

Distal Tibial Osteomyelitis in a Pediatric Patient: A Radiological-Oriented Case Report

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ABSTRACT

Osteomyelitis is a serious pediatric bone infection, often hematogenous in origin and primarily caused by *Staphylococcus aureus*. We present the case of a 12-year-old girl with persistent left ankle pain misdiagnosed initially as a sprain. Imaging played a crucial role in diagnosis: ultrasound revealed soft tissue edema, CT scan showed metaphyseal changes suggestive of chronic osteomyelitis, and MRI confirmed a medullary abscess with physeal involvement. The patient received empirical IV antibiotic therapy (ceftriaxone and clindamycin) and underwent surgical debridement. Her clinical course was favorable with complete resolution. This case highlights the importance of radiological staging in pediatric osteomyelitis diagnosis. MRI proved the most sensitive tool for assessing bone marrow edema and soft tissue extension. In low-resource settings, a stepwise imaging approach, guided by clinical context, enables accurate diagnosis. The radiologist's active role in interdisciplinary decision-making was pivotal for timely treatment, preventing chronic complications and long-term sequelae.

KEYWORDS: Pediatric osteomyelitis; distal tibia; magnetic resonance imaging (MRI); subperiosteal abscess; radiologic diagnosis.

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INTRODUCTION

Osteomyelitis is a bone infection that involves the cortical bone, bone marrow, and periosteum, generating an inflammatory process that, if not treated promptly, may progress to chronicity (1). In the pediatric age group, the most common presentation is acute hematogenous osteomyelitis, secondary to bacterial dissemination through the bloodstream

(2). This condition represents a medical emergency, as delayed diagnosis may lead to permanent bone damage, joint dysfunction, and even severe systemic complications (3). Worldwide, the incidence of acute osteomyelitis in children has been estimated at between 2 and 13 cases per 100,000 annually, with higher frequency in males under five years of

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age (2,4). In settings with limited access to healthcare services or diagnostic resources, this rate may be even higher. Long bones are the most frequently affected anatomical sites in the pediatric population, particularly their metaphyseal regions, due to dense vascular supply and the presence of terminal vessels that facilitate bacterial colonization (2,5). The most common locations include the femur, humerus, and especially the distal tibia, given its exposure to frequent microtrauma during ambulation.

Epidemiology and Risk Factors.

Osteomyelitis (OM), a bone infection most commonly caused by bacteria, more frequently affects the pediatric population. Its global incidence ranges from 2 to 13 cases per 100,000 children per year but may rise to as high as 28 per 100,000 in children under three years of age due to their immunologic immaturity and the rich metaphyseal vascularization characteristic of that stage of development (6).

A clear male predominance has been observed, with a 2:1 ratio compared with females. The main routes of dissemination include hematogenous spread—the most frequent in pediatric cases—direct inoculation (such as from fractures or surgical procedures), and extension from contiguous infections such as septic arthritis, sinusitis, or odontogenic infections (7,8).

Staphylococcus aureus is the most common etiologic agent across all age groups, including methicillin-resistant strains (MRSA). In children under five years of age, *Kingella kingae* has emerged as a relevant pathogen, particularly in subacute presentations with nonspecific symptoms (9,10).

At the national level, chronic osteomyelitis is estimated to represent approximately one case per 500 hospitalizations, with higher incidence in southern states such as Guerrero, Oaxaca, Veracruz, and Chiapas. In these regions, social factors such as malnutrition, overcrowding, and limited access to healthcare services contribute to its prevalence (10). Moreover, there has been a documented increase in infections caused by multidrug-resistant bacteria, posing a growing challenge for public health systems.

Seasonal variations have also been observed, with hospital admissions tending to increase toward the end of summer. Despite the absence of evident predisposing factors, the patient in this case—a 12-year-old girl—developed osteomyelitis, underscoring the importance of considering this diagnosis even in previously healthy and immunocompetent children.

Most Frequent Localization.

In pediatric patients, acute hematogenous osteomyelitis tends to localize in the long bones, which is attributed to the rich blood supply of the metaphyseal regions—growth areas where terminal vessels facilitate bacterial trapping and proliferation during episodes of bacteremia (1,2).

