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Pancreatic Metastasis as the Initial Presentation of a High-Grade Femoral Osteosarcoma in an Adolescent: An Exceptional Case Report"

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ABSTRACT

Introduction: Osteosarcoma is the most common primary malignant bone tumor in adolescents. Metastasis most commonly involves the lungs and bones. Pancreatic metastasis is extremely uncommon and usually occurs in advanced stages. We report an exceptional case of femoral osteosarcoma with pancreatic metastases present at the time of diagnosis.

Case Presentation: A 14-year-old female was admitted in February 2024 for a painful swelling of the left thigh and deterioration of general condition, accompanied by cholestatic jaundice. MRI showed a large left femoral tumor mass (65 × 56 × 219 mm) infiltrating surrounding soft tissues. Staging investigations identified a pancreatic tumor process causing biliary dilatation, along with pulmonary nodules and lytic bone lesions, suggesting metastatic dissemination at diagnosis. Bone biopsy confirmed a high-grade osteosarcoma. The patient received chemotherapy, which resulted in partial tumor regression. Surgery was not feasible. Despite a second-line chemotherapy regimen, the clinical course was unfavorable, marked by metastatic progression, spinal cord compression, and death in November 2024.

Conclusion: This case illustrates an atypical presentation of osteosarcoma with pancreatic metastases evident from the time of diagnosis. This inaugural localization highlights the highly aggressive nature of the tumor and emphasizes the need for comprehensive abdominal staging, even at the early stages of management.

Case Presentation:

A 14-year-old adolescent girl with no significant past medical history was admitted for a painful swelling of the left thigh that had been progressing for six weeks prior to presentation, coinciding with a traumatic event (motorcycle accident). The symptoms were associated with fever, deterioration of general condition, and cholestatic jaundice. Laboratory investigations showed normal serum lipase levels. Standard radiography revealed internal cortical lytic lesions of the left femur with diffuse periosteal reaction (Figure 1).

Magnetic resonance imaging (MRI) of the left thigh revealed a large tumoral mass involving the femur and surrounding muscles (65 × 56 × 219 mm), with associated intramedullary bone lesions (Figure 2).

Bone biopsy findings were consistent with a high-grade osteosarcoma infiltrating the soft tissues. Staging workup with thoraco-abdomino-pelvic CT (Figure 3) demonstrated a pancreatic tumoral process centered in the head of the pancreas, roughly rounded in shape, relatively well delineated with indistinct margins, containing areas of central necrosis, and measuring 38 × 40 × 50 mm (transverse × anteroposterior × craniocaudal). This lesion caused dilation of the common bile duct to 22 mm, along with intrahepatic biliary ductal dilation. Multiple pulmonary nodules and lytic bone lesions were also identified, indicating widespread metastatic disease at initial diagnosis, including the exceptional inaugural pancreatic involvement.

Bone scintigraphy demonstrated increased uptake in the femur corresponding to the known primary bone tumor, as well as hyperfixation

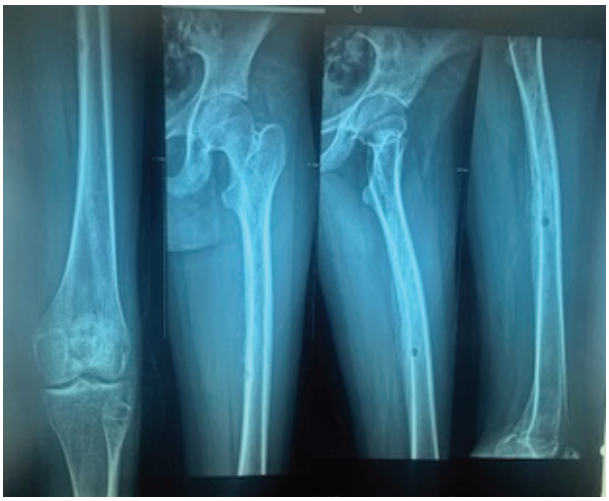

Figure 1: Standard radiograph of the left femur.

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in the skull, rib cage, sacrum, acetabulum, and left iliac bone, consistent with secondary bone involvement.

The patient was started on chemotherapy according to the osteosarcoma protocol (cisplatin and doxorubicin), receiving three preoperative cycles. Follow-up MRI of the left thigh showed a 61.5% reduction in the local tumor volume, with persistent and nearly stable intramedullary bone lesions. Follow-up thoraco-abdomino-pelvic CT demonstrated no supradiaphragmatic or infradiaphragmatic lesions, but persistent bone metastases involving the vertebral bodies of L1, L3, and T5, with vertebral collapse of T4.

