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Case Report

Sustained long-term complete regression of a giant cell tumor of the spine after treatment with denosumab

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Abstract

BACKGROUND CONTEXT: Although giant cell tumors (GCTs) are histologically benign, they may become locally aggressive bone tumors. As these lesions tend to respond poorly to radio- and chemotherapy, currently the standard surgical paradigm for the treatment of spinal GCTs involves *en bloc* surgical resection. Denosumab is a newly developed monoclonal antibody designed to inhibit the receptor activator of nuclear factor kappa-B ligand (RANKL) which has already been demonstrated to induce marked radiographic responses on GCTs of the appendicular skeleton. Nevertheless, the role of denosumab in the treatment algorithm of GCTs of the spine has not yet been defined.

PURPOSE: To describe the first case of sustained long-term complete clinical and radiographic regression of a GCT of the spine after treatment with the new RANKL antibody denosumab.

STUDY DESIGN: Case report and literature review.

METHODS: The authors describe the case of 22-year-old female patient, harboring a GCT involving the C2 vertebral body and odontoid process, who was treated in monotherapy with denosumab, resulting in complete long-term clinical and radiographic tumor remission.

RESULTS: There were no major side effects associated with the long-term pharmacological treatment with denosumab. From the clinical standpoint, the patient demonstrated complete remission of the disease while under treatment. The 16-month radiographic follow-up demonstrated complete disappearance of the osteolytic process and intense new cortical bone formation with restoration of the bone integrity of the C2 vertebral body.

CONCLUSIONS: This is the first report of sustained long-term complete clinical and radiographic regression of a GCT of the spine after treatment with the new RANKL antibody denosumab. Although future long-term follow-up studies are still necessary to establish important key points regarding the best therapeutic protocol with such a new drug (such as the optimal time frame to keep the patient under treatment), denosumab promises to bring major changes to the current therapeutic paradigm for GCTs of the spine, which, up to now, has strongly relied on *en bloc* surgical resection.

Keywords: Denosumab; Giant cell tumor; RANK ligand; Primary bone tumors; Upper cervical spine; En bloc resection; Osteogenesis; Osteolysis

Case report

History and examination

A 22-year-old female patient, without any morbidity or major events in her past medical history, presented to the emergency room with complaints of severe neck pain. The symptoms began 2 weeks before the evaluation with

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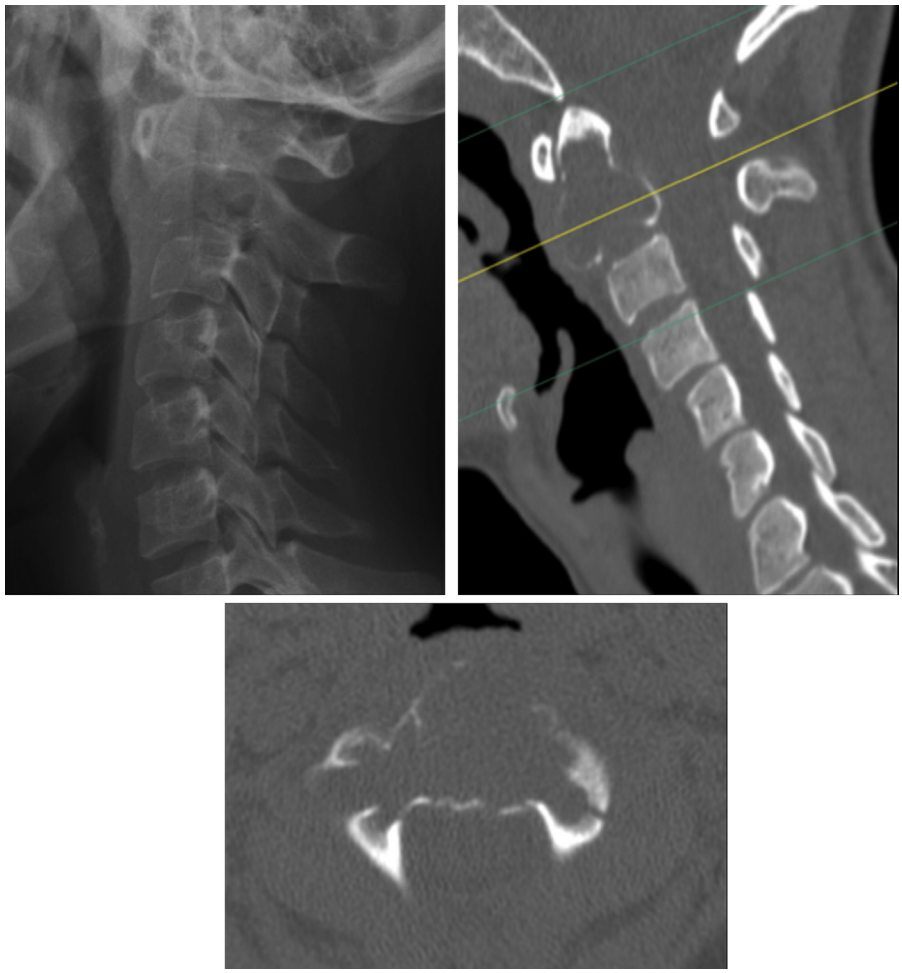

Fig. 1. (Top Left) Lateral plain X-ray of the cervical spine demonstrating an osteolytic lesion within the body and dens of C2. (Top Right) Sagittal computed tomography (CT) scan of the cervical spine demonstrating the same lesion. (Bottom) In the axial CT scan cuts, it is possible to observe the lateral extension of the osteolytic lesion to the vertebral foramina bilaterally, with an evident fracture on the lateral edge of the left foramen.

some ''discomfort'' in the posterior and upper portion of the neck. She denied any history of trauma. The pain progressed slowly to the point where it became severe, aggravating with minimal neck movement and unrelenting throughout the night. On examination, there was no obvious bruising or palpable masses in her neck. There was tenderness to palpation of the paraspinal muscles, and the pain was also exacerbated with passive neck motion. No focal neurologic deficits or signs of myelopathy were identified.

Radiographic investigations

Initial radiographic studies revealed an osteolytic lesion within the body and dens of C2 (Fig. 1, Top Left). Some degree of cervical instability was suggested by the anterior displacement of C1 over C2 and a misalignment of the spinolaminar line during dynamic x-rays. Cervical immobilization with hard collar was instituted, and the patient was admitted to the hospital for pain control and oncological workup. Further imaging studies included a computed tomography (CT) scan (Fig. 1, Top Right and Bottom) and a magnetic resonance (MR) imaging of the cervical spine (Fig. 2). The lesion was noted to be lytic and expansive, mainly within the body of C2 and odontoid process. Although a thin layer of intact cortical bone appeared to exist in some areas, it was clearly interrupted anteriorly, suggesting extraosseous extension of the lesion into the prevertebral tissues. The dens appeared to be fractured at its lateral and posterior aspects near its junction with the body of C2. On gadolinium-enhanced MR images, the mass lesion extended bilaterally into the transverse foramina of C2, displacing posterolaterally both vertebral arteries which, nonetheless, were confirmed to be patent according to a CT angiogram. Magnetic resonance imaging of the brain and spine ruled out the presence of any other lesion in the neural axis. Computed tomography scans of the chest, abdomen, and pelvis were obtained as part of the oncological workup, and no other lesions were identified. No blood dyscrasias or hypercalcemia was noted on laboratory blood tests. A positron emission tomography-CT scan revealed hypermetabolic activity of the lesion at C2 and an enlarged level 2 cervical lymph node.