

Sclerotic Shadows: Imaging Characteristics and Diagnostic Relevance of Bony Islands Around the Knee Joint

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Abstract

Bony islands, or enostoses, are benign medullary foci of compact bone most commonly encountered incidentally on radiographs. Their presence in the distal femur and proximal tibia is not uncommon, yet they are often misinterpreted as sinister sclerotic lesions, particularly in oncologic or trauma settings. Although enostoses are usually asymptomatic and stable over time, their dense radiographic appearance frequently prompts unnecessary tests or even invasive treatments because of worries about chronic osteomyelitis or metastatic illness. The imaging characteristics, diagnostic difficulties, and clinical decision-making processes pertaining to the bony islands surrounding the knee joint are all thoroughly explained in this position article. By drawing from both orthopaedic and radiological perspectives, the article underscores the importance of recognising these lesions early and correctly. It provides a pragmatic framework to differentiate enostoses from more aggressive pathologies using radiological signs such as lesion borders, periosteal reaction, and MRI signal characteristics. Furthermore, the discussion highlights the psychological, clinical, and economic consequences of overdiagnosis and proposes collaborative diagnostic strategies. The article emphasises the role of interdisciplinary understanding in minimising diagnostic errors and protecting patients from unnecessary interventions. It ultimately calls upon orthopaedic surgeons to be champions of imaging literacy, urging that these “sclerotic shadows” be viewed not with suspicion, but with informed clarity.

Keywords: Enostosis; Knee Joint; Musculoskeletal Imaging; Bone Neoplasms; Diagnostic Errors

Introduction

Incidental radiological findings are a frequent challenge in musculoskeletal practice. Among these, bony islands or enostoses occupy a curious space—benign, non-expansile lesions that often masquerade as aggressive pathology when context and interpretation falter. These compact intramedullary foci of cortical-type bone most commonly occur in long bones such as the femur and tibia, and their proximity to the knee joint raises important clinical considerations. While radiologically harmless, enostoses are often flagged as suspicious sclerotic foci, leading to over-investigation, unnecessary referrals, and in rare cases, inappropriate treatment plans.

In oncology patients, especially, a new sclerotic lesion seen on bone scan or radiograph however benign can evoke fear of osteoblastic metastasis. In trauma patients, a failure to differentiate enostosis from old bone infarct or low-grade infection can delay or complicate surgical planning. These diagnostic grey zones highlight a crucial need for orthopaedic surgeons to be proficient in musculoskeletal imaging interpretation, particularly when benign mimics like enostoses obscure the clinical picture.

This article presents a firm position: that the correct identification of bony islands is an essential diagnostic skill for modern orthopaedic practitioners. Through radiological differentiation, clinical examples, and evidence-based insights, it aims to reduce misdiagnosis, prevent over-treatment, and enhance interdisciplinary dialogue around these frequently misjudged lesions.

What are bony islands?

Bony islands, medically termed enostoses, are benign foci of compact bone within cancellous medullary bone. They arise due to developmental anomalies of endochondral ossification and represent non-pathological anatomical variants rather than neoplastic or inflammatory processes. Histologically, enostoses are composed of mature lamellar bone with haversian systems, identical to normal cortical bone, and are typically devoid of mitotic activity or malignant potential [1].

The prevalence of enostoses in the general population ranges from 10 - 15%, and they are most commonly identified in the pelvis, femur, tibia, and vertebrae [2]. These lesions are typically solitary, although multiple enostoses may occur in the benign condition osteopoikilosis.

Though often discovered incidentally, enostoses become clinically relevant when seen near joints like the distal femur or proximal tibia, especially in patients with bone pain, trauma, or malignancy history. The key challenge lies in distinguishing these lesions from aggressive differentials without resorting to costly or invasive diagnostic cascades.

Imaging characteristics that matter

On plain radiography, enostoses typically appear as well-circumscribed, homogeneously sclerotic lesions, usually less than 2 cm in diameter. A hallmark feature is their “brush border” or thorny margin, which represents trabeculae extending into cancellous bone—a sign of benign entrapment rather than infiltration [3].

Key radiographic features include:

- No cortical destruction
- No periosteal reaction
- No adjacent soft tissue mass
- Stability over time with serial imaging.

On computed tomography (CT), enostoses demonstrate high density (400-800 HU), confirming their compact nature. They are often more conspicuous on CT due to superior contrast resolution.

