

Diagnosis of Calcified Atheroma Plaque on Panoramic Radiography with Subsequent Confirmation by Doppler Ultrasound: Case Report

Irineu Gregnanin Pedron^{1*}, Mauricio Teixeira Duarte², Marcelo do Lago Pimentel Maia³, Marcelo Yoshimoto⁴, Leopoldo Penteadu Nucci da Silva⁵, Élio Hitoshi Shinohara⁶

¹DDS, MDS. Professor, Department of Periodontics and Integrated Clinic, School of Dentistry, Centro Universitário Braz Cubas, Mogi das Cruzes, and Independent Researcher, ISO Radiologia Odontológica (Itaquera), São Paulo, Brazil.

²DDS, MDS, PhD. Head and Professor, School of Dentistry, Faculdade de Ciências Médicas da Santa Casa de São Paulo, São Paulo, Brazil.

³DDS, MSc. Independent Researcher, ISO Radiologia Odontológica (Itaquera e Osasco), São Paulo, Brazil.

⁴DDS, MDS, PhD. Independent Researcher, MY Institute, São Paulo, Brazil.

⁵DDS, MDS, PhD. Hospital Israelita Albert Einstein, São Paulo, Brazil; Hospital Universitário Prof. Alberto Antunes, Alagoas, Brazil; Centro Universitário Afya Maceio, Brazil.

⁶DDS, PhD. Assistant Surgeon, Department of Oral and Maxillofacial Surgery, Hospital Regional de Osasco (SUS/SP). OMF Residency Program and ColosSUS Bucal, Osasco, Brazil.

*Corresponding Author: Irineu Gregnanin Pedron, DDS, MDS. Professor, Department of Periodontics and Integrated Clinic, School of Dentistry, Centro Universitário Braz Cubas, Mogi das Cruzes, and Independent Researcher, ISO Radiologia Odontológica (Itaquera), São Paulo, Brazil.

<https://doi.org/10.58624/SVOADE.2026.07.010>

Received: February 21, 2026

Published: March 06, 2026

Citation: Pedron IG, Duarte MT, Maia MLP, Yoshimoto M, da Silva LPN, Shinohara EH. Diagnosis of Calcified Atheroma Plaque on Panoramic Radiography with Subsequent Confirmation by Doppler Ultrasound: Case Report. *SVOA Dentistry* 2026, 7:2, 68-72. doi: 10.58624/SVOADE.2026.07.010

Abstract

Atherosclerosis represents a serious global public health problem. Early identification of calcified atheromatous plaques in the carotid artery is essential for the prevention of cerebrovascular and cardiovascular events. Panoramic radiography, a routine examination in Dentistry, allows incidental detection of these calcifications in the soft tissues of the neck, at the level of the C3 and C4 vertebrae. The purpose of this article is to present a case of initial detection of calcified atheroma plaque, first observed on panoramic radiography and later confirmed by ultrasound examination. The diagnostic accuracy of panoramic radiography in detecting atheromas, the importance of differential diagnosis, and the imperative need for confirmation by Doppler ultrasound were discussed. Panoramic radiography, an effective dental screening tool, can assist the dental surgeon in initial detection, even if incidental, giving them an important role in public, systemic, and oral health. Upon identifying such calcifications, the dental surgeon should refer the patient for specialised medical evaluation and confirmatory tests.

Keywords: *Dentistry; Atherosclerosis; Panoramic Radiography; Carotid Artery Diseases; Ultrasonography; Early Diagnosis.*

Introduction

Atherosclerosis is a chronic inflammatory disease characterised by the accumulation of fatty plaques, cholesterol and other substances in the arterial walls. Atherosclerosis is the leading cause of cardiovascular morbidity and mortality in Brazil and worldwide. The silent progression of this pathology often culminates in fatal outcomes, such as stroke and acute myocardial infarction. In this context, the identification of calcifications in the carotid artery becomes a crucial marker of vascular and systemic risk¹⁻³.

