



CASE REPORT:

Stafne Bone Defect of the Mandible: Radiologic Features and Diagnostic Considerations from a Case Report and Literature Review

Defecto óseo de Stafne de la mandíbula: características radiológicas y consideraciones diagnósticas a partir de un reporte de caso y revisión de la literatura

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Received: 2-VI-2026

Accepted: 27-VIII-2026

ABSTRACT: Stafne bone defect (SBD) is a rare, benign mandibular concavity usually detected incidentally on radiographic examinations. Although generally considered a static anatomical variation, its location and radiologic appearance may mimic cystic or neoplastic lesions. This article reviews the historical background, etiopathogenesis, imaging characteristics, anatomical variants, and differential diagnosis of SBD and presents a representative clinical case. A narrative literature search was conducted to contextualize the clinical and radiologic features of SBD. An incidental mandibular radiolucency was evaluated using panoramic radiography and cone-beam computed tomography (CBCT). SBD is typically described as a well-defined unilocular radiolucency below the mandibular canal associated with a lingual cortical depression containing salivary gland tissue. CBCT and magnetic resonance imaging improve diagnostic accuracy and facilitate identification of atypical variants, including anterior, condylar, buccal, bilateral, and multilocular defects. In the present case, CBCT confirmed a lingual cortical concavity without cortical expansion or root involvement, supporting conservative management. Recognition of the radiologic spectrum of SBD is essential to establish an accurate diagnosis and avoid unnecessary surgical intervention.

KEYWORDS: Mandible; Bone cysts; Salivary glands; Cone-beam computed tomography; Magnetic resonance imaging; Stafne bone defect; Static bone cavity.

RESUMEN: El defecto óseo de Stafne (DOS) es una concavidad mandibular benigna y poco frecuente, generalmente detectada de manera incidental en exámenes radiográficos. Aunque suele considerarse una variación anatómica estática, su localización y apariencia radiológica pueden simular lesiones quísticas o neoplásicas. Este artículo revisa los antecedentes históricos, la etiopatogenia, las características imagenológicas, las variantes anatómicas y el diagnóstico diferencial del DOS, y presenta un caso clínico representativo. Se realizó una búsqueda narrativa de la literatura para contextualizar las características clínicas e imagenológicas del DOS. Una radiolucidez mandibular incidental fue evaluada mediante radiografía panorámica y tomografía computarizada de haz cónico (CBCT). El DOS se describe típicamente como una radiolucidez unilocular bien definida, localizada por debajo del conducto mandibular y asociada con una depresión de la cortical lingual que contiene tejido de glándula salival. La CBCT y la resonancia magnética mejoran la precisión diagnóstica y facilitan la identificación de variantes atípicas, incluidas las formas anterior, condilar, vestibular, bilateral y multilocular. En el presente caso, la CBCT confirmó una concavidad cortical lingual sin expansión cortical ni compromiso radicular, lo que respaldó un manejo conservador. El reconocimiento del espectro radiológico del DOS es esencial para establecer un diagnóstico preciso y evitar intervenciones quirúrgicas innecesarias.

PALABRAS CLAVE: Mandíbula; Quistes óseos; Glándulas salivales; Tomografía computarizada de haz cónico; Imagen por resonancia magnética; Defecto óseo de Stafne; Cavity ósea estática.

INTRODUCTION

Stafne bone defect (SBD) is a rare, benign mandibular concavity that is usually asymptomatic and most often detected incidentally during radiographic examinations performed for unrelated diagnostic purposes. The entity was first described in 1942 by Stafne, who reported a series of well-defined radiolucent cavities located below the mandibular canal near the mandibular angle. In this landmark report, these lesions were characterized as asymptomatic and non-progressive, suggesting that they represent an anatomical variant rather than a pathological entity (1).

Since its original description, the lesion has been referred to by several terms, including static bone cavity, lingual mandibular bone defect, and mandibular salivary gland depression. Early reports occasionally classified it as a cyst; however, subsequent histopathological studies demonstrated the absence of an epithelial lining, confirming that SBD does not correspond to a true cystic lesion (2,3). Epidemiologically, SBD predo-

minantly affects middle-aged to elderly males and has a reported prevalence generally below 1%, with most cases identified incidentally on panoramic radiographs obtained for unrelated dental reasons (4,5). Nevertheless, increasing reports in pediatric patients and younger individuals have challenged the traditional view of SBD as an exclusively adult condition (6,7).

