

High Prevalence of Abdominal Aortic Aneurysm in Patients with Three-vessel Coronary Artery Disease

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WHAT THIS PAPER ADDS

This article studies the association between abdominal aortic aneurysm (AAA) and coronary artery disease (CAD) in a large contemporary series of patients undergoing coronary angiography. Although this association has been described previously, this is the first study that clearly correlates the frequency of AAA with the severity of CAD. Despite the fact that some recent epidemiologic studies suggest a decrease in the prevalence of AAA in the general population, we demonstrate that the disease remains widespread in the population of patients with three-vessel CAD, and we recommend cardiologists be aware of this association.

Objectives: Currently, the prevalence of abdominal aortic aneurysm (AAA) in patients with coronary artery disease (CAD) and the correlation between CAD severity and AAA prevalence are not clearly known. We conducted a prospective study to determine the prevalence of AAA in patients undergoing coronary angiography and to determine the risk factors and a coronary profile associated with AAA.

Methods: Over an 18-month period, abdominal aortic ultrasound was performed on 1,000 patients undergoing coronary angiography for suspected or known CAD, or prior to valve surgery. Clinical characteristics and coronary profile were collected from the patients.

Results: The overall number of previously repaired, already diagnosed, and new cases of AAA in the study population was 42, yielding a prevalence of 4.2%. Among the patients with newly detected AAAs, only two had an AAA diameter of >54 mm and were therefore treated surgically. In men aged ≥ 65 years, the prevalence reached 8.6%, while in men with three-vessel CAD it was 14.4%. Multivariate analysis showed that age ≥ 65 years ($p = .003$), male gender ($p = .003$), family history of AAA ($p = .01$), current smoking ($p = .002$), and three-vessel CAD ($p < .001$) were significantly associated with a higher prevalence of AAA.

Conclusion: The prevalence of AAA was high in men aged ≥ 65 years and in those with three-vessel CAD regardless of age. While our findings do not prove the cost-effectiveness of screening for AAA in these high risk patients, they do support the usefulness of a quick ultrasound examination of the abdominal aorta during routine transthoracic echocardiography in such patients.

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INTRODUCTION

Abdominal aortic aneurysm (AAA) is a chronic degenerative disease and an important cause of preventable death in the elderly. The overall mortality rate for patients with ruptured AAA varies between 65% and 85%,^{1–3} and about half of the deaths attributed to rupture occur before the patient reaches the operating room. In contrast, the mortality rate for an elective AAA repair ranges from 0.6% to 5.3%.^{4–7}

Several population-based studies have shown evident benefit in terms of mortality from screening for AAA among men aged ≥ 65 years^{8–10} and the Multicentre Aneurysm Screening Study¹¹ has demonstrated that screening is also cost-effective. In spite of this finding, few screening programs have been implemented in Europe, USA, and Australia.

Epidemiologic screening studies have suggested an association between AAA and atherosclerosis, such as coronary artery (CAD) or peripheral arterial disease (PAD).¹² The current prevalence of AAA in patients with CAD is not well known, although the prevalence of AAA in patients undergoing a coronary artery bypass graft or with acute coronary syndrome has been reported to be higher than in the general population, ranging from 6.6% to 18.2%.^{13–18} In

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contrast, several recent studies have indicated a decrease in the prevalence of AAA in the general population.^{19–21}

The objective of the present study was to determine the prevalence of AAA in patients undergoing coronary angiography and to elucidate the risk factors and the coronary profile associated with AAA. Our goal was to provide evidence for a more targeted AAA screening strategy in selected groups of patients with an elevated risk of AAA development.

MATERIAL AND METHODS

Study design

Between March 2009 and August 2010, a prospective study was conducted in the departments of cardiology and cardiovascular surgery of the University Hospital of Liège, Belgium. All patients undergoing coronary angiography prior to valve surgery or for suspected or known CAD were eligible for inclusion in the study. Patients with known AAA or with a previous replacement of the abdominal aorta for aneurysmal disease were also included. The clinical characteristics of the patients and their coronary profile were prospectively collected (see [Supplementary Methods](#)). The study was approved by the Ethics Committee of the University Hospital, and patients were asked to provide informed consent.

