Ascending aortic aneurysm in a young patient with arterial hypertension

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Abstract

Aortic aneurysm of the ascending aorta is a condition occurring with a frequency of approximately 2.1% in the population, and its risk increases with age. This case report pertains to a young man with severe primary arterial hypertension and obesity, in whom an ascending aortic aneurysm requiring surgical treatment was diagnosed. Based on the analysis of common risk factors for the development of an ascending aortic aneurysm, his risk of contracting the condition was found to be similar to the population's risk. The case highlights the need for an individual assessment of the patient regarding potential hypertension-mediated organ damage. Although echocardiography is not recommended by the European Society of Hypertension as a basic screening test for individuals with newly diagnosed arterial hypertension, its performance should be considered for individuals who are obese and/or suffer from arterial hypertension of grade 2 or higher.

Key words: ascending aortic aneurysm; aneurysm; ascending aorta; hypertension; primary arterial hypertension

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Introduction

A 26-year-old smoking male with no cardiac medical history was admitted to the cardiology outpatient department due to arterial hypertension incidentally discovered during routine occupational health examinations about 12 months ago. The patient did not report any complaints apart from intermittent occipital headaches. He worked as a crane operator, smoked about two cigarettes per week, and drank about two beers per week. In the past, he underwent surgery for a left-sided inguinal hernia repair as well as two post-traumatic knee joint surgeries. His father suffered from arterial hypertension too. The patient has been already treated with candesartan 16 mg and hydrochlorothiazide 12.5 mg as a single-pill combination (SPC). He declared that his home blood pressure measurement values fluctuated between 137/90 and 160/110 mm Hg. There were no abnormalities on physical examination except from obesity (body mass index 31.74 kg/m^2) and elevated office blood pressure (right arm: 157/103 mm Hg, left arm: 158/107 mm Hg). The electrocardiogram revealed no abnormalities, displaying a regular sinus rhythm at a rate of 65 beats per minute, an intermediate axis, PQ interval of 160 milliseconds, and no ST-T changes. The patient received combination antihypertensive treatment (olmesartan 40 mg, amlodipine 10 mg, hydrochlorothiazide 25 mg in a single pill and nebivolol 5 mg in a separate pill) and reached target blood pressure control within the next 2 months. In accordance with the home blood pressure measurements, the recorded blood pressure values ranged between

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Table 1. Blood test results

Parameter	Test result	Reference
WBC	7.11	4.00–10.00 × $10^3/\mu L$
RBC	5.15	4.50–5.90 × $10^6/\mu L$
HGB	15.4	14.0–18.0 g/dL
HCT	42.4	40.0–54.0%
PLT	244	140–440 × $10^3/\mu L$
Potassium	4.51	3.50–5.10 mmol/L
ALT	39	10–50 U/l
Creatinine	85.7	62.0–106.0 μmol/L
Glucose	4.73	3.30–5.60 mmol/L
Total cholesterol	3.5	3.2–5.2 mmol/L
LDL-C	1.4	< 3.4 mmol/L
HDL-C	0.79	> 1.0 mmol/L
Triglycerides	2.90	< 2.26 mmol/L
Uric acid	386	202–416 μmol/L
TSH	1.220	0.270–4.200 μIU/mL
Aldosterone	189.0	10–160 pg/mL at rest, 35–300 pg/mL in motion
Plasma renin activity	1.80	0.51–2.64 ng/mL/h at rest, 0.98–4.18 ng/mL/h in motion
Cortisol (morning)	10.1	2.3–19.4 μg/dL

WBC — white blood count/leukocytes; RBC — red blood count/erythrocytes; HGB — hemoglobin; HCT — hematocrit; PLT — platelets; ALT — alanine aminotransferase; LDL-C — low-density lipoprotein cholesterol; HDL-C — high-density lipoprotein cholesterol; TSH — thyrotropin

