Prevalence in digital panoramic radiographs of carotid area calcification among Iraqi individuals with stroke-related disease

Asmaa Tahseen Uthman, BDS, MSc,[a] and Asmaa Basheer Al-Saffar, BDS, MSc,[b] Baghdad and Mosul, Iraq
UNIVERSITY OF BAGHDAD AND UNIVERSITY OF MOSUL

Objective. The purpose of this study was to determine the prevalence of carotid calcification on digital dental panoramic tomography in a group of the Iraqi population who have some stroke-related vascular and or metabolic disease.

Study design. Digital dental panoramic tomographic images of 157 adult patients of age range 40-80 years having chronic illnesses such as coronary heart diseases, hypertension, type 2 diabetes, and hyperlipidemia and of 43 control subjects (age range 40-71 years, free of systemic diseases) were made and examined for the presence of carotid artery calcification adjacent or just below the intervertebral space between C3, C4, and C5 on both sides of patient's neck. The study group was subclassified into vascular, metabolic, and vascular-metabolic groups. Determinations were made of the prevalence, number, and distribution of carotid area calcifications. Forward stepwise logistic regression analysis was used to determine which risk factor is more liable to develop carotid artery area calcification.

Results. The statistical difference between patients with stroke-related diseases (vascular, metabolic, and vascular-metabolic groups) versus patients in the control group was highly significant concerning the prevalence of carotid area calcifications ($P < .01$). Carotid area calcification was identified in 38.8% of the study group. Bilateral calcifications were observed more than unilateral calcification for both genders (26.6% vs. 13.9% for men; 24.4% vs. 12.8% for women).

Conclusion. People with stroke-related vascular and/or metabolic diseases have greater prevalence of calcified area calcifications seen on panoramic radiographs than people who are otherwise healthy. **(Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2008;105:e68-e73)**

Stroke, or cerebrovascular accident (CVA), is the third leading cause of death in most countries in the world, following cardiovascular diseases and cancer.[1] It is considered to be a significant public health issue, owing not only to its high incidence, but also to the high costs involved in the physical and psychologic rehabilitation of the patients. About 60% of the patients who survive a stroke suffer a long-term physical and psychologic disability.[2] Although stroke may be preventable, a major challenge is to find effective methods of detection of stroke-prone patients. Most noncardiogenic strokes occur as a result of atherosclerosis involving the proximal internal carotid artery, calcification of which can be detected on dental panoramic radiography.[3] Friedlander and Lande,[4] for the first time, published the possibility of identifying calcified atheroma plaque within the carotid artery on panoramic radiograph. Carotid artery atheroma (CAA) is defined radiologically as a radiopaque mass appearing adjacent to the cervical spine and hyoid bone at the level of the lower margin of the third (C3) and the entirety of the fourth (C4) cervical vertebrae, about 1.5-2.5 cm inferior-posterior to the angle of the mandible.[5] Such calcification may appear as either a nodular radiopaque mass or radiopaque vertical lines inferior to the angle of the mandible.[4] Carotid atherosclerosis is not the only cause of soft tissue calcification seen anterior to the cervical vertebrae in panoramic radiographs. Care needs to be applied to differentiate carotid calcification from calcified triticious or thyroid cartilages as well as calcified lymph nodes.[6] Factors predisposing carotid atherosclerosis include advancing age, male gender, systolic hypertension, hyperchlolestrolemia, cigarette smoking, diabetes mellitus, physical inactivity, obesity, and coronary artery diseases.[7] Lewis and Brooks[8] recommend the use of panoramic radiographs to identify patients at risk for developing a CVA. Reduction in morbidity and mortality through early identification of stroke-prone patients would have powerful humanitarian and economic

Fig 1. Bilateral CCAA.