The most frequently affected sites include the distal femur, proximal humerus, and, most notably, the distal tibia. The latter stands out not only due to its vascular anatomy but also its constant exposure to microtrauma associated with

childhood physical activity (3,4). Less commonly, other bones such as the ilium, calcaneus, or vertebrae may be involved.

This predilection for the tibia is not only anatomical but also clinically relevant, as inflammatory signs—such as localized pain, warmth, tenderness, and limping—tend to manifest early in this location. This facilitates timely diagnostic suspicion if appropriate clinical vigilance is maintained (5). In the present case, the infection affected the distal left tibia, a site frequently documented in the literature as one of the most prevalent locations in pediatric osteomyelitis, reinforcing the clinical consistency of the observed presentation.

Classically, childhood osteomyelitis presents acutely with localized pain, swelling of the affected area, fever, limited range of motion, and general malaise. The concurrence of these symptoms often allows for early diagnostic suspicion (6,7).

However, in an increasing number of patients—particularly those with subacute or chronic forms—the clinical presentation may be nonspecific or insidious. Fever may be absent, and the pain may be misinterpreted as resulting from a sprain or other benign musculoskeletal injury. This variability in clinical presentation can delay both diagnosis and initiation of appropriate therapy (8).

In some cases, the only initial signs may include persistent limb pain, localized swelling without systemic evidence, or partial response to symptomatic treatment. This clinical pattern requires maintaining a high index of suspicion, even in the absence of fever or overt inflammatory signs—especially when the clinical course does not align with other more common orthopedic conditions.

The case presented here clearly exemplifies an atypical clinical course, where local symptoms persisted without prominent systemic manifestations, complicating the initial diagnosis. This highlights the importance of considering osteomyelitis in the differential diagnosis, even in previously healthy patients, when clinical evolution is not as expected.

Radiologic Diagnosis.

The diagnostic approach to osteomyelitis in pediatric patients requires a multimodal strategy in which imaging techniques play a fundamental role—not only in confirming clinical suspicion but also in accurately delineating the anatomic extent of infection, evaluating possible complications, and guiding both surgical and conservative therapeutic decision-making (9,10).

In the present case, the diagnostic protocol began with ultrasound, a technique noted for its safety and accessibility in pediatric practice. Despite its limitations in assessing deep bone structures, ultrasonography revealed soft-tissue edema and hypoechoic fluid collections—findings sufficient to justify more advanced imaging studies.

Computed tomography (CT), performed as the second step with bone window settings, demonstrated an ovoid hypodense lesion in the distal-medial metaphysis of the tibia,

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with sclerotic margins, lamellar periosteal reaction, and discontinuity across the physis extending toward the lateral condyle. These findings suggested a destructive lesion with signs of active remodeling, consistent with subacute or prolonged-evolution osteomyelitis.

Magnetic resonance imaging (MRI), performed with and without contrast, was the modality that established the definitive diagnosis. This study provided detailed visualization of bone and soft-tissue involvement, revealing a Salter-Harris type II fracture in the distal metaphysis, medullary collection with post-contrast enhancement, and inflammation involving the epiphysis, physis, and diaphysis. Additionally, findings of tenosynovitis, ligamentous distension, joint synovitis, and diffuse involvement of the talus were documented—reinforcing the suspicion of osteomyelitis with concomitant septic arthropathy. This combination of findings decisively guided clinical and surgical management.

Strengths of the Imaging Approach.

The stepwise application of imaging methods proved to be highly cost-effective, allowing progression from basic tools such as ultrasonography to higher-resolution studies like CT and MRI without compromising diagnostic accuracy.

MRI, in particular, provided detailed three-dimensional characterization of bone and soft-tissue involvement, which was crucial for surgical planning. This level of definition allowed clear delineation of lesion boundaries, identification of fistulous tracts, and estimation of metaphyseal and epiphyseal involvement.

Furthermore, the integration of multimodal imaging facilitated differentiation between fractures, bone infections, and other inflammatory processes that could mimic or coexist with similar clinical presentations. This optimized antibiotic therapy, preventing unnecessary empirical treatments or excessive surgical interventions.

Contextual Limitations and Applied Solutions.