Table 2. Echocardiography result

Parameter	Result
Interventricular wall thickness	13 mm
Posterior wall thickness	10 mm
Diastolic left ventricular internal dimension	57 mm
Systolic left ventricular internal dimension	43 mm
Left ventricular ejection fraction (Biplane)	60%
Left atrium diameter	46 mm
Left atrial volume index (Biplane)	36 mL/m^2
Right atrium area	23.6 cm^2
Right ventricular outflow tract diameter	37 mm
Right ventricular basal diameter	42 mm
Aortic annulus diameter	30 mm
Aortic root diameter	47 mm
Sinotubular junction diameter	52 mm
Ascending aorta diameter	55 mm
Aortic arch diameter	20 mm
Descending (abdominal) aorta diameter	20 mm
Left ventricular outflow tract diameter	24 mm
Inferior vena cava diameter	14 mm
Aortic regurgitation grade	Mild/moderate (vena contracta 5 mm, pressure half time 615 ms)
Mitral regurgitation grade	Mild
Tricuspid regurgitation grade	Mild
Tricuspid regurgitation velocity	2.57 m/s
Pulmonic regurgitation grade	Mild
Mitral inflow pattern	Normal (E = 75 cm/s, A = 60cm/s, E/A = 1.26)
Aortic valve velocity	1.41 m/s
Pulmonic valve velocity	0,67 m/s

120 and 130 mmHg systolic and 70 and 75 mmHg diastolic. In the ambulatory blood pressure monitoring, the mean readings during activity were 120/78 mm Hg, during rest 101/62 mm Hg, with an overall 24-hour average of 114/73 mm Hg. Evaluation of secondary causes of hypertension and organ complications was planned. Blood tests results such as renal, hepatic and thyroid function parameters, cholesterol low-density lipoprotein (LDL), fasting glucose, plasma renin activity, aldosterone and cortisol levels were normal (Tab. 1). He had only an elevated triglyceride level. The 24-hours urine collection test for metoxycatecholamines excretion was also negative. The abdominal ultrasound result was normal. The Doppler ultrasound examination of the renal arteries revealed no stenosis, and the flow parameters were within normal limits: in the right renal artery the peak systolic velocity was 100 cm/s, the renal-to-aortic ratio was less than 1, and the resistance index was 0.62, in the left renal artery the peak systolic velocity was 95 cm/s, the renal-to-aortic ratio was less than 1, and the resistance index was 0.63. Echocardiography revealed enlargement of the ascending aorta to 5.5 cm in diameter, as well as mild to moderate tricuspid aortic valve regurgitation, mild tricuspid and mitral regurgitations, interventricular septum hypertrophy and mild atrial enlargement (Tab. 2, Fig. 1A). An aortic coarctation was excluded. The isolated ascending aortic aneurysm was confirmed on computed tomography scans. The patient was referred to a cardiac surgery clinic and he underwent the Bentall de Bono surgery a few months later (Fig. 1B). He was not presenting the clinical signs of Marfan syndrome or other connective tissue disorders and the genetic investigation was not followed. He had no family history of aortic aneurysm. Despite his young age, the patient met the criteria for the diagnosis of metabolic syndrome (hypertriglyceridemia, obesity and arterial hypertension). He was advised to follow a low-fat

