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Bizarre Parosteal Osteochondromatous Proliferation (Nora's Lesion): A Case Report

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Abstract

Introduction: *Bizarre parosteal osteochondromatous proliferation (BPOP), commonly referred to as Nora's lesion, is a rare benign neoplasm arising from the cortical surface of bone. It is characterized by distinctive clinicoradiologic and histopathologic features and by a non-negligible propensity for local recurrence. Extracranial, non-acral localizations—including involvement of the malleolar region—are uncommon and may represent a source of diagnostic uncertainty.*

Case Presentation: *We report the case of S.G., a 56-year-old male, who presented for clinical evaluation due to a progressively enlarging swelling of the left lateral malleolus, with an onset approximately two months prior to presentation. Imaging assessment, including conventional radiography and computed tomography, demonstrated a parosteal osteochondromatous lesion adherent to the underlying cortical bone, without continuity with the medullary cavity and without evidence of infiltration of the adjacent soft tissues. The overall radiologic features were suggestive of BPOP. The case was retrospectively analyzed through integration of clinical and imaging findings, with appropriate consideration of the principal differential diagnoses.*

Discussion: *Bizarre parosteal osteochondromatous proliferation is regarded as a histologically benign yet locally active lesion, with a biological behavior that may, in certain cases, mimic that of aggressive surface bone neoplasms. This potential for misinterpretation is particularly pronounced in anatomically atypical sites, such as the malleolar region, where limited familiarity and overlapping imaging features may further complicate diagnostic assessment. In such contexts, a multidisciplinary approach is essential, grounded in careful radiologic–pathologic correlation to ensure diagnostic accuracy. Complete surgical excision with clear margins represents the treatment of choice. Nevertheless, the recurrence rates reported in the literature are not negligible, underscoring the need for adequate resection and structured postoperative surveillance.*

Conclusions: *Although rare, malleolar involvement by Nora's lesion falls within the recognized topographic spectrum of BPOP. Awareness of this potential presentation is critical to avoid overestimation of malignant potential and the consequent adoption of unnecessarily aggressive therapeutic strategies. The documentation*

of additional well-characterized cases will be instrumental in refining our understanding of the clinicobiological behavior of this entity and in optimizing its diagnostic and management pathways.

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Introduction

Nora's lesion, also termed bizarre parosteal osteochondromatous proliferation (BPOP), represents a rare benign tumor arising from the surface of bone, characterized by a distinctive constellation of clinical, radiologic, and histopathologic features. The entity was originally described in 1983 by Frederick E. Nora and colleagues, who first delineated its defining morphologic characteristics in the small bones of the hands and feet [1]. Subsequent clinicopathologic investigations, including those conducted by Manuel F. Meneses and collaborators, further refined its histologic characterization and more precisely defined its morphologic spectrum and biologic behavior, thereby consolidating its nosologic classification [2,3]. BPOP demonstrates a marked predilection for the small tubular bones of the hands and feet; however, it is not confined to these anatomical districts. Although less common, involvement of non-acral skeletal sites—including long bones and other atypical locations—has been documented. This heterogeneous topographic distribution reflects the broad variability of its clinicopathologic presentation and underscores the complexity of its diagnostic framing within the spectrum of surface bone lesions [2-6].

Indeed, the literature documents involvement of the skull, mandible, clavicle, and pelvis, as well as metaphyseal segments of long bones, further supporting the biological plasticity of BPOP and its non-exclusive acral distribution [7,8].

From an epidemiologic standpoint, BPOP most frequently affects young adults in the second to third decades of life, without a clearly established sex predilection. It thus represents a rare entity that, although uncommon, appears to be relatively evenly distributed across the adult population [2,8,9].

Clinically, the lesion typically presents as a slowly enlarging mass, occasionally associated with pain. Its temporal progression and morphoradiologic features may closely resemble those of malignant surface bone neoplasms, thereby complicating the initial diagnostic work-up and necessitating meticulous clinicoradiologic and histopathologic correlation [9-11].

