Original Research Paper

Volume - 13 | Issue - 07 | July - 2023 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Radiology

MRI FINDINGS OF OSTEOSARCOMA: A CASE SERIES

Dr. Kapil Sankhla Junior Resident, Gauhati Medical College and Hospital

Dr. Parul Dutta Professor, Gauhati Medical College and Hospital

ABSTRACT **Background:** Osteosarcoma is a malignant bone tumour with various sub-types that manifest differently in imaging, demographics, and biological behaviour. Early diagnosis, treatment planning, and prognosis assessment rely on radiological findings from modalities such as conventional radiographs, computed tomography (CT) scans, and magnetic resonance imaging (MRI). In this article we will be discussing about MRI findings. **Case Presentation:** This case series highlights patients diagnosed with different osteosarcoma sub-types. **Conclusion:** Radiological findings play a crucial role in the diagnosis, treatment planning and prognosis assessment of osteosarcoma. Conventional radio-graphs, CT scans, and MRI provide unique insights into the characteristics and extent of osteosarcoma lesions. Further research is needed to optimize imaging protocols and explore novel imaging techniques for improved accuracy and prognostic value in osteosarcoma.

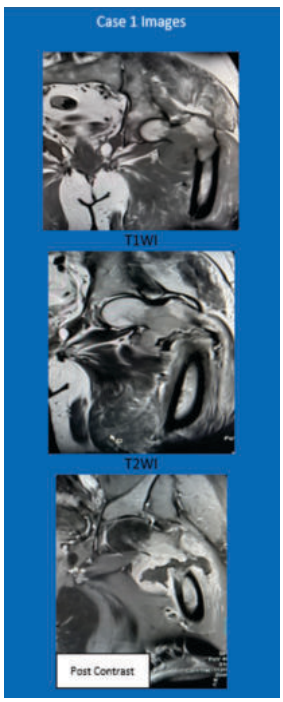
KEYWORDS : Osteosarcoma & MRI.

INTRODUCTION

Osteosarcoma is a malignant bone-forming tumour that originates in bone-forming cells. It is the most common primary paediatric bone malignancy and accounts for approximately 20% of all primary bone tumours. Osteosarcoma is highly heterogeneous in its manifestation, which permits division into several subtypes according to the degree of differentiation, location within the bone, and histological variation. These subtypes vary in imaging appearance, demographics, and biological behaviour 1.

For patients with classic osteosarcoma, radiography is almost always the initial imaging modality. Once the diagnosis is suspected, magnetic resonance imaging (MRI) is essential to determine the distribution of the tumour within the bone and the extent of any associated soft tissue mass. On MRI, osteosarcoma is characterized by intermediate intensity of soft tissue and low signal intensity of ossified components on T1. High signal intensity of soft tissue and low signal intensity of ossified components on T2. Considerable contrast enhancement of solid components on T1 contrast 2.

Case Series

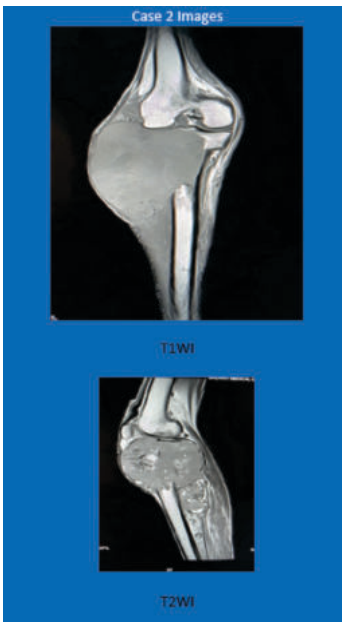


Case 1: A 51-year-old male presented with pain and stiffness for 1 month around left hip joint following a trivial fall. Physical examination revealed a palpable mass at upper end of left femur.

CEMRI study reveals a large hetero intense, eccentrically located, expansile heterogeneously enhancing lesion with internal necrosis involving the metaphysio-diaphyseal junction of upper end of the left femur including the neck, greater trochanter invading into the adjacent soft tissues with associated pathological fracture. There is adjacent subcutaneous and myofascial oedema.