Dentistry, through imaging, is strategically inserted into this early diagnosis scenario. Panoramic radiography, widely requested for the diagnosis and planning of dental treatments, covers the anatomical region of the cervical vertebrae (C3 and C4), where the bifurcation of the carotid artery is located. Calcified atheromatous plaques often appear as incidental findings in these examinations: radiopaque nodular, vertical or irregular masses, located posteroinferior to the angle of the mandible and adjacent to the epiglottic air space^{1,4,5}.

Although the diagnostic accuracy of panoramic radiography for this purpose has been corroborated by meta-analysis studies⁶, the definitive diagnosis cannot be based exclusively on two-dimensional dental imaging, requiring confirmation by more specific methods, such as Doppler ultrasound^{1,4,7}. In this perspective, the purpose of this article is to present the case of the initial detection of calcified atheroma plaque, initially observed on panoramic radiography and subsequently confirmed by Doppler ultrasound examination.

Case Presentation

An African-descendent male patient, 69 years-old, attended the dental clinic for periodontal follow-up.

Periodontal treatment was performed 18 months ago. Clinically, the patient presented excellent gingival condition, good motivation and favourable prognosis (Figure 1).

Regarding systemic health, the patient reported type II diabetes mellitus and high blood pressure. As a result of these diseases, metformin 1000mg and amlodipine 10mg, respectively, are usually administered.

The panoramic radiograph confirmed the healthy appearance of the periodontium, showing only bone resorption of the alveolar processes in both jaws, resulting from previously treated periodontal disease (Figure 2). However, in the region below the mandibular angles, elongated and circular radiopaque images were observed (arrows - Figure 3).

Given the characteristics presented and the anatomical region, the diagnostic possibility of calcified atheroma plaque was raised. In this regard, the patient was referred to a cardiologist in writing, in a letter, with the diagnostic hypothesis.

After three months, the patient returned for a periodontal follow-up appointment. At this appointment, the patient presented the tests requested by the cardiologist. The Doppler ultrasound showed signs of atheromatosis with fibrocalcified plaque on the posterior wall of the left ventricle. Blood flow was considered normal (Figure 4).

In addition to the drugs already administered, the cardiologist is now administering 40 mg of atorvastatin to the patient.

The patient continues to receive periodontal care and is in good condition.



Figure 1. Clinical aspect of the patient undergoing periodontal control.



Figure 2. Panoramic radiograph for periodontal follow-up.

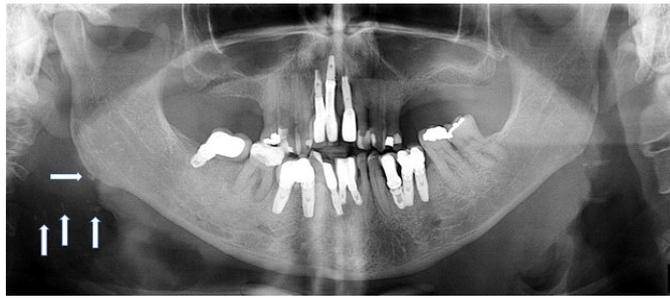


Figure 3. Panoramic radiograph showing radiopaque images suggestive of calcified atheromas (arrows).

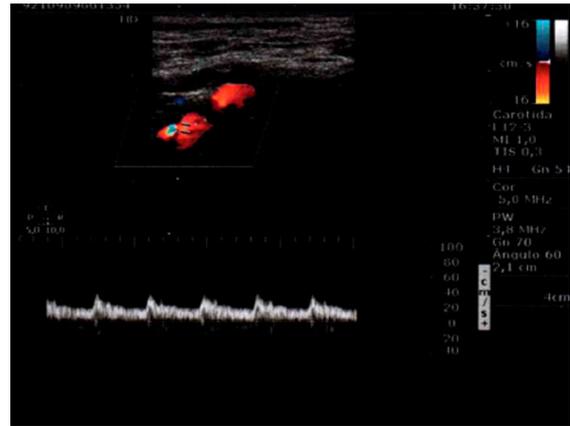


Figure 4. Doppler ultrasound confirming the presence of calcified atheromatous plaques in the carotid artery.