Radiographically, SBD typically appears as a well-defined unilocular radiolucency with sclerotic borders located on the lingual surface of the posterior mandible. Because of this appearance, it must be differentiated from odontogenic cysts, benign tumors, and other mandibular lesions (8,9). Advances in imaging modalities, particularly cone-beam computed tomography (CBCT) and magnetic resonance imaging (MRI), have substantially improved diagnostic accuracy by enabling detailed assessment of cortical morphology and lesion content (10-12). Although the posterior mandible remains the most frequently affected site, atypical presentations involving the anterior mandible, mandibular angle, buccal cortex, or condyle have

increasingly been reported (13-15). These variants may complicate diagnosis and increase the risk of misinterpretation as pathological lesions, occasionally leading to unnecessary diagnostic procedures or surgical exploration (16,17).

The exact etiopathogenesis of SBD remains uncertain. The most widely accepted hypothesis attributes the defect to pressure-induced bone resorption caused by adjacent salivary gland tissue, particularly the submandibular gland, although developmental and growth-related mechanisms have also been proposed, especially in cases diagnosed during childhood (18,19). Given the expanding clinical and radiological spectrum of SBD, a comprehensive understanding of its historical background, imaging characteristics, and diagnostic challenges is essential. Therefore, the aim of this study was to review the current evidence on Stafne bone defect and to present a representative clinical case highlighting its radiologic features and diagnostic considerations.

MATERIALS AND METHODS

LITERATURE SEARCH STRATEGY

A narrative literature search was conducted to identify relevant publications on Stafne bone defect of the mandible. The search was performed in PubMed, Scopus, Web of Science, and Embase. The terms used included “Stafne defect,” “Stafne bone defect,” “static bone cavity,” “lingual mandibular bone defect,” and “mandibular salivary gland depression,” combined with “mandible,” “panoramic radiography,” “cone-beam computed tomography,” “CBCT,” and “magnetic resonance imaging.” The search covered publications from 1942, when the condition was first described, to February 2026. The review primarily focused on contemporary evidence, while Stafne’s original

1942 publication was included to provide historical context. The reference lists of relevant articles were also manually screened to identify additional pertinent studies.

ELIGIBILITY CRITERIA

Peer-reviewed articles in English were considered when they addressed the epidemiology, etiopathogenesis, imaging features, anatomical variants, differential diagnosis, or clinical management of Stafne bone defect. Case reports, case series, observational imaging studies, and review articles were included when they contributed relevant diagnostic or clinical information. Articles were excluded when they were unrelated to mandibular or maxillofacial findings, lacked sufficient diagnostic or imaging information, or full text was not available.

STAFNE BONE DEFECT

HISTORICAL EVOLUTION

Since Stafne first described this entity in 1942, the understanding of this mandibular concavity has progressively evolved. Early uncertainty regarding its nature led to inconsistent terminology and varying interpretations. With advances in imaging techniques and histopathological correlation, Stafne bone defect (SBD) is now widely recognized as a non-pathological anatomical variant, supporting conservative diagnostic approaches (2,3).

Subsequent developments in cross-sectional imaging and long-term observational studies have reinforced the view that SBD represents a benign anatomical concavity rather than a pathological process, consolidating current clinical practice that favors conservative diagnosis and management.

ETIOPATHOGENESIS

The salivary gland hypothesis remains the most widely accepted explanation for the development of Stafne bone defect. This concept is supported by CBCT and MRI findings demonstrating continuity between the osseous concavity and adjacent salivary gland tissue, most commonly the submandibular gland (11,18).

Nevertheless, alternative mechanisms have been proposed. Developmental and growth-related theories attempt to explain cases diagnosed in younger individuals, as well as non-static variants in which changes in lesion size or morphology are observed over time (7,20). These observations suggest that SBD may represent a spectrum of anatomical variations influenced by both developmental and mechanical factors.

ANATOMICAL VARIANTS AND ATYPICAL PRESENTATIONS

Although posterior mandibular involvement below the mandibular canal on the lingual surface remains the classical presentation, increasing evidence has documented atypical locations and configurations. Reported variants include anterior mandibular defects, bilateral involvement, double cavities, buccal cortical localization, and condylar defects (9,13-15,21,22).