Surgical intervention was deemed infeasible due to diffuse bone involvement and the non-oncologic nature of the highly mutilating surgery that would have been required. Disease progression prompted second-line chemotherapy according to the OS-2005 protocol (high-dose methotrexate, etoposide, and ifosfamide). The clinical course was marked by the onset of spinal cord compression, cachexia, pleural effusion, cutaneous metastases, and diffuse bone pain after week 8 of the protocol. The patient died eight months after diagnosis due to severe respiratory and neurological distress.

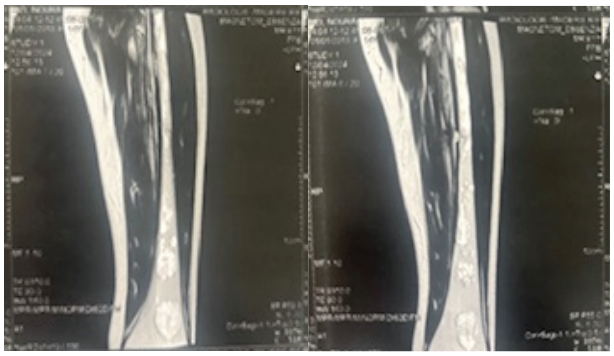

Figure 2: MRI of the left thigh.

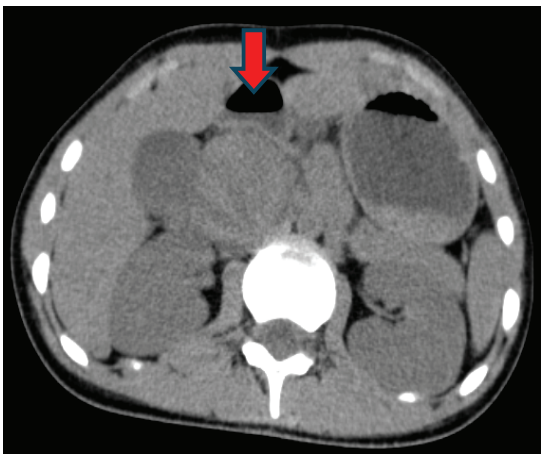

Figure 3: Non-contrast CT scan.

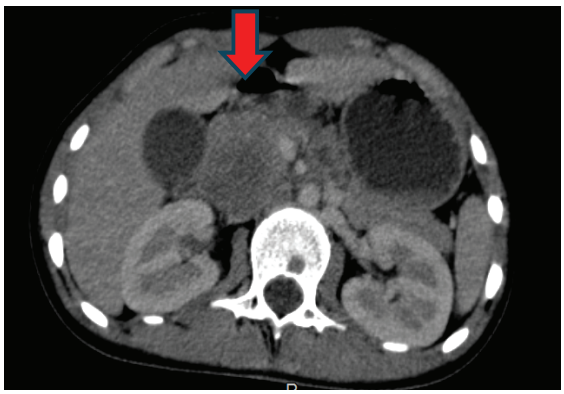

Figure 3: Contrast-enhanced CT scan (portal venous phase), Lesional Oprocess centered on the head of the pancreas.

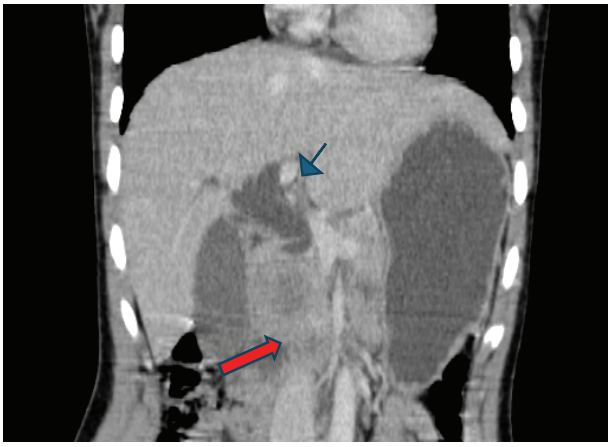

Figure 3: Coronal abdominal CT scan in the portal venous phase showing a lesional process centered on the head of the pancreas, exhibiting heterogeneous contrast enhancement (red arrow), with dilation of the common bile duct and upstream intrahepatic bile ducts (blue arrow).

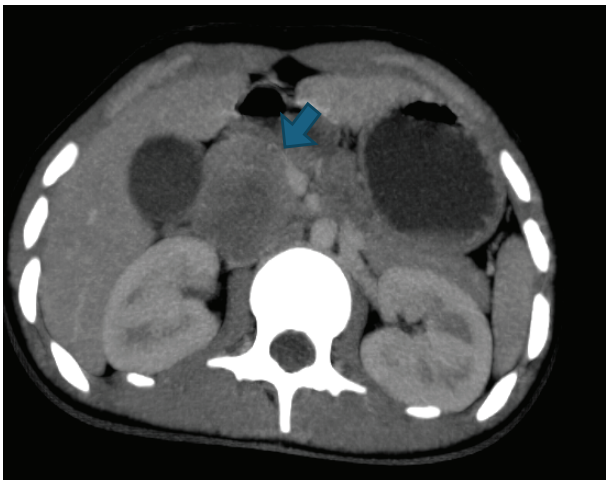

Figure 3: Axial abdominal CT scan in the portal venous phase showing the lesional process displacing the inferior mesenteric vessel, which appears thin-caliber yet patent (blue arrow).

