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European Journal of Cardio-thoracic Surgery 25 (2004) 65–68

EUROPEAN JOURNAL OF CARDIO-THORACIC SURGERY

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High prevalence of unsuspected abdominal aortic aneurysms in patients hospitalised for surgical coronary revascularisation

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Received 12 May 2003; received in revised form 30 September 2003; accepted 20 October 2003

Abstract

Objectives: Prevalence of abdominal aortic aneurysms (AAA) is not exactly known among patients with coronary artery disease (CAD) who are considered for surgical revascularisation. We evaluated the value of screening AAA among coronary patients admitted in our cardiovascular surgery unit. **Methods**: Over a 24-month period, an abdominal echography was proposed to male patients aged 60 or more while hospitalised for surgical coronary revascularisation. Patients with previous investigation of the aorta were excluded. The aorta was considered aneurysmal when the anterior–posterior diameter was of 30 mm or more. **Results**: Three hundred and ninety-five consecutive patients all accepted a proposed abdominal echographic screening for AAA. Forty unsuspected AAA were detected (10.1%). The mean diameter was 38.9 ± 1.3 mm. Four AAA were larger than 50 mm and considered for surgery after the CABG procedure. Surveillance was proposed to the other 36, especially the 10 patients with an AAA larger than 40 mm. Patients with AAA were significantly older than those without AAA (71.3 ± 0.8 vs. 69.4 ± 0.3 years, $P < 0.05$). Smoking history ($P < 0.05$) and hypertension ($P < 0.05$) were also associated more frequently with AAA. More than 16% of the patients being smokers and suffering hypertension presented with unsuspected AAA. **Conclusions**: In-hospital screening of AAA is very efficient among patients with coronary artery disease. Therefore, patients with CAD may be considered for routine AAA screening.

Keywords: Abdominal aortic aneurysm; Screening; Coronary artery disease; Risk indicators; Cardiac surgery

1. Introduction

Because abdominal aortic aneurysms (AAA) and coronary artery disease (CAD) share most of their risk factors, it is expected that AAA might be more prevalent among patients with known CAD. However, even though prevalence of CAD among patients with AAA is well known due to the fact that coronary investigation are often required prior to aortic surgery [1], the opposite is not necessarily true. In fact to date only sparse data exists regarding the prevalence of AAA among patients with a known CAD and most information comes from studies involving not specifically patients with CAD but including them as a subgroup of a more general population [2–4].

Screening AAA is a reasonable strategy, especially since this disease is hardly ever symptomatic, and its progression usually becomes obvious only at rupture. Thousands of AAA related death occur each year in Western countries, and only 50% of patients with a ruptured AAA who reach the operating room may survive [5,6]. Conversely, mortality and morbidity in elective surgery is low [7].

Screening for AAA is, however, globally not very popular among the medical community. Nevertheless, a few studies have shown the value of restricting the screening to a defined population at risk. For example, a group of male patients aged 60 or more may present up to 8% of unsuspected AAA [8]. In the current study, we took the opportunity and convenience of hospitalisation to investigate the relationship between CAD and AAA.

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doi:10.1016/S1010-7940(03)00674-2

As previously mentioned, age, smoking history and hypertension are among the risk factors shared by both CAD and AAA disease. Therefore, patients with CAD may represent a special group of patients at risk for AAA.

2. Patients and methods

Over a 2-year period, all consecutive male patients aged 60 or more and operated in our unit for an elective myocardial revascularisation, were proposed a routine ultrasonographic (Vingmed System5, GEMedical Systems, Milwaukee, USA) examination of their abdomen, focusing on the aorta and its major side branches. Diagnosis of an AAA was based on the anterior–posterior diameter measurement of 30 mm or more [9]. Patient information was obtained from hospital files and completed by direct interview. Patients with an already diagnosed AAA or in which prior investigations or surgery involved the abdominal aorta were excluded. Cerebrovascular disease was considered in patients with a known significant stenosis of the carotid artery. Similarly, peripheral vascular disease was considered in patients with Fontaine claudication stage IIa or higher or if patient had undergone previous treatment for chronic limb ischaemia. The protocol of this study was reviewed and approved by our local ethical committee. All patients were carefully informed and agreed to participate in the study before screening was performed.

