Endovascular treatment of aortic coarctation: a case report

Tratamento endovascular da coarctação da aorta: relato de caso

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Abstract

Aortic coarctation is a congenital cardiovascular malformation of high prevalence. It is characterized by a narrowing of the thoracic aorta usually just distal to the left subclavian artery. It is more common in males, with a ratio of 2 to 3:1. The clinical presentation consists of hypertension in the upper limbs and reduction of pulses in the lower limbs. The traditional treatment is open surgical repair; however, endovascular techniques have been used, with good results. We report the case of a 24-year male patient with a seven-year history of claudication of the lower limbs and difficult to treat arterial hypertension, secondary to aortic coarctation, successfully treated with angioplasty and aortic endograft.

Keywords: aortic coarctation; endovascular procedures; angioplasty.

Resumo

A coarctação da aorta é uma malformação cardiovascular congênita de elevada prevalência. É caracterizada por um estreitamento da aorta torácica, geralmente logo abaixo da artéria subclávia esquerda. É mais frequente no sexo masculino na razão de 2 a 3:1. O quadro clínico habitualmente é composto por hipertensão arterial em membros superiores e diminuição de pulsos em membros inferiores. Tradicionalmente, o tratamento proposto é cirúrgico, mas a técnica endovascular vem sendo descrita com bons resultados. Relatamos um caso de um paciente do sexo masculino, 24 anos, quadro clínico de claudicação dos membros inferiores e hipertensão arterial sistêmica difícil de controlar há sete anos, com diagnóstico de coarctação da aorta sem outras malformações associadas. O tratamento endovascular foi realizado através de angioplastia da coarctação e implante de endoprótese vascular.

Palavras-chave: coaração aórtica; procedimentos endovasculares; angioplastia.

Introduction

Aortic coarctation (AoCo) accounts for about 5 to 8%[1-3] of congenital heart diseases, affecting 6 to 8% of liveborns. It is defined as a narrowing, usually at the aortic isthmus, between the left subclavian artery and the *ductus arteriosus*[4]. If not treated, it may lead to early complications, such as heart failure in the neonatal period, or late complications, such as aneurysms, dissections, coronary artery disease and intracranial hemorrhage, resulting from arterial hypertension secondary to the coarctation[5]. Surgical treatment is the traditional therapeutic option, with good early and late results[6-8].

Endovascular procedures for treatment of aortic coartaction have been reported in the literature. Balloon angioplasty, combined with stents and endografts, has been improved in the last years, with the aim of minimizing the complications of treatment that may result from dilation of the narrowed area, such as rupture and restenosis[6]. Currently, in series of cases published in the world literature, endovascular treatment of aortic coarctation has shown to be a safe and effective procedure in the medium and long

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term, with promising results and reduced surgical morbidity and mortality, as it is less invasive[6-8]. This article reports the case of a 24-year-old patient with symptomatic aortic coarctation, who was submitted to angioplasty followed by aortic endograft implantation, describing the results of treatment.

Case report

A 24-year-old white male was admitted to the Vascular and Endovascular Surgery Service of Hospital Geral Roberto Santos, with history of 1,000-meter intermittent claudication of lower extremities (thighs), associated with seven-year history of arterial hypertension requiring the regular use of an antihypertensive scheme with four drugs: clonidine 0.400 mg/day; enalapril 20 mg/day; slow-release nifedipine 40 mg/day and hydrochlorothiazide 50 mg/day. At physical examination, the patient had an arterial blood pressure (AP) of 180/120 mmHg, with no abdominal bruits. The upper limbs pulseswere strong and symmetric and the lower limbs pulses were not palpable. There was marked difference between arterial blood pressure of the upper limbs (180/120 mmHg) and the lower limbs (60/30 mmHg). The ankle/brachial index was not measured. No bruits were heard at the carotid arteries. Auscultation of the heart showed regular rhythm, without bruits. Complete physical examination was otherwise normal.

Pre-operative work-up consisted of the following exams:

1. Echocardiogram: normal (ejection fraction: 73%).
2. Laboratory exams: values within normal ranges.
3. Imaging exams: CT angiography showed critical stenosis of the proximal descending thoracic aorta, right after the origin of the left subclavian artery, compatible with aortic coarctation, (Figures 1 and 2). Digital subtraction angiography, confirmed the CT angiography findings.

