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Predictors Associated With Increased Prevalence of Abdominal Aortic Aneurysm in Chinese Patients with Atherosclerotic Risk Factors

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WHAT THIS PAPER ADDS

This study determined the prevalence and predictors of abdominal aortic aneurysm (AAA) in Chinese patients with atherosclerotic risk factors. Although epidemiological screening studies have demonstrated that the prevalence of AAA of Asian origin appeared to be lower, this is the first study to focus on AAA prevalence in Chinese patients with atherosclerotic risk factors. The results from the present study demonstrate that the recent screening strategies for AAA may not be applicable to the Chinese population, and a high risk group that may be suitable for AAA screening is identified.

Objective/Background: Epidemiological screening studies have demonstrated that the prevalence of abdominal aortic aneurysm (AAA) of Asian origin appears to be low and so increases uncertainty about the cost effectiveness of screening for AAAs in Chinese people. Some studies have demonstrated a higher prevalence of AAA in patients with atherosclerotic risk factors. The purpose of the study was to determine the prevalence of AAA and to explore the high risk group of AAA in Chinese patients with atherosclerotic risk factors.

Methods: From November 2014 to July 2015, a prospective observational study was conducted in Guangdong General Hospital. In total, 1582 consecutive patients with atherosclerotic risk factors and undergoing coronary angiography for suspected or known coronary artery disease were enrolled to be screened for AAA by abdominal aortic ultrasound. Because of inadequate ultrasound image quality, the analysis was based on the 1541 (97.4%) patients whose abdominal aortic ultrasound images were adequate.

Results: The prevalence of AAA was 1.6% in the whole study population and 2.9% in male patients aged over 65 years. In multivariate analysis, age $\geq$ 65 years ($p = .029$), smoking ($p = .037$), hypertension ($p = .026$), and aortic root diameter $>$ 30 mm ($p = .003$) were independent predictors of AAA. The prevalence of AAA was 0% (0/153) in patients without any independent predictor, 0.6% (3/502) in patients with one predictor, 1.0% (6/597) in patients with two predictors, 4.8% (12/249) in patients with three predictors, and up to 10% (4/40) in patients with four predictors ($p < .001$; p value for trend $< .001$).

Conclusion: Age $\geq$ 65 years, smoking, hypertension, and aortic root diameter $>$ 30 mm emerged as independent predictors of AAA in Chinese patients. Stepwise increases in the prevalence of AAA were found to depend on the number of independent predictors. Ultrasound screening for AAA could be considered in these high risk patients, especially those with three or four predictors.

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INTRODUCTION

Abdominal aortic aneurysm (AAA) is an important cause of preventable death in the elderly. In spite of the development of further understanding and better treatment of AAA over the last few decades, it continues to be a major cause of death, with 80% overall mortality in the event of rupture.[1,2]

Four large randomised controlled trials (RCTs),[3–6] with AAA prevalence rates of 4–7.2%, demonstrated that screening for AAA in elderly men would reduce AAA specific mortality by 40% during the 3–5 year follow-up period.[7] Owing to the benefit of AAA screening, the 2014

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European Society of Cardiology (ESC) guidelines on the diagnosis and treatment of aortic diseases recommended that population screening for AAA with ultrasound should be performed in all men > 65 years of age (Class I, Level A) and may be considered in women > 65 years of age with a history of current/past smoking (Class IIb, Level C).[8]

However, some studies have demonstrated that the prevalence of AAA of Asian origin may be low.[9–11] The cost effectiveness of screening AAA in these populations with low prevalence was uncertain. As the cost effectiveness of screening AAA is affected by disease prevalence, the present study sought to evaluate a specific population with the potential for higher detection rates of AAA.[12]

Epidemiological screening studies have demonstrated a higher prevalence of AAA in patients with atherosclerotic risk factors than in the normal population.[13–15] AAA and atherosclerosis may share some risk factors, such as age, smoking, hypertension, and hyperlipidaemia.[16] A meta-analysis demonstrated that the prevalence of AAA is approximately 2.4 times higher among patients with a history of coronary artery disease (CAD) compared with the general population without CAD.[17] It was assumed that screening for AAA in these higher risk populations may be more effective.

