

Symptomatic pathological fracture of odontoid as the primary presentation of multiple myeloma: Evaluation by 3D CT, conventional MR imaging, and in-phase and opposed-phase MR technique

Suyash Mohan, Ashish Verma, Saurabh Guleria, Shreesh K Mittal, Sunil Kumar*

Department of Radiodiagnosis, Sanjay Gandhi Postgraduate Institute of Medical Sciences, Raebareilly Road, Lucknow 226014, UP, India

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Abstract

Odontoid fractures commonly occur as a result of traumatic cervical spine injuries; pathological fractures being distinctly uncommon. Malignant tumors involving atlanto-axial spine are uncommon, metastases remain a common cause of pathological fractures at this site. Although, myeloma deposits in the cervical spine often occur, primary presentation of multiple myeloma with pathological fracture of odontoid consequent to such deposits is extremely rare. The above feature and its occurrence at an unusual site are the highlights of this report. A short review of the available literature has also been done. We further describe the utility of in-phase and opposed-phase imaging in differentiation of benign from malignant vertebral fracture in context to the present case.

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1. Introduction

Multiple myeloma (MM) is a clonal B-lymphocyte neoplasm of terminally differentiated plasma cells. It accounts for approximately 1% of all malignant diseases and represents about 10% of hematologic malignancies. Myelomatous deposits are most commonly seen in the axial skeleton, with diffuse bone pain being the most frequent presenting symptom. Spinal compression fractures occur in 55–70% of patients with MM, and may be focal due to a deposit or generalized due to increased osteolysis [1]. Metastases of MM are rare in odontoid process of C2 [2]. Symptomatic pathological fracture of odontoid due to such deposits as the initial presentation of MM is exceedingly rare and forms the highlight of the present report. In and opposed phase imaging is a novel, non-invasive tool which has recently been shown to be helpful in differentiation of benign from malignant vertebral

fractures [3]. In the present report we also describe our experience in differentiating benign from malignant myelomatous fractures utilizing the above technique.

2. Case report

We report a 59-year old male who presented with unremitting sub-occipital neck pain radiating to the shoulders and occiput along with restricted neck movements in the preceding four days. This was not associated with any limb weakness, sensory symptoms, and bladder or bowel involvement. Examination of the central nervous system (CNS) was normal with no focal neurologic deficits. A clinical diagnosis of cervical spondylosis was made and patient was referred to the department of radiology for imaging. Plain radiographs, computed tomography (CT) scan and magnetic resonance imaging (MRI) were done. Plain radiographs of the skull and cervical spine showed multiple, well defined, punched out lytic lesions with no sclerotic rim with a suspicious fracture at the base of odontoid. No flexion or extension radiographs were performed to define instability due to the

* Corresponding author. Tel.: +91 522 2668700x2565; fax: +91 522 2668017.

E-mail addresses: drsuyash@gmail.com (S. Mohan), anitasunilk@yahoo.co.in (S. Kumar).

