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Paediatric osteomyelitis mimicking malignancy: Clinical and radiologic perspectives

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Abstract
Low-grade chronic osteomyelitis can closely mimic malignant bone lesions in pediatric patients due to overlapping clinical and radiological features. We report the case of a 12-year-old with distal femoral swelling, in whom clinical and radiological findings showed no evidence suggestive of osteomyelitis, leading to an initial suspicion of neoplasia. Surgical debridement, however, revealed chronic osteomyelitis. This case highlights the importance of maintaining a high index of suspicion and performing timely surgical exploration to distinguish infection from neoplasia, thereby enabling early, targeted treatment and avoiding unnecessary oncologic interventions.

Keywords: Low-grade chronic osteomyelitis, pediatric bone lesions, distal femur swelling, surgical debridement, infection vs neoplasia

Introduction
Osteomyelitis is an inflammatory process involving the bone and bone marrow, most often caused by infection, that can present in acute, subacute, or chronic forms. It continues to be a challenging condition for clinicians due to its variable presentation, risk of progression, and potential for long- term disability. While the metaphysis of long bones is most frequently affected in children, adults may present with diaphyseal or epiphyseal involvement, especially in the context of trauma, surgery, or haematogenous spread. Magnetic Resonance Imaging (MRI) is considered the modality of choice for early diagnosis, as it can detect subtle marrow changes and accurately define the extent of osseous and soft tissue involvement. This report describes a case of distal femoral osteomyelitis complicated by periosteal breach, sinus tract formation, and large intercommunicating soft tissue abscesses, with emphasis on MRI findings and clinical relevance.

Case Presentation
A 12-year-old female presented with progressive pain, swelling, and restricted mobility around the right knee joint for 6 months, associated with dull aching pain for the past two months. There were no constitutional symptoms such as fever, weight loss, or malaise. The child reported minor trauma to the region approximately two months prior to the onset of pain.
On examination, a firm, non-tender, 4 × 3 cm swelling was noted over the anterolateral aspect of the distal femur (Figure 1). The overlying skin was normal, with no sinus or discoloration. Range of motion of the knee was minimally restricted due to discomfort.
Plain radiographs of the right femur showed metaphyseal splaying, cortical thinning, and subtle periosteal elevation (Figure 2), raising concern for a malignant lesion, particularly Ewing sarcoma or Osteosarcoma.
MRI of the right knee and distal femur revealed diffuse solid periosteal thickening involving the lower third of the femoral shaft, with altered marrow signal in the form of T1/T2/PDFS heterointense areas and predominant PDFS hyperintensities (Figure 3). There was focal breach of the anterior and posterior periosteum with a sinus tract, and extension of hyperintense content into the adjacent soft tissues. Multiple well-defined, peripherally enhancing, intercommunicating collections were noted, the largest measuring 5.8 × 5.1 × 6.9 cm along

the lateral aspect of the distal femur within the prefemoral fat (Figure 4). Extension into the intermuscular plane resulted in a secondary collection in the deep subcutaneous tissue over the lateral knee, measuring 5.3 × 1.7 × 8.3 cm. The medial patellar retinaculum demonstrated hyperintensity suggestive of inflammation, and there was mild T2 hyperintense joint effusion in the suprapatellar bursa and femoral recesses (Figure 5). The biceps femoris showed muscle edema, and adjacent subcutaneous fat stranding was present. No cutaneous breach was detected. Menisci, cruciate and collateral ligaments, and articular cartilage were intact.

Given the equivocal radiological picture with plain films suggesting a possible neoplastic lesion and MRI confirming extensive bone and soft tissue involvement but not showing features of aggressive malignancy and the absence of systemic symptoms, a decision was made for surgical exploration and biopsy to establish a definitive diagnosis.

Under spinal anesthesia, a cortical window was created via an anterolateral approach to the distal femur. Intraoperatively, purulent material and necrotic bone were encountered. The bone cavity was thoroughly debrided and irrigated with saline, hydrogen peroxide, and povidone-iodine.

STIMULAN antibiotic-loaded calcium sulfate beads were placed within the cavity (Figure 6), and a surgical drain was left for postoperative drainage.

Samples were sent for Gram stain, culture, AFB smear, KOH mount, and fungal culture. Histopathology showed chronic inflammatory infiltrates without malignant features. Culture confirmed no growth.

The postoperative period was uneventful. The drain was removed on the third day once output declined. The child was started on intravenous antibiotics as per culture sensitivity for 10 days, followed by oral antibiotics. Early mobilization with physiotherapy helped in recovery of limb function, and the patient resumed school within four weeks. (**Figure 7**). Serial radiographs showed resolution of inflammation and gradual bone remodeling.