Although advanced technologies such as positron emission tomography (PET/CT) or whole-body MRI are not available in all secondary-level hospitals, it was possible to implement a stepwise diagnostic strategy adapted to the local context. The progressive and rational use of accessible tools—beginning with ultrasound, followed by CT, and finally MRI—enabled adequate diagnostic precision without incurring unnecessary costs or compromising patient safety.

A key factor was the expert interpretation of the studies by the radiology team, whose experience allowed exclusion of other pathologies that could mimic chronic ankle pain, such as metaphyseal dysplasias or benign bone tumors.

Impact on Clinical Decision-Making.

Through integration of imaging findings, a clinical suspicion of subacute distal tibial osteomyelitis with medullary abscess formation and articular involvement was confirmed. This led to the indication for bone biopsy, immediate initiation of targeted empirical antibiotic therapy, and planning of surgical intervention via debridement and drainage. The patient

showed favorable clinical and imaging evolution following implementation of this therapeutic plan.

Laboratory Tests.

Although not specific for diagnosing osteomyelitis, laboratory tests are useful both in initial evaluation and clinical follow-up. Elevation of inflammatory markers such as C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) is common, with CRP being the most sensitive parameter for monitoring therapeutic response (10). In contrast, leukocytosis may be absent in some cases; thus, normal white blood cell counts do not exclude the diagnosis. Blood culture remains a key tool for identifying the etiologic agent, with a positivity rate ranging from 30% to 60%, and greater yield when performed prior to initiation of antibiotic therapy (11). In subacute, chronic, or atypical clinical presentations, obtaining samples via bone biopsy or surgical aspiration may be necessary to confirm microbiological diagnosis.

Treatment.

In anatomically complex locations such as the hip joint, the coexistence of septic arthritis and osteomyelitis has been reported in up to 30% of pediatric cases, reinforcing the need for early MRI evaluation (12).

In regions with high prevalence of methicillin-resistant strains, international clinical guidelines recommend initiating empirical treatment with vancomycin or clindamycin, with subsequent adjustment based on culture and antimicrobial susceptibility results (13). However, when atypical pathogens such as *Candida glabrata* are suspected, specific and prolonged antifungal regimens should be considered, particularly in immunocompromised patients (14).

When physeal involvement, persistent abscesses, or poor clinical response to medical therapy are present, surgical intervention is indicated. Bone debridement combined with drainage of purulent collections has been shown to reduce bacterial load, improve antibiotic penetration, and prevent progression to chronic osteomyelitis (15).

In the present case, therapeutic management was carried out through interdisciplinary collaboration between the pediatric and pediatric surgery departments. Given the radiologic evidence of distal tibial osteomyelitis with medullary abscess and physeal involvement, surgical debridement and direct drainage of the collection were performed, consistent with international recommendations for managing complicated osteomyelitis in the pediatric population.

JUSTIFICATION

Osteomyelitis in childhood constitutes a potentially serious medical condition that, if not diagnosed and treated in a timely manner, may lead to permanent functional sequelae or severe systemic complications. Although it is a relatively uncommon pathology, its clinical presentation can be insidious, delaying appropriate management and increasing the risk of chronicity.

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This clinical case gains particular relevance in contexts such as that of Latin America, where inequality in access to specialized diagnostic services persists. In Latin America, the epidemiology of pediatric osteomyelitis has not been fully established due to the absence of national registries and irregular case reporting. The predominant causal agent is *Staphylococcus aureus*, with variations in the proportion of methicillin-susceptible (MSSA) and methicillin-resistant (MRSA) strains depending on the country. Multicenter series in Mexico have shown a predominance of MSSA, whereas reports from South American countries such as Argentina, Chile, and Uruguay have highlighted an increase in community-acquired MRSA infections.

In general, the lack of standardized epidemiological surveillance limits regional comparisons, but the need for diagnostic and therapeutic protocols tailored to local realities is well recognized. The Pan American Health Organization (PAHO) has emphasized that infectious diseases continue to represent a significant burden on health systems in the region, particularly when they affect pediatric populations in vulnerable conditions (16). Similarly, the United Nations (UN), through its Sustainable Development Goals (SDGs), has made an explicit call in SDG 3 to ensure healthy lives and promote well-being for all at all ages, with emphasis on equitable access to timely and high-quality healthcare services (17).