Additional reports have described occurrences in anatomically unusual sites—such as the temporal region, the spine, and specific segments of long bones, including the femur—further confirming the marked biologic and topographic heterogeneity of this lesion and contributing to a clinical profile that is less rigidly confined to the traditionally recognized acral locations [12-14].

From a radiologic standpoint, BPOP typically appears as a well-circumscribed calcified or ossified mass arising from and firmly attached to the cortical surface, characteristically lacking continuity with the underlying medullary cavity. This morphologic feature represents a key discriminating criterion in the differential diagnosis with osteochondroma and other parosteal lesions exhibiting benign or potentially aggressive behavior [4,9,15-17].

On magnetic resonance imaging, the lesion may demonstrate heterogeneous signal characteristics, with variable intensity on T2-weighted sequences and no clear evidence of medullary extension. Nevertheless, it may occasionally display morphologic features suggestive of apparent biologic aggressiveness, thereby generating potential interpretative uncertainty [16].

Clinical and surgical management strategies have been progressively clarified through larger case series, which have documented a non-negligible rate of local recurrence. These findings further support the characterization of BPOP as a histologically benign entity with a locally active clinical behavior [6,18].

Histopathologic examination reveals an architecturally disorganized proliferation composed of a heterogeneous admixture of cartilaginous, osseous, and fibrous tissue. The cartilaginous component is characterized by chondrocytes that may appear enlarged and occasionally binucleated, together with the distinctive phenomenon of so-called "blue bone," a morphologic feature considered highly suggestive and virtually pathognomonic of the lesion [2,3,15].

Although these findings may evoke structural atypia from a purely morphologic standpoint, they are not associated with cytologic features of malignancy or histologic parameters indicative of neoplastic transformation. The absence of significant atypia, abnormal mitotic activity, and stromal infiltration allows for a clear distinction from entities such as parosteal chondrosarcoma and surface osteosarcoma, which constitute the principal differential diagnoses among surface bone malignancies [19].

The etiopathogenesis of BPOP remains a matter of debate. Historically, it was interpreted as a reactive proliferative process, potentially secondary to trauma [20]. However, more recent cytogenetic evidence demonstrating recurrent chromosomal rearrangements has supported the hypothesis of a true neoplastic proliferation, albeit with benign biologic behavior and a propensity for local activity [4,5,21,22].

From a therapeutic perspective, complete surgical excision represents the treatment of choice in symptomatic cases [6,18]. Despite its histologic benignity, available case series report local recurrence rates ranging from approximately 20% to over 50%, with the highest incidence occurring within the first two years following treatment [3,6,8]. This clinical course underscores the necessity for prolonged and methodologically rigorous clinical and radiologic follow-up.

The occurrence of BPOP in the malleolar region carries particular clinical and diagnostic relevance, representing an atypical localization compared with its more commonly described topographic distribution [2,4,6]. In this setting, systematic integration of clinical, radiologic, and histopathologic data is essential to prevent overestimation of malignant potential and the consequent adoption of unnecessarily aggressive therapeutic strategies, as also emphasized in recent reports advocating a multidisciplinary, integrated approach [23-24].

In light of the rarity of the condition, the variability of its clinicoradiologic manifestations, and the persistent uncertainties regarding its etiopathogenesis and optimal management described in the literature, the documentation of additional well-characterized cases with comprehensive multidisciplinary correlation is of considerable interest.

The present study therefore aims to contribute to a more precise delineation of the clinical and diagnostic profile of bizarre parosteal osteochondromatous proliferation through the presentation of an additional case report with detailed clinical, radiologic, and histopathologic correlation. The objective is to refine differential diagnostic criteria, reduce the risk of overdiagnosis of malignant disease, and provide clinically relevant elements to optimize therapeutic decision-making and follow-up strategies.