The patient was taken to Angiography Suite in the Operating Room, where he was submitted under general anesthesia to the endovascular treatment of aortic coarctation. Under sterile conditions, a oblique right lower quadrant abdominal incision and extraperitonial dissection of the ipsilateral common iliac artery were performed. Through the common iliac artery, diagnostic angiography was performed with 5Fr Pigtail® catheter, confirming the subocclusive stenosis in the thoracic aorta. Systemic heparin (5,000 units) was administered. After that, an hydrophilic Road Runner® (Cook) guidewire was advanced across the stenosis, that was carefully dilated using balloons of progressive sizes (6x30, 8x40 and 10x40 mm) (Figure 3). The post-angioplasty

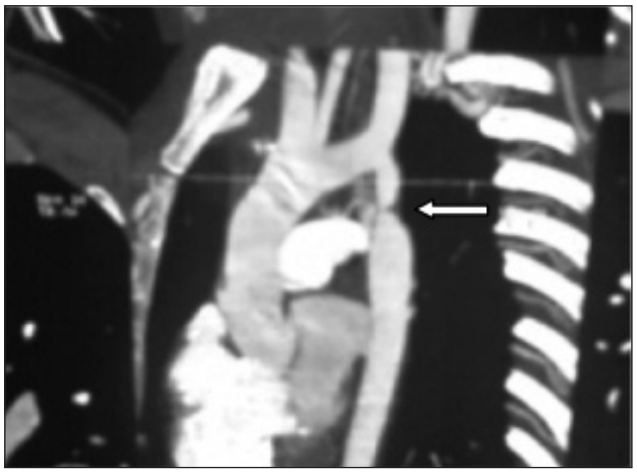

Figure 1. The patient's angiotomography showing aortic narrowing in its isthmus region (arrow) compatible with coartaction.

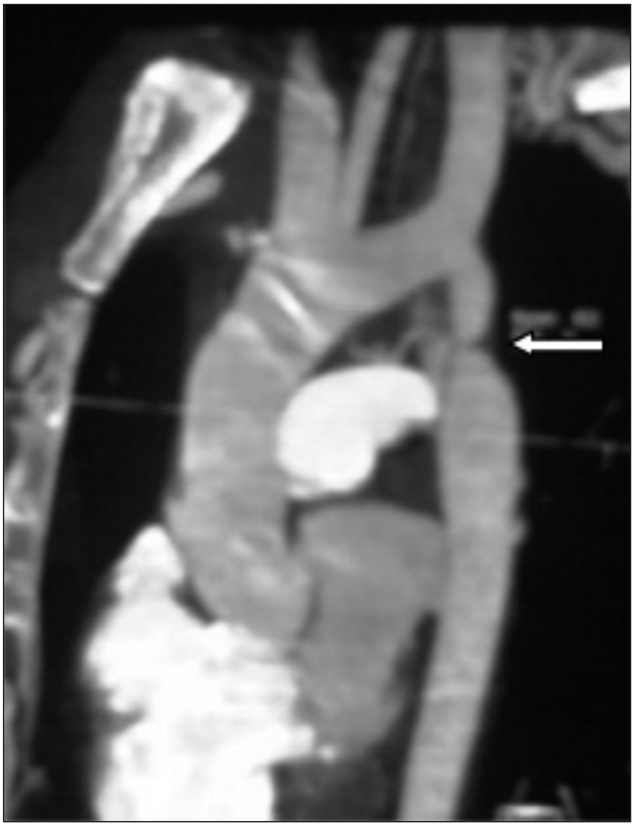

Figure 2. The patient's angiotomography showing subocclusive narrowing (arrow) of the aorta lighting below the left subclavian artery origin.

control angiography showed a 50% residual stenosis of the thoracic aorta, associated with elastic recoil. A stiff guidewire in a Pig Tail® catheter was advanced across the lesion into the ascending aorta. This way, it was possible to deploy, through the right common iliac artery access, a Valent® (Medtronic) endograft across the coartaction, with proximal fixation to the aorta right after the left subclavian artery origin (Figure 4). The endograft was accommodated with a Coda® (Cook) balloon (Figure 5). The procedure lasted around 90 minutes. No hemotransfusion was necessary and the patient was sent to the intensive care unit.

