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CASE REPORT

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Osteoid osteoma of the cervical spine depicted as dumbbell tumor by MRI

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Abstract We report a case of 14-year-old male patient with osteoid osteoma of the cervical spine. Magnetic resonance imaging (MRI) revealed a large dumbbell-shaped paravertebral tumor in the region of the exiting left C6 nerve. A computed tomographic (CT) scan after myelography showed a much smaller bony defect in the medial aspect of the left C6 pedicle with central calcification and extensive bone sclerosis around the defect, typical of osteoid osteoma. The diagnosis was confirmed postoperatively. The resected specimen exhibited extensive vascularization of the osteoid tissue. The case is presented because MRI did not allow a specific diagnosis of osteoid osteoma, and suggested the tumor was larger than in reality it was, by also depicting the reactive inflammation around the tumor as if it were part of the tumor.

Key words Osteoid osteoma · MRI · Inflammatory reaction

Introduction

Magnetic resonance imaging (MRI) has recently become the first choice for diagnosis of pathological changes within the spinal canal, since it can readily delineate lesions, especially in the soft tissue. We report a case of osteoid osteoma of the cervical spine, in which a T2*-weighted gradient echo MR image showed a dumbbell-shaped tumor derived from a nerve root, while a CT scan and full MRI examination revealed the delineated nidus and surrounding sclerotic region, which led us to diagnose an osteoid osteoma. CT scan more specifically detects lesions of osteoid osteoma compared with MRI, since MR images may delineate the surrounding reactive inflammatory change as if it were a part of the lesion.

Case report

From the beginning of July in 1994, a healthy 14-year-old boy had been suffering from limited range of neck motion and neck pain. In December, the pain began to radiate into his left shoulder and elbow. At the initial evaluation at another hospital, he was diagnosed with a dumbbell tumor of the cervical spine on MRI examination with a 0.5-T unit and referred to our hospital. A T2-weighted gradient echo MR image suggested a paravertebral tumor along the left C6 nerve root (Fig. 1). On initial evaluation on admission to our hospital, the patient was in obvious distress due to severe neck pain radiating along the sensory distribution of the left C6 nerve root. Results of both the neurological examination and laboratory studies were normal. Roentgenograms of the cervical spine revealed sclerotic changes within the left pedicle of the sixth cervical vertebra (Fig. 2). Technetium-99m bone scintigraphy demonstrated markedly increased activity on the left side of the sixth cervical vertebra (Fig. 3). A myelogram was normal, but a CT scan af-

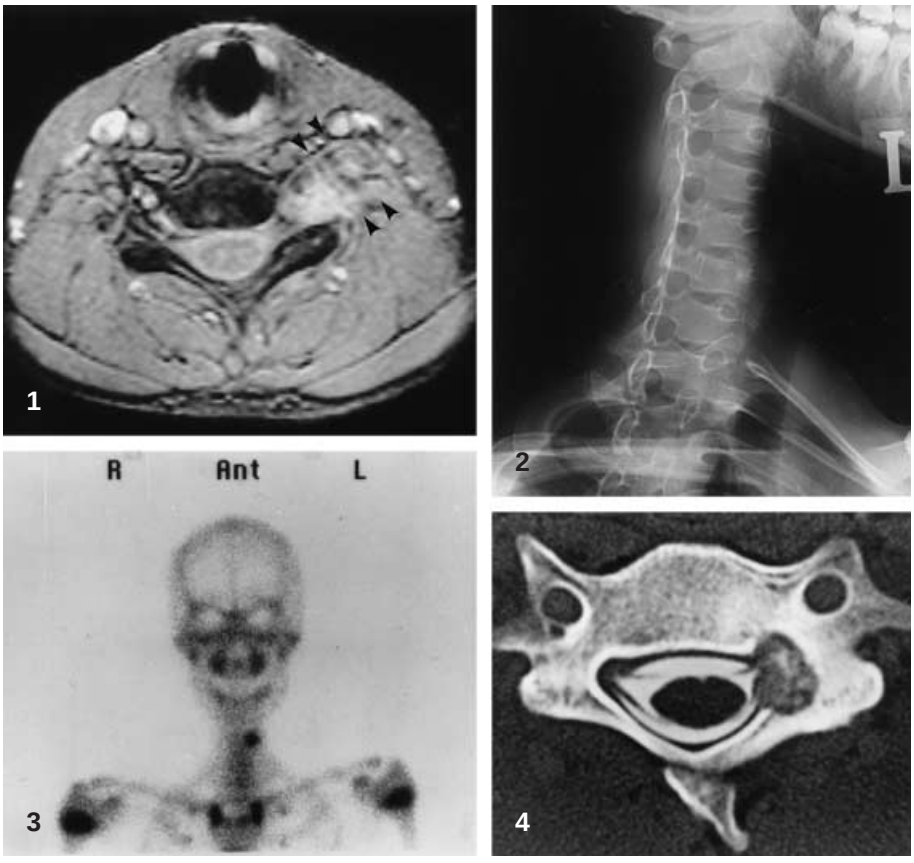

Fig. 1 Axial gradient echo T2-weighted magnetic resonance (MR) image at the C6 level, taken at an outside hospital, reveals a high-intensity mass resembling a dumbbell tumor

