¹ Hospital São José do Avaí, Itaperuna, RJ, Brazil

² Universidade Iguaçu, Campus V, Itaperuna, RJ, Brazil

Severe aortic stenosis associated to large abdominal aortic aneurysm: concomitant treatment with transcatheter aortic valve replacement and endovascular aneurysm repair

Estenose aórtica severa associada a aneurisma de aorta abdominal volumoso: tratamento concomitante com troca valvar aórtica transcater e reparo endovascular do aneurisma

Júlio Tinoco Nunes¹, Eugênio Carlos de Almeida Tinoco¹, Emanuela de Oliveira Gallo², Monique Bandoli França Pereira¹, Luiz Vinícius Andrade Hipólito¹, Antônio Carlos Botelho da Silva¹

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ABSTRACT – An 85-year-old patient with multiple comorbidities presents with severe symptomatic aortic stenosis and concomitant infrarenal abdominal aortic aneurysm with 100mm in diameter. A transcatheter aortic valve replacement was done along with concomitant percutaneous repair of the aneurysm. The therapeutic strategy was initially to implant the transcatheter aortic valve prosthesis, and then to perform the implantation of the aortic bifurcated endograft, with extensions to the right and to the left, to exclude a large fusiform aneurysm, due to the high risk of rupture with the hemodynamic changes after aortic bioprosthesis implant. The procedure was performed without complications, and the patient was discharged from hospital after 4 days, with no alterations in renal function, minimal paravalvular regurgitation, and no endoleak at the exclusion of the abdominal aneurysm.

Keywords: Aortic valve stenosis; Aortic aneurysm, Abdominal; Transcatheter aortic valve replacement; Endovascular procedures

RESUMO – Paciente de 85 anos de idade, portador de múltiplas comorbidades, apresentando estenose aórtica severa sintomática e aneurisma de aorta abdominal infrarrenal concomitante, com 100mm de diâmetro. Foram realizados troca valvar aórtica transcater e reparo percutâneo do aneurisma, de forma concomitante. A estratégia terapêutica foi inicialmente implantar a prótese valvar aórtica transcater e, em ato contínuo, realizar o implante de endoprótese aórtica bifurcada, com extensões à direita e à esquerda, para exclusão do volumoso aneurisma fusiforme, devido ao alto risco de ruptura com as mudanças hemodinâmicas após o implante da bioprótese aórtica. O procedimento foi realizado sem intercorrências, e o paciente recebeu alta hospitalar após o quarto dia, sem comprometimento da função renal, com mínima regurgitação paravalvar e sem *endoleak* na exclusão do aneurisma abdominal.

Descritores: Estenose da valva aórtica; Aneurisma da aorta abdominal; Substituição da valva aórtica transcater; Procedimentos endovasculares

INTRODUCTION

An 85-year-old male patient with severe symptomatic aortic stenosis (AS), who was diagnosed as abdominal aortic aneurysm (AAA), 100mm-long in its largest diameter. The patient presented a risk score of 5.6% according to the Society of Thoracic Surgeons (STS), EuroSCORE II of 16%, and Essential Frailty Toolset (EFT) of 3. The treatment scheduled was transcatheter aortic valve replacement, followed by endovascular repair of the aneurysm during the same procedure.

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Corresponding author:

Júlio Tinoco Nunes
Serviço de Hemodinâmica e Intervenção Cardiovascular do Hospital São José do Avaí
Rua Cel. Luís Ferraz, 397 – Centro
CEP: 28300-000 – Itaperuna, RJ, Brazil
E-mail: juliotinoconunes@gmail.com

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CASE REPORT

An 85-year-old male patient, former smoker, dyslipidemic, with a definitive pacemaker. He went to the cardiology outpatient clinic due to exertional dyspnea and three episodes of syncope over the previous 2 months. Upon clinical examination, he presented with a 3+/6+ systolic murmur in the aortic area, and a pulsatile mass in the mesogastrium. The transthoracic echocardiography showed a tricuspid aortic valve with calcified leaflets, left ventricular hypertrophy, maximum transvalvular aortic gradient of 113mmHg, mean gradient of 54mmHg, peak aortic jet velocity of 5.3m/s, and valvular area by continuity equation of 0.8cm², with moderate regurgitation, confirming a double aortic lesion with a predominance of stenosis. The computed tomography angiography (CTA) of the abdominal aorta showed a large fusiform aneurysm, with largest diameter of 100mm, mural thrombus, and proximal neck of 35mm (Figure 1). Coronary angiography demonstrated no significant atherosclerotic lesions. The CTA assessment of the aortic valve apparatus is shown in Figure 2.

Despite the classification of intermediate risk, the patient presented criteria of frailty, and since significant clinical variables are not considered in risk scores, the percutaneous implantation of an aortic bioprosthesis was chosen, with a simultaneous endovascular approach of the AAA due to the imminent risk of rupture (100mm along its largest diameter).

Figure 1. Measurements by computed tomography angiography of the cross-section diameters of the abdominal aorta in different axes (A, B, and D), and tortuosity of the iliac arteries and abdominal aorta (C).

