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LDL size and subclasses in patients with abdominal aortic aneurysm

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Abstract

Since the type of dyslipidemia in patients with abdominal aortic aneurysm (AAA) is still insufficiently defined, we measured plasma lipids and analyzed LDL size and subclasses by gradient gel electrophoresis in 30 male patients (69±6 years, BMI: 27±3) with newly diagnosed AAA and in 26 age- and BMI-matched male healthy controls. Patients with AAA had lower HDL-cholesterol ($p<.0001$), increased triglycerides ($p=.0002$) and smaller LDL size ($p<.0001$) as well as increased levels of total small, dense LDL ($p=.0210$) in relation to controls. Multivariate analysis also showed that small LDL size was independently associated with the presence of AAA ($p=.0350$). Increased levels of small, dense LDL may therefore represent a common feature in patients with AAA.

Keywords: Abdominal aortic aneurysm; LDL size; Small; Dense LDL

1. Introduction

The prevalence and type of dyslipidemia in patients with abdominal aortic aneurysm (AAA) are still insufficiently defined. Patients with AAA may show lower high-density-lipoproteins (HDL)-cholesterol levels and higher triglycerides concentrations [1], two lipid abnormalities usually accompanied by increased levels of small, dense LDL [2]. In fact, both the quality and the quantity of low-density-lipoproteins (LDL) seem to exert a direct influence on cardiovascular risk and LDL comprise multiple distinct subclasses with at least four major subspecies: large LDL-I, medium LDL-II, small LDL-III and very small LDL-IV [2].

LDL size is an important predictor of cardiovascular events and progression of coronary heart disease (CHD) and its predominance has been accepted as an emerging cardiovascular risk factor [3]. Yet, LDL size and subclasses have not been assessed in patients with AAA, a category of subjects carrying a CHD risk equivalent to those with established CHD and this potentially limits the utility of information we have on this category of high-risk subjects. Therefore in the present study we investigated whether patients with AAA have reduced LDL size or increased levels of small, dense LDL.

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2. Methods

2.1. Patients and control subjects

Approximately 1500 patients undergoing catheter angiography during a period of ten months at our Angiographic Unit were evaluated according to the following inclusion criteria: male gender and the presence of AAA. According to these inclusion criteria we identified as potentially eligible for our study 104 patients. We then excluded patients with renal or hepatic diseases able to modify plasma lipoproteins, those using hypolipidemic drugs and CHD patients because they show peculiar plasma lipoproteins alterations [2]. According to these criteria we included in our study 30 subjects with newly diagnosed AAA after giving informed written consent. As controls we selected a group of 26 healthy male subjects, recruited from family members of hospital co-workers, matched for age and body mass index (BMI) with the same exclusion criteria described above. None of them used hypolipidemic drugs in the last 12 months before starting the study. The study protocol was reviewed and approved by the local Ethics Committee.

Among main cardiovascular risk factors, hypertension (systolic or diastolic blood pressure respectively higher than 140 and 90 mmHg or pharmacological therapy with antihypertensive drugs), diabetes (fasting glucose plasma concentrations >126 mg/dl or pharmacological therapy with

Table 1
Clinical and laboratory characteristics in all subjects (as mean±SD).

	Controls (n=26)	P=	AAA (n=30)
Age (years)	68.7±4.9	ns	68.8±5.8
BMI (kg/m^2)	26.9±2.1	ns	27.4±3.3
Hypertension (n,%)	4 (15)	<.0001	20 (67)
Smoking (n,%)	5 (19)	<.0001	21 (70)
Diabetes (n,%)	0 (0)	.0023	9 (30)
Total-cholesterol (mmol/L)	4.22±0.48	ns	4.47±0.80
Triglycerides (mmol/L)	1.13±0.42	.0002	1.74±0.66
HDL-cholesterol (mmol/L)	1.21±0.18	<.0001	0.83±0.18
LDL-cholesterol (mmol/L)	2.49±0.54	ns	2.84±0.77
LDL size (Å)	275±7	<.0001	263±8
Total small, dense LDL (%)	28±6	.0210	34±9

antidiabetic drugs or insulin) and smoking habits were recorded. BMI was calculated as kg/m^2.

2.2. Laboratory analyses

Plasma lipids were measured by standard enzymatic–colorimetric methods in fasting plasma. For patients with AAA blood samples were collected before the angiography. LDL size and subclasses were assessed by whole plasma 2–16% nondenaturing polyacrylamide gradient gel electrophoresis, as previously described [4]. LDL subclass distribution (LDL-I, IIA, IIB, IIIA, IIIB, IVA and IVB) was calculated as percentage of total LDL.

2.3. Statistical analysis

Statview 5.0 (SAS Institute, NC, USA) was used to perform non-parametric Mann–Whitney test for numeric variables and McNemar test for nominal variables. Multivariate analysis was performed by stepwise multiple regression in order to assess possible clinical and laboratory variables independently associated with the presence of AAA.

3. Results

AAA showed higher prevalence of hypertension (p<.0001), smoking (p<.0001) and diabetes (p=.0023) with lower HDL-cholesterol (p<.0001) and increased triglycerides (p=.0002) (Table 1). AAA also had smaller LDL size (p<.0001) due to reduced LDL-I (p<.0001) and increased LDL-IIB (p<.0001), -IIIA (p<.05) and -IVB particles (p<.05) (Fig. 1), with higher levels of total small, dense LDL (p=.0210).