Case 2:

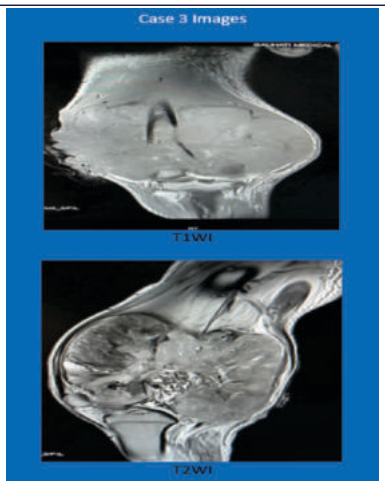
A 22 year old male presented with pain and swelling around right knee joint for 3 months. Physical examination revealed a palpable mass involving right knee joint with decreased range of motion of right knee joint.



MR study reveals large lobulated expansile heterogeneously enhancing lesion involving the proximal epiphysis & metaphysis of tibia and fibula with internal necrosis, cortical breach with soft tissue extension.

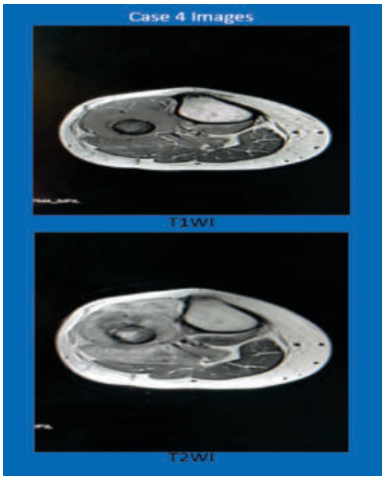
Case 3: A 17 year old presented as a follow up case of DFLCP (Distal femoral locking compression plate) removal and external fixation of right femur with swelling and pain of lower right femur and stiffness of right knee joint. Physical examination revealed a palpable mass in lower right femur.

MR study reveals expansile lytic lesion involving the meta-diaphyseal region of the lower right femur with cortical break, destruction, underlying pathological fracture, infiltrating into muscles of all compartments, encasement of vessel and surrounding myofascial oedema.



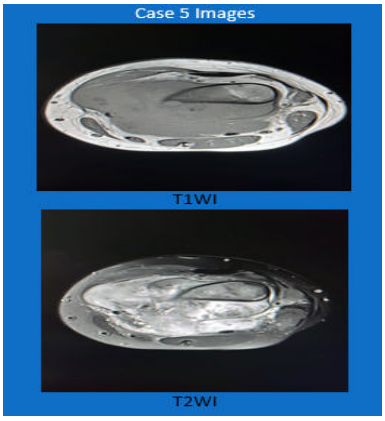
Case 4: A 32 year old female presented with 3 months history of pain and swelling of below right knee joint laterally. Physical examination revealed a palpable mass at the upper end of fibula with decreased range of motion of right knee joint.

MR features reveal heterogeneously lobulated soft tissue lesion involving metaphyseal region of the fibula extending to the epiphysis with wide zone of transition with adjacent myofascial oedema.



Case 5: An 11 year old female presented with 3 months history of pain, swelling and stiffness in left thigh. Physical examination revealed a palpable mass involving left femur.

MR study reveals an infiltrative intra-medullary lesion in relation to the meta-diaphyseal region of the left femur with cortical breach and extension into the adjacent soft tissue, interrupted periosteal reaction, extension into adjacent muscles, surrounding myofascial oedema.

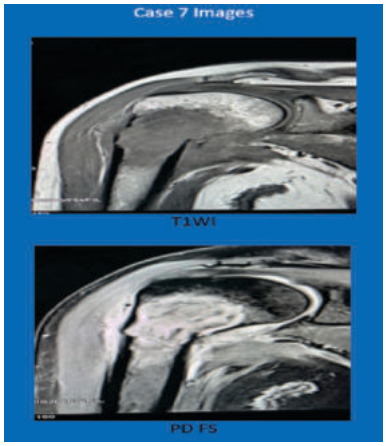


Case 6: A 14 year old female presented with swelling around left distal leg region laterally. Physical examination revealed a palpable mass involving distal fibula with surrounding soft tissue swelling with a cuticular defect.

