

Surgical management of an osteoblastoma involving the entire C2 vertebra and a review of literature

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Received: 29 November 2015 / Revised: 5 February 2016 / Accepted: 5 February 2016
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Abstract

Purpose The purpose of this study was to evaluate the surgical management of an osteoblastoma involving the entire C2 vertebra.

Materials and methods A 14-year-old girl presented with unbearable neck pain. Her medical history was unremarkable. Computed tomography and magnetic resonance imaging revealed lytic and osteoblastic bone lesions involving the entire C2 vertebra. The tumor was resected in two stages with vertebral artery mobilization. Histological examination confirmed the diagnosis of osteoblastoma. The pain resolved postoperatively, and the patient had no further complaints. Sufficient fusion formation and no tumor recurrence with no complaints were seen in postoperatively 4 years.

Conclusion Marginal resection remains the best treatment for osteoblastoma of the spine. If tumor tissue surrounds the vertebral artery, the vertebral artery should be mobilized and the surrounding tumor mass excised.

Keywords C2 vertebra · Osteoblastoma · Marginal resection

Introduction

Osteoblastomas constitute less than 1 % of all bone tumors and generally develop from the long bones and posterior vertebral elements [1]. Unlike those in other regions, cervical osteoblastomas often occur in the vertebral body. Osteoblastoma of the cervical region is uncommon, and there are few reports of its treatment. The most common symptom is pain. However, they can cause neurological deficits and deformities depending on the location in the spine [2].

Osteoblastomas of C2 may envelop the vertebral artery. Removal of the entire tumor with preventing VA is difficult [2]. We report a successful outcome following resection of a C2 osteoblastoma with vertebral artery liberation and the restoration of spinal stability.

Case

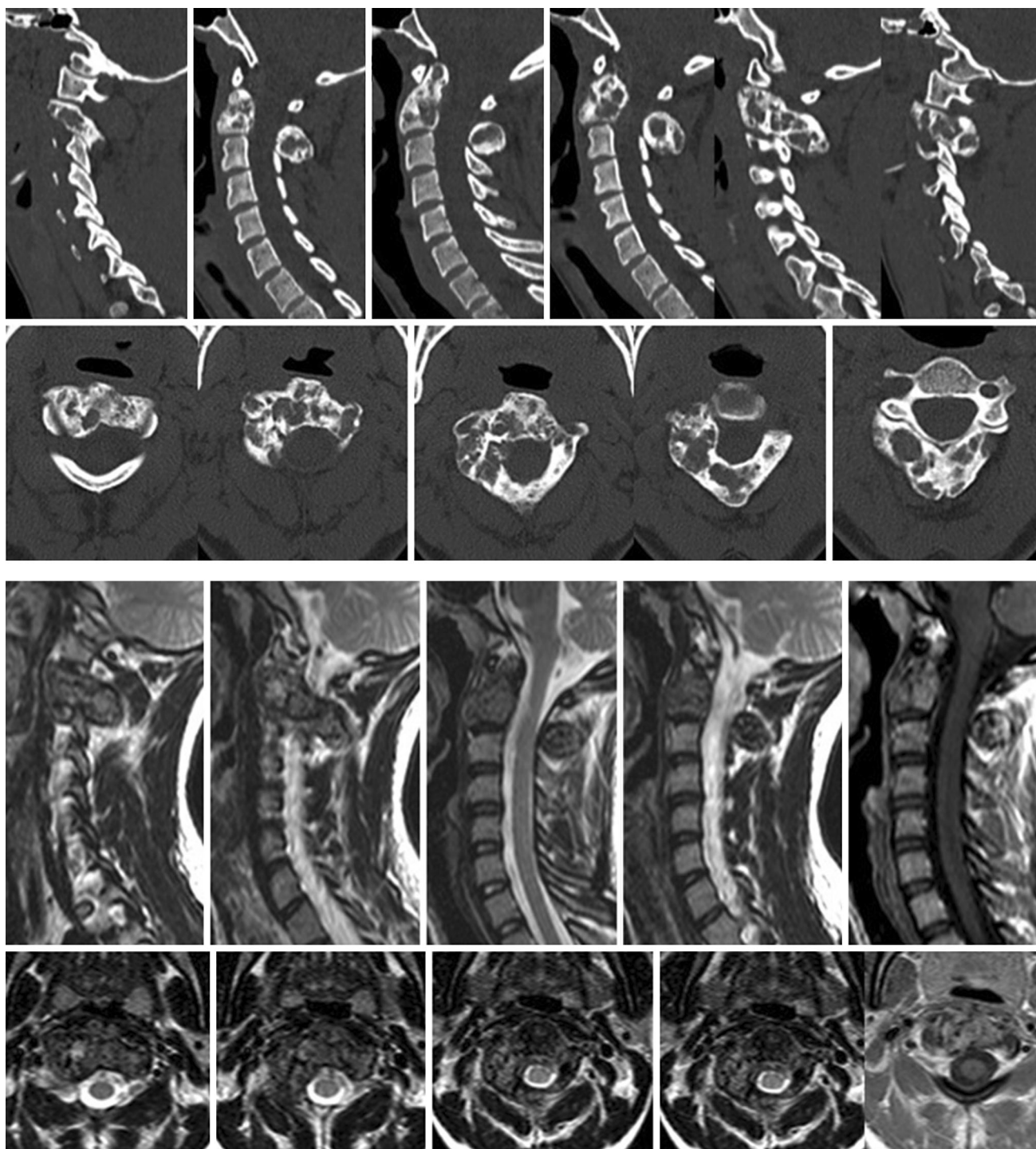
A 14-year-old girl presented with constant pain in the neck for 6 months. She had no history of trauma or other disease. The neurological examination was normal. Cervical computed tomography (CT) and magnetic resonance imaging (MRI) showed lytic and osteoblastic bone lesions that involved in the entire C2 vertebra, but they had not invaded the surrounding tissues (Figs. 1, 2).