Multiple regression analysis (data not shown) revealed that among all investigated parameters (including age, BMI, smoking, diabetes, hypertension, plasma lipids and LDL size and subclasses) only HDL-cholesterol (p=.002), smoking (p=.013) and LDL size (p=.035) were independently associated with the presence of AAA.

4. Discussion

This is the first study reporting that patients with AAA, beyond plasma lipid alterations, have smaller LDL size due to increased small, dense particles. Multivariate analysis also showed that, beyond smoking and low HDL-cholesterol, small LDL size was independently associated with the presence of AAA. However, observational prospective studies are needed to test whether increased levels of small, dense LDL represent a risk factor for AAA, and if so

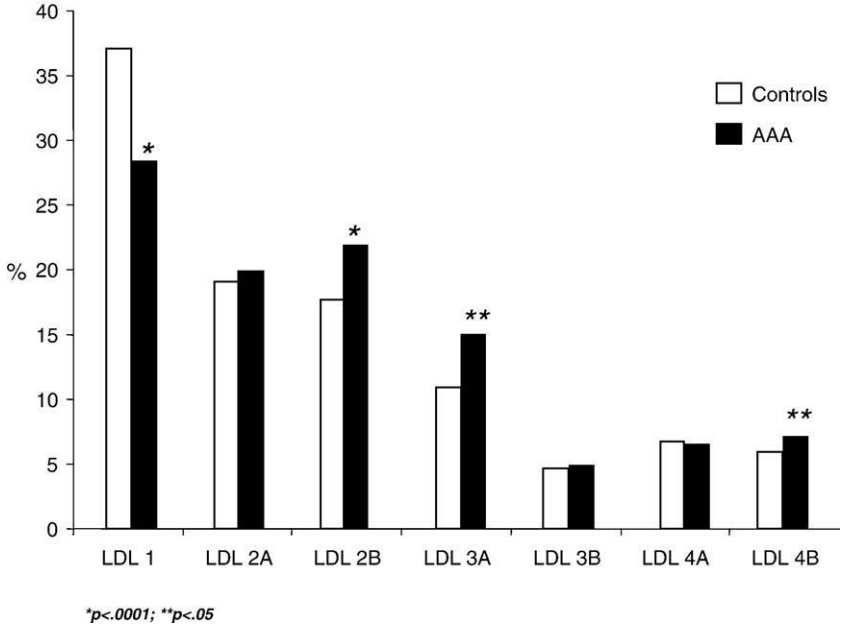

Fig. 1. Mean LDL subclasses in the two groups.

whether therapy focused on such lipid abnormality may lower the incidence or progression of AAA.

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Levitronix ventricular assist device as a bridge-to-recovery for post-cardiotomy cardiogenic shock

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Keywords: Levitronix; Ventricular assist device; Bridge-to-recovery; Cardiogenic shock

Post-cardiotomy cardiogenic shock occurs following 2–6% of adult cardiac procedures. [1] The typical initial treatment strategy includes the use of inotropic pharmacological agents and intra-aortic balloon pump (IABP) support but despite this mortality remains as high as 60%. [2] Therefore attention has turned to the use of ventricular assist devices (VAD), which are capable of restoring normal haemodynamics and organ perfusion even in the case of complete myocardial pump failure. The use of these devices for long-term support as a bridge-to-transplantation is well established [3], however the use of VADs post-cardiotomy as a bridge-to-recovery is still under evaluation.

The ideal VAD should be easy to prime, implant, manage and explant; capable of high flows; relatively inexpensive and be able to operate with little or low dose anticoagulation for more than 24 h. Following previous work at our institution [4] we propose the Levitronix Centrimag magnetically levitated, centrifugal pump device for such a purpose. We describe the successful use of the Levitronix centrifugal pump as a bridge-to-recovery in two patients with post-cardiotomy cardiogenic shock.

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1. Case one

A 48-year-old woman with severely impaired left ventricular function (LVEF 27%) and moderate to severe mitral regurgitation (MR) was referred for surgical revascularisation and mitral valve repair. She had developed angina in February 2006 and an angiogram in April 2006 revealed 100% LAD and severe RCA stenosis. She received angioplasty and stent to the LAD. Two weeks later her anginal symptoms returned and she underwent further stenting to the LAD for in-stent stenosis and stenting of the RCA. Two months later she underwent elective open cholecystectomy and suffered a peri-operative myocardial infarction and was admitted to the intensive care unit (ICU) in cardiogenic shock. After recovering from this episode she underwent further angiography which revealed 90% in-stent LAD and RCA stenoses. Dobutamine stress echocardiography revealed poor anterior and apical LV segments with viable basal segments, moderate MR and moderate pulmonary hypertension. Cardiac MRI revealed 9 of 17 viable myocardial segments with 3 hibernating segments.

The patient underwent uneventful two-vessel coronary artery bypass grafting [LIMA to LAD and SVG to RCA] and mitral valve repair (28 mm ETLogix annuloplasty ring) and was separated from cardiopulmonary bypass in sinus rhythm