MR study reveals a neoplastic lesion involving the distal fibular shaft at the meta-diaphyseal region with cortical break, periosteal reaction, intra-medullary extension, showing heterogeneous post contrast enhancement with marrow oedema and surrounding myofascial reactive oedema.

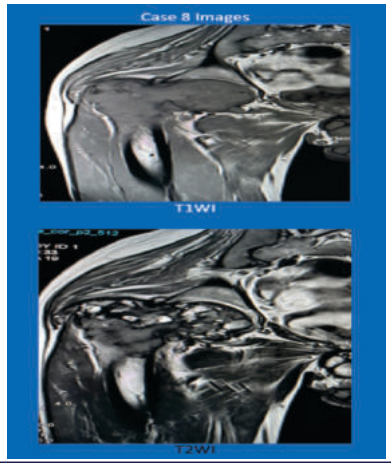
Case 7 A 52 year old female presented with pain and stiffness around right shoulder following trivial injury preceded by swelling around right shoulder joint for a period of 2 months.

MR study reveals a expansile lytic lesion in the epi-metaphyseal region of the head and proximal shaft of right humerus, intra-medullary extension, surrounding myofascial oedema with pathological fracture.



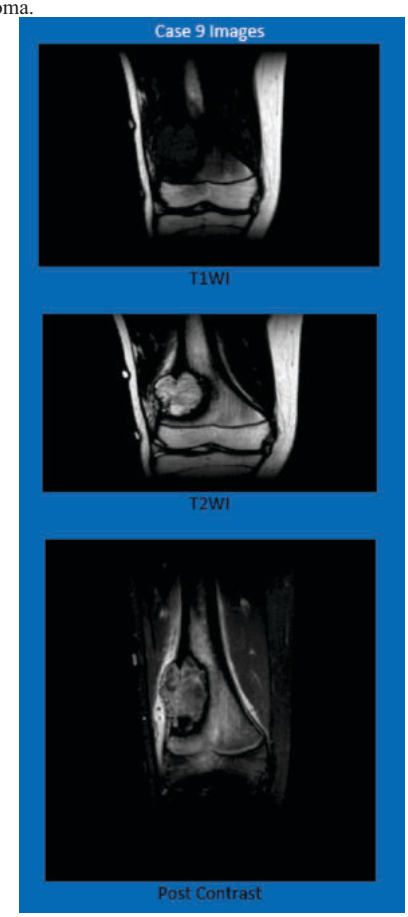
Case 8 A 35 year old male presented with 1 month history of pain, swelling and restricted movement at right hip joint. Physical examination revealed swelling around right hip joint with decreased range of motion.

MRI of hip joints reveals an expansile lytic lesion with wide zone of transition, involving right femoral head, neck, inter trochanteric region, upper shaft with multiple cystic areas within, causing cortical thining, breach, pathological fracture and extra-osseous extension.



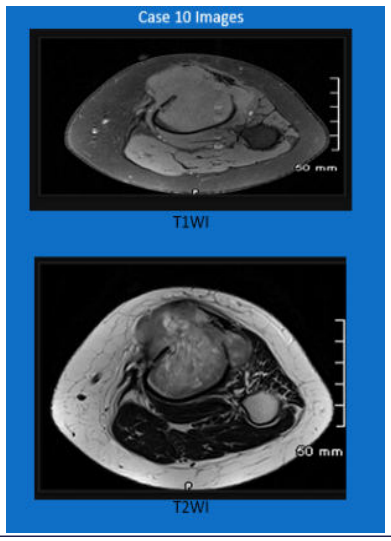
Case 9: A 16-year-old male presented with a three-month history of progressively worsening pain and swelling in the right knee. Physical examination revealed a firm, tender mass at the right distal femur.

