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# PRIMARY OSTEOSARCOMA PRESENTING IN AXIAL BONES IN CHILDHOOD*

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**Six cases of osteosarcoma occurring between 1971 and 1992 and involving the axial bones were reviewed. They constituted 4% of 129 osteosarcomas occurring in the skeleton in childhood during the same period at our center. The patients' ages ranged from eight to seventeen years. Four of the six patients were female. The distribution of axial bones of osteosarcoma was as follows: one case was in the vertebrae, two cases in the craniofacial bones (maxilla and mandible), two cases in the pelvis and one case in the ribs. The prognosis was very poor, with only one case of mandible osteosarcoma still alive. The other five patients died three to sixteen months after first diagnosis. A combination of wide surgical resection and aggressive chemotherapy may offer the best chance for long-term survival.** *Key words: osteosarcoma, axial bone, childhood.*

Osteosarcoma constitutes approximately 22 percent of all primary malignant tumors of the bone[1]. More than 80 percent of osteosarcomas occur at the ends of long bones. Involvement of the axial skeleton occurs in 15-20 percent of cases of osteosarcoma in the pediatric age-group[1].

The aim of this report was to present our experience with osteosarcoma as a primary tumor of axial bones in six cases at the Pediatric Oncology Unit of Hacettepe Children's Hospital.

## Case Reports

### *Case 1*

A nine-year-old girl was admitted in 1977 with a six-month history of intermittent pain in the neck and head. On physical examination a 3 x 2 cm mass was palpated behind the left sternocleidomastoid muscle. She had weakness in the arms and legs, and a positive Hoffman sign bilaterally. Roentgenograms of the cervical spine revealed dislocation of the second cervical vertebra. Chest radiography was normal. The first cervical vertebra, a hard mass, and the second

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and third cervical laminae were removed. The pathologic diagnosis was osteosarcoma. Postoperatively, vincristine + adriamycine + cyclophosphamide (VAC) chemotherapy was started[2]. Three months later, because of the progressively increasing mass in her neck, a new protocol was planned; however, the patient died due to progressive disease in the third month.

*Case 2*

A 17-year-old girl was admitted to our center in 1986 because of a swelling of the maxilla for more than six months. On physical examination, a hard mass was found on her right maxilla and extended through the right nasal cavity. Roentgenograms of the craniofacial bones showed a right maxillary tumor with involvement of the medial wall of the maxillary antrum. Chest radiography was normal. The patient had been diagnosed with rhabdomyosarcoma of the face seven years previously in Germany, when she presented with the same complaints. She had received chemotherapy and radiotherapy, the details of which were obscure. Biopsy of the mass in the nasal sinus showed osteosarcoma. After biopsy, she received T-10 A Grade I-II chemotherapy protocol since we could not perform tomography of the lesion to demonstrate it to be expansile with lytic and necrotic area[3]. Although she received two courses of this protocol, no decrease in the mass was noted. The treatment protocol was changed to high-dose methotrexate (6 g/m$^2$) with rescue four times; however, the tumor did not respond to chemotherapy. The patient was lost to follow-up eight months after first admission.

*Case 3*

A 17-year-old girl was admitted to our center in 1987 with a two-month history of swelling and pain in the right side of the pelvis. She had been diagnosed with retroperitoneal rhabdomyosarcoma 10 years before in our center, and had received VAC chemotherapy for two years. Also, at the time of diagnosis she received 45 Gy radiotherapy to the abdomino-pelvic anterior and posterior, parallel, opposed fields. Two years later she was considered to be in remission and her treatment was stopped. In 1987, examination revealed a firm mass on her right crista iliaca anterior superior region. A plain film of the pelvis showed a sclerosing lesion with destruction of the anterior right ilium. Chest plain radiography and computerized thoracal tomography were normal. Biopsy of this tumor showed osteosarcoma. The patient received six courses of high-dose methotrexate therapy (10 g/m$^2$/day/infusion). Despite intensive chemotherapy, she developed pulmonary metastasis. Her treatment was changed to T-10 A Grade I-II chemotherapy protocol, but she died due to progressive disease in the eleventh month.

