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CASE REPORT

Radiographic Identification of Type III and Type IV Mandibular Dense Bone Island in an Elderly Patient

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ABSTRACT

Introduction: Dense Bone Island (DBI), or idiopathic osteosclerosis, is an asymptomatic radiopaque lesion often found incidentally during radiographic exams. Its etiology is linked to bone maturation, though not fully understood. The purpose of this report is to describe the radiographic identification of DBI in an elderly patient.
Objective: To report a case of Type III and IV DBI in the mandible and discuss its radiographic differentiation from other pathologies.
Case: A 62-year-old female patient underwent panoramic radiography, which revealed well-defined, homogeneous radiopaque lesions in the edentulous regions of teeth 37 and 47; while another radiopaque lesion was found at the apical region of tooth 44. The lesions were classified as Type III DBI as they were separate from any teeth or lamina dura and Type IV DBI since it was around root apex.
Outcome: Accurate identification through panoramic imaging allowed for a definitive diagnosis without the need for invasive procedures.
Conclusion: Panoramic radiography is an effective tool for identifying DBI, and recognizing its specific features is vital to avoid unnecessary interventions.

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INTRODUCTION

Often found in the lower jaw near the roots of premolars and molars, Dense Bone Island (DBI) – also referred to as idiopathic osteosclerosis or periapical enostosis – is a symptom-free bone variation. DBI is an intraosseous lesion that is generally asymptomatic and relatively common, with a prevalence ranging from 2.3–9.7% depending on the population and research methodology.[1,2] These lesions are reported to be more frequent in Asian and African populations compared to Caucasians and show a higher predilection in female individuals.[3-5]

Most cases of DBI are identified as incidental findings during radiographic examinations, utilizing either panoramic or periapical radiography. Panoramic radiography is widely used in dentistry as it provides a comprehensive view of the maxilla, mandible, and surrounding tissues, making it an effective initial screening tool for detecting abnormalities, such as DBI.[6] Although the exact cause of DBI remains unknown, it is believed to stem from vascular factors and internal pressure affecting jaw bone growth, making it a natural developmental variation rather than a reaction to local triggers.[2,7]

Radiographically, DBI presents as a well-demarcated radiopaque area varying from a few millimeters up to two centimeters in size. It can adopt a round, oval, or irregular shape, and typically occurs in the premolar and molar zones – positioned at the root tip, between roots, or completely detached from the teeth – unaffected by tooth vitality or the presence of the tooth itself.[1,8]

Based on the classification system for radiopaque lesions, DBI is categorized into five distinct types. Type I is an interradicular DBI located between the tooth roots. Type II is an apical–interradicular DBI, characterized by a lesion located at the apex that extends into the interradicular area. Type III is a separate DBI located in the apical region but clearly isolated from the teeth and lamina dura. Type IV is classified as an apical DBI primarily located around the root apex, while Type V is a completely separate DBI found outside the tooth-bearing area.[7,8] Research by Sisman *et al.* indicated that the Type IV apical classification is the most common (51.6%), followed by Type V separate (22.9%). Meanwhile, research by Savitri *et al.* showed slightly different results, with Type V separate being the most frequent (47.81%), followed by Type IV apical (29.82%).[3,9]

The presence of DBI can affect surrounding bone tissue, particularly in the root apex area, potentially leading to external root resorption, eruption disturbances, and displacement of adjacent teeth.[10.11] Digital panoramic radiography and cone-beam computed tomography (CBCT) has an important role in visualizing jaw anatomical structures and detecting clinically significant asymptomatic findings, including idiopathic osteosclerosis (IO).[11]

Therefore, this case report underscores the clinical importance of early detection and precise radiographic identification of Dense Bone Island within the mandible, particularly in elderly patients. While DBI is typically asymptomatic and often discovered incidentally, the radiographic features observed in this patient are consistent with Type III DBI, a classification that carries unique diagnostic implications in advanced age, and also Type IV DBI, which sometimes mimics pathological lesions. Recognizing these specific radiographic features differentiates this benign developmental variation from other more complex pathological entities, such as hypercementosis or periapical cemento-osseous dysplasia (PCOD). By situating the diagnosis within the context of an elderly patient, this report highlights the importance of accurate identification to avoid unnecessary invasive interventions while ensuring appropriate periodic monitoring for potential complications affecting the surrounding dental structures.

CASE

A 62-year-old female patient presented to the Radiology Department of RSGM FKG Universitas Trisakti for a panoramic radiographic examination for implant placement at an edentulous area, as she had difficulties in mastication. The patient was instructed to remove any items that could interfere with the radiographic results—such as earrings, orthodontic appliances, dentures, glasses, or necklaces—and was fitted with a lead apron. The patient was subsequently positioned with her chin on the support, aligning the midsagittal plane perpendicular and the Frankfort Horizontal Plane (FHP) parallel to the floor (or the occlusal plane inclined at a 20° angle) while maintaining an edge-to-edge relationship on the bite guide. The patient was instructed to swallow and place her tongue against the palate.