Table I. Distribution of presumed calcified carotid artery atheromas (CCAAs) in the study group

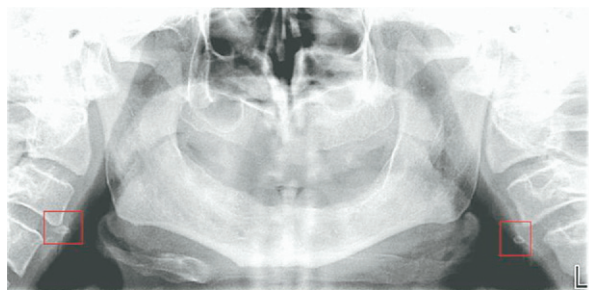| Radiographic finding	Men (n = 79)		Women (n = 78)		Total (n = 157)	
	n	%	n	%	n	%
Carotid artery calcification	32	40.5	29	37.2	61	38.85
Right side calcification	24	30.4	25	32.1	49	31.2
Left side calcification	29	36.7	23	29.5	52	33.1
Unilateral CCAAs	11	13.9	10	12.8	21	13.37
Bilateral CCAAs	21	26.6	19	24.4	40	25.4

significance.[3] It is for this reason that the dentist's careful evaluation of the dental panoramic radiographs might be instrumental in saving a patient's life. Cohen et al.[9] considered panoramic radiographs to be powerful markers for subsequent vascular events, and patients who have carotid calcification should be referred for cerebrovascular and cardiovascular evaluation and management. Therefore, the present study was made to determine the prevalence of calcified atherosclerotic lesions among a group of Iraqi patients with stroke-promoting chronic illnesses.

MATERIALS AND METHODS

Two hundred individuals were enrolled in the study. The study group consisted of 157 patients (79 men and 78 women, age range 40-80 years) with chronic illnesses:

1. Vascular group: comprising 75 patients (38 men and 37 women) having hypertension and/or coronary heart disease.
2. Metabolic group: comprising 42 patients (21 men and 21 women) having type 2 diabetes mellitus and/or hyperlipedemia.
3. Vascular-metabolic group: comprising 40 patients (20 men and 20 women) having combined vascular and metabolic diseases.

The control group comprised 43 age-matched healthy individuals, without vascular or metabolic disease.

All individuals were radiographed using the Planmeca Proline CC digital dental panoramic system. Data was processed using Dimax Pro/Classic software version 3.2.1 in high resolution mode. To optimize the image for carotid area calcification detection, a radiograph was made with the patient 1 cm anterior and 1 cm superior to the focal trough suggested by the manufacturer of the panoramic system.

METHODS

The medical records of all individuals in the studied group were reviewed for factors related to atheroscle-

rosis. Hypertension was characterized as the current use of an antihypertension medication or a systolic blood pressure of >140 mm Hg and/or a diastolic blood pressure of >90 mm Hg on 3 occasions. Hyperlipidemia was construed as a note in the medical record identifying elevation of a fasting total serum cholesterol level of more than 200 mg/dL. Coronary heart diseases (angina and myocardial infarction) were characterized in the patient's medical records with 2 recent ECG reports confirming the diagnosis. A diagnosis of patients with type 2 diabetes was made by having a fasting plasma glucose >125 mg/dL on 2 separate occasions. All radiographic interpretations were performed by one of the authors, who was blinded to which cohort each radiographic image belonged. All radiographic images were examined in subdued light for the presence of presumed calcified carotid artery atheroma (CCAA). Data analysis consisted of using Fisher exact test to compare the prevalence rate for presumed CCAA found on digital dental panoramic images. Forward stepwise logistic regression analysis also was used to determine the risk factors that may lead to development of presumed CCAA.

RESULTS

Presumed CCAA was identified in 61 out of 157 individuals (38.8%) in the study groups (Fig. 1). They were identified on the panoramic images of 32 men (40.5% of the men in the study groups) and in 29 women (37.2% of the women in the study groups). Bilateral presumed CCAAs were identified in 21 male (26.6%) and 19 female (24.4%), whereas unilateral carotid artery calcification (CAC) was observed in 11 male (13.9%) and 10 female (12.8%) patients (Table I).

Table II shows the numbers and the percentages of presumed CCAA for the right and left sides in the study group. A nonsignificant statistical difference ($P > .05$) was seen between the 2 sides. Moreover, a nonsignificant statistical difference was also seen between gen-