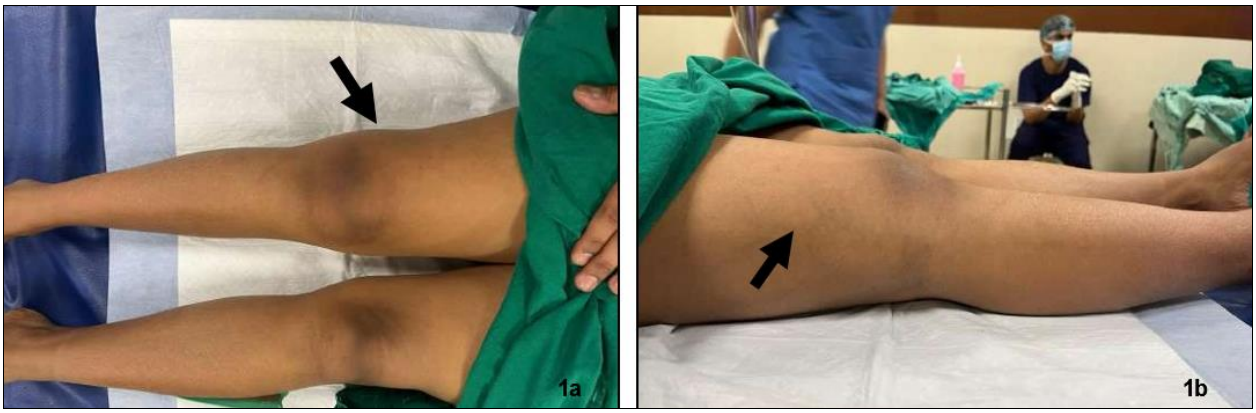

Fig 1: (1a) Anterior view (1b) Lateral view. A firm, non-tender swelling was noted over the anterolateral aspect of the distal femur.

Fig 2: Plain radiographs of the right femur showed metaphyseal splaying, cortical thinning, and subtle periosteal elevation.

