Metastatic disease to the vertebral column with extension into the epidural space may result in acute spinal cord compression. Epidural spinal cord compression from metastatic disease occurs in 5% of patients who die of cancer [5]. The initial symptom in approximately 80–95% of cases is progressive back or neck pain, radicular pain, or referred pain that may be present for months [5, 6, 7, 8]. Pain may be the only presenting symptom in patients with documented cord compression. Weakness may be present in up to 76% of cases at the time of diagnosis [9]. Other symptoms include bladder and bowel dysfunction in 57% and sensory loss in 35–51% [9, 10]. The clinical decision to pursue advanced imaging in certain cases and not in others is made more difficult by the often nonspecific clinical presentation, and no clinical symptom or sign has been identified which can adequately discriminate patients with early compression from those without [11].

While any metastatic lesion may involve the spine, tumors found most frequently include myeloma and breast and prostate cancer [10]. Epidural tumor is found in the thoracic region in approximately 68% of cases, the lumbosacral region in 16% of cases, and in the cervical region in 15% [9]. A second site of compression was found in 9% of cases in one series [11]. Many factors may correlate with the functional prognosis at the time of diagnosis. These include neurological status at the time of treatment, the degree of cord compression, the absence of vertebral collapse at the time of diagnosis, and the duration of symptoms [7]. Of these, in a multivariate analysis, only pretreatment motor function was found to be a significant factor determining improve-
ment of motor function [6]. This finding emphasizes the importance of a high clinical index of suspicion and rapid radiologic evaluation to expedite treatment.

Plain radiographs may be revealing in the presence of characteristic appearance of metastatic disease of the spine. This includes destructive or sclerotic lesions of varying size within the vertebral bodies, pedicle erosion, and compression deformity [5, 10] (Fig. 1). In patients with metastatic epidural compression, plain films have been shown to be abnormal in up to 85% of cases [10]. The likelihood of radiographic abnormality appears to be higher in patients with breast or lung primary sites than in those with lymphoma or pediatric tumors [12]. CT may reveal the extent of osseous involvement and may help visualize the paraspinal, epidural soft tissue component of disease. CT, myelography, and the combination remain viable and sensitive alternatives to MRI if these are more readily available or the patient is not a candidate for MRI [5, 13].

In patients with neurologic symptoms, MRI has become the imaging modality of choice to detect suspected neoplastic involvement of the spine [14] (Fig. 2). This has largely replaced myelography, allowing a noninvasive assessment of the site(s) of involvement with extremely sensitive detection of vertebral body metastasis, paraspinal lesions, epidural masses, and foraminal disease [5, 10] (Fig. 3). The compressive lesion frequently arises from the vertebral body but may originate in the paraspinal or mediastinal region (Fig. 4). While the distinction between benign and malignant compression fractures may be made with a moderate degree of certainty by MRI [10], compression fractures in patients with multiple myeloma may have otherwise benign characteristics [15]. Differentiation between benign and malignant vertebral body compression fractures is discussed further in this issue in “Nontraumatic spine disorders: part II,” the second review article in this series.

Assessment for cord compression by MRI often involves sagittal imaging of the entire spine with T1 and T2 weighting. Axial images may then be performed through regions of interest. While a specific anatomic

![Fig. 1a, b Absent pedicle from metastatic disease. Spinal radiograph (a) reveals absent left T8 pedicle (arrow). Sagittal T1-weighted image (T1WI) (b) shows that the underlying disease primarily involves the vertebral body with extension into the pedicle (arrow).](image1)

![Fig. 2a–d Metastatic epidural cord compression. Sagittal T1WI after gadolinium administration (a) and T2WI (b) show extent of epidural, vertebral, and mediastinal tumor involvement in the thoracic spine. Axial pre- (c) and postgadolinium T1WI (d) show the extent of cord compression in this patient with metastatic intra-abdominal desmoplastic small cell tumor. Tumor involves numerous vertebral bodies and the neural foramina at the level of compression.](image2)