These atypical presentations broaden the classical definition of SBD and may pose important diagnostic challenges, particularly when evaluation relies solely on conventional radiography (13-15,21,22). Awareness of these variants is essential, as unusual locations may mimic odontogenic or non-odontogenic pathological lesions, increasing the risk of misinterpretation and unnecessary surgical exploration (16,17,25).

IMAGING CHARACTERISTICS

Early reports highlighted the value of cone-beam computed tomography in the evaluation of Stafne bone defect, enabling precise visualization of lingual cortical concavities and lesion boundaries even before the widespread adoption of advanced imaging protocols (23).

Panoramic radiography often provides the first indication of SBD; however, CBCT is currently considered the imaging modality of choice for definitive evaluation (10,12). Magnetic resonance imaging (MRI) may further contribute by identifying soft tissue content within the defect, particularly salivary gland tissue (23).

In addition to conventional imaging techniques, emerging artificial intelligence-based approaches have shown promising results in improving diagnostic accuracy. Deep learning algorithms applied to panoramic radiographs have demonstrated the ability to differentiate SBD from pathological mandibular radiolucencies, potentially reducing misdiagnosis and unnecessary interventions (24).

DIFFERENTIAL DIAGNOSIS

The radiographic appearance of Stafne bone defect requires careful differentiation from a wide spectrum of mandibular pathologies, including odontogenic cysts, fibro-osseous lesions, and both benign and malignant neoplasms. Several reports describe lesions initially misdiagnosed as pathological entities, such as ossifying fibroma or connective tissue neoplasms, when evaluation was based solely on panoramic radiographic findings (16,17,25).

Advanced imaging modalities, particularly CBCT and MRI, play a crucial role in the differen-

tial diagnosis by demonstrating preserved cortical integrity and identifying soft tissue content compatible with salivary gland tissue (10-12,23). Accurate differentiation is essential to prevent overtreatment and avoid unnecessary invasive procedures (4,26,27).

CLINICAL MANAGEMENT

Once a definitive diagnosis of Stafne bone defect is established, conservative management with periodic radiological follow-up is widely recommended. Given its benign and typically non-progressive nature, surgical intervention is generally unnecessary and should be reserved for cases in which diagnostic uncertainty persists despite advanced imaging (4,26,27).

The increasing availability of high-resolution CBCT and MRI has further reduced the need for surgical exploration, supporting a non-invasive diagnostic approach that prioritizes patient safety while ensuring diagnostic confidence (10-12,23).

CASE REPORT

ETHICAL CONSIDERATIONS

The clinical data and images presented in this report were obtained in accordance with institutional ethical standards and the principles of the Declaration of Helsinki. Written informed consent was obtained from the patient for publication of clinical information and radiographic images.

PATIENT INFORMATION

A 53-year-old man presented to a university-affiliated dental teaching and care center with diffuse mandibular discomfort in the right posterior quadrant that had persisted for several weeks. The symptoms were clinically associated with occlusal trauma and chronic infection of non-restorable molars. The patient reported no extraoral swelling, sensory disturbances, or limitation of mouth opening.

CLINICAL FINDINGS

Intraoral examination revealed extensive carious destruction of posterior teeth, occlusal wear facets consistent with traumatic contacts, partial edentulism, and generalized plaque accumulation. Palpation of the mandibular region revealed no swelling, fluctuation, or cortical expansion. Both vestibular and lingual cortical plates appeared clinically intact.

DIAGNOSTIC ASSESSMENT

As part of the diagnostic evaluation, a panoramic radiograph was obtained. The image revealed a well-circumscribed unilocular radiolucency in the right posterior mandible, located inferior to the mandibular canal and anterior to the mandibular angle. No evidence of cortical perforation, root resorption, or surrounding bone reaction was observed. Although the lesion was asymptomatic and incidentally detected, its

radiographic appearance warranted a differential diagnosis that included odontogenic cysts (periapical, dentigerous, and keratocystic), ameloblastoma, fibrous dysplasia, and focal bone marrow defects (7,16).

To further characterize the lesion, cone-beam computed tomography (CBCT) was performed. Axial, sagittal, and coronal reconstructions demonstrated a well-defined lingual cortical depression measuring approximately 12.3×20.8 mm, with preserved cortical margins, no buccal cortical involvement, and no relationship with adjacent tooth roots. These imaging features were consistent with Stafne bone defect (SBD), and therefore no biopsy or surgical intervention was indicated (12,13) (Figure 1, Figure 2).

