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## Carotid artery calcification detected on panoramic radiographs in a group of Thai population

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**Objective.** To determine the prevalence of carotid artery calcification (CAC) detected on panoramic radiographs in a Thai population.

**Study design.** The panoramic radiographs of the patients 50 and older (N = 1,370) visiting Mahidol University from January 1998 through September 2004 were retrospectively reviewed for CAC. The medical records of the positive subjects were then reviewed.

**Results.** Thirty-four (2.5%) of the 1,370 patients, 16 men and 18 women, with a mean age of 69 and a range of 50 to 87 years, had 1 or more CACs. These calcifications were unilateral in 25 (73.5%) and bilateral in 9 (26.5%) subjects. Of those positive subjects, 18 reported hypertension, 10 reported diabetes mellitus, and 5 reported hyperlipidemia.

**Conclusions.** Although it is uncommon to find CAC in the Thai population, dentists should be aware of this calcification on the routine panoramic radiographs and promptly refer for cerebrovascular and cardiovascular evaluation.

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Stroke is one of the most common diseases leading to disability or death in Thailand.<sup>1</sup> Several risk factors for stroke are classified into nonmodifiable and modifiable factors. The former are age, gender, ethnicity, and heredity, and the latter are hypertension, diabetes mellitus, hyperlipidemia, obesity, smoking, and carotid atherosclerotic disease.<sup>2</sup> Early detection of these risk factors reduces the morbidity and mortality. In 1981, Friedlander and Lande suggested that panoramic radiograph is a useful aid in detecting patients at risk of stroke, because the carotid artery calcification (CAC) may be seen in the lower corners of the panoramic radiograph adjacent to the cervical vertebrae at the level of the C3-C4 intervertebral junction.<sup>3</sup> Such calcification may appear as either a nodular radiopaque mass or radiopaque vertical lines inferior to the angle of mandible.<sup>3</sup>

Carotid atherosclerosis is not the only cause of cervical calcification seen anterior to the cervical vertebrae in panoramic radiographs. Dentists must be careful to differentiate CACs from anatomic structures including calcified triticeous or thyroid cartilages, hyoid bone, calcified stylohyoid ligament, and epiglottis and from pathologic conditions such as calcified lymph

nodes, phleboliths, submandibular salivary gland sialoliths, and tonsilloliths.<sup>4,5</sup>

The purpose of this paper was to determine retrospectively the presence of CAC detected on routine panoramic dental radiographs in a Thai population.

### MATERIALS AND METHODS

From January 1, 1998, through September 30, 2004, all panoramic radiographs used as a part of dental care on patients 50 years of age and older at the Faculty of Dentistry, Mahidol University, Thailand, were retrospectively reviewed for the presence of CAC.

All radiographs were taken using either the orthopantomograph-OP100 (Instrumentarium Imaging, Tuusula, Finland), the Planmeca PM2002CC (Planmeca Oy, Helsinki, Finland), or the Orthoralix (Philips Medical Systems, Monza, Italy) panoramic x-ray systems and Kodak dental film (T-MAT G; Eastman Kodak, Rochester, NY) with Kodak Lanex regular intensifying screen. The exposed films were processed with a Kodak X-OMAT 2000 automatic film processor according to the manufacturer's recommendations. The radiographs were examined by an oral and maxillofacial radiologist (SP) in subdued ambient light using transmitted light from a standard viewing box for the presence of the CACs appearing as an irregular, heterogeneous, verticolinear, or circular radiopaque mass inferior to the angle of the mandible and adjacent to the cervical vertebrae at the level of the C3-C4 intervertebral junction. Other cervical calcifications, including calcified triticeous cartilage, hyoid bone, superior horn of thyroid cartilage, calcified lymph nodes, phleboliths, and submandibular

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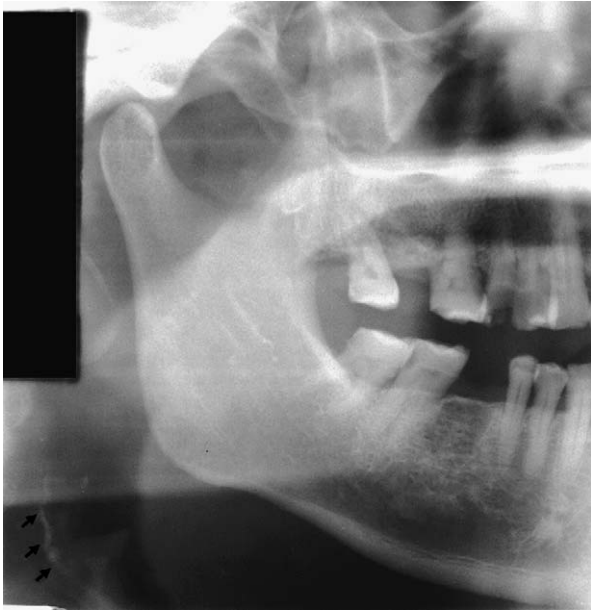