Data are expressed as mean ± S.E.M. Statistical calculations were performed using Stata 6.0 (Stata Corporation, College Station, TX, USA). Student's *t*-test was used for comparison of continuous variables, the chi-square test was chosen for categorical data. For the multivariate analysis, a logistic regression analysis was performed for potential confounding variables. A P value <0.05 was considered significant for all analysis.

3. Results

A total of 395 male patients aged 60 or more were proposed a screening of their abdominal aorta looking for dilative angiopathy. None of them refused the exam and all were therefore included in this study. In fact, the ultrasonographic examination was performed around the 7th postoperative day, following the directives of our ethical committee. A preoperative additional unsuspected diagnosis might have deleterious psychological consequences in a patient already concerned by the coming major cardiac surgery and thus postoperative screening was recommended. The characteristics of the patients are summarised in Table 1.

Distribution of aortic diameters of aneurismal aortas is reported in Fig. 1. Forty AAA were diagnosed, representing a prevalence of 10.13%. The mean diameter of these aneurysms was 38.9 ± 1.3 mm. Interestingly, four AAA (10% of AAA) were larger than 50 mm and were totally asymptomatic. For these patients, a surgical or endovascular procedure was proposed, and all patients were successfully operated within 6 months following myocardial revascularisation. A careful follow-up was proposed to the other 36 patients, especially in the 10 patients (25% of total AAA) with a mean diameter larger than 40 mm.

As expected, age was associated with an increasing rate of AAA (Table 1 and Fig. 2). The prevalence of 7.0% AAA among patients aged 60–65 doubled in patients of 80 or more (14.3%). Smoking history and hypertension were also significantly associated with AAA in this group of patients

Table 1
Characteristics of male patients aged 60 or more, and requiring surgical myocardial revascularisation

	Male patients with CAD, aged 0 or more	No AAA	AAA	P*
N	395	355	40 (10.1 %)	
Age	69.6 ± 0.3	69.4 ± 0.3	71.3 ± 0.8	<0.05
Bodyweight (kg)	78.8 ± 0.6	78.6 ± 0.6	79.9 ± 2.1	n.s.
BMI	26.9 ± 0.2	26.9 ± 0.2	26.6 ± 0.6	n.s.
NYHA	2.8 ± 0.1	2.7 ± 0.1	3.0 ± 0.2	n.s.
Stenotic coronary vessels	2.6 ± 0.02	2.6 ± 0.04	2.7 ± 0.1	n.s.
CABG	2.7 ± 0.05	2.7 ± 0.05	2.5 ± 0.1	n.s.
Smoking history	49.1%	47.3%	65.0%	<0.05
Hypertension	62.0%	60.0%	80.0%	<0.05
Hyperlipidaemia	60.3%	59.4%	67.5%	n.s.
DM	20.5%	21.7%	10.0%	n.s.
COPD	7.3%	6.8%	12.5%	n.s.
Peripheral vasc. disease	10.9%	10.1%	17.5%	n.s.
Carotid stenosis	16.2%	16.3%	15.0%	n.s.
EF <30%	5.6%	5.1%	10.0%	n.s.

BMI, body mass index; NYHA, New York Heart Association classification of angina pectoris; CABG, number of coronary bypass performed; HTA, arterial hypertension; COPD, chronic obstructive pulmonary disease; EF, left ventricular ejection fraction. * No AAA versus AAA.