Discussion

When faced with a suggestive finding, clinical protocol requires referral to a physician (cardiologist or vascular surgeon)¹. It is important to emphasise that, given the seriousness of the case, the referral should always be made in writing, as we have recommended here. Many patients underestimate the severity of atherosclerosis as a risk factor for cerebrovascular and cardiovascular diseases and do not follow the referral to a physician, running greater risks of systemic health complications.

Diagnostic confirmation is primarily performed by Doppler ultrasound (Duplex Scan), a non-invasive, radiation-free, low-cost examination capable of assessing the degree of stenosis and blood flow haemodynamics⁷⁻⁹. Other tests such as angiotomography and magnetic resonance imaging may be requested for more detailed assessments of vascular anatomy and plaque composition, especially in surgical cases¹⁰.

The validity of panoramic radiography in detecting atheromas is widely debated and validated in the literature, provided it is understood as a screening method and not a final diagnosis. Panoramic radiography has moderate sensitivity for identifying calcifications, but requires confirmation^{6,11}. Subsequent confirmation of the presence of calcified atheromatous plaques by Doppler ultrasound has established an effective line of care^{1,7}.

Contemporary literature points to a direct correlation between the presence of these calcifications in dental examinations and an increase in white blood cell count, suggesting an active systemic inflammatory state¹¹. From this perspective, this serological characteristic can also be expected in patients with periodontal disease, given that it is an infectious disease.

Delving deeper into this correlation, recent studies bring new perspectives on the morphology of calcifications. Bladh et al.⁸ (2024) observed that defined forms of calcifications in panoramic radiographs correlate with specific signs of cardiovascular disease on ultrasound. Similarly, Karlsson et al.⁹ (2025) reinforced that the severity of calcifications visualised on panoramic radiographs is directly associated with the severity of vascular disease measured on carotid ultrasound. However, Kwon et al.¹⁰ (2022) warned, when comparing panoramic radiographs with Computed Tomography Angiography (CTA) in patients with and without stroke, that the absence of calcification on panoramic radiography does not completely rule out risk, since non-calcified (unstable) plaques are not visible on conventional X-rays.

The presence of calcified atheromatous plaque in the carotid artery observed on panoramic radiography is not an isolated event, but a reflection of compromised systemic health. Positive radiographic images were associated with classic risk factors such as diabetes mellitus, hypertension, and dyslipidaemia^{3,12}. Additionally, the presence of calcified atheromatous plaque, periodontal bone loss, and osteoporosis was observed, suggesting a common inflammatory and tissue ageing syndrome [5].

Corroborating this inflammatory hypothesis, Chang et al.¹¹ (2021) demonstrated that elevated atherogenesis was associated with increased white blood cell counts in patients with positive findings on panoramic radiography. From this perspective, carotid calcifications on panoramic radiographs were considered independent predictors of future vascular risk^{1,2}.

The dental surgeon primarily performs differential diagnosis. It is important to note that not all radiopacity in the cervical region is an atheroma. It is imperative to distinguish calcified atheromatous plaques in the carotid artery from other anatomical structures (such as the hyoid bone, elongated styloid process, calcification of the stylohyoid ligament, triticeal cartilage and superior horn of the thyroid cartilage) and other pathologies (sialoliths in the submandibular gland, tonsilloliths and lymph node calcifications)^{1,6,12}. The location between the C3 and C4 vertebrae, below the mandibular angle, is the main topographical criterion for suspected atheroma.

To assist in this differentiation and reduce human subjectivity, Artificial Intelligence (AI) has emerged as a promising tool^{13,14}. Deep learning algorithms with high accuracy in detecting carotid plaques in panoramic radiographs have been used, suggesting that the future of diagnosis will involve clinical decision support software, minimising interpretation errors due to overlapping structures¹⁴.

Conclusions

Panoramic radiography transcends its primary dental function, establishing itself as a vital auxiliary tool in the early detection of calcifications in the carotid artery. The presence of these calcifications is strongly associated with high cardiovascular risks, diabetes, and systemic inflammatory processes. From this perspective, identification by the dental surgeon is possible through the evaluation of panoramic radiography. However, it is essential to recognise the limitations of two-dimensional examination and the need for rigorous differential diagnosis to avoid false positives with other cervical calcifications. Confirmation by Doppler ultrasound remains the gold standard. Therefore, the dental surgeon must take a proactive stance in comprehensive health, identifying lesions, informing the patient and making the appropriate medical referral, contributing decisively to the prevention of fatal outcomes such as stroke.

