CLINICAL REPORT

Femoral parosteal osteosarcoma 18 years after its discovery: A case report


a Pathology and Anatomy Department, M.T. Mâamouri hospital, Merezka road, 8000 Nabeul, Tunisia
b Orthopaedics and Traumatology Department, M.T. Mâamouri hospital, Merezka road, 8000 Nabeul, Tunisia
c Radiology Department, M.T. Mâamouri Hospital, Nabeul, Tunisia
d Pathology and Anatomy Department, Salah Azaïez Institute, Tunis, Tunisia

Accepted: 16 October 2008

KEYWORDS
Parosteal osteosarcoma; Juxtacortical osteosarcoma

Summary Osteosarcomas are a heterogeneous group of tumors with diverse anatomical, clinical, and progressional characteristics. Parosteal osteosarcoma, or juxtacortical osteosarcoma, is a rare form of osteosarcoma that develops at the bone surface, but has a better prognosis than other conventional osteosarcomas. We report the observation of a 22-year-old female patient whose initial presentation was an enormous tumefaction of the knee that had been progressing for 10 years. The biopsy concluded in PO of the lower third of the femur. Staging was negative. The tumor had reached an enormous size and required amputation of the left lower extremity. A custom external prosthesis was manufactured to get her back to walking. Eight years after surgery, no local recurrence or metastasis has been detected. Parosteal osteosarcoma is a rare form of osteosarcoma with very slow progression (in spite of the particularly dramatic presentation in our observation), with an excellent prognosis and very rare metastasis.
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Introduction

Parosteal osteosarcoma (PO), or juxtacortical osteosarcoma (JCO), is a rare anatomical and clinical variant of osteosarcoma, accounting for 4% of cases [1,2]. It progresses slowly and has a good prognosis compared to conventional osteosarcoma. The authors report an original observation that illustrates the low aggression of this tumor and discuss its anatomical and clinical features.

Observation

We report the case of a female patient, born in 1978, consulted in 1995 at the age of 17 years for a painless mass in the right knee that had appeared at the age of 12 years (1990) and progressively increased in volume. The physi-
Figure 1  The first X-ray of the knee (at the age of 17 years): mass of the lower one third of the femur, dense, relatively well limited, attached to the metaphyseal cortex by a wide base.

Clinical examination revealed a 2 cm mass at its largest above the right popliteal fossa with knee flexion moderately limited. The X-ray showed a mass in the lower third of the femur that was dense, relatively well limited, attached to the metaphyseal cortex by a wide base (Fig. 1). The biopsy showed moderately cellular malignant tumor proliferation, with slightly atypical and rarely mitotic fusiform cells surrounded by osteoid trabeculae, providing a diagnosis of JCO. Conservative treatment (wide resection of the tumor with knee prosthesis) preceded by a course of first-line chemotherapy was planned at this stage. However, the patient only received two cycles and then was lost to follow-up. Two years later, in 1997, with continued progression and no response to the chemotherapy, amputation was proposed but refused by the patient. She returned 3 years later (2000), at the age of 22, with a considerable increase in tumor volume. The physical examination showed a tumor mass measuring 40 cm at its widest point, limiting all knee movement (Fig. 2). The plain X-ray showed voluminous lytic and condensing bone tumor, occupying the lower third of the femur extending to the middle third with invasion of the soft tissues (Fig. 3).

Magnetic resonance imaging (MRI) showed a voluminous heterogeneous tumor, measuring approximately 35 cm × 25 cm, invading the soft tissues, the knee joint, the upper third of the tibia and fibula, as well as the medullary cavity, encompassing the vessels. This tumor was slightly hypointense compared to the muscle and included areas of hypointense signal on T1-weighted sequences, with no enhancement after gadolinium injection. It was located approximately 10 cm from the center of the femoral head, with no skip metastases (Fig. 4).

The staging bone scintigraphy and thoracoabdominal CT showed no secondary extension. The patient was treated by amputation at the hip, performed on 20 May 2000, 10 years after the first symptoms.

Figure 2  Enormous tumor mass measuring 40 cm at its widest point, limiting all knee movement.

The anatomopathological examination of the specimen showed a 42 cm × 38 cm tumor of the knee and thigh. It was located 7 cm from the limit of surgical resection. The cut specimen presented a lobulated, whitish aspect with no notable cartilaginous zones. The skeletal muscles, the knee joint, and the upper end of the tibia and fibula were invaded by the tumor.

The histological analysis showed a malignant mesenchymatous proliferation, moderately cellular, made up of long, linear and eosinophilic material, sometimes calcified with no...
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Figure 4  MRI: heterogeneous tumor, slightly hypointense signal compared to muscle, with T1-weighted hyposignal areas, with no enhancement after gadolinium injection. The tumor invaded the soft tissues of the knee and the medullary cavity with no skip metastases.

osteoblastic cells in the periphery, corresponding to osteoid (Fig. 5). The tumor cells were spindle-shaped, with little eosinophil cytoplasm and a long or ovoid, hyperchromatic, and moderately atypical nucleus. Mitoses were rare (Fig. 6). There were no areas of dedifferentiation. We diagnosed juxtacortical (parosteal) osteosarcoma with no dedifferentiation areas, with healthy excision margins.