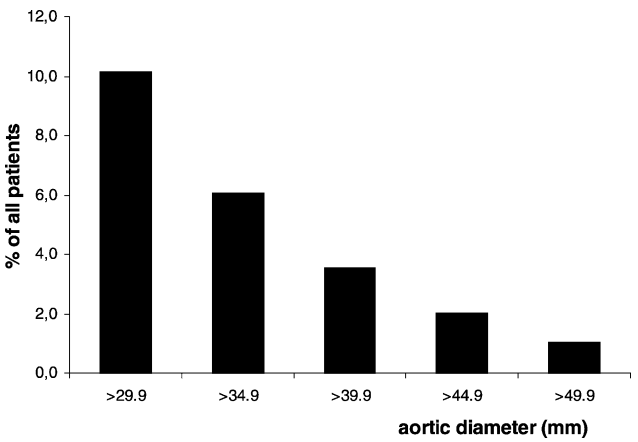

Fig. 1. Distribution of abdominal aortic diameters ≥30 mm among male patients aged 60 or more and operated for CABG.

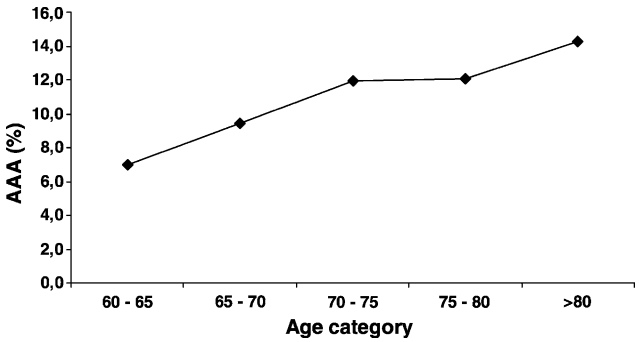

Fig. 2. Distribution of the prevalence of unsuspected AAA among male patients aged 60 or more and operated for CABG.

(Table 1). In fact, patients with either smoking history or hypertension had a significantly higher risk of having an unsuspected AAA (13.1% and 13.5%, respectively) as opposed to those patients with neither a smoking history nor hypertension (1 out 74 patients; 1.35%; $P < 0.01$) (Table 2). Moreover, patients having both a smoking history and hypertension had an even higher rate of previously unknown AAA (16.1%) (Table 2). Logistic regression analysis showed the age (OR = 1.07; 95% CI = 1.0083–1.1358), history of smoking (OR = 2.37; 95% CI = 1.1789–4.7794) and hypertension (OR = 2.68; 95% CI = 1.1899–6.0375) as independent risk factors for AAA in this group of patients.

The degree of severity of CAD was high in our patients as reflected by a preoperative NYHA functional class of 2.8, a significant stenosis in a mean of 2.6 coronary vessels, and an average of 2.7 CABG performed. Prevalence of AAA was not clearly related to the severity of the coronary disease (Table 3). No difference was observed in terms of NYHA classification or number of bypass between patients with and those without an AAA. There was nevertheless a reduced risk among patients with a single vessel CAD as compared to patients with CAD involving two or three vessels (Table 3B).

4. Discussion

Based on the shared risk factors between CAD and AAA, we hypothesised that patients with CAD have a higher risk of having an AAA. Consequently patients operated in our unit for myocardial revascularisation where proposed an abdominal echography to look at their abdominal aorta. We observed in a group of almost 400 consecutive male patients aged 60 or more that prevalence of AAA approximated 10%. This prevalence was even higher (more than 13%) when we considered only the subgroup of patients with one additional commonly shared risk factor, i.e. smoking history or hypertension. Importantly, this subgroup of patients still represented 321 patients or more than three-quarters of the total number of male patients aged 60 or more. Even more importantly, only one unsuspected AAA out of the 74 patients that were neither smoker nor had hypertension would have been missed if we had chosen this screening strategy. Restricting the screening even more, by including for example only male patients older than 60 and with both a smoking history and hypertension would certainly increase the efficiency—more than 16% of AAA would have been detected in our study—but would have missed too many unsuspected AAA.

