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CASE REPORT

Severe aortic stenosis and cardiogenic shock: A therapeutic challenge☆

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KEYWORDS
Severe aortic stenosis;
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Abstract Acute heart failure in patients with severe aortic stenosis and left ventricular systolic dysfunction is well known for its dire prognosis and limited therapeutic options.

The authors describe the case of a man admitted for non-ST-elevation myocardial infarction. Diagnostic exams revealed severe aortic stenosis, with good left ventricular systolic function, and two-vessel coronary artery disease. The development of cardiogenic shock with left ventricular systolic dysfunction on day four led to changes in the therapeutic strategy. Percutaneous aortic balloon valvuloplasty coupled with complete myocardial revascularization was performed with a view to future surgical intervention. After discharge, the patient was readmitted with cardiogenic shock after acute pulmonary edema and cardiopulmonary arrest. Ventilator weaning was not possible due to acute heart failure and so it was decided to administer levosimendan, which resulted in substantial clinical and echocardiographic improvement. The patient subsequently underwent successful aortic valve replacement.

This case highlights the challenge that characterizes the management of patients with concomitant coronary artery disease, left ventricular systolic dysfunction and severe aortic stenosis. Percutaneous aortic balloon valvuloplasty and levosimendan were safe and effective in the treatment of acute heart failure, acting as a bridge to surgery.

PALAVRAS-CHAVE
Estenose aórtica grave;
Choque cardiogénico;
Valvuloplastia aórtica com balão;
Levosimendan

Estenose aórtica grave e choque cardiogénico: um desafio terapêutico

Resumo A insuficiência cardíaca aguda na estenose aórtica grave com compromisso da função sistólica global tem um prognóstico reservado, com opções terapêuticas limitadas.

Os autores descrevem o caso clínico de um doente admitido por enfarte agudo do miocárdio sem supradesnivelamento de ST, no qual o estudo complementar revelou estenose aórtica grave, com boa função ventricular esquerda, e doença coronária de 2 vasos. O desenvolvimento de choque cardiogénico, com compromisso grave da função sistólica global, ao quarto dia de

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internamento, alterou a estratégia terapêutica, optando-se por realizar valvuloplastia aórtica com balão e revascularização miocárdica percutânea completa, com vista a posterior referenciação para cirurgia valvular. Após a alta, apresentou novo quadro de choque cardiogénico em contexto de insuficiência cardíaca aguda e paragem cardiorrespiratória. Por dificuldade na extubação, iniciou perfusão de levosimendan, com franca melhoria clínica e ecocardiográfica. Posteriormente, o doente foi submetido com sucesso a implantação de prótese valvular aórtica.

Este caso demonstra o desafio que caracteriza a estabilização e o tratamento destes doentes. A valvuloplastia aórtica com balão e o levosimendan foram eficazes e seguros no tratamento da insuficiência cardíaca aguda e permitiram estabelecer a ponte para a cirurgia.

Introduction

Degenerative aortic stenosis (AS) is the most prevalent valve disease in developed countries (4.6% in patients aged over 75,[1] a figure that is expected to rise with ageing populations). When symptomatic it is associated with high mortality and surgical valve replacement becomes a priority.[2] The surgical risk of replacement is generally low and long-term results are excellent, the survival curve being close to that of the general population. However, prognosis is less good in patients with left ventricular (LV) dysfunction, particularly those with acute heart failure (HF). Such patients are usually excluded from clinical trials and clinical evidence in this area is sparse; therapeutic options are accordingly limited.

Percutaneous aortic balloon valvuloplasty (PABV) was first described in 1986 by Cribier et al.[3] as an alternative to surgery. Despite initial enthusiasm, medium- and long-term results were disappointing, with high restenosis rates (>70% after the first year) and no beneficial effect on the natural course of the disease.[4] It is now used as a palliative measure or as a bridge to more permanent treatment.[5]

Levosimendan has both positive inotropic and vasodilatory effects without increasing myocardial oxygen consumption.[6] Its main active metabolite, OR-1896, prolongs its time of action to 7-9 days.[7] Vasodilators have traditionally been considered to be contraindicated in severe AS, but this has recently been challenged.[8]

The case presented here highlights the therapeutic challenge posed by patients with severe AS and cardiogenic shock. PABV and levosimendan were two therapeutic options that proved safe and effective.

Case report

A 67-year-old man with a history of hypertension, insulin-treated type 2 diabetes, hypertriglyceridemia, obesity and obstructive sleep apnea syndrome, and suspected poor compliance with medication, was admitted to the emergency department with anginal chest pain of around six months' duration, worsening in the previous two weeks (CCS class II-III). Physical examination him to be hemodynamically stable (blood pressure 107/43 mmHg, heart rate 60 bpm); cardiac auscultation revealed a grade III/VI crescendo-decrescendo systolic murmur over the aorta radiating to the carotid arteries but no signs of HF. The ECG showed sinus rhythm with voltage criteria for LV hypertrophy, repolarization abnormalities of the lateral wall suggestive of overload and/or myocardial ischemia, and poor R-wave progression in V1-V4. There was a slight isolated rise in troponin I (0.071-0.102 ng/ml) on laboratory testing.

The patient was admitted to the cardiac intensive care unit with a diagnosis of non-ST-elevation myocardial infarction, in Killip class I.

The transthoracic echocardiogram (Figure 1) revealed a non-dilated left ventricle with mild hypertrophy of the ventricular septum and good global and segmental systolic function, a calcific aortic valve with a peak transvalvular gradient of 74 mmHg and mean gradient of 49 mmHg, and valve area of 0.77 cm^2 calculated by the continuity equation.

Coronary angiography (Figure 2) showed two-vessel coronary artery disease (75% lesion in the mid left anterior descending artery and 90% lesion at the origin of the posterior descending artery). Hemodynamic study revealed an aortic valve gradient of 97 mmHg.

Given the diagnosis of severe AS and two-vessel coronary artery disease, surgery was scheduled for implantation of an aortic valve prosthesis and myocardial revascularization. However, on day four the patient developed angina at rest, with dyspnea and agitation, associated with hemodynamic instability (blood pressure 80/60 mmHg, sinus tachycardia and signs of poor peripheral perfusion). Following the diagnosis of cardiogenic shock, optimized medical therapy, mechanical ventilation and high-dose vasopressor and inotropic support (noradrenaline 20 μg/min and dobutamine 15 μg/kg/min) were begun.

The ECG showed sinus tachycardia with more marked ST depression (2 mm) in the lateral wall. Echocardiography revealed apical akinesia with moderate to severe global systolic dysfunction and a mean aortic gradient of 44 mmHg; laboratory tests showed elevation of troponin I to 12 ng/ml and worsening renal function.

In view of the patient's hemodynamic instability with cardiogenic shock, aortic valvuloplasty was performed (Figure 3) with a 20-mm NuCLEUS balloon under pacing