Conflict of Interest

The authors declare that they have no conflict of interest.

References

1. Pedron IG, Maia MLP. Diagnóstico de ateromas calcificados nas radiografias panorâmicas. *Rev Assoc Paul Cir Dent* 2024;78(2):118.
2. Garoff M, Ahlqvist J, Jäghagen EL, Wester P, Johansson E. Carotid calcifications in panoramic radiographs can predict vascular risk. *Dentomaxillofac Radiol* 2025;54(1):28-34.
3. Gustafsson N, Ahlqvist J, Norhammar A, Näslund U, Rydén L, Wester P, Jäghagen EL. Association of high cardiovascular risk and diabetes with calcified carotid artery atheromas depicted on panoramic radiographs. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2022;133(1):88-99.
4. Bladh M, Gustafsson N, Engström G, Kennbäck C, Klinge B, Nilsson PM, Jönsson D, Jäghagen EL. Defined shapes of carotid artery calcifications on panoramic radiographs correlate with specific signs of cardiovascular disease on ultrasound examination. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2024;137(4):408-420.
5. Ramesh A, Soroushian S, Ganguly R. Coincidence of calcified carotid atheromatous plaque, osteoporosis, and periodontal bone loss in dental panoramic radiographs. *Imaging Sci Dent* 2013;43(4):235-43.

6. Schroder AGD, Araujo CM, Guariza-Filho O, Flores-Mir C, Canto GL, Porporatti AL. Diagnostic accuracy of panoramic radiography in the detection of calcified carotid artery atheroma: a meta-analysis. *Clin Oral Investig* 2019;23(5):2021-2040.
7. Rocha BA, Carneiro LOB, Vespasiano A, Horta MCR. Detection of calcified carotid atheroma on panoramic dental radiography and its confirmation by Doppler ultrasound. *Einstein (Sao Paulo)* 2021;19:eAI5707.
8. Bladh M, Gustafsson N, Engström G, Kennbäck C, Klinge B, Nilsson PM, Jönsson D, Jäghagen EL. Defined shapes of carotid artery calcifications on panoramic radiographs correlate with specific signs of cardiovascular disease on ultrasound examination. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2024;137(4):408-420.
9. Karlsson A, Gustafsson N, Wester P, Zamure-Damberg L, Jäghagen EL. Carotid artery calcifications on panoramic radiographs are associated with vascular disease severity on carotid ultrasound. *Dentomaxillofac Radiol* 2025:twaf061.
10. Kwon Y-E, An C-H, Choi K-S, An S-Y. Comparison of carotid artery calcification between stroke and nonstroke patients using CT angiographic and panoramic images. *Dentomaxillofac Radiol* 2022;51(8):20210500.
11. Chang TI, Wu X, Boström KI, Tran HA, Couto-Souza PH, Friedlander AH. Elevated White Blood Cell Count Resultant Atherogenesis is Associated With Panoramic-Imaged Carotid Plaque. *J Oral Maxillofac Surg* 2021;79(5):1069-1073.
12. Barona-Dorado C, Gutierrez-Bonet C, Leco-Berrocal I, Fernández-Cáliz F, Martínez-González JM. Relation between diagnosis of atheromatous plaque from orthopantomographs and cardiovascular risk factors. A study of cases and control subjects. *Med Oral Patol Oral Cir Bucal* 2016;21(1):e66-71.
13. Kats L, Vered M, Zlotogorski-Hurvitz A, Harpaz I. Atherosclerotic carotid plaque on panoramic radiographs: neural network detection. *Int J Comput Dent* 2019;22(2):163-169.
14. Vinayahalingam S, van Nistelrooij N, Xi T, Heiland M, Bressemer K, Rendenbach C, Flügge T, Gaudin R. Detection of carotid plaques on panoramic radiographs using deep learning. *J Dent* 2024;151:105432.

Copyright: © 2026 All rights reserved by Pedron IG and other associated authors. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.