MRI revealed a lobulated mass with heterogeneous signal intensity on T1-weighted images, high signal intensity on T2-weighted images, and significant contrast enhancement. The tumour extended into the surrounding soft tissues. A biopsy confirmed the diagnosis of osteosarcoma.



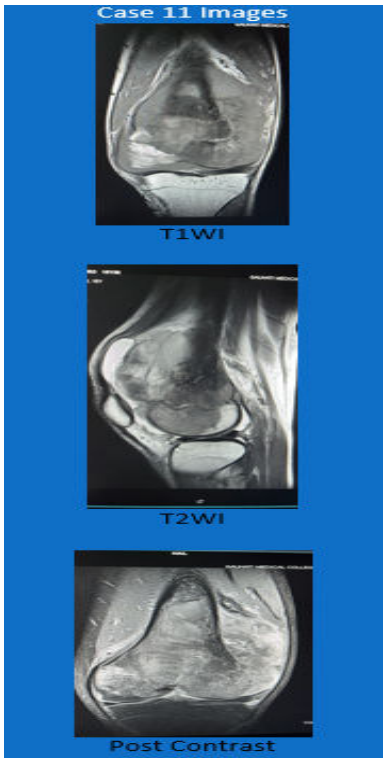
Case 10: A 14-year-old female presented with a six-month history of pain and swelling in the left knee. Physical examination revealed a palpable mass in the proximal tibia.

MRI demonstrated a heterogeneous mass with intermediate signal intensity on T1-weighted images, high signal intensity on T2-weighted images, and moderate contrast enhancement. The tumour was confined to the bone. A biopsy confirmed the diagnosis of moderate-grade osteosarcoma.



Case 11: 18-year-old male presented with a two-month history of pain and stiffness in the left knee. Physical examination revealed a palpable mass in the left distal femur.

MRI revealed a heterogeneous mass with intermediate signal intensity on T1-weighted images, high signal intensity on T2-weighted images, and significant contrast enhancement. The tumour extended into the surrounding soft tissues. A biopsy confirmed the diagnosis of osteosarcoma.



DISCUSSION

Radiological findings of osteosarcoma are crucial for early diagnosis, treatment planning, and prognosis assessment. Several imaging modalities, including conventional radiographs, computed tomography (CT) scans, and magnetic resonance imaging (MRI), have been employed to identify and evaluate osteosarcoma lesions. In this discussion, we will summarize the salient radiological findings of osteosarcoma as reported in the published literature to date.

Conventional radiographs remain the primary imaging modality for the initial evaluation of suspected osteosarcoma cases. Classic radiographic features of osteosarcoma include a mixed lytic and sclerotic bone lesion with a poorly defined, infiltrative margin, periosteal reaction manifesting as Codman's triangle or sunburst appearance, and soft tissue extension with or without calcification (1,2). The presence of these features helps differentiate osteosarcoma from other bone tumours and benign conditions (3).

CT scans provide more detailed information on the extent of cortical destruction, intraosseous and soft tissue involvement, and the presence of matrix mineralization, which can be helpful in the evaluation of osteosarcoma (4). Furthermore, CT scans can also help assess the response to neoadjuvant chemotherapy by detecting changes in tumour size, density, and mineralization (5).

MRI is considered the gold standard for assessing the local extent of osteosarcoma and its involvement of adjacent soft tissues, neurovascular structures, and the joint space (6). MRI can reveal the tumour's internal characteristics, such as the presence of necrosis, haemorrhage, or cystic degeneration, which can be useful in determining the tumour's aggressiveness and planning treatment strategies (7). In addition, MRI can help monitor the response to neoadjuvant chemotherapy by evaluating changes in tumour size and signal intensity (8).

Several studies have reported correlations between specific radiological findings of osteosarcoma and patient outcomes. For

example, larger tumour size, more extensive bone destruction, and the presence of skip metastases on imaging have been associated with a worse prognosis (9,10). Additionally, a good response to neoadjuvant chemotherapy, as evidenced by the reduction in tumour size and decreased signal intensity on MRI, has been linked to improved survival and a lower risk of local recurrence (11,12).