The panoramic radiograph (Figure 1) revealed homogeneous radiopaque areas located in the posterior mandible at the edentulous regions of teeth 37 and 47, while another radiopaque lesion was noted at the apical area of tooth 44. These lesions exhibited well-defined borders with irregularly rounded shapes that blended with the surrounding normal trabecular bone pattern. The internal structure demonstrated high bone density without medullary spaces or a peripheral radiolucent rim. No cortical expansion or pathological involvement of the mandibular canal was observed in the vicinity of the lesions. The patient was unable to remove the earrings before the radiographic examination. As a result (Figure 1) bilateral circular radiopaque artifacts were observed in the regions of the right and left earlobes (white arrows). Corresponding bilateral ghost images were also evident as radiopaque projections superimposed over the floor of the right and left maxillary sinuses (yellow arrows).

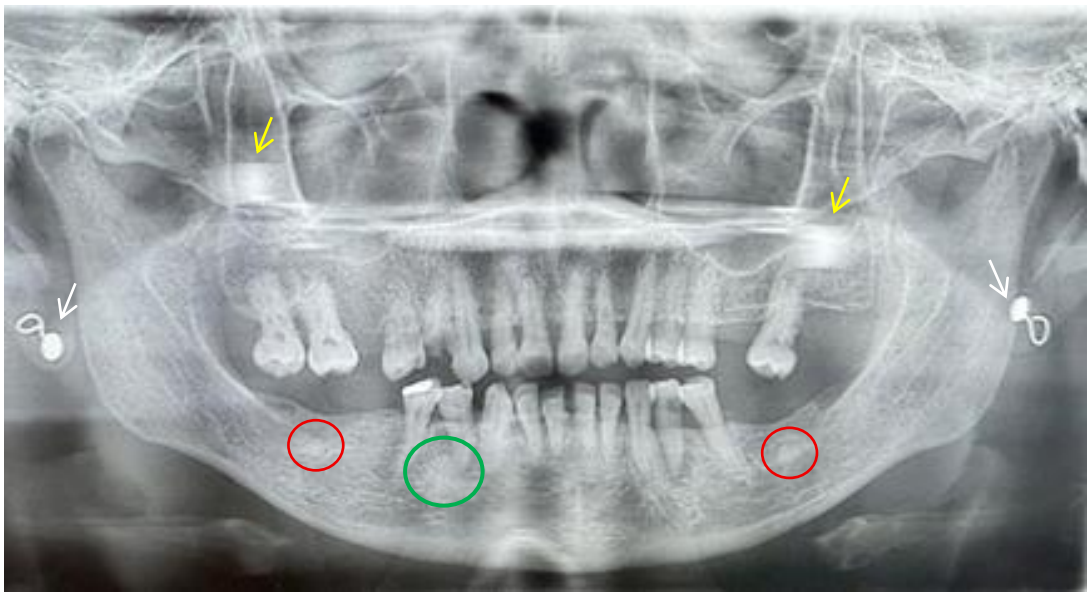

Figure 1. Panoramic radiograph showing well-defined radiopaque lesions in the edentulous regions of teeth 37 and 47 (red circles) consistent with Type III Dense Bone Island, and another radiopaque lesion in the apical area of 44 (green circle), presenting as a Type IV Dense Bone Island.

DISCUSSION

Typically identified on radiographs, Dense Bone Island (DBI)–variously termed idiopathic osteosclerosis, enostosis, bone scar, bone whorl, or focal periapical osteopetrosis–is a developmental variation of hamartomatous cortical bone. The condition is hypothesized to stem from impaired resorption during endochondral ossification. Microscopic evaluation reveals compact, hypercalcified bone tissue without marrow cavities or inflammatory cells.[12]

Radiographically, DBI exhibits characteristic features such as well-defined radiopaque borders, although in some cases it may blend with the surrounding trabecular bone. The lesion typically lacks a radiolucent rim or capsule and is directly continuous with normal bone. Its internal structure may vary depending on its size and morphology, but it generally presents as a homogeneous radiopacity.[6]

In this case, the radiographic findings showed well-demarcated, homogeneous radiopaque lesions located in the edentulous posterior mandible, clearly disconnected from the adjacent teeth and lamina dura. Based on these features, the lesion was classified as Type III DBI, which is defined as an isolated radiopaque lesion located in the apical region but not associated with tooth structures.[1,8] Another radiopaque lesion, located around the root apex of tooth 44, with an irregularly rounded shape, separated from the adjacent teeth and lamina dura, was classified as Type IV DBI. The anatomical location observed in this case is consistent with previous studies reporting a higher prevalence of DBI in the mandibular premolar–molar region.[3,9]