Case Presentation

A 56-year-old male was referred to the Department of Diagnostic Imaging on January 13, 2026, for evaluation of a lesion involving the left lateral malleolus, first noted approximately two months earlier. Clinically, the lesion presented as a progressively enlarging swelling located at the anterior aspect of the lateral malleolus. A preliminary radiographic examination had already demonstrated a structured peri-malleolar osseous calcification.

The patient denied any recent or remote history of significant trauma to the affected ankle. He reported only mild local discomfort during prolonged ambulation, without spontaneous pain at rest, functional limitation, or impairment of routine daily activities.

On physical examination, a firm, well-circumscribed swelling was observed, clearly demarcated from the surrounding soft tissues and apparently adherent to the underlying osseous plane. The mass was non-ten-

der on deep palpation. The overlying skin was intact and normotrophic, with no signs of local inflammation, erythema, increased temperature, or trophic changes. No peripheral neurovascular deficits were detected, distal sensation was preserved, and there were no clinical signs suggestive of tibiofibular or tibiotalar joint instability.

The diagnostic work-up initially included conventional radiography, which demonstrated a structured peri-malleolar calcified mass. In light of this finding, the evaluation was supplemented with targeted computed tomography (CT) of the left lateral malleolus.

CT imaging revealed an exostosis-like lesion with osteochondromatous features, arising from the anterior periosteal aspect of the lateral malleolus. The lesion exhibited well-defined corticomedullary differentiation, with close and direct apposition to the malleolar cortex and no evidence of continuity between the underlying medullary cavity and the exophytic proliferation. Maximal dimensions were approximately 10 × 18 × 34 mm. The margins appeared undulating, with a lobulated morphology, and no clearly appreciable cartilaginous cap was identified. There was no cortical disruption or imaging evidence of aggressive osseous erosion.

The surrounding soft tissues were unremarkable. No abnormalities were detected in the ligamentous structures of the lateral collateral compartment of the ankle, nor were alterations observed in the distal tibiofibular syndesmosis. The deltoid ligament complex and the spring ligament were also within normal limits. No osteochondral lesions were identified at the tibiotalar joint, and the signal characteristics of the examined osseous structures were preserved. The Achilles tendon and plantar fascia appeared normal. No intra-articular effusion or fluid collections within the regional bursae were documented.

Magnetic resonance imaging of the left ankle confirmed the superficial nature of the lesion, demonstrating heterogeneous signal intensity on T2-weighted sequences, without evidence of infiltration of the adjacent soft tissues or medullary extension. No structural abnormalities of the capsuloligamentous components were identified, and there was no tibiotalar joint effusion or alteration of the evaluated tendinous structures.

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The present study was designed as a descriptive observational case report concerning a patient with a malleolar osseous lesion radiologically suggestive of Nora's lesion. The lesion was documented through conventional radiography, computed tomography, and magnetic resonance imaging.

The case was retrospectively analyzed by means of a comprehensive review of the patient's medical history and clinical findings, as well as detailed assessment of the radiographic, MRI (Figure 1 A-B; Figure 2 A-B; Figure 3 A-B; Figure 4 A-B) and CT (Figure 5 A-B; Figure 6 A-B; Figure 7 A-B; Figure 8 A-B) characteristics of the lesion. Particular attention was devoted to elements relevant to the differential diagnosis with other benign and malignant parosteal neoplasms.

Systematic integration of the clinical and imaging data, re-evaluated within a multidisciplinary setting, was overall considered highly suggestive—on a preliminary basis—of bizarre parosteal osteochondromatous proliferation (BPOP, Nora's lesion), thus supporting a working diagnosis grounded on clinico-radiologic correlation.