*Case 4*

An eight-year-old girl was admitted in 1990 with complaints of swelling and pain in the right side of the pelvis for the previous three months. On examination a firm mass was palpated in her right gluteal region. Plain films of the pelvis showed a sclerosing lesion with permeative destruction of the cortex of the right ilium. Chest plain radiography and computerized thorax tomography were normal. Biopsy of this tumor showed osteosarcoma. The tumor was then resected en bloc. She received one course of T-10 A Grade I-II chemotherapy protocol[3]. The tumor recurred in the same region and right hemipelvectomy was formed. After surgery, she again received two courses of the same protocol, but six months later local recurrence was observed. Following the removal of her sacrum, she received a radiotherapy dose of 45 Gy to the right hemipelvis and 20 Gy to the spine. One month later she developed a third recurrence with involvement of the L5 vertebra. At the 16-month follow-up, she died due to progressive disease.

*Case 5*

A 14-year-old boy was admitted in 1991 complaining of swelling and pain in front of the right parotis gland for six months. On physical examination, a firm, tumor-like 3 x 3 cm mass in front of the right parotis gland and right facial asymmetry were noted. Plain film of the mandible showed involvement of the posterior part of the horizontal ramus with destruction of the right ramus. Chest plain radiography and computerized thorax tomography were normal. Radical surgical excision of the right corpus of the mandible with soft tissue margins was done. Histopathologic examination showed osteosarcoma. Postoperatively he received T-10 A Grade I-II chemotherapy protocol[3]. After two courses of cisplatin he had 50 percent decrease in creatinine clearance, and chemotherapy was cancelled. Two months after stopping chemotherapy, a right hemimandibulectomy was performed. At this time we found no tumor involvement in the pathologic specimen. This patient was still alive without evidence of disease three years later.

*Case 6*

A 12-year-old boy was admitted in 1991 with a four-month history of swelling of the left chest wall. On physical examination, a hard, 20 x 20 cm mass was noted between the left axilla and left mamma. Chest plain radiography showed an 8 x 8 cm irregular mass between the second and seventh ribs which was not related to the pulmonary parenchyma. Computerized thorax tomography was normal.

The tumor was excised along with the second, third and fourth ribs. Postoperatively the patient received two courses of cisplatinum (100 mg/m$^2$ IV) and adriamycin (45 mg/m$^2$ IV). However, four months after the first diagnosis, pulmonary metastasis was discovered in addition to local recurrence. He died due to progressive disease in the sixth month.

## Discussion

Osteosarcoma typically involves long bones, particularly the distal femur and proximal tibia with a predilection for the metaphyses[4]. Although the disease more frequently affects males than females (1.5:1), four of six patients in our study were female. The peak incidence of osteosarcoma occurs in the second decade of life during the adolescent growth spurt[5,6]. Our patients were all in the second decade of life (Table I).

Table I: Selected Clinical Characteristics of Six Patients with Osteosarcoma of the Axial Bones

| Patient No. | Age Sex | Tumor Location | Associated Disease | Surgery | Treatment | | Survival |
|---|---|---|---|---|---|---|---|
| | | | | | Chemotherapy | Radiotherapy | |
| 1 | 9 F | Vertebra | – | Radical primary area excision | VAC | – | 3 month DwD |
| 2 | 17 F | Maxilla | RMS | Biopsy | T-10 A Grade I-II protocol High dose Mtx | – | Lost to follow-up |
| 3 | 17 F | Pelvis | RMS | Radical primary area excision | High dose Mtx T-10 A Grade I-II protocol | – | 11 month DwD |
| 4 | 8 F | Pelvis | – | Hemipelvectomy | T-10 A Grade I-II protocol | 45 Gy right hemipelvis 20 Gy spine | 16 month DwD |
| 5 | 14 M | Mandible | – | Right mandibulectomy | T-10 A Grade I-II protocol | – | 3 years NED |
| 6 | 12 M | Rib | – | Radical primary area excision | CDDP+Adriamycin | – | 6 month DwD |

M : Male
VAC : Vincristine + adriamycin + cyclophosphamide
RMS : Rhabdomyosarcoma
Mod. : Modified
CDDP : Cisdiammine dichloroplatinum
F : Female
DwD : Died with disease
Mtx : Methotraxete
NED : No evidence of disease

Primary osteosarcoma of the axial skeleton is a very rare tumor of young adults. The occurrence in children has merited case reports or small seris in the literature, and has been observed to represent a small percentage of osteosarcoma patients[7-10]. Although there have been many case reports of osteosarcoma in axial bones, no reported study has specifically documented a series of these lesions.

