Vertebral Osteosarcoma – A Report of Five Cases

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Abstract

Background: Vertebral osteosarcoma is rare, accounting for 3%–5% of all osteosarcomas. It tends to occur in a slightly older age group. The prognosis is poor compared to osteosarcoma of extremities.

Case Details: We present five cases of vertebral osteosarcomas. The patient's age ranged from 16 years to 54 years. There were four females and one male. They presented with pain, swelling, or weakness of limbs. Destructive lesions, mixed lytic and sclerotic lesions involving vertebral bodies, and/or pedicles were seen on imaging. A definitive diagnosis could not be made in two cases. On histopathological examination, all the cases turned out to be osteosarcomas.

Conclusion: Osteosarcoma of vertebrae has high rate of recurrence, metastasis, and mortality. Differentiation of vertebral osteosarcoma from other common bony lesions involving the spine is of utmost importance as the treatment is entirely different. Combination therapies including surgery, radiation, and chemotherapy achieve adequate short-term survival rates for vertebral osteosarcoma.

Keywords: Osteosarcoma, Spine, Vertebra.

Introduction

Osteosarcoma involving vertebrae occurs in less than 5% of all the osteosarcomas [1]. Clinical presentation includes pain and enlarging palpable mass. Computed tomography (CT) scan demonstrates cortical destruction and extraosseous extension [2]. Magnetic resonance imaging (MRI) is useful for the assessment of patients with intraosseous tumor spread or identification of neural compression [3, 4]. CT-guided biopsy techniques can be used, especially in lower thoracic and lumbar spine [5]. These patients are poor candidates for surgical excision because of proximity to the neural structures and hence have worst prognosis.

Case Reports

Case 1

A 31-year-old female presented with back pain. Radiological examination revealed altered signal intensity mass (Fig. 1a) involving body of dorsal (D)6 vertebrae. Evidence of intraspinal and intrathoracic extension was seen with compression of spinal cord. Biopsy was done and diagnosis of osteosarcoma (Fig. 1b) was made.

Case 2

A 54-year-female complained of low back pain. Clinical diagnosis was osteoblastoma/osteosarcoma. CT identified ill-defined lytic sclerotic lesion in the lumbar (L3) vertebral body. MRI showed altered signal with central compression of vertebral body and right pedicle with break in posterior cortex. The differential diagnosis was metastases and plasmacytoma. Whole-body scintigraphy revealed increased tracer uptake in L3 vertebral body. Bone biopsy outside was diagnosed as round cell neoplasm and immunohistochemistry done was inconclusive. We received slides for the second opinion which showed an osteoid producing neoplasm composed of spindle cells with hyperchromatic nuclei and the neoplastic cells were permeating normal bony trabeculae (Fig. 2a). MIB-1 labeling index was also high. Hence, it was diagnosed as osteoblastic osteosarcoma, high grade.

Case 3

A 46-year-old female presented with back pain. Clinical diagnosis was chondrosarcoma. On MRI, there was mixed lytic and sclerotic lesion involving L5 and sacral vertebrae with destruction of vertebral body. Radiology diagnosis was metastasis. Slides were received for second opinion and the diagnosis of osteosarcoma was made (Fig. 2b).

Case 4

A 26-year-old male complained of swelling at the back and weakness of four limbs. Radiological examination revealed an irregular mildly expansile lytic lesion involving D7 vertebrae with irregular heterogeneously enhancing soft-tissue component. The lesion was extending into spinal canal to neural foramen as an epidural

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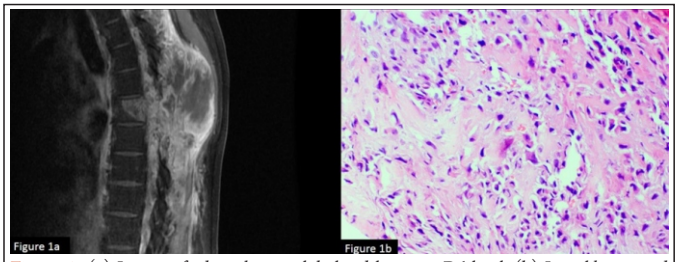

Figure 1: (a) Imaging finding showing lobulated lesion at D6 level. (b) Lace like osteoid between the cells H&E ×400.

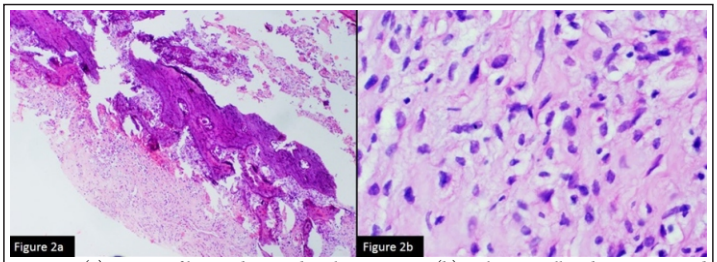

Figure 2: (a) Tumor infiltrating bony trabeculae H&E ×40. (b) Malignant cells in between osteoid H&E ×400.

component. Histopathological examination revealed spindle cells (Fig. 3a) with highly pleomorphic, hyperchromatic nuclei and scanty eosinophilic cytoplasm. Extensive areas of osteoid formation were noted. Areas showing necrotic changes, calcification, and chondroid change (Fig. 3b) were seen. Mitoses were frequent. Hence, it confirmed the diagnosis of osteosarcoma.

