Transcatheter tricuspid annuloplasty with the Cardioband device to treat severe functional tricuspid regurgitation

Anuloplastia tricuspídea percutánea con dispositivo Cardioband para el tratamiento de la insuficiencia funcional tricuspídea grave

To the Editor,

The classic study by Nath et al.[1] established that tricuspid regurgitation (TR) is associated with a 36% annual mortality, independently of biventricular function and pulmonary pressure. Until now, the only curative treatment has been surgery, which has high in-hospital mortality, at 8% to 10%.[2] Percutaneous treatment has come to the forefront as an alternative to surgery, with similar efficacy but without the associated high morbidity and mortality. We describe the first case carried out in Spain of percutaneous tricuspid annuloplasty with implantation of the Cardioband device (Edwards Lifescience; Irvine, California, USA).

An 80-year-old woman with permanent atrial fibrillation, rheumatic heart disease with mitral stenosis treated with a mechanical valve replacement at age 69 years, had developed moderate pulmonary hypertension prior to surgery. For at least 5 years, she had severe TR but was clinically stable. In recent months, she had clinically deteriorated, with 2 hospital admissions, and was in functional class III, with edema and ascites despite diuretic treatment with furosemide and spironolactone. Transthoracic and transesophageal echocardiography showed a normally-functioning prosthetic mitral valve, massive functional TR with severe dilatation of the right heart cavities and preserved biventricular function. The tricuspid annulus diameter was 50 mm, with 13 mm separation, and a tenting height of 8 mm. Hemodynamic studies revealed a right atrial pressure of 12 mmHg, pulmonary pressure of 33/10 mmHg, a mean pulmonary pressure of 18 mmHg, and left ventricular end diastolic pressure of 12 mmHg. Coronary angiography showed normal coronary arteries. In light of the patient's age and surgical history, following a case conference, it was decided to opt for percutaneous treatment.

The Cardioband consists of a Dacron band that is fixed along the tricuspid annulus with a series of anchors (stainless steel screws). Inside the band there is a wire that can be adjusted, in a cinching motion, to reduce the tricuspid annulus (figure 1A). To determine whether the patient's anatomy is suitable for the implant, in addition to echocardiography, it is essential to perform cardiac computed tomography. The size of the implant is chosen based on the length of the annulus, measured from the start of the anterior leaflet to the coronary sinus; the distance to the right coronary artery must also be assessed, to avoid potential complications. In this case, the length measured on computed tomography was 105.6 mm, which corresponded to a size E Cardioband (there are 6 sizes), with no *a priori* risk of coronary perforation (figure 1B, C).

The procedure was performed under general anesthetic and with fluoroscopic and transesophageal echocardiographic guidance. The left femoral artery was cannulated for right coronary artery catheterization with a guide catheter, and an angioplasty guidewire was inserted as a marker of the tricuspid annulus. Via right femoral venous access, a 24 Fr steerable sheath from the Cardioband deployment system was introduced into the right atrium. Through this, a guide catheter was advanced to the site of attachment of the band, containing the implant catheter that deploys the anchors to fix the band to the tricuspid annulus. The implant was attached starting at the anteroseptal commissure, 25 mm from the aortic valve, and running clockwise to the posteroseptal commissure. As the guide catheter was withdrawn to expose the Dacron band, the band was fixed to the annulus with 16 screws: 3 within the first 10 mm and then 1 every 8 mm. Once implanted, the guide catheter and implant catheter were withdrawn and a separate catheter was introduced to adjust the size of the implant, reducing the septolateral diameter of