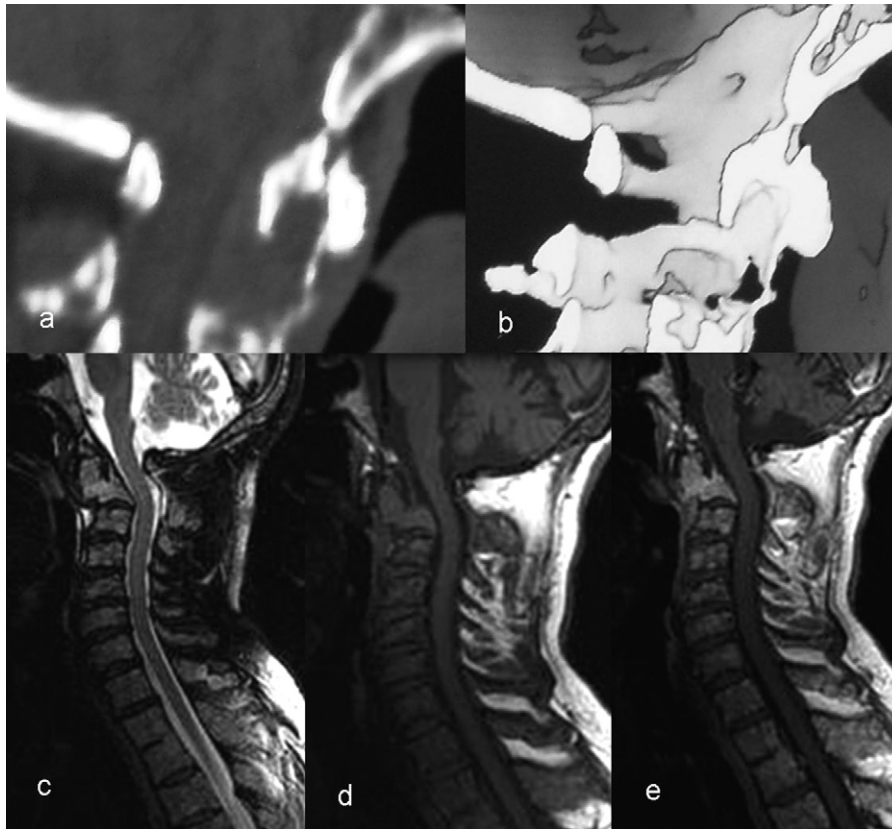


Fig. 1. (a and b) 3D Sagittal reformatted CT images showing destruction and cortical disruption of the base of the odontoid from the body of C-2 with anterior subluxation of C1. Sagittal T2 WI (c), T1 WI (d) and post contrast (e) MRI of the cervical spine showing myelomatous deposits in the body of C-2. The deposit at the base of odontoid has an enhancing soft tissue component and is associated with pathological fracture and anterior subluxation of C1.

risk of iatrogenic fracture/subluxation and neurological dysfunction. Helical CT (Picker 5000, Picker International Inc., Cleveland, OH, USA), with three-dimensional reformations of the cranio-vertebral junction (CVJ), were done which confirmed the radiographic findings. An additional fracture in the tip of odontoid was also seen (Fig. 1a, b). Standard MRI of cervical spine was done on a 1.5 T superconducting magnet (GE Signa, Milwaukee, WI, USA). This consisted of a fast spin echo (FSE) T2W, spin echo (SE) T1W, and fat suppressed T2W sequences in axial and sagittal planes. Post-contrast SE T1W sequences were also acquired after injection of intravenous gadolinium compound (Omniscan, Amersham health AS, Oslo, Norway) (Fig. 1c, d, e). Multiple hyperintense lesions were noted in all cervical vertebrae corresponding to the lytic lesions seen on plain radiographs and CT scan. There was a large ill-defined lesion noted at the base of the odontoid associated with a pathological fracture. Multiple other similar lesions were seen in the body and lateral masses of C2 vertebra. There was anterior subluxation of odontoid and anterior arch of atlas over the body of C2. The fracture at the base of odontoid was associated with soft tissue mass which showed post contrast enhancement. The available canal diameter was compromised; no cord compression or feature suggesting myelopathy was however noted. In addition

sagittal in-phase (IP) [repetition time (TR), 90–185; echo time (TE), 2.4 or 6.5; flip angle, 90°] and opposed-phase (OP) [repetition time (TR), 90–185; echo time (TE), 4.6–4.7; flip angle, 90°] gradient recalled echo sequences were acquired. The mean of three signal intensity values was taken by placing elliptical region of interest (ROI) at the site of pathology located at the base of odontoid. The signal intensity ratio (SIR) was calculated by dividing mean SIR on OP by mean SIR on IP imaging and was 0.98 (greater than 0.8) suggesting the possibility of an ongoing malignant process at the fracture site [3]. Based on above clinico-radiological findings a provisional diagnosis of multiple myeloma was made. A serum electrophoresis was subsequently done which revealed the presence of M-peak. The diagnosis was confirmed on the basis of bone marrow aspiration and biopsy. Chemo-radiation for multiple myeloma was hence started with a hard cervical collar added for pain relief and spinal stabilization; the patient is stable till the last outpatient attendance.

3. Discussion

MM is a disease of middle and old age (median age at diagnosis is 65 years), with about 3% of patients being younger

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