

Osteosarcoma. A case report

Chris Raymundo Monroy Roque M.D.
Yessika Mariela López Samayoa M.D.
Paul Reginaldo Villagrán Ovando M.D.
Ludwing Gudiel Pérez M.D.
José Carlos Echeverría Solís M.D.
Mary Geyovana Cotí Coyoy M.D.

Background: Osteosarcoma is a malignant tumor characterized by neoplastic cells that produce osteoid tissue and bone. It accounts for approximately 20% of all primary bone sarcomas, with a higher incidence during the second decade of life and in males compared to females (ratio 3:2), and a second peak in individuals over 35 years of age, almost always secondary in nature. The most common clinical manifestations are pain and soft tissue mass.

Keywords: Osteosarcoma.

Quetzaltenango, Guatemala

Case Report

Radiology



Osteosarcomas are malignant bone-forming tumors. They are the second most common primary bone tumor after multiple myeloma, accounting for approximately 20% of all primary bone tumors. In children, they are considered the most common primary bone tumor. Osteosarcomas can be classified into primary and secondary forms, as well as into histological subtypes, among which conventional osteosarcoma is the most prevalent.

Primary osteosarcoma typically occurs in young patients (ages 10–20), with 75% of cases diagnosed before the age of 20. This is attributed to increased activity in bone growth centers during puberty and adolescence. A slight male predominance has been observed.

Secondary osteosarcoma presents in elderly individuals and is generally associated with malignant transformation of Paget's disease, extensive bone infarctions, post-radiotherapy for other conditions, osteochondroma, and osteoblastoma.

The diagnosis of osteosarcoma is based on a combination of characteristic radiographic and pathological features. The essential diagnostic criteria are defined by the World Health Organization (WHO) classification of bone tumors (5th edition).

- Imaging characteristics of a bone tumor
- Osteoid matrix with neoplastic bone formation
- Permeative and destructive growth pattern

Case report

A 17-year-old female patient from Quetzaltenango presented with right knee pain that

began two years prior while residing in the United States. After three months in the country, the pain intensified and was accompanied by edema, erythema, and warmth at the affected site. She was evaluated at a hospital where diagnostic investigations were initiated. However, a radical treatment was recommended, prompting the patient to request a medically unadvised discharge and return to Guatemala, where she began treatment at Hospital Regional de Occidente.

Upon consultation, there was evident anatomical distortion of the affected knee, excoriations, purulent discharge, reduced range of motion, and pain rated 9/10, unrelieved by oral analgesics. The patient also reported weight loss and dyspnea with minimal exertion. Multimodal analgesic therapy was initiated. Due to the clinical presentation, a plain radiograph was performed, followed by thoracoabdominopelvic and right knee computed tomography, along with a biopsy. The final diagnosis was osteosarcoma.

Discussion

Due to the patient's decision to discontinue treatment in the United States and return to her home country, therapy was delayed. At the time of evaluation, pulmonary cannonball lesions were already evident, along with worsening symptoms, general deterioration, ulcer formation, anatomical distortion, and ankylosis of the affected limb.

Conventional radiography continues to play a significant role in diagnosis. Typical features of high-grade conventional osteosarcoma include: medullary and cortical bone destruction, a wide transition zone, a