The importance of documenting and interpreting cases such as the present one lies in their evidence-based academic

contribution, as well as in highlighting the need to strengthen diagnostic capacity in secondary-level hospitals. The systematization of such cases can guide future public health policies, promote the rational use of diagnostic resources, and, most importantly, improve clinical outcomes for pediatric patients in resource-limited settings.

OBJECTIVE

To systematically describe the diagnostic and therapeutic approach of a case of subacute osteomyelitis of the distal left tibia in a previously healthy pediatric patient treated at the General Hospital of Cancún “Dr. Jesús Kumate Rodríguez” during the year 2025, with the purpose of generating replicable clinical evidence that contributes to decision-making in resource-limited contexts.

METHODOLOGY

A descriptive study was conducted based on the review of a clinical case of pediatric osteomyelitis located in the distal tibia. The diagnosis was based on clinical findings, imaging studies—with emphasis on magnetic resonance imaging—and the patient’s clinical evolution.

Additionally, a bibliographic search was carried out in medical databases (PubMed, SciELO, RSNA, Google Scholar) to identify and analyze previously reported clinical cases with similar characteristics, in order to compare findings and contextualize the case within the existing scientific literature.

CLINICAL CASE.

Table 1. Chronological Summary of Clinical Course, Diagnostic Actions, and Management.

Date / Time	Clinical Findings	Diagnostic Actions	Management / Treatment
June 2024	Sharp pain in the left ankle, without traumatic history. Initially intermittent, later persistent, limiting ambulation.	Outpatient consultation → diagnosed as Grade I ankle sprain.	Analgesics and relative rest.
June – September 2024	Partial initial improvement. Subsequently, pain recurred with greater intensity, antalgic gait, progressive edema, and persistent erythema.	Medical reevaluation.	Continued conservative measures, without clinical resolution.
January 2025	Severe pain, edema, hyperemia, and limited joint mobility.	Referred to General Hospital of Cancún “Dr. Jesús Kumate Rodríguez.” Differential diagnoses: subacute osteomyelitis vs. bone tumor.	Hospital admission
Physical Examination	Moderate swelling of the left ankle, hyperemia, local warmth, tenderness on palpation, and restricted mobility.	Normal vital signs. Neurological and general examination unremarkable.	—
Imaging Studies	—	CT: Hypodense lesion in the distal tibial metaphysis with periosteal reaction and sclerotic margins. MRI: Salter-Harris type II fracture, intramedullary collection, cortical and physeal involvement, and soft-tissue	—

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		inflammation → findings compatible with complicated subacute osteomyelitis.	
Hospital Admission	Persistent pain refractory to prior management.	Blood cultures obtained prior to antibiotic initiation. Pediatric infectious disease consultation.	Initiation of IV antibiotic therapy: ceftriaxone + clindamycin. Clinical and inflammatory marker monitoring every 72 hours.

A 12-year-old female patient, currently attending the first year of secondary school, with a complete vaccination schedule and psychomotor development appropriate for her age. Blood type and Rh factor: O positive. She denied any relevant past medical history, drug or food allergies. The patient resides in Cancún, Quintana Roo, within a functional family unit and a stable socioeconomic environment.

The clinical picture began in June 2024 with a sharp, localized pain in the left ankle, with no evident history of trauma. The pain was progressive—initially intermittent, later becoming persistent—limiting joint mobility and making ambulation difficult. The patient’s mother reported local swelling and erythema, without fever or systemic symptoms.

An initial evaluation at an external clinic resulted in a diagnosis of grade I ankle sprain, and conservative management with analgesics and relative rest was indicated. Partial improvement was achieved, but after three months, the pain recurred with greater intensity, accompanied by a limping gait, progressive edema, and persistent erythema.

In January 2025, given this atypical evolution and lack of improvement with conservative treatment, the patient was referred to the General Hospital of Cancún “Dr. Jesús Kumate Rodríguez.” Upon admission, differential diagnoses included subacute osteomyelitis and a bone tumor of the distal left tibia. A complementary diagnostic protocol was initiated.

Physical Examination on Admission.