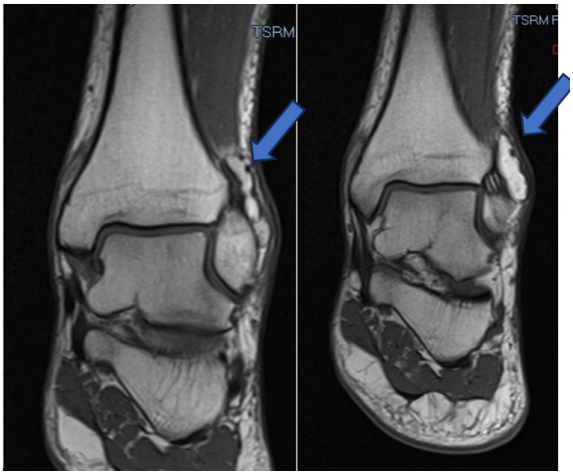

Figure 1A–B: MRI (coronal T1-weighted TSE sequence) of the left ankle demonstrating an osteochondroma-like lesion arising from the anterior aspect of the lateral malleolus. The lesion shows clear corticomedullary differentiation, lacks continuity with the fibular cancellous bone, and does not exhibit an evident cartilaginous cap (arrows).

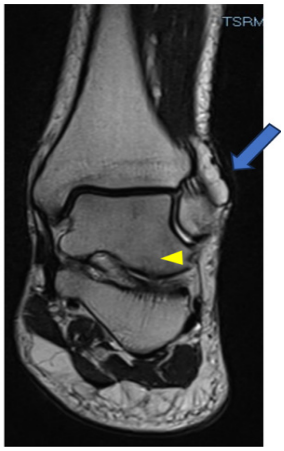

Figure 2: MRI of the left ankle, coronal T2-weighted TSE sequence

Imaging confirms the presence of Nora's lesion (arrow). The anterior periosteal proliferation arising from the lateral malleolus demonstrates heterogeneous signal intensity on T2-weighted images. A mild tibiotalar joint effusion is also noted, visible as a thin hyperintense fluid layer on T2-weighted sequences (arrowhead).

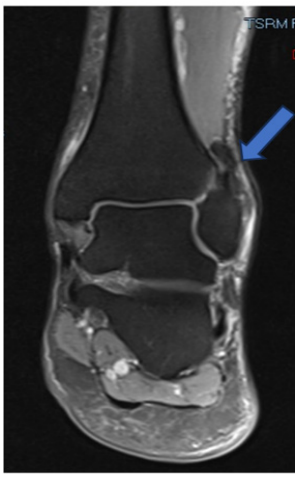

Figure 3: MRI of the left ankle, coronal T2-weighted TSE FAT SAT

The periosteal lesion arising from the anterior aspect of the lateral malleolus demonstrates predominantly hypointense signal on fat-suppressed T2-weighted images (arrow).

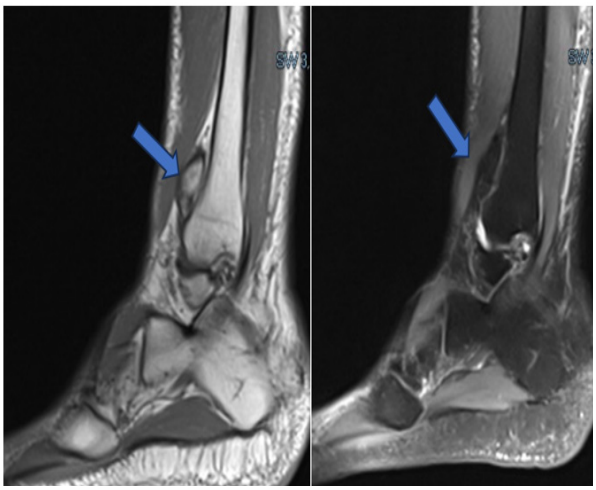

Figure 4A–B: MRI of the left ankle, sagittal T1-weighted TSE and T1-weighted TSE FAT SAT

Exophytic periosteal lesion arising from the anterior aspect of the lateral malleolus, demonstrating intermediate signal intensity on T1-weighted images and hypointensity on fat-suppressed T1-weighted sequences (arrows).