Surgery was planned. First, laminectomy of C2 with removal of intervertebral joints was performed, and the posterior portion of the mass to the vertebral artery was excised totally with a posterior approach, and the vertebral arteries were freed. After stabilizing the spine with screws in the occiput and lateral mass of C3–C4, posterior fusion was performed using two autologous rib grafts. The posterior grafts were fixed to the occiput by insert under the

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Figs. 1, 2 Cervical CT and MRI show lytic and osteoblastic bone lesions that involved in the entire C2 vertebra

occipital plate, atlas by connecting rope and C3–C4 laminae by compressing under rods. Before performing the anterior resection, we waited for 1.5 months to allow better integration of the bone screws and posterior grafts. Some relief of the neck pain in the period between the two stages was observed. Then, the odontoid and the mass located

anterior to the vertebral artery were excised totally via the anterolateral/retropharyngeal approach to the high cervical spine. An autologous rib graft was placed between C1 anterior arch and C3 corpus under compression. The graft attached to C1 anterior arch with fish-mouth shaped and stabilized to C3 body with miniplates after decortications

Fig. 3 Fusion was detected in the cervical spine radiographs

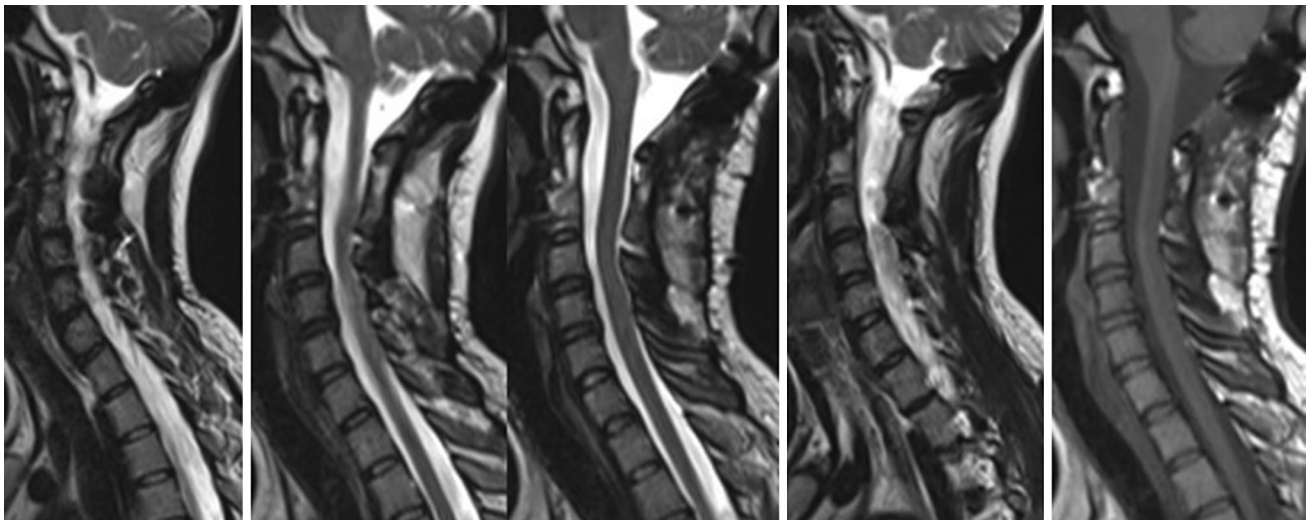


Fig. 4 No recurrence was observed on cervical MRI

of C1 anterior arch and C3 corpus. Bone Wax (Aesculap Implant Systems) and FLOSEAL Hemostatic Matrix (Baxter) were used for control of bleeding. In addition, meticulous homeostasis was performed. Excessive bleeding was not observed in both approaches.