The patient was conscious, alert, and in good general condition, with a painful facial expression. Vital signs were within normal limits. Neurological examination revealed no focal signs or motor/sensory deficits. The rest of the general physical examination was unremarkable.

In the lower limbs, moderate swelling of the left ankle was observed, with erythema, increased local temperature, and restricted range of motion. The patient reported intense pain on palpation and joint movement. There were no obvious bony deformities, but articular swelling was evident. The contralateral limb showed no abnormalities.

Initial Management.

Given the prolonged, treatment-refractory course, a comprehensive diagnostic re-evaluation was performed. Advanced imaging studies were ordered, including computed tomography (CT) and both plain and contrast-enhanced magnetic resonance imaging (MRI).

The CT scan revealed a hypodense lesion in the distal metaphysis of the left tibia, with periosteal reaction and sclerotic borders (Image 1-2). MRI demonstrated a Salter-Harris type II fracture, intramedullary abscess formation, cortical and physeal involvement, as well as inflammatory changes in the surrounding soft tissues, all compatible with complicated subacute osteomyelitis (Image 3).

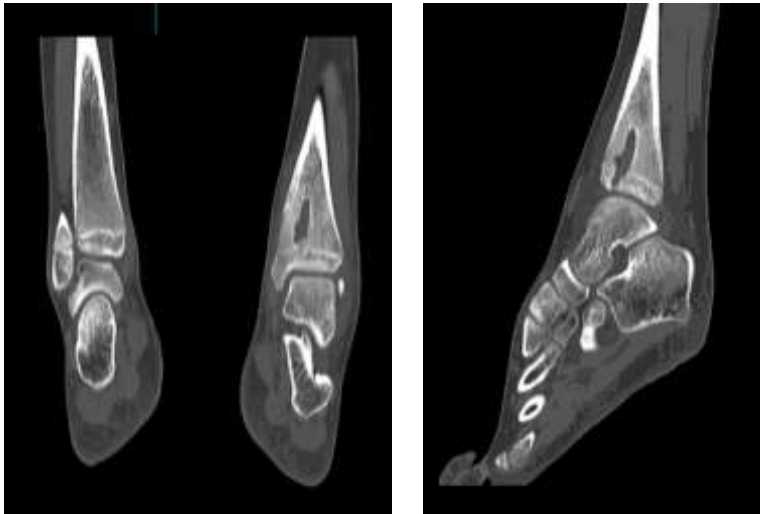


Image 1-2. In the distal and medial tibial metaphysis, a well-defined ovoid hypodense focal lesion (12 Hounsfield units) was observed, with sclerotic margins extending toward the epiphyseal plate. The lesion measured 27 × 64 × 7.3 mm in its major axes and demonstrated lamellar periosteal reaction along the lateral aspect of the distal tibia. A cortical discontinuity was identified across the physis, with anterior extension toward the lateral condyle of the distal tibia.



Image 3. T2-weighted MRI sequence. The bony structures show a vertical fracture line in the distal and medial metaphysis of the tibia, with evidence of bone remodeling changes associated with an intramedullary collection involving the metaphysis, physis, and diaphysis, measuring approximately 29 × 6 × 7 mm. Peripheral bone marrow edema and periosteal reaction along the medial border of the tibia are also noted.

Empirical intravenous antimicrobial therapy was initiated, targeting the most common pathogen implicated in pediatric bone infections. The patient received ceftriaxone and clindamycin. Blood cultures were obtained prior to antibiotic administration and evaluated by the pediatric infectious disease service on January 27, 2025. Results were negative after 72 hours of incubation. Clinical and inflammatory follow-up assessments were scheduled every 72 hours.

Hospital admission was justified based on clinical and imaging findings, allowing timely intervention to prevent orthopedic complications.

Stepwise Radiologic Approach.

The radiology department implemented a structured, stepwise diagnostic protocol to optimize diagnostic sensitivity. The initial ultrasound revealed soft tissue edema and hypoechoic images suggestive of a fluid collection.

Subsequently, CT scanning demonstrated a hypodense lesion with periosteal reaction, excluding aggressive neoplastic processes. A non-contrast MRI of the left ankle was then performed, showing a distal tibial fracture classified as Salter-Harris type II with bone remodeling changes, an intramedullary abscess, and inflammatory alterations—suggestive of osteomyelitis. Therefore, a contrast-enhanced MRI was recommended to confirm the diagnosis.