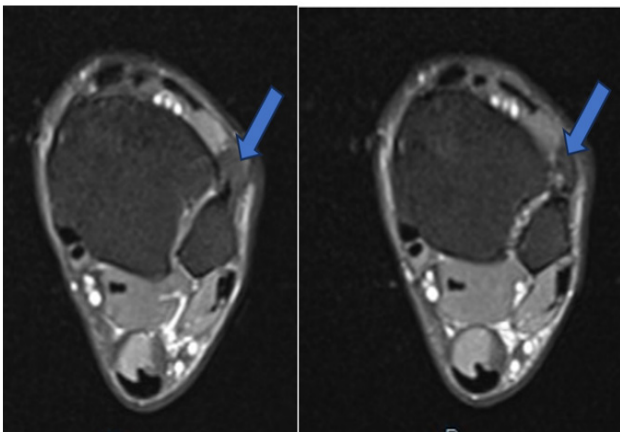

Figure 5A–B: MRI of the left ankle, sagittal proton density (PD) TSE fat-suppressed sequences. The periosteal lesion arising from the anterior aspect of the lateral malleolus demonstrates hypointense signal on PD fat-suppressed images.

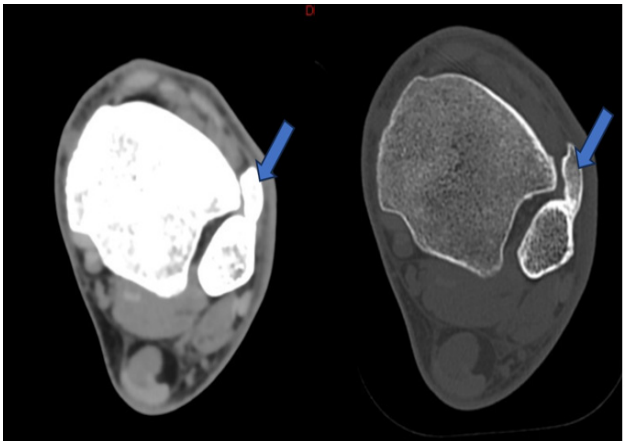

Figure 6A–B: CT of the left ankle, axial plane with soft-tissue (A) and bone (B) reconstruction algorithms. CT imaging confirms the presence of Nora's lesion at the level of the lateral malleolus (arrows).

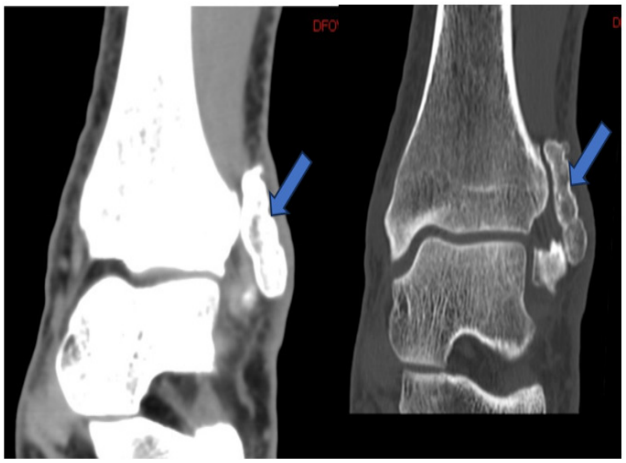

Figure 7A–B: CT of the left ankle, axial plane, soft-tissue (A) and bone (B) reconstruction algorithms: Exostotic periosteal proliferation arising from the anterior aspect of the lateral malleolus, appearing as a well-defined calcified mass adherent to the cortical surface and lacking evident continuity with the medullary cavity (arrows).