The purpose of the study was to determine the prevalence of AAA and to explore the high risk group of AAA in Chinese patients with atherosclerotic risk factors.

MATERIALS AND METHODS

Study patients

From November 2014 to July 2015, a prospective observational study was conducted at the Department of Cardiology, Guangdong General Hospital, Guangzhou, People's Republic of China. The study was approved by the ethics committees of Guangdong General Hospital and written informed consent was obtained from all the patients in the study. Screening for AAA by abdominal aortic ultrasound was performed in 1582 consecutive patients with atherosclerotic risk factors undergoing coronary angiography for suspected or known CAD. Atherosclerotic risk factors in the study included smoking history, hypertension, diabetes mellitus, and hyperlipidaemia. Patients with known AAA or with a previous replacement or endovascular aortic surgery for aneurysmal disease were also included. Excluded were patients with abdominal aortic ultrasound images of inadequate quality, autoimmune diseases, or neoplasia. Because of obesity or intestinal gas leading to inadequate quality of the abdominal aortic ultrasound images, 41 (2.6%) patients were excluded from the study. The analysis was based on the 1541 (97.4%) patients whose abdominal aortic ultrasound images were adequate. Demographic data and risk factors were collected prospectively.

Coronary angiography

The study population included patients with atherosclerotic risk factors undergoing coronary angiography for suspected or known CAD. Therefore, coronary angiography was performed in all the patients. CAD was defined by coronary angiography as the existence of a stenosis > 50% of the lumen diameter of at least one major coronary vessel. The severity of CAD referred to the number of identified stenosed vessels (lumen diameter < 50%; one, two, or three vessel disease) and was evaluated by two experienced cardiologists who were blinded to patient demographics and ultrasound evaluation of the abdominal aorta. A third cardiologist was advised in case of disagreement, and the majority view was adopted.

Echocardiography and ultrasound screening of the abdominal aorta

Transthoracic echocardiography was routinely performed in patients with atherosclerotic risk factors. Routine transthoracic echocardiography, including two dimensional, M-mode, and Doppler techniques was performed and measurements were made according to the guidelines of the American Society of Echocardiography.[18] The aortic root diameter was measured at the level of the sinus of Valsalva from the parasternal long axis view at the onset of the QRS complex.

AAA was diagnosed by ultrasound scanning with a Philips iE 33 imager equipped with a 2.0—5.0-MHz multiplane probe. All studies were reviewed by two experienced echocardiographers who were blinded to patient demographics and coronary profile. A third echocardiographer was advised in case of disagreement, and the majority view was adopted.

Following the 2014 ESC guidelines on the diagnosis and treatment of aortic diseases,[8] ultrasound scanning of the abdominal aorta was performed with the patient in the supine position. Scanning the abdominal aorta consisted of longitudinal and transverse images, from the diaphragm to the aortic bifurcation. The maximum infrarenal anterior—posterior aortic diameter was measured from outer edge to outer edge. Final diagnosis of AAA was based on the maximum abdominal aortic diameter measurement of > 30 mm.

Evaluation of atherosclerotic risk factors

The atherosclerotic risk factors evaluated in the present study included age, sex, smoking history, hypertension, diabetes mellitus, hyperlipidaemia, and coronary artery disease.

Hypertension was defined as present if the blood pressure measured twice in the hospital exceeded 140 mmHg (systolic) or 90 mmHg (diastolic), or if the patient had a history of hypertension or current usage of antihypertensive medications.

Diabetes mellitus was defined as present if the fasting plasma glucose exceeded 7.0 mmol/L or 11.1 mmol/L 2 h after a meal, or if the patient had a history of diabetes or current usage of diabetic medications.

Hyperlipidaemia was defined as a low density lipoprotein cholesterol level > 4.1 mmol/L, or total cholesterol level > 5.7 mmol/L, or triglyceride level > 1.7 mmol/L, or current usage of medication to treat hyperlipidaemia.

Fasting blood samples were taken on the morning of the second day in hospital. Serum lipid levels were measured by