Patient selection

1,027 consecutive patients were invited for an ultrasound (US) screening during the 18-month study period. Of these patients, 21 (2.0%) refused to participate and in six other patients, the abdominal aorta could not be properly visualized because of abdominal obesity. Thus, a total of 1,000 patients (699 men and 301 women) were involved in the US screening program. All patients were of European ancestry. Their characteristics are summarized in [Table 1](#) and in [Supplementary Table 1](#).

US examination

AAA was diagnosed by ultrasonographic examination of the abdomen using a 2.0–5.5 MHz convex-array probe (Logiq e BT08 US sonographer; General Electric Healthcare, Little Chalfont, UK). All examinations were done in B mode by the same vascular operator the morning before coronary angiography. The maximum infrarenal aortic diameter (anteroposterior or transverse axis) was obtained in the cross-sectional view. Final diagnosis of AAA was based on an anteroposterior and/or transverse diameter (outer-to-outer diameter) measurement of ≥ 30 mm.

Statistical analysis

Quantitative variables were expressed as mean $\pm$ SD, whereas frequency tables were used for categorical findings. Student *t* test and chi-square test were used in univariate analysis as appropriate. Logistic regression analysis was applied to identify significant AAA risk factors, separately and in combination. Results were considered statistically significant at $p < .05$. All statistical tests were performed using SAS package (version 9.3 for Windows).

RESULTS

During the screening period, 10 patients reported a history of AAA repair, 13 others were already known to suffer AAA, and 19 patients were newly diagnosed with AAA, thus yielding a prevalence of 4.2% ($n = 42$). The prevalence amounted to 5.9% (41/699) in men and 0.3% (1/301) in women. The characteristics of patients with and without AAA are displayed in [Table 1](#) for the most relevant variables and in [Supplementary Table 1](#) for the other variables. As shown in [Table 1](#), age ≥ 65 years (odds ratio [OR] = 3.53; 95% confidence interval [CI]: 1.54–8.09), male gender (OR = 19.3; 95% CI: 2.49–149), family history of AAA (OR = 3.80; 95% CI: 1.37–10.5), current smoking (OR = 5.93; 95% CI = 1.85–19.1), and presence of a three-vessel coronary disease (OR = 10.5; 95% CI: 2.72–40.1)

Table 1. Characteristics of screened patients, globally and according to absence or presence of abdominal aortic aneurysm (AAA).

Characteristic	All patients ($n = 1,000$)	No AAA ($n = 958$)	AAA ($n = 42$)	Univariate analysis	Multivariate analysis
Age (y), mean $\pm$ SD	64.0 $\pm$ 11.6	63.8 $\pm$ 11.6	70.3 $\pm$ 8.94	<.001	
Age ≥ 65	490 (49%)	462 (48.2%)	28 (66.7%)	.007	.003
Male gender	699 (69.9%)	658 (68.7%)	41 (97.6%)	.004	.005
Family history	79 (7.9%)	73 (7.6%)	6 (14.3%)	.12	.01
Smoker ever	703 (70.3%)	666 (69.5%)	37 (88.1%)	.03	.005
Past smoker	434 (43.4%)	414 (43.2%)	20 (47.6%)		.22
Current smoker	269 (26.9%)	252 (26.3%)	17 (40.5%)		.003
Coronary profile				<.0001	<.0001
No significant lesion	267 (26.7%)	263 (27.5%)	4 (9.5%)		
One-vessel disease	361 (36.1%)	350 (36.5%)	11 (26.2%)		.47
Two-vessel disease	238 (23.8%)	228 (23.8%)	10 (23.8%)		.18
Three-vessel disease	134 (13.4%)	117 (12.2%)	17 (40.5%)		<.001
Mean number of affected coronary arteries $\pm$ SD	1.2 $\pm$ 1.0	1.2 $\pm$ 1.0	2 $\pm$ 1	<.0001	
Aortic diameter (mm), mean $\pm$ SD ^a	18.10 $\pm$ 6.02	17.30 $\pm$ 3.50	41.9 $\pm$ 13.2	—	—

Note. Data are presented as mean $\pm$ SD, number of patients (n), or percentages.

^a After exclusion of the 10 patients with previous AAA repair.

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