The contrast-enhanced MRI of the left ankle identified tubular bone structures with increased signal intensity on both

T1- and T2-weighted sequences, with cortical and medullary involvement extending into the epiphysis, metaphysis, and diaphysis of the distal tibia. Marked gadolinium enhancement was observed. The talus exhibited diffuse hyperintensity, along with joint effusion in the tibiotalar and subtalar articulations, and diffuse signal increase in the adjacent soft tissues. These findings supported the diagnosis of focal distal tibial osteomyelitis with abscess formation, physeal involvement, and possible joint communication.

This sequential imaging strategy enabled a comprehensive diagnosis, which was fundamental for timely therapeutic decision-making. MRI was emphasized as the essential modality for early detection of bone lesions and surgical planning.

Imaging Follow-up in the Surgical Context.

During the surgical stage, continuous radiologic support was provided. Preoperative mapping with contrast-enhanced MRI allowed accurate delineation of the abscess and planning of a conservative surgical approach.

In the postoperative period, serial MRIs and follow-up plain radiographs demonstrated resolution of the abscess, improvement of edema, and normalization of bone marrow signal, without evidence of deformity or growth plate disturbance.

Table 2. Stepwise Radiological Approach and Follow-up.

Diagnostic Method	Main Findings	Diagnostic Contribution
Ultrasound (US)	Soft tissue edema and hypoechoic areas suggestive of fluid collection.	Detected early inflammatory changes; limited specificity for excluding bone pathology.
Computed Tomography (CT)	Hypodense lesion in the distal tibial metaphysis with periosteal reaction. No evidence of aggressive neoplastic process.	Provided greater osseous detail; allowed exclusion of malignant lesions, though with limited sensitivity for early medullary changes.

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Non-contrast Magnetic Resonance Imaging (MRI)	Salter-Harris type II fracture of the distal left tibia, intramedullary collection, and inflammatory changes in surrounding soft tissues.	Enabled presumptive diagnosis of osteomyelitis.
Contrast-enhanced Magnetic Resonance Imaging (MRI + gadolinium)	Intense enhancement of cortical, medullary, epiphyseal, metaphyseal, and distal diaphyseal regions of the left tibia. Subperiosteal abscess with joint communication. Diffuse involvement of soft tissues and talus.	Confirmed the diagnosis of complicated osteomyelitis and guided surgical planning.
Preoperative Mapping (Contrast-enhanced MRI)	Precise delineation of the collection.	Facilitated conservative surgical planning.
Postoperative Follow-up (Serial MRI + Plain X-rays)	Resolution of abscess, improvement of edema, and progressive normalization of bone findings. No deformity or growth disturbance.	Demonstrated favorable response to treatment and absence of orthopedic complications.

Discharge Criteria and Radiologic Follow-up.

Before discharge, a new MRI demonstrated complete resolution of the abscess and bone marrow edema. Plain radiographs confirmed structural integrity with no residual sequelae. The patient was discharged in stable clinical condition, with scheduled follow-up by pediatric orthopedics to monitor growth and rule out potential complications.

Active Participation of the Radiology Department.

Imaging played a key role throughout all stages of care—diagnosis, surgical guidance, and follow-up. This collaboration allowed imaging studies to be tailored to the evolving clinical needs and highlighted the cross-disciplinary importance of radiology in therapeutic decision-making.

Outpatient Follow-up.

Biweekly clinical evaluations were scheduled during the first two months, including ankle examination and monitoring of inflammatory markers. The patient progressed favorably, regaining full ambulation without pain or inflammatory signs. The family received education on warning symptoms and the importance of continued follow-up. Ongoing clinical and radiologic surveillance confirmed complete resolution of the infectious process, with no joint sequelae or growth disturbances.