In the immediate post-operative period, strong symmetric pulses were already palpable in the lower limbs, without pressure gradient between the lower and upper limbs. The patient also presented improvement of his intermittent claudication and better control of blood pressure levels. Currently, the patient is taking enalapril 10 mg/day only. He was discharged from the hospital on the 4th post-operative day and has been followed in the outpatient clinic.

Discussion

AoCo is an excentric narrowing of the descending aorta in the region between the left subclavian artery and the *ductus arteriosus*. It is characterized by discrepancy between the upper and lower limbs pulses and systolic arterial pressure, with reduced or absent femoral pulses. The diagnosis can be suspected at a routine physical examination.

AoCo can be associated with other congenital malformations, such as persistent arterial duct (*patent ductus arteriosus*) in 48.1%, aortic valve alterations in 12.8% and interventricular communication in 11.4% of the pediatric patients[9]. It may have a broad symptomatological spectrum, resulting from the associated heart failure and respiratory tract infections. At physical examination, it is common to find severe systemic arterial hypertension, a heart murmur and hyperphonesis of the second sound. Transthoracic echocardiogram can show left ventricular hypertrophy and bicuspid aortic valve. In the case reported herein, no associated congenital anomalies were diagnosed.

Surgical repair has been the treatment of choice for AoCo, which may control arterial hypertension[6-8]. However, the literature shows that arterial hypertension may persist in patients who have been submitted to successful surgical treatment of coarctation[5]. Numerous factors have been involved in the persistence of elevated tensional levels in operated patients, such as the patient's age and weight at time of surgical treatment, the technique employed, the anatomical characteristics and

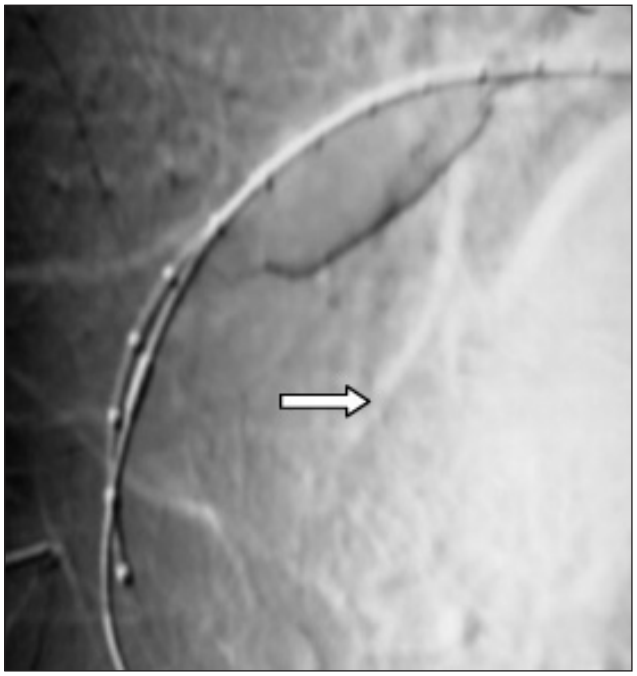

Figure 3. Dilatation of subocclusive stenosing lesion performed with 10x40 mm balloon angioplasty (arrow).