THERAPEUTIC INTERVENTION

The affected mandibular molars were extracted due to focal infection, occlusal trauma,

and prosthodontic treatment planning. The Stafne bone defect was managed conservatively with clinical observation and radiological follow-up (2).

FOLLOW-UP AND OUTCOMES

At the one-year follow-up, panoramic radiography demonstrated that the bone cavity remained stable in size and morphology. The patient reported complete resolution of pain after dental extractions, with no complications during the follow-up period. The absence of clinical symptoms and the radiographic stability of the lesion were consistent with the diagnosis of Stafne bone defect (1,15).

PATIENT PERSPECTIVE

The patient reported feeling reassured after learning that the lesion represented a benign anatomical condition. He expressed satisfaction with the conservative management plan and adhered to the recommended follow-up visits.

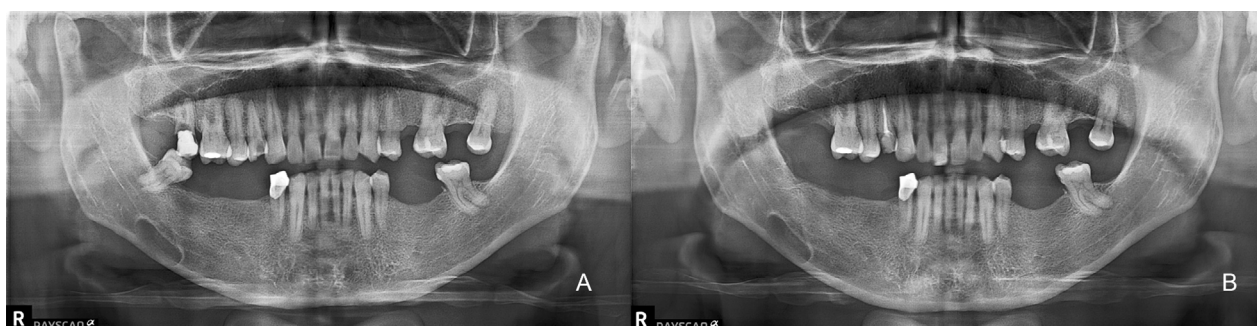


Figure 1. Baseline panoramic radiograph (A) showing a well-defined radiolucent area in the right mandibular angle. Follow-up panoramic radiograph obtained after one year (B) demonstrating no significant changes in size, morphology, or cortical integrity, consistent with a stable Stafne bone defect.