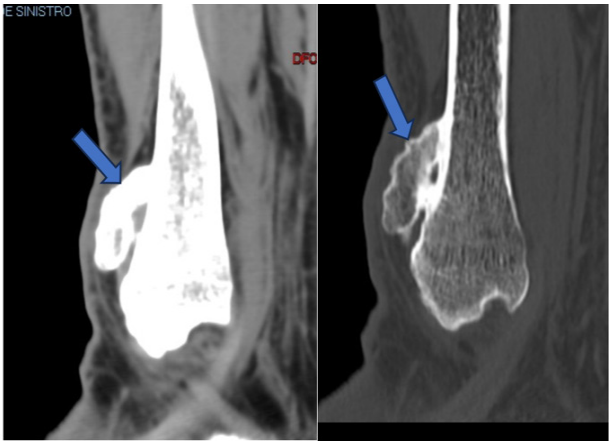

Figure 8A–B: CT of the left ankle, sagittal plane, soft-tissue (A) and bone (B) reconstruction algorithms. Exostotic periosteal lesion arising from the anterior aspect of the lateral malleolus, characterized by a lobulated, calcified structure, well-circumscribed and firmly adherent to the cortical surface, without evident continuity with the underlying medullary cavity.

Discussion

Bizarre parosteal osteochondromatous proliferation occupies an intermediate nosologic position in which histologic benignity coexists with a locally active clinical behavior, generating a degree of interpretative tension that is not devoid of diagnostic ambiguity. The rarity of the condition, together with its frequent morphologic overlap with surface bone neoplasms of malignant potential, mandates a critical diagnostic framework grounded in rigorous clinicoradiologic correlation and, when indicated, histopathologic confirmation.

In the present case, the malleolar localization—atypical when compared with the more commonly reported acral distribution—is associated with an age exceeding the epidemiologic peak traditionally described in the literature. This element could reasonably heighten initial diagnostic uncertainty. Nevertheless, the absence of medullary continuity, the intimate cortical adherence, the lobulated morphology with undulating margins, and the lack of soft-tissue infiltration represent radiologic features

strongly supportive of BPOP, thereby substantially reducing the likelihood of alternative entities such as conventional osteochondroma, parosteal chondrosarcoma, or superficial osteosarcoma.

The literature reports variable—and at times substantial—rates of local recurrence, confirming a biologic behavior that, while histologically benign, cannot be regarded as clinically inert. This feature necessitates a proportionate therapeutic strategy and adequately prolonged follow-up, while simultaneously avoiding overly aggressive interventions that are not justified by the true biologic profile of the lesion.

A degree of etiopathogenetic uncertainty also persists. Although a post-traumatic reactive hypothesis historically represented a prevailing interpretative model, more recent cytogenetic evidence supporting recurrent chromosomal alterations has favored the concept of a benign neoplastic proliferation, thereby contributing to a redefinition of the lesion's underlying biologic nature.

In the present patient, the malleolar presentation—occurring in the absence of radiologic signs of aggressiveness and exhibiting morphologic characteristics consistent with BPOP—fits coherently within the spectrum of topographic variability already described. At the same time, it underscores the importance of including this entity in the differential diagnosis of parosteal lesions, even when arising in anatomical sites not classically reported.

Conclusions

The present case highlights that Nora's lesion may arise in the malleolar region in an adult patient beyond the typical age range of peak incidence, representing an uncommon yet biologically plausible presentation. Accurate interpretation requires systematic integration of clinical and imaging data, with particular emphasis on the absence of medullary continuity and the lack of soft-tissue infiltration—key elements in the differential diagnosis from aggressive surface bone neoplasms.

Heightened awareness of these distinguishing features may help reduce the risk of overdiagnosis of malignancy and guide appropriately proportioned therapeutic strategies, thereby avoiding unnecessarily radical surgical interventions. Further documentation of similarly well-characterized cases will contribute to a more precise delineation of the clinicobiological profile of BPOP and to refinement of its diagnostic and management paradigms.

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