Figure 2. Evaluation of the diameters (26.3mm and 23.5mm), perimeter (74.19mm), and area (428.33mm²) of the aortic valve ring (A and B). Height of the left (C) and right (D) coronary arteries.

The procedure was performed under general anesthesia, monitored by transesophageal echocardiography, and full anticoagulation, maintaining activated clotting time of more than 300 seconds. Due to the tortuosity of the iliac and femoral arteries, dissection of the access routes was chosen, with bilateral surgical exposure of the common femoral arteries. For the transposition of the aneurysmal sac, a hydrophilic guide wire was used under diagnostic catheter, which was posteriorly substituted by a stiff guide wire. Utilizing a medium extra support guide wire Safari™ (Boston Scientific Corporation, Marlborough, MA, USA) a SAPIEN XT 26mm (Edwards Lifesciences Corporation, Irvine, CA, USA) bioprosthesis was implanted, with no predilation, under rapid pacing, using 1mL below nominal volume, aiming to achieve 15% oversizing. After the initial implant, echocardiography showed paravalvular regurgitation of moderate to significant degree. A new dilation with 0.5mL additional volume was chosen, causing significant improvement of the regurgitation, with approximately 18% oversizing (Figure 3).

Next, over the Safari™ guide, the Cook Zenith® TFF 36×95mm (Cook Medical LLC, Bloomington, IN, USA) abdominal aorta endografts were implanted, with extensions to the right (13×74mm and 24×56mm) and to the left (20×56mm). A control aortography showed well-positioned endografts, patent renal arteries using free-flow and normal flow through the external iliac arteries, with no signs of endoleak (Figure 4). The use of a reduced volume (75mL) of non-ionic contrast was possible by means of meticulous planning of the procedure with CTA.

Figure 3. Aortography showing well-positioned prosthesis with patent coronary arteries and absence of paravalvular regurgitation.

Figure 4. Angiography result after implantation of endografts in the abdominal aorta and iliac arteries.

DISCUSSION

Symptomatic AS and AAA are critical clinical conditions, increasingly more prevalent with aging of the population. The prevalence of AS is approximately 4.6% in patients aged over 75 years.¹ AAA has a prevalence of 5.9% in men over 80 years of age.² On the other hand, the combined prevalence of the two pathologies is not well known, but a recent study has demonstrated a prevalence of 6% in patients submitted to transcatheter aortic valve implant.³ Conven-

tional treatment, with surgical replacement of the aortic valve and simultaneous approach of the AAA, especially in elderly patients, is of elevated risk. In the same way, treatment of AAA in the presence of critical AS involves an unacceptably high risk. Thus, the presence of both conditions in a patient with multiple comorbidities represents a therapeutic dilemma.

Percutaneous implantation of a biological aortic valve was first performed in 2002 and is an alternative to treat AS in high-risk patients.⁴ Currently, more than 350 thousand prostheses have already been placed worldwide.⁵ The procedure is considered class I in unoperable patients, and class II in those at a high surgical risk, according to the valvulopathy consensus of the American Heart Association/American College of Cardiology (AHA/ACC) and the European Society of Cardiology (ESC).^{3,6}

The AAA larger than 5.5cm occur in 5% of men aged over 50 years.⁷ Endovascular repair was developed as a transcatheter technique to infrarenal AAA treatment in 1991.⁸ Recognized as the standard treatment, the procedure has a significantly lower risk of intra- and postoperative complications as compared to open surgery, and can be safely used in high-risk patients with multiple comorbidities.⁷

With the percutaneous aortic valve implantation, left intraventricular peak and final diastolic pressures drop, while the aortic systolic and diastolic pressures increase.⁹ Risk of rupture of the AAA increases according to its size: for aneurysms <5cm in diameter, the 5-year risk of rupture is 1 to 2%, whereas for those >5cm, the risk rises to 20 to 40%.¹⁰ Saccular aneurysms present with greater risk of rupture in comparison with fusiform aneurysms. Vorp et al. showed that mechanical stress of the wall increased due to asymmetry in abdominal aorta aneurysms,¹¹ which is considered as important as the aneurysm diameter in terms of risk of rupture.

The exact time for the elective repair of AAA is a complex concern, which requires multidisciplinary involvement and consideration of several issues. In the case described, the procedure was urgent since the 100mm diameter would imply prohibitive risks after correction of valvular stenosis due to hemodynamic modifications. Therefore, the concomitant approach, along with the vascular operation, was planned because of the risk of rupture. Although there was no worsening of renal function, partly because of the renal protection measures taken (hydration, very small volume of non-ionic and low-osmolarity contrast media), we could have used carbon dioxide for the implantation of the vascular endografts, to further reduce the final contrast volume.¹² The patient had an excellent recovery and continued in good clinical condition for 2-year follow-up.

The finding of AAA in a patient with AS calls for considerations. The hemodynamic consequence of the successful valvular implant is increased systolic pressure, and therefore, increased tension, besides the risk of aneurysm dilation and rupture. Thus, we maintain that it is possible to take a combined sequential approach for patients with both pathologies.

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None.

CONFLICT OF INTEREST

The authors declare there are no conflicts of interest.

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