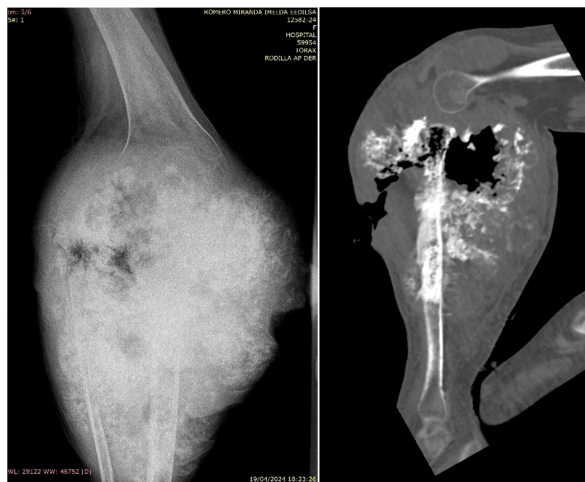


Figure 1. On plain radiography of the right knee and leg, a large, amorphous lesion is observed, with an aggressive sunburst periosteal reaction, bone destruction, a wide transition zone, neoplastic bone formation, and loss of normal anatomical structures. On non-contrast computed tomography of the knee (sagittal view), there is discontinuity of the proximal tibial cortex, with an aggressive sunburst periosteal reaction. The patellar tendon and tibial tuberosity are not visualized due to superimposition by the neoplastic process. A fistulous tract extending to the surface is documented, with internal gas pockets. In the axial projection, calcifications and a central gas-filled area are observed. The patella appears preserved, with no evidence of tumor invasion.

permeative or moth-eaten appearance, and aggressive periosteal reactions such as sunburst pattern, Codman's triangle, or onion-skin layering. A soft tissue mass and calcification of the tumor matrix are also commonly observed.

Computed tomography (CT) is primarily used to guide biopsy and assist in staging. CT contributes little beyond plain radiography and magnetic resonance imaging (MRI) in direct tumor evaluation. An exception to this is predominantly lytic lesions, where small amounts of mineralized material may be undetectable on both plain radiographs and MRI.

MRI has proven to be an essential tool for accurately determining local staging and evaluating limb-sparing resection strategies, particularly in assessing intraosseous tumor extension and soft tissue involvement. Growth plate assessment is also critical, as 75–88% of metaphyseal tumors cross into the epiphysis. T1-weighted sequences are optimal for evaluating intramedullary tumor extension, which may be overestimated on T2-weighted images.

T1-weighted imaging demonstrates non-mineralized soft tissue components with intermediate signal intensity. Mineralized/ossified components show low signal intensity. Peritumoral edema presents with intermediate signal intensity. Scattered regions of hemorrhage exhibit variable signal characteristics. Solid components enhance with contrast administration.

T2-weighted imaging reveals non-mineralized soft tissue components with high signal intensity. Mineralized/ossified components show low signal intensity. Peritumoral edema also presents with high signal intensity.

Conclusion

Bone pain, joint pain, and palpable mass are symptoms that require professional evaluation and are often the initial reasons for consultation in affected patients. Pain is the most frequent complaint in osteosarcoma; therefore, patients must be informed about pain management strategies and available treatment options. Given the high prevalence of depression and anxiety, psychological counseling should be provided to both the patient and their family. It is essential to educate the patient and their family regarding therapeutic alternatives, pain control, and available support services. In approximately 90% of cases, osteosarcomas metastasize to the lungs, making complementary imaging studies necessary.

Conflicts of interests

The authors have no conflicts of interests.

Acknowledgements

We extend our gratitude to Hospital Regional de Occidente for its support of the Radiology Department by providing the necessary supplies and equipment for the timely diagnosis of patients. Special thanks to Dr. José Carlos Echeverría and Dr. Mary Cotí for their valuable contribution to the diagnosis of this case.

References

1. Lozano, MG, Moreno, MJ, Muñoz, M, Vila, LF. Leturia DM, et al. Osteosarcomas: De la semiología, clásica a las técnicas multimodalidad. Seram [Internet]. 13 de mayo de 2016 [citado 28 de agosto de 2025]; 1(1).
2. Lam Van, L. Osteosarcoma. Artículo de referencia, Radiopaedia.org (consultado el 28 de agosto de 2025)
3. Ga McRae, DJ Flemming, Templo HT, et al. Las múltiples caras del osteosarcoma.
4. Vinay Kumar, Abul K. Abbas, Nelson Fausto. Robbins y Cotran: Bases patológicas de la enfermedad. (2005) ISBN: 9780721601878 - Google Libros
5. 3. Murphey MD, Robbin MR, Mcrae GA et al. Las múltiples facetas del osteosarcoma. RadioGraphics Volumen 17, Número 5, 1 de septiembre de 1997.
6. Gail Yarmish, Michael J. Klein, et al. Características de imagen del osteosarcoma primario: subtipos no convencionales.

RadioGraphics Volumen 30, Número 6,6 de
septiembre de 2010.

Chris Raymundo Monroy Roque
Radiology Department
Hospital Regional de Occidente
Quetzaltenango, Guatemala