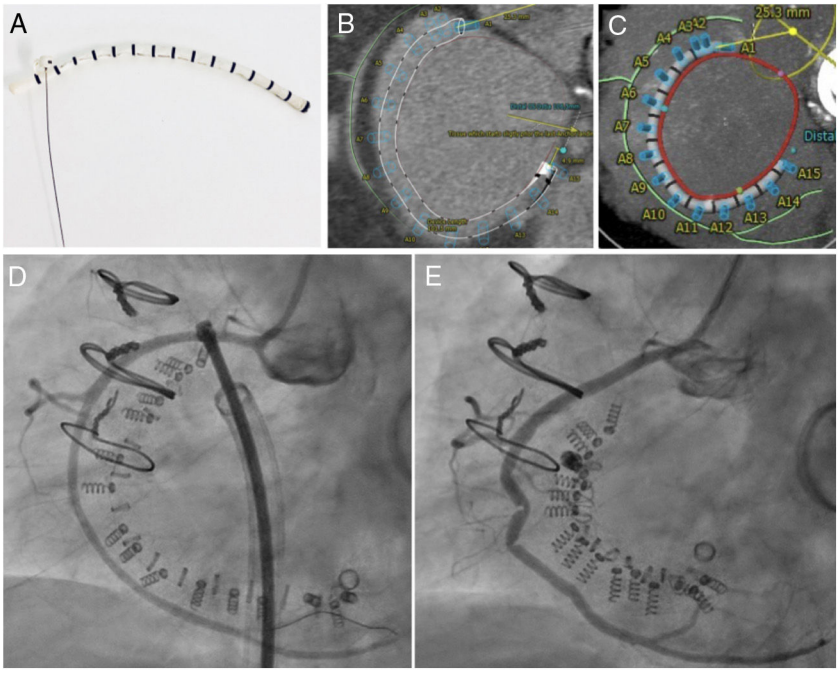

Figure 1. A: images of the Cardioband, which consists of a Dacron band with radio-opaque markers and an internal wire. B and C: 3mensio computed tomography reconstruction (Pie Medical Imaging; Maastricht, Netherlands), showing the length of the Cardioband along the tricuspid annulus (red), the anchors (blue), the distance to the right coronary artery (green) and the distance to the aortic valve (yellow) from the first screw in the implant. D: images of the Cardioband and the right coronary artery immediately after implantation before adjustment. E: Cardioband after adjustment and reduction of the annulus, with evidence of traction on the right coronary artery.

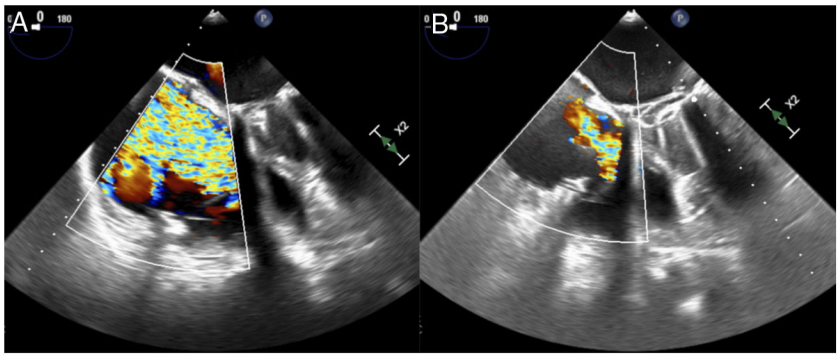

Figure 2. A: transesophageal echocardiography prior to adjustment of the Cardioband, showing massive tricuspid regurgitation. B: moderate tricuspid regurgitation after adjustment of the Cardioband.

the tricuspid annulus by cinching the wire inside the Cardioband, from 50 to 36 mm on echocardiography. After the annulus had been adjusted, 2 stenoses were observed in the middle segment of the right coronary artery, probably caused by the traction exerted, the long-term significance of which is unknown (figure 1C, D, videos 1 and 2 of the supplementary data). At the end of the procedure, the patient had moderate TR (figure 2, videos 3 and 4 of the supplementary data). She was discharged 2 days later having improved clinically and functionally (New York Heart Association functional class II); at 1-month postdischarge she had no signs of right heart failure.

There is little experience so far with this device, generally coming from the TRI-REPAIR registry,[3] which included 30 patients from 8 European centers and demonstrated the safety of the procedure at 6 months, as well as its efficacy in reducing TR and improving symptoms. In conclusion, the tricuspid Cardioband is a direct percutaneous annuloplasty device that offers an alternative to surgery in patients who are inoperable or high risk. Larger studies with longer follow-up are required to determine its long-term safety and efficacy.

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CONFLICTS OF INTEREST

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APPENDIX. SUPPLEMENTARY DATA

Supplementary data associated with this article can be found in the online version available at https://doi.org/10.1016/j.rec.2019.10.024

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Aortic regurgitation in continuous flow left ventricular assist devices for long-term use: a diagnostic and therapeutic challenge

La insuficiencia aórtica en las asistencias ventriculares mecánicas de larga duración y flujo continuo: reto diagnóstico y terapéutico

To the Editor,

Aortic regurgitation (AR) of at least moderate severity is a frequent complication in patients with a long-term continuous flow left ventricular assist device (LVAD) (affecting 25%-30% of patients in the first year). However, its prevention and management are sources of controversy, given the limited evidence available. In addition, its clinical presentation can be atypical and may delay the diagnosis of this potentially life-threatening complication.[1]

We present the case of a 72-year-old man with a mechanical mitral prosthesis after native valve endocarditis in 2003. The patient had an extensive anterior myocardial infarction due to a septic embolism that progressed to severe left ventricular dysfunction. Optimal treatment was implemented and he had good functional status until he progressively deteriorated about 2 years ago, developing dyspnea on minimal exertion and needing several hospitalizations that sometimes required the use of inotropic agents. Workup was begun to evaluate the possible use