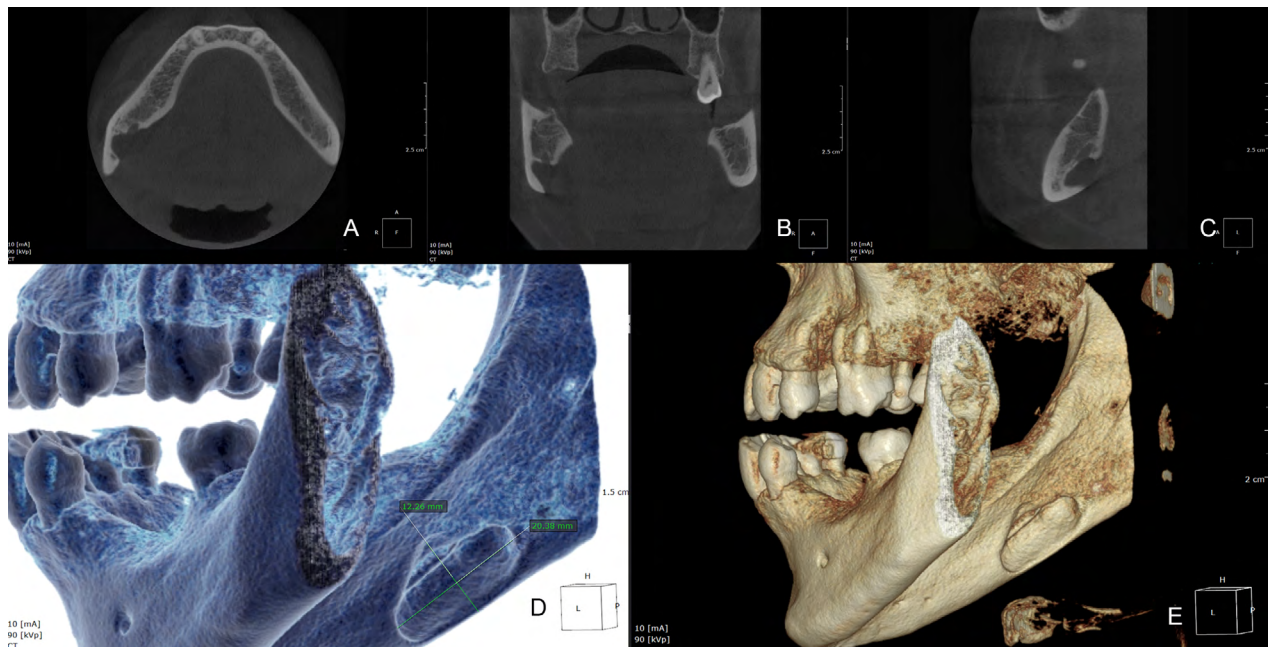


Figure 2. Cone-beam computed tomography (CBCT) evaluation of the lesion and three-dimensional reconstruction. (A) Axial view, (B) coronal view, and (C) sagittal view demonstrating a well-defined lingual cortical concavity in the right posterior mandible. (D) Digital measurements showing preserved cortical margins and absence of buccal cortical expansion. (E) Three-dimensional reconstruction illustrating the spatial relationship between the defect and adjacent mandibular structures.

DISCUSSION

Stafne bone defect (SBD) is an uncommon benign mandibular anomaly most often detected as an incidental radiographic finding. It is typically described as a non-progressive anatomical concavity located in the posterior mandible inferior to the mandibular canal (1,3,28-30). In the present case, the lesion was identified during imaging performed to investigate diffuse mandibular discomfort initially attributed to traumatic occlusion and chronic dental infection. The detection of a circumscribed radiolucency beneath the mandibular canal in a clinically asymptomatic region illustrates the diagnostic challenge posed by anatomical variants that may mimic pathological lesions (8,16).

The reported prevalence of SBD is low, generally ranging from 0.1% to 0.48%, (32) although larger epidemiological studies have described frequencies approaching 1% in certain populations (31-33). The present case corres-

ponds to the demographic profile most frequently described in the literature, affecting a middle-aged male in the sixth decade of life (4-7) (Table 1).

Radiographically, SBD classically appears as a solitary unilateral radiolucent defect with well-defined corticated margins in the posterior mandible (1,10,33). Although this presentation is typically characteristic, several atypical variants have been reported, including bilateral lesions, buccal cortical involvement, and alterations in mandibular contour (13-15,21). These variants may complicate interpretation and increase the risk of misdiagnosis as pathological lesions (16).

The differential diagnosis therefore includes odontogenic cysts, ameloblastoma, fibrous dysplasia, and focal bone marrow defects (7,16,25). In the present case, the coexistence of dental infection and mandibular discomfort initially raised suspicion of a pathological process; however, careful radiographic evaluation allowed correct

identification of the lesion as a developmental anatomical variant (9).

Advanced imaging techniques, particularly cone-beam computed tomography (CBCT), play a pivotal role in confirming the diagnosis (10-12). In this patient, CBCT enabled detailed evaluation of lesion location, extension, and cortical integrity. Multiplanar reconstructions demonstrated a lingual cortical depression without buccal expansion or root involvement, findings consistent with previously reported imaging characteristics of SBD (12,23,34).

Although the exact pathogenesis remains uncertain, two principal mechanisms have been proposed. The most widely accepted explanation attributes the defect to pressure-induced bone resorption caused by adjacent salivary gland tissue, particularly the submandibular gland (2,18). Histopathological studies demonstrating salivary gland tissue within similar defects support this hypothesis, (17,29) while developmental mechanisms have also been suggested, especially in cases diagnosed in younger individuals (6,20).

Beyond the description of the present case, the narrative review identified several consistent

patterns across the included studies (Table 2). Stafne bone defect predominantly affects middle-aged men and is most often detected incidentally on radiographic examination of the posterior mandible. Recent publications have increasingly shifted from the description of typical presentations toward the characterization of atypical anatomical variants and the refinement of imaging-based diagnosis, particularly through cone-beam computed tomography. This evolution underscores the growing role of advanced imaging in improving diagnostic confidence and preventing unnecessary surgical intervention.