A walking prosthesis was prescribed that allowed the patient to walk autonomously with no discomfort or assistance. She was followed-up in outpatient consultation until February 2008, with a last follow-up X-ray (of the thorax) and scintigraphy (bone scintigraphy) showing neither recurrence nor metastasis 18 years after the first symptoms.

Figure 5  Histology of parosteal osteosarcoma: moderately cellular proliferation with long osteoid trabeculae with no osteoblastic areas (magnification × 250).

Figure 6  Greater magnification (× 400). Tumor cells are spindle-shaped with a long or ovoid nucleus, hyperchromatic, and moderately atypical.

Discussion

PO, or JCO, is a rare disease described for the first time by Gerschickter and Copeland in 1951 [3]. It is the most frequent form of bone surface osteosarcoma [1,2]. It is a well-differentiated, low-grade disease.

PO onset is on average 10 years later than conventional osteosarcoma [4,5]. Age at onset is between 15 and 40 years, with a mean of 28 years [2,6,7]. There seems to be a female predominance, with a sex ratio of 1:3. Our patient was a 12-year-old girl at the time of diagnosis. PO usually presents with a globular, juxta-articular mass that is fairly well limited, hard in consistency, slow-growing, generally painless, but it can cause functional discomfort, limiting joint movement in one third of cases [6,7]. The painless quality of the disease explains the delay in diagnosis. In our observation, the tumor evolved progressively and slowly for 10 years, reaching an impressive size.

The most frequent seat is the distal end of the femur, where the tumor arises typically on the posterior side. This location is followed by the proximal end of the tibia, then rarely by the proximal end of the femur, humerus, and radius [1,5]. PO cases reaching the carpal or tarsal bones and the flat bones have been described [7].

The radiology aspect is typical. PO presents as a radiopaque, metaphyseal mass developing on the external side of the cortex, extending toward the soft tissues. This mass is dense and homogeneous, with polycyclic or archiform contours. At an early stage, there is a radiotransparent groove that separates the tumor from the bone cortex except at the base of the implantation. When it is present, this sign has a high diagnostic value. It disappears in voluminous tumors. According to Edeiken-Monroe et al., this clear ring corresponds to the periosteum between the tumor and the bone cortex [7,8]. Periosteal reaction, frequent in conventional osteosarcoma, is absent in PO. In our case, the first X-ray showed a dense, quite well-limited mass, attached to the metaphyseal cortex by a wide base. The clear space between the tumor and the cortex is not very sharp on the X-ray image.
CT provides a better image of the radiotransparent groove, clarifies the tumor's implantation base, and demonstrates any intramedullary extension or satellite lesions. MRI is the choice examination to detect intramedullary invasion and elucidate the tumor's position in relation to vascular and nerve structures [7,9]. In our case, MRI demonstrated a voluminous heterogeneous tumor invading the soft tissues, the knee joint, the upper third of the tibia and fibula, and the medullary cavity, including the vessels.

The macroscopic aspect is typical. The tumor presents as a voluminous, exophytic, ossified mass, with well-limited contours, attached to the bone by a wide base, pushing the adjacent structures back. The cut specimen has a heterogeneous aspect, showing some fibrous zones and some cartilaginous zones. Intramedullary extension is present in 25% of cases and should be meticulously searched for in multiple samples. The existence of areas of soft and fleshy consistency suggest dedifferentiation [1]. In our case, these zones of soft and fleshy consistency were not found.

Histologically, the tumor comprises parallel osteoid trabeculae with or without a peripheral osteoblastic area. These trabeculae are separated by cellular proliferation, made up of spindle-shaped cells presenting minimal atypia and a low level of mitotic activity [1,2].

In 50% of cases, the tumor presents areas of cartilaginous differentiation in the form of nodules or a cap in the surface [1]. In the case reported here in, we found no cartilaginous nodules. Three histological grades are distinguished: grades I and II, corresponding to the conventional form, with a low level of malignity. Grade III, corresponding to the dedifferentiated form with manifest atypia and mitoses, has a high level of malignity.

Dedifferentiation is observed in 15% of cases. It is present at diagnosis or most often at recurrence. This dedifferentiation can manifest as osteosarcoma, fibrosarcoma, or malignant histiocytoma [1]. In the case reported herein, no areas of dedifferentiation were found and the tumor was low grade (conventional PO).

The differential diagnosis is made essentially with benign lesions such as osteoma, osteochondroma, ossifying myositis, and periosteum desmoid. Clinical and radiological data contribute enormously to the diagnosis. Histologically, these lesions do not develop in a sarcomatous stroma and the cells are regular with no atypia or hyperchromatism. The differential diagnosis is also made with low-grade periosteal osteosarcoma, which is aggressive, with no metastasis after 18 years of progression. Areas of dedifferentiation are the main factor indicating poor prognosis. Our observation illustrates that this tumor is not aggressive, with no metastasis after 18 years of progression.

References