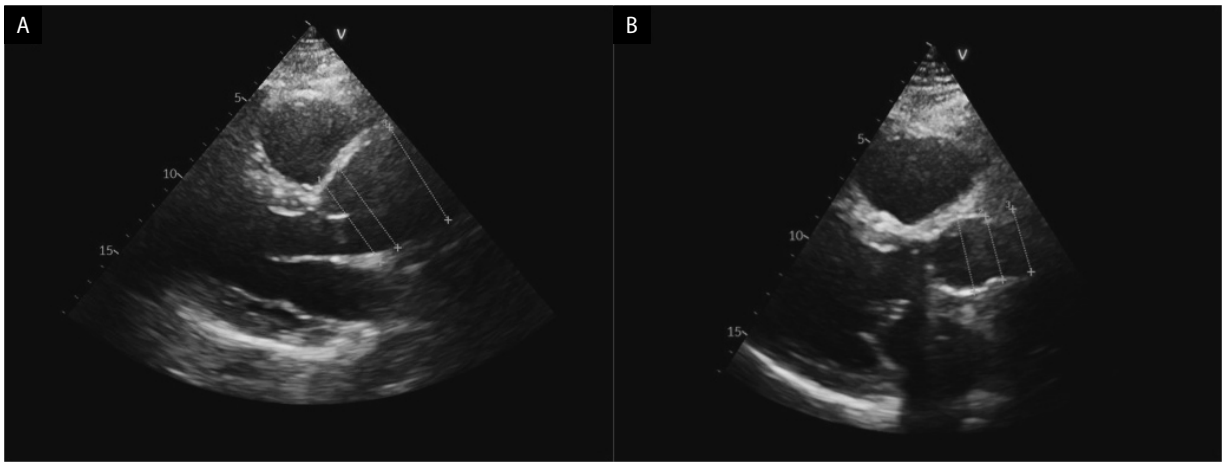

Figure 1. A. Dilation of ascending aorta in echocardiography. 1 — aortic root diameter (4.7 cm), 2 — sinotubular junction diameter (5.2 cm), 3 — (5.5cm). **B.** Post Bentall de Bono operation status. Artificial aortic valve St Jude Medical (SJM) ascending aorta diameter Masters 25 VAVGJ and ascending aorta vascular prosthesis in echocardiography. 1 — aortic root prosthesis diameter (3.5 cm), 2 — sinotubular junction prosthesis diameter (2.9 cm), 3 — ascending aorta prosthesis diameter (2.9 cm)

and low-calorie diet to achieve weight reduction, but due to the aortic aneurysm, an increase in physical activity before and shortly after the surgery was not recommended. However, after a half-year post-operation, he was able to return to his occupation.

The prevalence of aortic dilatation defined as diameter of minimum 4 cm is estimated at 2.1% and has a strong correlation with male sex and older age [1]. The incidence of dilatation of ascending aorta is increasing, so the present prevalence may be even higher [2]. That observation is probably associated with the rising number of computed tomography scans performed every year for any reason. Symptoms of ascending aorta aneurysm usually do not occur, but chronic chest pain may be present rarely. That is why this condition is found mostly accidentally [3]. The risk factors of ascending thoracic aortic aneurysm are older age, body surface area above 1,7 m^2, arrhythmia, aortic valve disease, arterial hypertension and family history of aortic aneurysm [4]. Common screening criteria are not available; however, the risk algorithm for ascending aortic aneurysm has been published recently [4]. According to that algorithm the presented patient would have about 2% risk of disease. Besides male gender, he had only two risk factors for the development of an aortic aneurysm — obesity (high body surface area — 2.46 m^2) and arterial hypertension. It is not surprising that the prevalence of ascending aortic dilatation is quite rare in patients under the age of 50 [1]. However, the case demonstrates that echocardiography, which is not recommended as a basic screening test for hypertension-mediated organ damage for all hypertensive patients, should be considered in cases when the patient has an elevated body surface area or has a high severity of hypertensive disease [5]. It is impossible to determine whether arterial hypertension caused the development of an aortic aneurysm in this patient or if the aneurysm occurred independently because of unknown reasons. Nevertheless, uncontrolled arterial hypertension, especially high diastolic blood pressure, certainly contributes to the dilation of the aortic root. The surgery has obviously reduced the patient's susceptibility to aortic diseases, but his cardiovascular risk remains elevated due to persistent chronic diseases requiring further monitoring.

Ethics statement

This case report does not involve any experimental research on animals or human patients, ethical approval is not necessary.

Author contributions

K.S.-S. contributed to the study conception. Data collection was performed by K.S.-S., A.O. and M.S.. Material preparation and writing of manuscript was covered by K.T. K.S.-S., M.R. and A.O. edited and reviewed the manuscript. All authors read and approved the final version of the manuscript.

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None.

Conflict of interest

Authors declare no conflict of interests.

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