Discussion

Osteosarcoma is the most common primary malignant bone tumor in children and adolescents. Boys are more frequently affected than girls, and the primary tumors most commonly arise in the metaphyses of long bones such as the femur, tibia, and humerus [1]. Osteosarcoma has a high metastatic potential. The most frequent metastatic sites are the lungs (≈98%), pleura, and bones. Less commonly, the liver, brain, and regional lymph nodes may be involved, while metastases to the gastrointestinal system, particularly the pancreas, are extremely rare [2].

We report an exceptional case of femoral osteosarcoma with inaugural pancreatic metastasis, an unusual localization at diagnosis and a marker of poor prognostic severity. Pancreatic metastases, regardless of the primary cancer, are rare, and even more so in osteosarcoma. In most documented cases, pancreatic metastases occur after initial treatment, in the context of recurrence or metastatic progression, rather than at initial presentation [3, 11]. Our case, with pancreatic involvement identified at diagnosis, underscores the importance of comprehensive staging at initial evaluation.

Thanks to advances in imaging techniques and prolonged patient survival through chemotherapy, surgery, and follow-up, these unusual visceral localizations are increasingly reported [4,12].

Imaging plays a key role in staging. Multiple modalities are employed, including ultrasound, CT, MRI, endoscopic ultrasound (EUS), and occasionally PET-CT.

Pancreatic metastases from osteosarcoma exhibit highly variable appearances. They may present as solid, frequently heterogeneous masses with necrosis and sometimes intralesional calcifications, resembling the

primary bone tumor [5]. They can also appear as cystic lesions, as described by Akpinar et al., where the metastasis mimicked a pancreatic cyst, potentially confounding the diagnosis with cystadenoma or pseudocyst [6]. Mixed or large lesions causing compression of adjacent structures have also been reported [5].

These observations confirm that pancreatic osteosarcoma metastases show variable CT features—solid, cystic, necrotic, with or without calcifications—making radiologic diagnosis alone challenging. Histologic confirmation through biopsy (EUS-FNA or other methods) is essential. Several authors emphasize the value of EUS-guided biopsy to avoid extensive surgery [7,8]. In our case, a bone biopsy of the primary site, combined with the resolution of the lesions under chemotherapy, was sufficient to confirm the metastatic nature, without the need for biopsy of the pancreatic lesion.

A Korean series of 124 pancreatic metastases identified 12 sarcomas, including one case of osteosarcoma, demonstrating that although pancreatic involvement is rare, it should be considered in patients with a history of sarcoma [9]. Some metastases may present with complications: Yoshida et al. reported two cases of acute pancreatitis secondary to metastatic pancreatic infiltration from osteosarcoma [10]. These data highlight that any pancreatic mass in a patient with osteosarcoma should raise suspicion for metastatic disease.

The presence of synchronous visceral metastases is a poor prognostic factor, reflecting early hematogenous dissemination. Visceral metastases are often more aggressive and less responsive to treatment; several published cases report rapid progression and poor outcomes [5,11]. In the Asan Medical Center study, the median interval between the primary osteosarcoma and pancreatic metastasis was 28.5 months; in one case, the pancreatic metastasis was detected even before the primary bone tumor, complicating the diagnosis [12].

Management is challenging: pancreatic metastasectomy has been attempted in some cases, but its benefit remains unproven [5]. In complicated forms (pancreatitis, large mass, multiple dissemination), treatment is often palliative [10].

Therefore, the identification of pancreatic metastasis from osteosarcoma, particularly when inaugural, should raise awareness of disease severity and warrants comprehensive staging and multidisciplinary management involving oncology, radiology, surgery, and gastroenterology.

Conclusion

The presence of pancreatic involvement in osteosarcoma reflects an inherently aggressive systemic disease and represents a particularly unfavorable prognostic factor. This rare visceral localization indicates early hematogenous dissemination and should raise suspicion for additional occult metastases. This case highlights the importance of comprehensive staging at the time of diagnosis, including the search for unusual visceral metastases, especially when atypical digestive or biological signs such as cholestasis or jaundice are present. Multidisciplinary management and close follow-up are essential to optimize early diagnosis, guide therapeutic strategy, and anticipate potential complications.

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