The high number of unsuspected AAA that we found among male patients aged 60 or more and addressed for surgical myocardial revascularisation was already suggested from previous studies [2–4]. However, most reports did not specifically address the patients with CAD, and especially not the surgical patients. In fact, in the current study, we were very selective as we considered only patients with angiographicaly proven significant coronaropathy. Consequently and because those patients were proposed a surgical treatment, the severity of the CAD is certainly already advanced by the time they are screened for an AAA. This may be confirmed by the fact that a significant stenosis was found in a relatively high number of diseased coronaries (mean of 2.6 main vessels per patient), as well as by the quite high number of bypass required (2.7 bypass per patient). A clear relationship between the extent of the CAD and the prevalence of AAA may be suggested from our results as patients with a double or triple vessel disease presented with a three times higher prevalence of AAA as compared to patients with a single vessel disease. This needs, however, to be verified by including for example non-surgical patients.

Table 2
Characteristics and distribution of AAA among male patients aged 60 or more and requiring surgical myocardial revascularisation

	N	%	Diameter of AAA (mm)	> 50 mm
No smoking history, no hypertension	1/74	1.35	40.02	0
Hypertension	32/245	13.06	38.66 ± 1.44	4
Smoking history	26/192	13.54	37.76 ± 1.46	2
Smoking history AND Hypertension	19/118	16.10	37.97 ± 1.88	2

Table 3
Relation between prevalence of AAA and the severity of the CAD

(A) Angina status (NYHA)		
0–2	13/146	9.0%
3–4	27/249	10.8%
(B) Number of diseased vessels		
1	1/38	2.6%
2	9/72	12.5%
3	39/295	10.2%
(C) Number of bypass		
1	4/52	7.7%
2	14/111	12.6%
3	20/160	12.5%
4–6	2/72	2.8%

Screening of patients hospitalised for myocardial surgical revascularisation was highly efficient. Abdominal echography was proposed while the patient was still hospitalised and none of the patients refused the investigation. After a clear explanation was given regarding the potential relationship between the cardiac and vascular diseases, an abdominal echography was performed generally at day 7. Obviously the successful cardiac procedure encouraged most of them to pay better attention to their cardiovascular status and specifically to the abdominal aorta. To our knowledge, this complete acceptance rate was never previously reported in any of the several AAA screening programs [8,10–13]. The usual rate is reported to be around 65% with a highest reported rate of 83% [8]. Our 100% attendance rate is certainly an important aspect of this study as it leaves no doubt regarding the targeted population. In other words, the data really reflects the studied group of male patients aged 60 or more and admitted for a surgical coronary revascularisation. Conversely, in studies with a low attendance rate, conclusions about the real prevalence should be taken with lots of caution since the patients who did not attend the investigation program may represent a special population with its own risk and therefore a bias may be introduced. Performing the abdominal US while the patient is still hospitalised has other advantages. The exam could be repeated in situations where the initial exam was not conclusive, for example, due to gas interposition. In fact, in a series of patients we systematically repeated the exam after a few days in order to confirm the accuracy of the investigators (intra- and inter-observers variability, data not shown).

In this study, we defined an AAA in accordance with the consensus definition of the Society of Vascular Surgery and the International Society of Cardiovascular Surgery [9]. One may, however, criticise that this definition does not lead to treatment consequences since most surgeons now agree to operate on AAA not smaller than 50 mm. However, 30 mm may represent the onset of a dilative angiopathy and consequently those patients should be followed carefully, looking for increase in diameter. Again, progressive dilation of an AAA is only rarely symptomatic and the diagnosis is still too often found only at rupture.

In conclusion, the present study clearly confirms the high prevalence of unsuspected AAA among male patients aged 60 or more and addressed for surgical myocardial revascularisation. We also demonstrated the maximal efficiency of such a program. Therefore, since all these patients are hospitalised, a screening is easy to organise and certainly needs to be considered, especially in patients with a smoking history or hypertension.

Acknowledgements

The authors are grateful to Christine Rufieux for her help in the statistical analysis.

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