Primary osteosarcoma arising in the vertebral column is rare. The incidence in several reported large series of osteosarcoma of the bone has ranged from 0.85-2.0 percent[11-13]. The distribution is fairly equal between lumbar and thoracic segments of the spine, but cervical involvement is less common[11].

Vertebral osteosarcoma often occurs in irradiated or Pagetic bone[14]; however, there was no history of irradiation or Paget's disease in our first patient. Due to

the early diffusion of this tumor to the medullary canal, patients tend to display neurological involvement associated with pain, as in our first patient. The prognosis of these lesions in the vertebra has been uniformly poor. In Barwick et al's[12] series, only one patient survived for more than two years and most died within a year of diagnosis. According to Shives et al.[15], mean survival is 10 months, but in some rare cases it may reach 2.6 years or even 11 years without pulmonary metastasis. Our patient with vertebral osteosarcoma lived only three months after diagnosis.

Osteosarcoma of the craniofacial bones is again a rare neoplasm, accounting for 6-13 percent of all osteosarcomas[16]. The maxilla is also an uncommon site for osteosarcomas, either post-irradiation or de novo[10]. In two large series, this site accounted for only 3.5 and 2.9 percent of cases[17, 18]. Osteosarcoma of the craniofacial bones tends to affect patients in the third decade, while osteosarcoma of the long bones affects patients in the second decade of life. In our sries, two patients (Cases 2 and 5) had osteosarcoma of the craniofacial bones. One of them had received irradiation due to rhabdomyosarcoma of the cheek seven years previously. Radiation therapy is a risk factor for the development of bone sarcomas, and the relative risk for osteosarcoma increases in doses exceeding 10 Gy[19]. The most common complaints in patients with osteosarcoma of the craniofacial bones are swelling followed by pain, while pain is the initial complaint in patients with osteosarcoma of the peripheral bones[16]. In these two patients, swelling was noted as the first complaint followed by pain. The prognosis in patients with post-irradiation sarcoma has been shown to be very poor, regardless of the location of the primary lesion and the length of survival[15]. Although a predilection for the female sex is noted in mandibular tumors, our patient (Case 5) was a boy[16]. In the case of craniofacial bones, the role of chemotherapy is less clear, mainly because local control is still a major problem and distant metastases are rare[10].

Primary osteosarcomas of the pelvic bones are uncommon. Dahlin and Uni[20] reported an incidence of 9.5 percent in their extensive study of 1274 osteosarcomas at the Mayo Clinic. As mentioned previously, ionizing radiation is known to predispose patients to the development of osteosarcoma. The features in our third case that are typical of post-radiation sarcoma of the bone include the latent period of 10 years between therapy and the occurrence of sarcoma, the rapidly fatal clinical course and the uncommon sites. Because of its rarity and poor prognosis, osteosarcoma of the pelvis has traditionally been grouped with other nonresectable sarcomas for treatment purposes[21, 22]. Thus, relatively little information is available in the literature concerning the response of pelvic osteosarcoma to systemic and regional chemotherapy. In our fourth case, although we performed a mutilating surgical procedure in addition to chemotherapy, the patient died due to progressive disease.

Osteosarcoma of the ribs is a very rare neoplasm, constituting one percent of all osteosarcoma cases[1]. There is relatively little information about treatment for this kind of osteosarcoma.

The poor prognosis of osteosarcoma localized in the axial bones has been discussed frequently in the literature and confirmed by our cases. In the past, treatment was only palliative. It is our belief that even modern chemotherapy, which has considerably improved the prognosis in tumors of the extremities, is not actually efficacious in the treatment of osteosarcoma of the axial bones. The anatomical site also precludes adequate oncologic treatment, which is indispensable to success. We believe that more aggressive surgery, such as total removal of the affected axial bone, together with adjuvant therapy pre- and postoperatively, is currently the most rational treatment. A larger number of cases submitted to this type of surgery with long-term follow-up will tell us if it is possible to improve the short- and long-term prognosis.

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