Fig. 2 Oblique roentgenogram of the cervical spine shows a sclerotic transformation of the left pedicle of the sixth cervical vertebra

Fig. 3 Technetium-99m bone scintigraphy demonstrates markedly increased activity on the left side of the sixth cervical vertebra

Fig. 4 Computed tomographic (CT) scan after myelography reveals a nidus in the region of the left pedicle of the sixth cervical vertebra with sclerotic change of the surrounding bone

ter myelography revealed a tumor nidus in the medial aspect of the left pedicle. Around the nidus, the bone was increased in density and exhibited sclerotic changes (Fig. 4). On further MRI study at our hospital (1.5-T unit), an oval mass was demonstrated in the left pedicle of C6. The mass was isointense to the cord and surrounded by a hypointense area on the T1-weighted image, and hypointense to the cord, surrounded by mild hyperintensity on the T2-weighted image. With gadolinium enhancement, the mass was homogeneously enhanced and the surrounding area was heterogeneously enhanced. At the contiguous section of MRI, enlarged soft tissue image could be recognized in the left C6/7 neural foramen (Fig. 5). Although a dumbbell-shaped tumor was suspected, based on the initial MRI findings taken at an outside hospital, the diagnosis of osteoid osteoma was made based on the bone scintigram, CT scan and further MRI study. Surgical resection with a microscope was chosen for the treatment. After a midline longitudinal incision from C5 to C7, the paravertebral muscle was retracted and the lamina and the facet were exposed only on the left side. The interarticular portion of C6 was drilled with a high-speed drill and the nidus was completely resected. The resected specimen exhibited extensive vascularization in the osteoid tissue (Fig. 6). The patient's symptoms remitted postoperatively. Five years postoperatively, the patient is asymptomatic and satisfied with the results of the treatment.

Discussion

In 1935, Jaffe first reported osteoid osteoma as a benign bone tumor with established histological features [5]. Its nidus is highly vascularized in osteoid tissue and is surrounded by granulation tissue and reactive osteosclerosis. This bone tumor usually develops in young adult males and most commonly in the proximal femur.

Successful treatment requires surgical en bloc resection of the nidus to prevent recurrence. Osteoid osteoma is located in the spine in nearly 10% of all reported cases [4]. In this location, osteoid osteoma presents typical clinical symptoms. The earliest symptom is constant or episodic pain of varying intensity that increases with activity and is localized at the site of the lesion [3, 6]. The pain frequently becomes more apparent at night [2]. When spinal lesions are suspected, MRI is now performed routinely. In the case of osteoid osteoma, however, MRI sometimes demonstrates lesions with a diffuse process larger than the actual lesion. This is referred to as the flare phenomenon [1]. Yamamura et al. [12] reported that the degree of inflammation on MRI varies with the site of the nidus. When the nidus is encapsulated within the cortical bone, the inflammation is limited. When the nidus is located within the cancellous bone, edema in the bone marrow is marked and the entire vertebral body may be involved. When the nidus is located near the soft tissue, edema extends along the soft tissue. Because of these phenomena, care must be taken in the interpretation of MR images in osteoid osteoma, since MRI can provide mis-

