

What Are the Potential Implications of Identifying Intracranial Internal Carotid Artery Atherosclerotic Lesions on Cone-Beam Computed Tomography? A Systematic Review and Illustrative Case Studies

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Purpose: A systematic literature review was performed to examine the clinical implications of intracranial internal carotid artery calcific atherosclerotic lesions (IICACALs) detected at cone-beam computed tomographic (CBCT) examinations.

Materials and Methods: The PubMed database was queried in 2 separate searches using the linked search terms *non-contrast enhanced cone beam computed tomography and calcified intracranial vascular lesions* and *non-contrast enhanced computed tomography and calcified intracranial vascular lesions*. Reviewed were all English-language articles using CBCT or CT imaging that enrolled neurologically asymptomatic and symptomatic patients. Excluded were studies describing patients with hemorrhagic stroke. Illustrative cases describing incidentally detected IICACALs on CBCT scans are provided.

Results: Three articles described identification of IICACALs on CBCT scans of almost 1,500 dental patients. Two of these fully addressed the subject, with 1 noting that IICACALs were benign and another urging patient referral for further workup. Five non-contrast-enhanced CT studies were evaluated in detail; all confirmed IICACALs as a substantive risk marker of advanced stenotic disease in the cerebral circulation, central brain atrophy, concomitant advanced atherosclerotic disease in the cardiovascular circulation, and an indicator of future ischemic events. Five CBCT examinations showing IICACALs in the cavernous and ophthalmic segments are presented.

Conclusion: Few studies have denoted the importance of identifying IICACALs on CBCT scans. However, all non-contrast-enhanced CT studies emphasized the clinical significance of these lesions in relation to cerebral and cardiovascular disease. Therefore, IICACALs seen on CBCT and CT scans present the same risk and should prompt referral for further evaluation.

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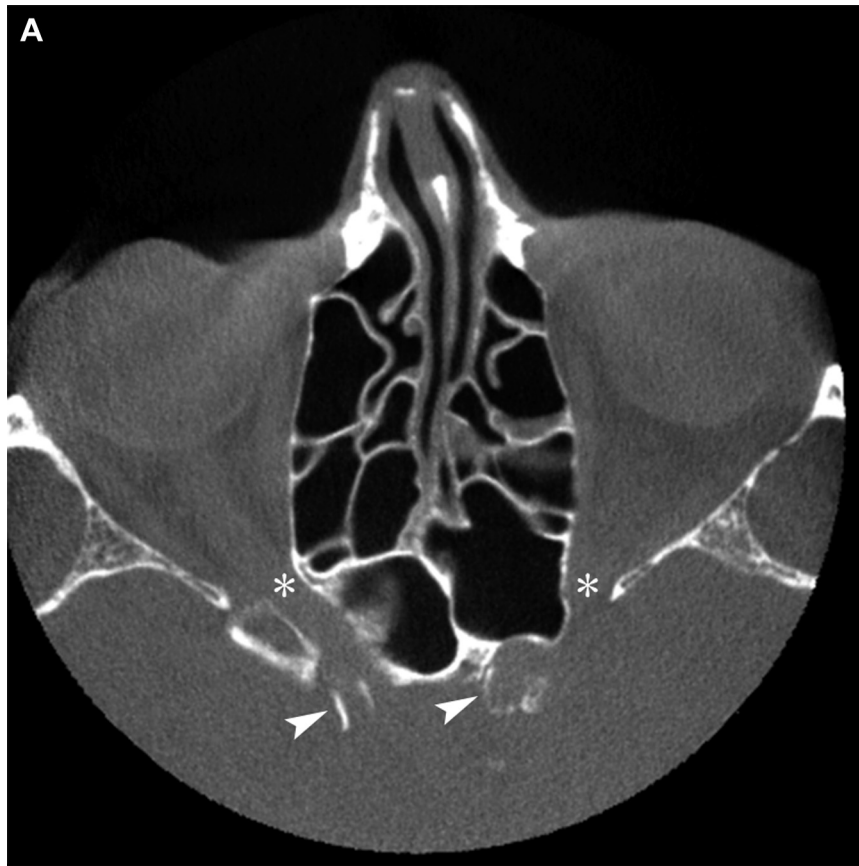


FIGURE 1. A, An axial section at the level of the optic canals (asterisks) visualizes bilateral calcifications in the ophthalmic segments (arrowheads) of the intracranial internal carotid artery. (**Fig 1 continued on next page.**)

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Each year almost 800,000 Americans have a stroke.¹ At admission to the emergency room, non-contrast-enhanced computed tomography (CT) of the brain is performed routinely to rule out hemorrhage and for consideration of intravenous thrombolytic therapy. These imaging studies have documented that intracranial internal carotid artery calcific atherosclerotic lesions (IICACALs) are in many instances the likely cause of the stroke in older patients from all ethnic groups.²⁻⁵ Furthermore, other studies have shown that these calcific lesions are associated with coronary artery disease (CAD) given the systemic nature of the atherosclerotic process.^{6,7} These lesions are just now being recognized on cone-beam CT (CBCT) studies of dental patients. However, uniformity as to their clinical significance is lacking. To clarify this situation, the authors designed a systematic review of the literature.

Materials and Methods

SEARCH STRATEGY

The systematic review was conducted by an explicit search of the literature published to date, using the US National Library of Medicine PubMed database,

aggregated by the linked search terms *cone beam computed tomography* and *calcified intracranial vascular lesions*. Searches were reviewed by 1 author (A.H.F.). Given the paucity of initial results and the authors' contention that the information garnered by studies using medical single-detector or /multidetector CT would likewise be relevant, a second search was undertaken using the linked terms *non-contrast enhanced computed tomography* and *calcified intracranial vascular lesions*.

INCLUSION AND EXCLUSION CRITERIA

Chosen for review were all articles using CBCT or CT imaging that enrolled neurologically asymptomatic and symptomatic male and female patients from any ethnic group. Excluded were studies describing patients with hemorrhagic stroke, traumatic injuries before neurologic surgery, or therapeutic irradiation of the brain.

SELECTION OF REPRESENTATIVE CASE STUDIES

For illustrative purposes, representative CBCT examinations were culled from the University of

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