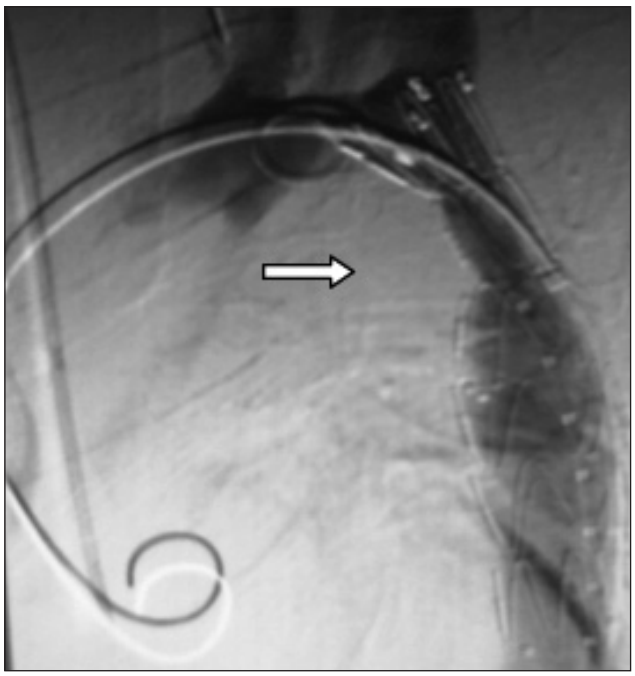

Figure 4. Endovascular treatment of aortic coarctation: endograft implantation (arrow) in the thoracic aorta below the left subclavian artery origin.

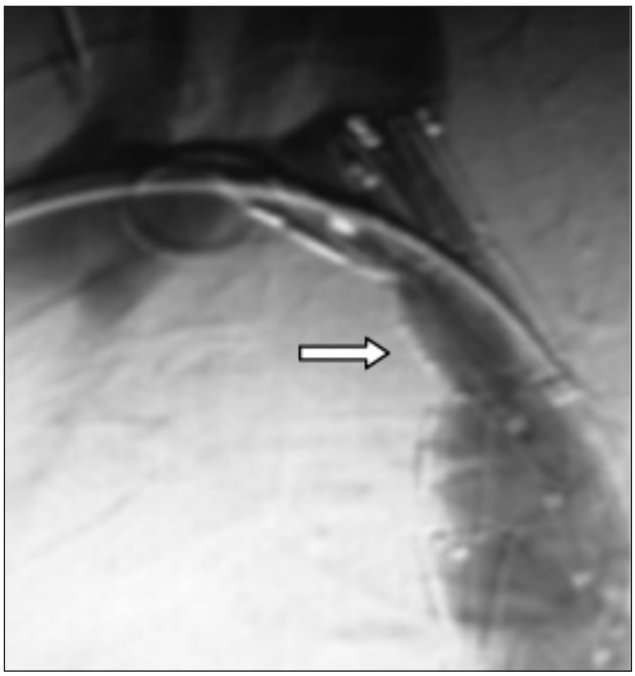

Figure 5. Endovascular treatment of aortic coarctation: endograft accommodation in the thoracic aorta with a proper balloon.

the duration of post-operative follow-up[5]. Operated patients should be continuously monitored to evaluate blood pressure levels the presence of hypertensive response to exercise[5]. With the purpose of achieving the symptomatic control and preventing complications, the treatment is traditionally indicated when the diagnosis is confirmed, usually after the insidious onset of clinical symptoms. The main indications for surgical treatment described in the literature are: heart failure in infancy, and late diagnosis in older children or adults with current symptoms and pressure gradient over 20 mmHg between the upper and lower limbs[10]. In this case report, the intervention was indicated for difficult–to-control hypertension associated with limiting claudication of the lower limbs.

Balloon angioplasty, with stenting or endografting, has emerged as a promising alternative in the treatment of AoCo. It presents low rates of complications, such as aneurysms, dissections, rupture, hypertension and recurrent or residual coarctation[11] in the medium and long term. The results are influenced by the patient's age and lesion site[12].

After angioplasty with stenting, the pressure gradient is partially or fully improved, and reduced use of antihypertensive medication may occur, as observed in this case report. The results are better than those obtained with balloon angioplasty alone[6]. Similar results to those obtained in this case have been achieved by other authors[10-15], showing the clear benefits for the arterial hypertension control after the angioplasty with stenting in the treatment of AoCo.

The endovascular treatment of aortic coarctation described in this case adds to other reports in the literature, reinforcing the impression of an effective and safe therapeutic option, with low rate of complications and less invasive for adult patients. Long-term follow-up should be performed carefully in these cases. However, controlled studies are required to establish the real role of endovascular procedures in this affection.

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Data collection: ATCY, MCSBP, AJS
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Critical analysis: VPS, RPR, AJS, RAC
Final approval*: ATCY, MCSBP, VCM, AJS, RPR, RAC, VPS
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