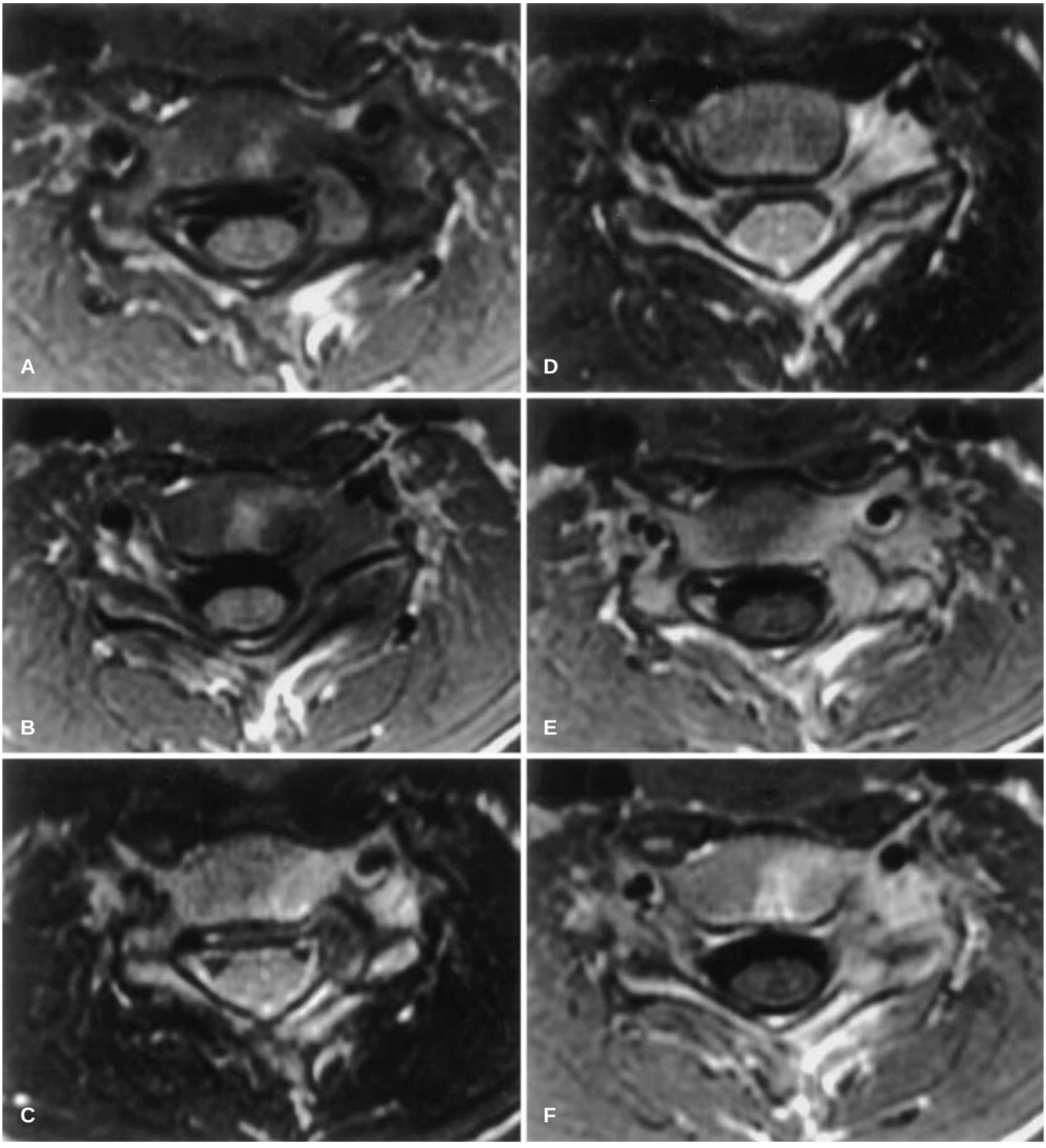

Fig. 5 A–F MR images with a 1.5-T unit at our institute. **A, B** Contiguous, axial T1-weighted spin echo images at C6. **C, D** contiguous, axial T2-weighted spin echo images at the same level as **A** and **B**. **E, F** Post-contrast, contiguous, axial T1-weighted spin echo images at the same level as **A, B**. An oval mass is seen in the left pedicle of C6. The mass is isointense to the cord, surrounded with a hypointense area, on the T1-weighted image (**A**) and hypointense to the cord, surrounded with mild hyperintensity, on the T2-weighted image (**C**). The mass is homogeneously enhanced and the surrounding area is enhanced heterogeneously on the post-contrast T1-weighted image (**E**). At the left C6/7 neural foramen there is a mass-like lesion, which shows mild hypointensity on the T1-weighted image (**B**) and hyperintensity on the T2-weighted image (**D**). This lesion is homogeneously enhanced on the post-contrast T1-weighted image (**F**)

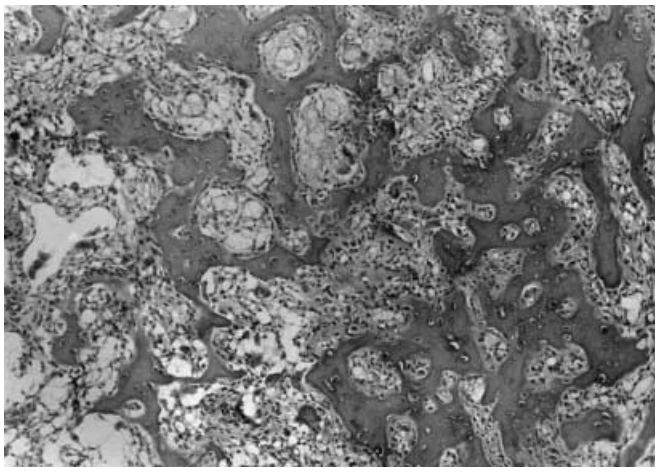

Fig. 6 The pathologic specimen exhibiting extensive vascularization of osteoid tissue

leading images. It should not be used in the initial assessment of a possible osteoid osteoma [10, 11]. On the other hand, some reports have postulated that information provided by MRI was particularly valuable for diagnosing osteoid osteoma, especially in a rare location [8, 9]. In our case, because the nidus was located in the medial aspect of the pedicle near the left C6 nerve root, the inflammatory reaction extended along the left C6 nerve root and adjacent soft tissue, resulting in the appearance of a dumbbell-shaped tumor on MRI. Because the quality of the initial MR image was not excellent, it demonstrated lesions with a diffuse process larger than the actual lesion. CT images thus appear to be more specific in diagnosing osteoid osteoma than MR images, especially when using the gradient echo technique.

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