DISCUSSION

Osteomyelitis in pediatric patients continues to pose a major diagnostic challenge, particularly in its subacute form, due to its nonspecific clinical presentation and variability of imaging findings in early stages. In this case, the 12-year-old patient presented without fever and with localized pain, absent of systemic manifestations, which complicated initial identification—contrasting with reports by Álvarez López and Méndez, where symptoms tend to be more overt (18,19). The diagnostic strategy implemented followed a stepwise protocol that began with plain radiography—known for its low sensitivity in early phases—followed by computed tomography and magnetic resonance imaging. The latter was essential for identifying bone marrow edema, physeal involvement, and an intramedullary collection compatible with an early abscess (20,23). Unlike studies that prioritize

advanced modalities such as scintigraphy or PET/CT, this second-level hospital achieved an accurate diagnosis using accessible and sequential imaging resources, underscoring the reproducibility of this approach in similar contexts.

Empirical treatment with ceftriaxone and clindamycin was a reasoned decision, based not only on adequate antimicrobial coverage against *Staphylococcus aureus* and facultative anaerobes but also on institutional availability and the patient's clinical stability (24,25). Although aligned with international evidence, this therapeutic choice was consciously adapted to the local operational setting, reflecting context-sensitive clinical reasoning rather than the mere application of guidelines.

Given the persistence of local signs and imaging findings suggestive of a subperiosteal collection, surgical intervention was indicated. Debridement and drainage of the osteomyelitic focus helped reduce bacterial load, improve antibiotic penetration, and prevent complications such as sequestrum formation, angular deformity, or premature physeal closure. This proactive approach demonstrates that surgery was not a last-resort measure but a preventive strategy grounded in analytical clinical judgment (26).

This case reinforces the value of a progressive and adaptable diagnostic approach capable of yielding positive outcomes even in resource-limited settings. The experience is transferable to other secondary-level hospitals facing technological constraints but staffed with skilled professionals and critical clinical reasoning. Moreover, the case has significant educational value—it illustrates to residents and medical students that the quality of care does not depend solely on access to sophisticated technology but on structured clinical reasoning and effective multidisciplinary collaboration.

CONCLUSION

This case highlights the pivotal role of radiology in the management of pediatric osteomyelitis—a complex, predominantly bacterial bone infection that most commonly affects children and is often caused by *Staphylococcus aureus*, particularly in subacute forms with atypical

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presentations. The absence of fever and systemic symptoms in this patient underscored the need for a rigorous and context-aware imaging evaluation to guide differential diagnosis from early stages.

From a radiologic standpoint, the study demonstrated the efficacy of a stepwise imaging approach: ultrasound as the first-line, accessible method for detecting soft tissue edema or collections; computed tomography for characterizing bone lesions, assessing periosteal reaction, and excluding neoplasms; and magnetic resonance imaging as the most sensitive and specific modality for identifying intramedullary abscesses, metaphyseal involvement, and soft tissue extension. This process showed that even in secondary-level hospitals, where advanced modalities such as PET/CT are unavailable, accurate diagnosis can be achieved through rational and clinically guided use of available imaging resources.

The experience reaffirmed that the radiologist's role extends beyond image interpretation—it requires clinical-radiologic judgment, integration of findings with patient context, consideration of pediatric vascular and anatomic patterns, and active participation in interdisciplinary decision-making. Ultimately, this case consolidates a broader vision of the radiologist as an essential actor in the comprehensive management of pediatric osteomyelitis.

ETHICAL CONSIDERATIONS

Informed consent was obtained for all diagnostic and surgical procedures described in this report, as well as for the use of clinical images and subsequent publication, ensuring full confidentiality of personal data. All actions adhered to the ethical principles of the Declaration of Helsinki and the provisions of the *General Health Law of Mexico*. Measures were taken to protect the patient's identity, eliminating any potentially identifiable information (27,28). This case holds ethical and academic relevance because it represents a clear opportunity for clinical learning and decisive, patient-centered management, while upholding the principle of beneficence. It is expected that the publication of this report will contribute to the generation of evidence and promote good clinical practice in similar pediatric cases.

The case report was reviewed and approved under the guidelines of the Research Committee and the Ethics Committee of the General Hospital of Cancún "Dr. Jesús Kumate Rodríguez," with approval numbers: Dictamen-CEI-2025-012-HGC and Dictamen-CI-2025-012-HGC, respectively.

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CONFLICT OF INTERESTS

The authors declare no conflict of interest.

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