On magnetic resonance imaging (MRI), enostoses present as:

- Very low signal on all sequences (T1, T2, STIR)
- No surrounding marrow oedema
- No enhancement post-contrast.

These MRI features are crucial in ruling out sclerotic metastases, which often show heterogeneous signal intensity, may exhibit surrounding oedema, and sometimes enhance with contrast [4].

The diagnostic confusion - A real concern

Despite well-described imaging characteristics, enostoses are still frequently misinterpreted. In many radiology reports, phrases like “sclerotic lesion of uncertain aetiology” or “suggest clinical correlation to exclude metastasis” place the onus on clinicians to pursue further workup. This often leads to:

- Unnecessary MRI scans or bone scintigraphy
- Oncology referrals
- Patient anxiety and treatment delays
- In rare cases, biopsy of an entirely benign lesion.

A study by O'Donnell and Saifuddin found that over 30% of incidentally discovered bony islands prompted further unnecessary imaging in oncology patients [5]. Similarly, in a review of radiological audits, 13% of bone biopsies performed for “sclerotic lesions” were ultimately diagnosed as enostoses [6].

This underscores the clinical and economic burden posed by diagnostic uncertainty surrounding enostoses. The solution lies not only in radiology but in orthopaedic literacy of imaging features.

Orthopaedic relevance and clinical decision-making

In orthopaedic clinics, where imaging is used to evaluate pain, deformity, trauma, or surgical planning, the presence of a sclerotic lesion can confound decision-making. Particularly when enostoses are found in the weight-bearing metaphyses around the knee, they may be mistaken for:

- Healing stress fractures
- Chronic osteomyelitis
- Bone infarcts
- Low-grade neoplasms
- Metastatic deposits.

Yet, most enostoses are asymptomatic, and any symptoms arising near them are usually unrelated [7]. Recognising this distinction is crucial to avoid anchoring bias during clinical assessment.

In preoperative planning for procedures like total knee arthroplasty (TKA) or osteotomies, misclassifying a bony island as metastasis or infection may delay surgery or even misdirect the surgical approach. Therefore, orthopaedic surgeons must develop a structured approach to evaluating incidental lesions and knowing when reassurance is the best intervention.

Preventing misdiagnosis

Preventing misinterpretation of enostoses requires a shared vocabulary and mutual trust between radiologists and orthopaedic teams. Radiologists must be encouraged to use descriptive, non-alarming terminology such as “likely enostosis” rather than vague language that implies uncertainty.

Simultaneously, orthopaedic surgeons must take ownership of imaging interpretation-particularly when it pertains to lesion stability, context, and morphology. A proposed strategy is the use of educational checklists or radiology review templates that highlight benign features such as:

- Solitary lesion
- Stable size across imaging
- Brush border appearance
- Absence of oedema or soft tissue involvement.

Training orthopaedic residents to read basic imaging with confidence and to challenge overcalls when appropriate will strengthen the diagnostic chain and reduce unnecessary referrals.

Feature	Enostoses (Bony Islands)	Sclerotic Metastases
Number of Lesions	Usually solitary	Often multiple
Margins	Well-defined, brush border	Irregular, ill-defined
Periosteal Reaction	Absent	May be present
Soft Tissue Involvement	Absent	Often present
Lesion Growth	Stable over time	May increase in size
MRI Signal	Low on all sequences	Variable, may enhance
Bone Marrow Oedema	Absent	May be present
Common Locations	Long bones, pelvis, spine	Spine, pelvis, long bones, ribs
Symptoms	Asymptomatic	May have systemic or local symptoms
Clinical Concern	Low	High

Table 1: Differentiating enostoses vs sclerotic metastases.

Conclusion

Bony islands may be biologically quiet, but their impact on clinical behaviour can be unnecessarily loud. Misinterpreted enostoses contribute to a cascade of imaging, referrals, and anxiety that could be entirely avoided with sharper radiological discernment and orthopaedic insight. As surgeons, we must be vigilant not only in the operating theatre but in the realm of diagnostic clarity. Our ability to recognise these “sclerotic shadows” for what they are; benign, stable, and irrelevant to most clinical decisions can significantly reduce patient burden, healthcare cost, and mental fatigue for all involved. Let us reaffirm the role of imaging literacy as a core orthopaedic skill, and advocate for a collaborative model where “benign until proven otherwise” becomes the default approach for enostoses in the knee region [8-10].

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