Fig. 1. Portion of panoramic radiograph of 62-year-old male with hypertension, diabetes, and hyperlipidemia (case 7) shows verticolinear radiopacity of the carotid artery calcification (*arrows*) on the right side.

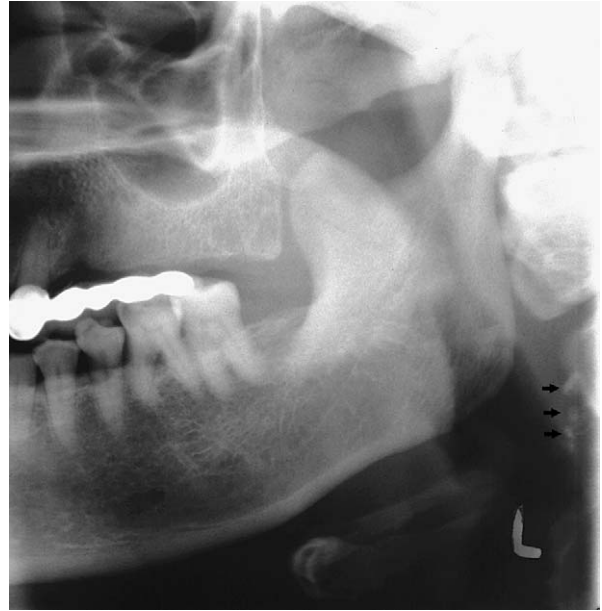


Fig. 2. Portion of panoramic radiograph of 61-year-old female with hypertension and diabetes (case 6) shows multiple irregular radiopacities of the carotid artery calcification (*arrows*) on the left side.

salivary gland sialoliths, were excluded according to Almog et al's differential diagnosis of CACs.<sup>5</sup>

When the CACs were identified, the medical records were reviewed for the factors related to atherosclerosis, including hypertension, diabetes mellitus, hyperlipidemia, etc. Hypertension was characterized as a systolic blood pressure of 140 mm Hg or greater and/or a diastolic blood pressure of 90 mm Hg or greater or by the current use of antihypertensive drugs. Diabetes mellitus, characterized by excessive amounts of sugar in the blood and urine, was revealed by baseline glycemia concentrations higher than 120 mg% or the use of hypoglycemic drugs or insulin therapy. Hyperlipidemia was defined as by total cholesterol concentrations higher than 200 mg/dL, low-density lipoprotein values above 130 mg/dL, or a minimum 6-month hypocholesterol treatment.

## RESULTS

### Study population analysis

The study population consisted of 602 males and 768 females with a mean age of 59.6 (range 50-92) at the time of panoramic radiographs taken. Of the 1,370 individuals, 34 (2.5%) were noted to have CAC on panoramic radiographs. The 1,336 individuals (97.5%) who had no CAC consisted of 586 males and 750 females.

CAC appeared as an irregular, heterogeneous, verticolinear, or circular radiopaque mass inferior to the angle of mandible and adjacent to the cervical vertebrae at the levels of the C3-C4 intervertebral junction (Figs. 1 and 2). The 34 CAC patients consisted of 16 males with a mean age of 69.8 years (range 50-87) and 18 females with a mean age of 68.6 years (range 50-82). These calcifications on the panoramic radiographs were unilateral in 25 (73.5%) and bilateral in 9 (26.5%) subjects (Table I).

### Relationship between CAC and the medical records

The medical records of 34 CAC patients were reviewed for the risk factors associated with CAC. Three of them were not available for review. Of those in the positive group, 18 subjects (52.9 %) reported hypertension, 10 subjects (29.4%) reported diabetes mellitus, and 5 subjects (14.7%) reported hyperlipidemia, as shown in Table I. Three subjects had all of the above 3 conditions and 7 subjects had 2 conditions, either hypertension and diabetes mellitus or hypertension and hyperlipidemia. Other medical histories were cataract, asthma, gout, bleeding disorder, renal disease, tumor, and lung and heart diseases. Only 1 patient of the positive group reported smoking and none reported alcohol use.

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