Case 5

A 16-year-old female presented with pain and swelling in the back. CT scan features were suggestive of bone tumor arising from transverse process of L5 vertebrae with large calcifications which were of chondroid and osteoid type. On MRI, a destructive lesion with soft-tissue component and foci of bone formation was noted. The possibility of osteosarcoma was given. Core biopsy showed osteoid forming neoplasm composed of plump spindle cells with osinophilic cytoplasm and hyperchromatic moderately pleomorphic nuclei (Fig. 4a). Occasional mitoses (Fig. 4b) were noted. Tumors cells were producing calcifying osteoid. Hence, it was reported as osteosarcoma.

Discussion

Patients with vertebral lesions typically present at an older age than those with appendicular lesions. Most of the patients present in the fourth decade of life. However, in the present study, a single case was seen in a 16-year-old girl. Egea-Gamez et al. studied three pediatric vertebral osteosarcomas in which the age of the children was 9 years, 11 years, and 15 years, respectively [6]. Yalniz et al. reported vertebral osteosarcoma in a 27-year-old female at lumbar vertebrae [7]. After surgical debulking and chemoradiotherapy, the patient was alive after 15 years.

Men are affected more often than women. In the present study, females predominated. Osteosarcomas have predilection for the lumbosacral spinal segments. Lumbar spine was involved in three cases and thoracic spine in two cases in the present study. These tumors affect the vertebral body in 90% of patients [8]. Extension into the posterior elements is also common. The symptomatic period between onset and final diagnosis ranges from 2 to 18 months [3]. Imaging findings diagnosed osteosarcoma in three cases based on typical features. Metastases, plasmacytoma, and osteoblastoma were the differential diagnosis in two other cases. The typical "ivory vertebra appearance," highly suggestive of osteosarcoma, is seen only in 6–7% of the cases [5]. Knowledge of the spectrum of lesions that can affect the bony spine and the surrounding soft tissues is crucial in directing appropriate investigation and treatment.

About 30% of osteoblastomas occur in spine [9]. They are common in the second and third decades. They are usually >2 cm. They involve posterior elements and are equally distributed in the cervical, thoracic, and lumbar segments. Radiologically, they appear as expansile destructive lesions which are partially calcified. Extension to vertebral body can occur. Histology confirms the diagnosis.

Plasmacytomas are single localized tumors consisting of monoclonal plasma cells. Patients may present with bone pain, pathological fracture, or signs of cord compression. Radiology reveals lytic lesions. MRI is the preferred modality for diagnosis. Diffuse sheets of plasma cells are seen under microscopy.

Metastases are usually seen in elderly patients. The patients occasionally give a history of symptoms elsewhere in the body. Metastatic carcinoma can display a variety of radiologic appearances such as osteolytic, osteoblastic, and mixed features. Carcinomas of the lung, kidney, thyroid, and gastrointestinal tract are usually osteolytic, whereas prostate and bladder are typically osteoblastic. A mixed pattern can be seen in carcinomas of breast and lung [10]. Histopathological examination clinches the diagnosis.

In recent years, aggressive adjuvant and neoadjuvant chemotherapy has improved the outcome of patients with osteosarcoma [3]. The effect of chemotherapy is only temporary, and pre-operative chemotherapy should be followed by intensive surgical resection whenever possible to enhance the survival [11]. Early detection and accurate diagnosis is important in improving not only the prognosis but also the quality of the patient's life [12].

Conclusion

Osteosarcoma involving vertebrae is infrequent and hence it is difficult to diagnose based on radiological findings alone.

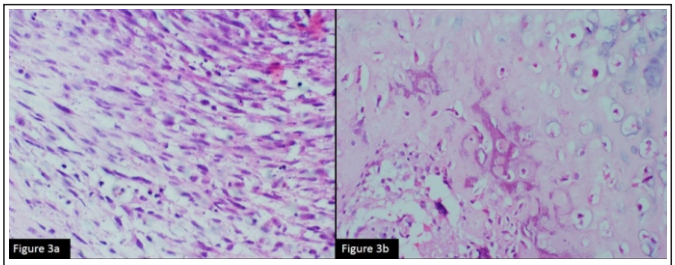

Figure 3: (a) Fibroblastic area H&E ×400. (b) Calcifying osteoid and chondroblastic areas H&E 400.

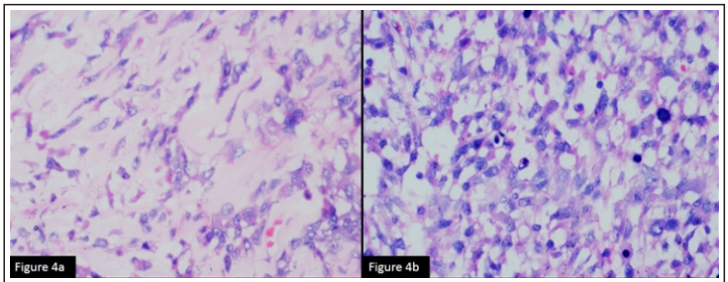

Figure 4: (a) Osteoblastic area H&E ×400. (b) Mitosis H&E ×400.

Microscopic examination plays a crucial role in those cases. Both benign and malignant tumors were on radiological differential diagnoses in this study which were later ruled out on biopsy. The treatment options for other tumors are different; hence, a definitive diagnosis is must for the patient management and familiarity with various types of spine tumors is a requisite. Patients need individualized treatment plans and combination therapy usually improves the prognosis.

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