Furthermore, the absence of a radiolucent halo and lack of cortical expansion in this case are in accordance with the typical radiographic presentation of DBI described in the literature.[6] The lesion was asymptomatic and identified incidentally during routine panoramic radiography, which aligns with previous reports describing DBI as a non-progressive and clinically insignificant condition.[7,11]

Generally, DBI remains stable over time and does not require treatment. However, in certain cases, particularly when lesion growth is observed, further evaluation may be necessary. Surgical intervention, such as biopsy, is only recommended when there is a significant increase in size, defined as approximately 25% within six months or 50% within one year.[13,14] In the absence of such progression, conservative management with periodic radiographic monitoring is considered appropriate.

The principal radiographic differential diagnoses for dense bone island (DBI) include hypercementosis and periapical cemento-osseous dysplasia (PCOD) mature stage, as these lesions may present as radiopaque findings in the periapical region. However, several distinguishing features facilitate an accurate diagnosis.[15,16] DBI is characterised by a homogeneous radiopaque mass within the cancellous bone that is not fused to the tooth root and typically lacks a surrounding radiolucent rim. In contrast, hypercementosis represents excessive deposition of cementum that remains continuous with the root surface, resulting in enlargement of the root while preserving the periodontal ligament space and lamina dura. PCOD in its mature stage may also appear radiopaque; however, it is usually surrounded by a thin radiolucent rim and demonstrates a characteristic progression from an initial radiolucent stage to a mixed radiolucent-radiopaque stage before becoming predominantly radiopaque. [17-21] In the present case, the lesion was not continuous with the root surface and showed no peripheral radiolucent rim. These findings support the diagnosis of dense bone island and effectively exclude hypercementosis and periapical cemento-osseous dysplasia.

Panoramic radiography serves as an essential diagnostic tool for detecting and assessing DBI, offering a broad visualization of the maxillofacial complex that facilitates the discovery of asymptomatic lesions.[6,22]

Overall, the presented clinical and radiographic findings in this case are consistent with the existing literature, emphasizing the importance of accurate radiographic interpretation in achieving a definitive diagnosis and preventing unwarranted invasive procedures.

Table 1. Comparison of dense bone island, hypercementosis and periapical cemento-osseous dysplasia

Feature	Dense Bone Island	Hypercementosis	Periapical Cemento-osseous Dysplasia
Relation to tooth	Separate from root	Fused to root surface	Usually adjacent to root apex
Attachment to root	No	Yes	No
Periodontal ligament space	Usually intact	Intact and surrounds enlarged root	Usually preserved
Radiolucent rim	Absent	Absent	Present, especially in mature lesions
Internal appearance	Homogeneous radiopacity	Root-shaped radiopacity	Mixed → mature radiopacity
Progression	Usually stable	Slowly enlarges with root	Radiolucent → mixed → radiopaque
Tooth vitality	Vital	Vital	Vital
Shape	Round/oval	Enlarged root (bulbous-shaped)	Round/oval or irregular

CONCLUSION

Panoramic radiography is an effective adjunctive diagnostic modality for identifying pathological and non-pathological conditions in the maxillofacial region, thereby guiding clinical decision-making, particularly in determining the need for surgical intervention. Accurate radiographic identification of Dense Bone Island (DBI) is essential, as it represents a benign and asymptomatic condition that does not require invasive treatment. In this case, the characteristic radiographic features enabled a definitive diagnosis of Type III and Type IV DBI, allowing clear differentiation from other radiopaque lesions such as hypercementosis and periapical cemento-osseous dysplasia. This distinction is clinically significant, as misinterpretation may lead to unnecessary procedures, including biopsy or endodontic intervention. Consequently, an appropriate conservative management approach with periodic monitoring was implemented, avoiding overtreatment while ensuring optimal patient care.

DECLARATION

Authors Contributions

[CCH]: Methodology, Writing – Original Draft; **[RT]:** Conceptualization, Investigation, Formal Analysis, Writing – Original Draft; **[IF]:** Supervision, Validation, Writing – Review & Editing; **[SPAA]:** Validation, Writing – Review & Editing. All authors have read and approved the published version of the manuscript and agreed to be accountable for all aspects of the work.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Informed consent was already obtained from the patient.

Consent for Publication
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Data Availability Statement
The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Declaration of Generative AI In Scientific Writing
The authors declare that no generative AI or AI-assisted technologies were used in the writing or preparation of this manuscript. The authors reviewed, verified, and edited all outputs and take full responsibility for the integrity and accuracy of the publication.

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