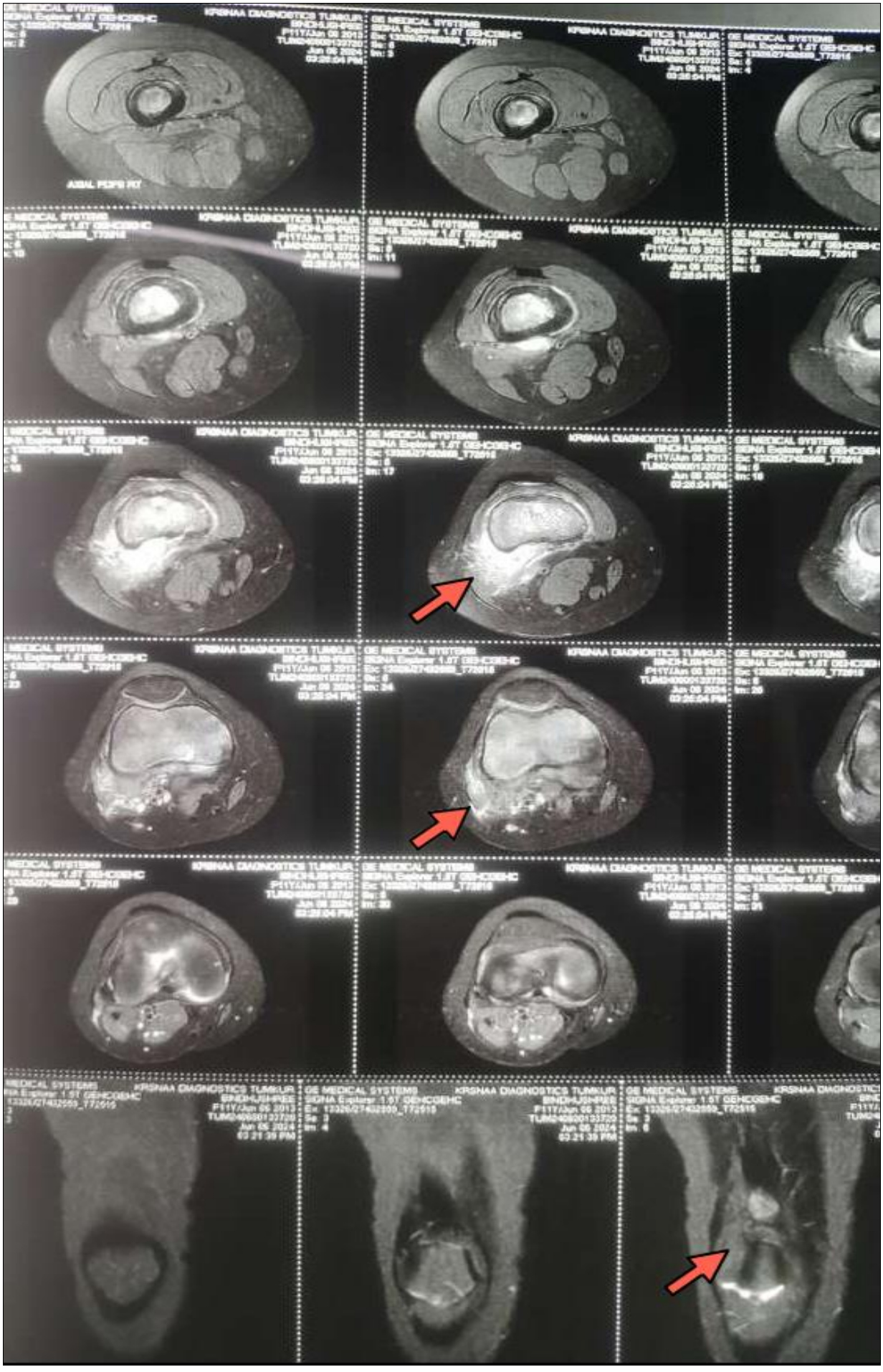

Fig 3: MRI of the right knee and distal femur revealed diffuse solid periosteal thickening involving the lower third of the femoral shaft

Fig 4: MRI of the right knee and distal femur showing focal breach of the anterior and posterior periosteum with a sinus tract, and extension of hyper-intense content into the adjacent soft tissues