From a clinical perspective, accurate recognition of SBD is essential to prevent unnecessary surgical intervention. Unlike neoplastic or inflammatory bone lesions, SBD generally remains asymptomatic and radiographically stable over time (14,26,27). In the present case, one-year follow-up confirmed the non-progressive behavior of the defect, supporting a conservative management strategy. The resolution of symptoms after dental extraction further indicated that the radiographic finding represented an incidental anatomical variation unrelated to the patient's initial complaint. The principal clinical, anatomical, and imaging features of Stafne bone defect are summarized in Table 1.

Table 1. Clinical, epidemiological, and imaging characteristics of Stafne bone defect.

Category	Variable	Description
Epidemiology	Predominant age	Middle-aged and elderly adults; occasional cases reported in pediatric patients (1,6,7,31-34)
	Sex distribution	Male predominance (4,5)
Anatomical characteristics	Typical location	Posterior mandible, inferior to the mandibular canal on the lingual surface (1,10)
	Atypical locations	Anterior mandible, mandibular angle, condyle, buccal cortex (13-15)
Clinical features	Clinical presentation	Usually asymptomatic; frequently detected as an incidental radiographic finding (2)
Radiographic findings	Panoramic radiograph	Well-defined unilocular radiolucency with corticated borders (8)
	CBCT characteristics	Lingual cortical depression with preserved cortical margins and no buccal expansion (10,12)
	MRI characteristics	Soft tissue content compatible with salivary gland tissue (11)
Etiopathogenesis	Proposed mechanisms	Pressure-induced bone resorption from adjacent salivary gland tissue; developmental variants (18,19)
Differential diagnosis	Radiological differential diagnosis	Odontogenic cysts, fibro-osseous lesions, benign or malignant tumors (16,17,25)
Management	Clinical management	Conservative approach with periodic radiologic follow-up; surgery rarely indicated (4,26)

Table 2. Demographic, clinical, and radiological trends identified in the reviewed literature on Stafne bone defect.

Study	Design	n	Mean age	Male (%)	Predominant location	Main imaging	Clinical implication
Philipsen <i>et al.</i> , 200228	Literature review + case series	652	NR	Predominantly male	Posterior	Panoramic	Established the epidemiological profile of SBD
Hisatomi <i>et al.</i> , 201932	Retrospective	91	58.5	74.7	Posterior	Panoramic	Most lesions were incidental and asymptomatic
Morita <i>et al.</i> , 202134	CT study	40	57.3	70	Posterior	CT	Detailed tomographic characterization
Huang <i>et al.</i> , 202210	Retrospective	6	NR	NR	Posterior	CBCT	Proposed a CBCT-based morphologic classification
Yamany <i>et al.</i> , 202512	Case series	4	39.5	75	Posterior	CBCT	Reinforced the value of CBCT for diagnosis
Kopciuch <i>et al.</i> , 202514	Literature review + case series	3	NR	NR	Anterior	CBCT	Highlighted the rarity of anterior SBD and the role of conservative follow-up

CONCLUSIONS

Stafne bone defect represents a distinctive anatomical variant of the mandible whose recognition remains clinically important despite its benign nature. The integration of current evidence with the present case underscores the value of careful radiographic interpretation when well-circumscribed mandibular radiolucencies are identified incidentally. Advanced imaging modalities, particularly cone-beam computed tomography, allow accurate characterization of the characteristic lingual cortical depression and facilitate reliable differentiation from pathological lesions. Awareness of this entity is essential to establish an appropriate conservative approach, ensuring diagnostic confidence while preventing unnecessary surgical interventions.

DECLARATIONS

CONSENT FOR PUBLICATION: Written informed consent was obtained from the patient for the publication of this case report and any accompanying images.

COMPETING INTERESTS: The authors declare that they have no competing interests.

FUNDING: This study did not receive external funding.

AUTHOR CONTRIBUTION STATEMENT: Conceptualization and Clinical Protocol Design: C.A.P.A.; Literature Review and Case Selection: Y.V.M., G.A.S.H. and M.A.L.F.; Methodology and Data Analysis: C.M.S. and M.A.L.F.; Clinical Documentation and Resources; Y.V.M. and G.A.S.H.; Writing – Original Draft Preparation: C.M.S.; Writing – Critical Review and Editing: C.A.P.A., C.M.S. and M.A.L.F.; Supervision, Validation, and Project Administration: C.A.P.A.

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