

Summary of: Evaluation of carotid calcification detected using panoramic radiography and carotid Doppler sonography in patients with and without coronary artery disease

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FULL PAPER DETAILS

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Objectives Carotid artery calcification is responsible for an estimated 5% of ischaemic strokes. Carotid doppler sonography (DS) is a frequently used non-invasive method for assessing carotid artery stenosis and calcification. This study assessed the utility of panoramic radiography to detect any carotid artery calcification in patients with and without coronary artery disease, as well as the level of agreement between panoramic radiographs and DS findings. **Methods** Ninety subjects who underwent coronary angiography for any reason in Namazi Hospital, Shiraz University of Medical Science during an 11 month period received a DS assessment and panoramic radiograph. The radiopacities adjacent to the cervical vertebrae at or below the intervertebral space between C3–C4 were diagnosed as carotid artery calcifications. Carotid calcifications were scored as present or absent and pattern of calcification was noted by a maxillofacial radiologist who was blind to the angiogram and sonogram results. The final sample population was 84 subjects, providing data on 168 carotid arteries. **Results** The panoramic radiograph had a sensitivity of 66.6% and a positive predictive value of 45% for detecting carotid artery calcifications in patients whose angiograms confirmed the coronary artery disease. It had 50% sensitivity in patients with normal angiogram. The level of agreement between panoramic radiographs and DS results was weak. **Conclusion** Because of low sensitivity and positive predictive value, the panoramic radiograph can not be considered an accurate or reliable method for detecting carotid artery calcification.

EDITOR'S SUMMARY

The march of science is such that it throws up some tantalising possibilities which subsequently are found not to hold as much promise as originally thought. The exciting observation that carotid artery calcification may be detected on panoramic radiographs taken for the primary purpose of dental diagnosis spawned a whole raft of studies and papers. The hope was that opportunistic and possibly life saving detection of general disease conditions might accrue from otherwise routine examination.

Alas, this paper seems to indicate that the earlier hope has not been entirely fulfilled and that the reliability of such detection is at best, poor. This is particularly disappointing since the fur-

ther extrapolation that carotid artery calcification might be associated with coronary artery disease would also have dramatic medical implications leading from the humble dental OPG.

While the paper might be regarded as being negative in the sense that it dismisses some hitherto held views, it also has the power of reinforcing the value of the way in which our knowledge progresses. At all points in our development scientifically, clinically and technologically we have to believe that what we diagnose and advise, the treatments and therapies we apply are the best practice we know at the time. If further research and information changes these then we have to be prepared to change too. Similarly, we have to be ready to be honest with our patients as

well. When knowledge changes practice we have to be able to communicate effectively and carry those in our care along with us.

The full paper can be accessed from the *BDJ* website (www.bdj.co.uk), under 'Research' in the table of contents for Volume 207 issue 4.

Stephen Hancocks,
Editor-in-Chief

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IN BRIEF

- Panoramic radiographs do not seem to be a good screening tool for detection of carotid stenosis and are not cost effective for this purpose.
- There is poor clinical correlation between calcifications in panoramic radiographs and carotid ultrasound unless the patient has an advanced coronary problem.

COMMENT

In this study, the authors aimed to assess the reliability of panoramic radiography at detecting carotid artery calcification (CAC) in 90 patients who underwent coronary angiography, using duplex ultrasonography (DS) as the gold standard. Previous similar studies by others looked for CAC on panoramic radiographs and occasionally some of those identified with CAC would have ultrasound scans done. This study stands out from the rest because it has the opposite starting point: the patient group were those who had already undergone angiography and duplex sonography, therefore the identification of possible coronary and carotid artery disease was by the most reliable methods. To then try to compare panoramic findings makes these results much more robust than previous studies using panoramic radiography alone.

The results showed that for patients with normal angiogram, panoramic radiography had a sensitivity of 50%, specificity of 71.8%, a positive predictive value of 40% and a negative predictive value of 79.35% in detecting CAC. For patients with coronary artery disease, the respective values were 66.6%, 77.3%, 45% and 89.3%. The measurement of agreement between panoramic radiography and DS was weak (kappa statistic $k = 0.27$). These results, especially the low positive predictive value, clearly showed that panoramic radiography could not be considered a reliable test for carotid artery calcification.

Since 1981 when Friedlander first reported on identifying CAC from

panoramic radiographs, there have been a plethora of similar studies sifting through mountains of radiographs taken for suspected dental disease to look for this elusive beast. Its identification is technically challenging, as recognised by many authors, due to the multitude of calcified structures that also occur in the region, the most common being the triticeous cartilage. A lamentable fact is that few authors mention the limitations of a panoramic radiograph, which is only a tomogram, a curved slice through the jaws. Only those structures which lie within the tomographic plane will have their shadows shown sharply. Structures outside the focal trough are not shown or appear blurred. The panoramic technique is also prone to a number of errors, most commonly the positioning of the patient's Frankfort plane and mid-sagittal plane. In this paper, 6 out of 90 panoramics were excluded from the study due to poor quality. Interestingly these panoramics were not repeated.

There is some controversy and confusion over the pathological significance of calcified plaques in arteries, with non-calcified plaques now considered to be more important. Recent ultrasound studies suggest that echolucent arterial plaques are more vulnerable to necrosis, rupture and subsequent ischaemic events, and they are definitely not going to show up on radiographs! We should stop chasing shadows of shadows.

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AUTHOR QUESTIONS AND ANSWERS**1. Why did you undertake this research?**

There is a strong association between coronary artery disease and carotid artery stenosis. We wondered whether patients with coronary artery disease had calcified carotid atheroma and if so, whether it could be detected by means of panoramic radiography.

2. What would you like to do next in this area to follow on from this work?

We would be interested to investigate whether there are any specific patterns of calcification that can be identified in panoramic radiographs in those patients who show true carotid calcification in ultrasound. In addition, are there any anatomic landmarks that could be useful in panoramic radiography for better delineation of true carotid calcifications?