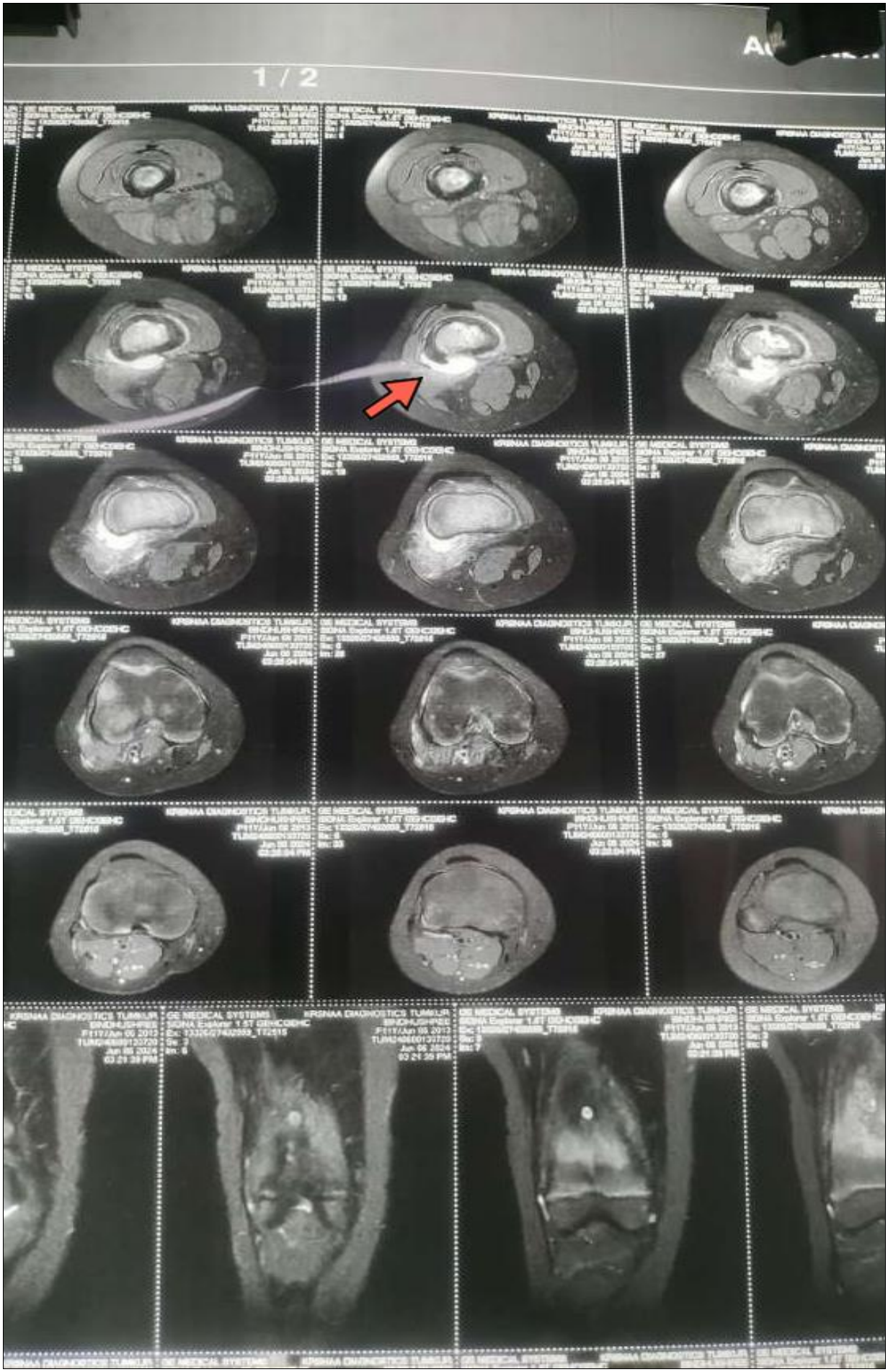

Fig 5: MRI of the right knee and distal femur showing extension into the inter-muscular plane resulted in a secondary collection in the deep subcutaneous tissue over the lateral knee, measuring 5.3 × 1.7 × 8.3 cm

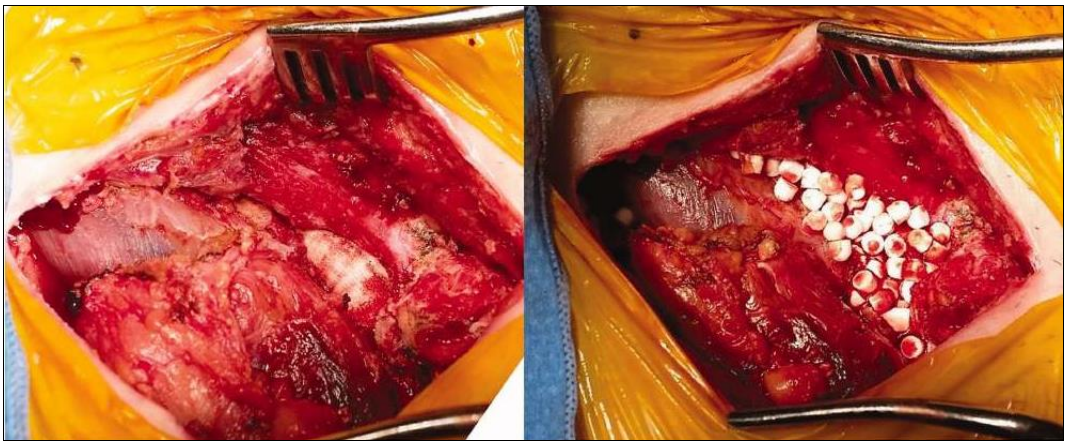

Fig 6: The bone cavity was thoroughly debrided and irrigated with saline, hydrogen peroxide, and povidone-iodine. STIMULAN antibiotic-loaded calcium sulfate beads were placed within the cavity Reference picture - (https://journals.sagepub.com/doi/10.1177/1708538116630859

Fig 7: (7a, 7b, 7c)) Post-op follow up 6 months, showing good range of motion.

Discussion

Osteomyelitis may arise via haematogenous spread, direct inoculation from trauma or surgery, or contiguous spread from adjacent infections. In subacute and chronic stages, the disease often manifests with cortical destruction, periosteal reaction, sinus tract formation, and extension into surrounding soft tissues, as in the present case. MRI is particularly valuable because of its high sensitivity for early bone marrow changes and its ability to delineate the full extent of infection, including subtle sinus tracts and deep collections. The blooming artifacts observed in this case likely correspond to hemosiderin deposits or microbleeds, reflecting chronic inflammation. The periosteal breach allowed purulent material to extend into the soft tissues, forming multiloculated abscesses along fascial planes. The knee joint effusion in this case was mild and likely reactive, as there was no evidence of septic arthritis or intra-articular abscess formation. From a management perspective, timely diagnosis with detailed MRI mapping facilitates targeted surgical debridement, drainage of abscesses, and appropriate antibiotic therapy based on culture sensitivity. This comprehensive approach is essential to prevent recurrence, preserve function, and minimize the risk of chronic osteomyelitis.

Conclusion

This case illustrates the critical role of MRI in detecting and characterizing complicated osteomyelitis, particularly when there is extensive extraosseous spread. Detailed imaging helps guide surgical planning and supports optimal clinical decision-making. Early recognition and aggressive management are vital to avoid chronic infection and functional impairment.

Disclosure

The authors declare no conflicts of interest.

Informed consent was obtained from the patient for publication of this case and accompanying images.

- **Disclosure:** The authors declare no conflicts of interest.
- **Author Contribution:** Not available

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