The patient had no postoperative problems. Histopathology of the tumor specimen was in keeping with a diagnosis of osteoblastoma. No adjuvant therapy was applied postoperatively. A cervical collar with chin support was recommended for 3 months. At the 4-year follow-up, the patient had no additional complaints, and fusion was detected in the cervical spine radiographs (Fig. 3). No recurrence was observed on cervical MRI (Fig. 4).

Discussion

Osteoblastomas are rare, benign, primary bone tumors that arise from osteoblasts [3]. They constitute 1 % of all bone tumors and 5 % of spinal tumors and occur mostly in individuals younger than 30 years old [4]. Most involve the long bones and spine, but they can also occur in the mandible and hand bones. They typically originate from the spinous processes and lamina in the spine [4, 5].

Although osteoblastomas are similar to osteoid osteomas from a histological perspective, they are less sclerotic and more aggressive than are osteoid osteomas [1]. Some osteoblastomas can recur locally and metastasize.

Furthermore, in the spine, osteblastomas are more frequent than osteoid osteomas [6].

Clinically, the most frequent symptom of an osteblastoma is pain, whereas other findings depend on the location of the tumor in the spine. Unlike osteoid osteomas, the pain of osteblastomas does not increase at night. The pain is not relieved with acetylsalicylic acid. The pain is non-specific, which can delay the diagnosis [7]. With growth, spinal osteblastomas may lead to scoliosis, radiculopathy, or myelopathy [7]. In our case, the interval between the onset of pain and the diagnosis was 6 months.

To diagnose the disease, CT and MRI are used. CT can show lytic bone lesions and expansive masses, whereas MRI can show soft tissue invasion [3]. If the diagnosis is not made using CT and MRI, a technetium bone scan can be performed [3].

The spinal tumors were staged according to the Enneking system: st.2 for active lesions and st.3 for benign aggressive lesions [8]. St.2 lesions were defined as mostly combined lytic and osteosclerotic image, with well defined borders. Frequently the lytic area is found surrounding an ossified core, strongly resembling the appearance of an osteoid osteoma. Diameter, by definition, must be superior to two cm. The clinical course is slowly progressive with pain and possible deformity related to muscle spasm. The lesion does not infiltrate the soft tissues. St.3 lesions were defined as fully lytic images, eroding the cortex and invading the canal and/or the surrounding soft tissues. The margins are not well defined, confirming the aggressiveness of the tumor. Some spot of pathologic bone can be found inside the lesion. The clinical course is faster with early possible neurologic symptoms.

Intralesional excision proved to be effective in st.2 lesions and en bloc resection in st.3 [9]. In our case, the osteblastoma is st 2. So marginal resection is enough.

The goal of treating spinal osteblastomas is to remove the tumor entirely and ensure the stability of body structures. The vertebral artery is located just anterolateral to the C2 pedicle and enters the transverse foramen [10]. A tumor at this level may envelop the vertebral artery. In this situation, as in our case, tumor resection should be performed after mobilization of the vertebral artery.

The anterolateral/retropharyngeal approach provides relatively easy access to the anterior arch of C1 and to the vertebral bodies of C2–C4 and can be applied to a variety of different conditions. In addition, this approach may be a viable alternative to the transoral route and its associated morbidities. In our case, the mass located anterior to the vertebral artery was excised totally via the anterolateral/retropharyngeal approach with no morbidities.

Radiotherapy can be applied to any residual mass, although malignant transformation has been reported

following radiotherapy [11]. In our case, no adjuvant therapy was applied postoperatively because of the known risk for malignant transformation and also marginal resection was applied. The complete resection of the lesion can prevent recurrence and malignant transformation [3]. The only treatment in osteblastomas is the radical excision.

Conclusion

The best treatment for osteblastomas in the spine is resection with a wide margin, instrumentation in unstable cases, and autologous grafting with fusion. If tumor tissue surrounds the vertebral artery, the vertebral artery should be mobilized and the surrounding tumor mass excised.

Compliance with ethical standards

Conflict of interest None of the authors has any potential conflict of interest.

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