In conclusion, radiological findings of osteosarcoma play a pivotal role in the diagnosis, treatment planning, and prognosis assessment of patients with this aggressive bone tumour. Conventional radiographs, CT scans, and MRI each offer unique insights into the characteristics and extent of osteosarcoma lesions. Further studies are needed to optimize imaging protocols and explore novel imaging techniques to enhance the accuracy and prognostic value of radiological findings in osteosarcoma.

CONCLUSION

In conclusion, the case series presented demonstrates the significant role of radiological findings in the diagnosis and management of osteosarcoma. Each case underscores the importance of using multiple imaging modalities, including conventional radiographs, CT scans, and MRI, to accurately assess the tumour's characteristics, extent, and involvement of surrounding tissues. The cases also highlight the varied presentations of osteosarcoma subtypes and emphasize the need for a thorough radiological evaluation to guide appropriate treatment planning and prognosis assessment. Future research should focus on optimizing imaging protocols, investigating novel imaging techniques, and exploring potential correlations between specific radiological findings and patient outcomes to enhance the accuracy and prognostic value of radiological findings in osteosarcoma.

REFERENCES

1. Murphey MD, Robbin MR, McRae GA, Flemming DJ, Temple HT, Kransdorf MJ. The many faces of osteosarcoma. Radiographics. 1997 Sep-Oct;17(5):1205-31.
2. Klein MJ, Siegal GP. Osteosarcoma: anatomic and histologic variants. Am J Clin Pathol. 2006 Apr;125(4):555-81.
3. Luetke A, Meyers PA, Lewis I, Juergens H. Osteosarcoma treatment – where do we stand? A state of the art review. Cancer Treat Rev. 2014 May;40(4):523-32.
4. Panicek DM, Gatsonis C, Rosenthal DI, Seeger LL, Huvos AG, Moore SG, et al. CT and MR imaging in the local staging of primary malignant musculoskeletal neoplasms: Report of the Radiology Diagnostic Oncology Group. Radiology. 1997 Jan;202(1):237-46.
5. Pochanugool L, Subhadharaphandou T, Dhanachai M, Hathirat P. Prognostic factors among 130 patients with osteosarcoma. Clin Orthop Relat Res. 1997 Oct;(344):200-7.
6. Bajpai J, Gamnagatti S, Kumar R, Sreenivas V, Sharma MC, Khan SA, et al. Role of MRI in osteosarcoma for evaluation and prediction of chemotherapy response: correlation with histological necrosis. Pediatr Radiol. 2011 Apr;41(4):441-50.
7. Lim CY, Liu X, He F, Li Z, Ni Y. Osteosarcoma: limb salvaging treatment based on MRI assessment of tumor necrosis. Eur J Radiol. 2012 Dec;81(12):e916-22.
8. Van Schuppen J, van Rijn RR, Bras J, Merks JH, Zwinderman KH, van der Heul RO, et al. The role of imaging studies in the initial management of extremity osteosarcoma. JBR-BTR. 2009 Sep-Oct;92(5):229-34.
9. Bielack SS, Kempf-Bielack B, Delling G, Exner GU, Flege S, Helmke K, et al. Prognostic factors in high-grade osteosarcoma of the extremities or trunk: an analysis of 1,702 patients treated on neoadjuvant cooperative osteosarcoma study group protocols. J Clin Oncol. 2002 Feb 1;20(3):776-90.
10. Bacci G, Longhi A, Cesari M, Versari M, Bertoni F. Influence of local recurrence on survival in patients with extremity osteosarcoma treated with neoadjuvant chemotherapy: the experience of a single institution with 44 patients. Cancer. 2006 Jan 15;106(2):270-6.
11. Grimer RJ, Taminiau AM, Cannon SR, Bielack S, Kempf-Bielack B, Windhager R, et al. Surgical outcomes in osteosarcoma. J Bone Joint Surg Br. 2002 Mar;84(3):395-400.
12. Kim MS, Lee SY, Cho WH, Song WS, Koh JS, Lee JA, et al. Prognostic effect of MRI features of tumour response to preoperative chemotherapy in extremity osteosarcoma. J Bone Joint