

# First colombian tricuspid endovascular valve in valve using kissing balloon technique for failed bioprosthesis annular cracking

## *El primer caso colombiano de reemplazo percutáneo válvula en válvula tricúspide utilizando la técnica de kissing balloon con fractura anular por falla bioprostética*

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### Abstract

We present the first case in Colombia of tricuspid endovascular valve in valve for failed bioprosthesis in a 40 years old patient with very high operative risk with great results, proposing kissing balloon annulus cracking technique as a practical solution for the colombian specialists.

**Keywords:** Tricuspid valve. Transcatheter valve replacement. Valve-in-valve replacement.

### Resumen

Se presenta el primer caso en Colombia de un reemplazo percutáneo tipo válvula en válvula por falla de bioprótesis tricúspide en un paciente de 40 años con un muy alto riesgo quirúrgico, con excelentes resultados, proponiendo la técnica kissing balloon de fractura anular como una solución práctica para los especialistas colombianos.

**Palabras clave:** Válvula tricúspide (VT). Reemplazo valvular transcatóter. Reemplazo de válvula en válvula.

### Clinical case

A 40-year-old female arrives at the emergency room presenting with palpitations and chest discomfort for the last 12 hours, past medical history of Ebstein malformation that required 4 tricuspid valve surgical replacements, all due to thrombotic deterioration especially with

mechanic prosthesis, last surgery was 15 years ago, using a biological Labcor #25 prosthesis.

The patient reported a previous baseline functional status NYHA I, asymptomatic; at physical examination heart rate 129 bpm, respiratory rate 18 bpm, blood pressure 109/67 mmHg, oxygen saturation 98%, no jugular vein distention or edemas were present.

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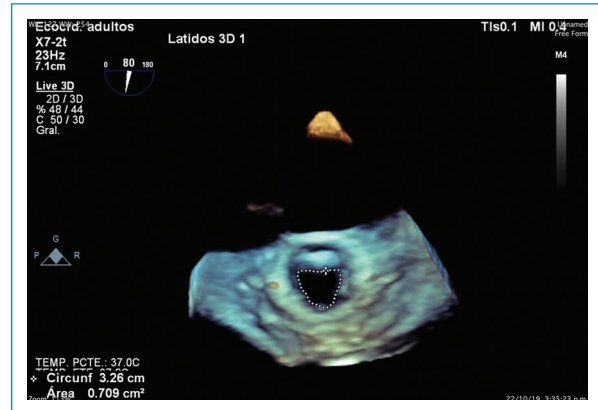
Electrocardiogram showed supraventricular tachycardia, that turned into atrial fibrillation with rapid ventricular response after treatment with IV metoprolol, leading to clinical deterioration, and immediate admission to the ICU for IV amiodarone infusion.

Transthoracic and transesophageal echocardiogram, showed severe right atrial enlargement of 54 cm<sup>2</sup>, small right ventricle along with low tricuspid annular plane systolic excursion (TAPSE 0.6) of biological prosthesis that presented signs of dysfunction: limited movement of the valves, annular sclerosis, diastolic turbulent flux, peak gradient 17 mmHg, mean gradient 5 mmHg, pressure half-time 113 ms and area 0.79 cm<sup>2</sup> (Fig. 1), with mild-moderate central insufficiency (vena contracta 3.9), small para-valvular leak (vena contracta 2 mm), with no relevant morphological or functional alteration in the rest of the cardiac structures and an LVEF of 60%.

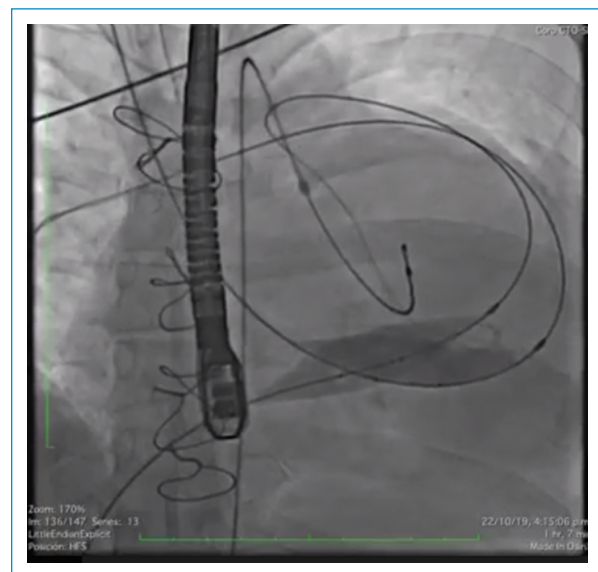
The patient had no other relevant symptoms or signs, and complementary laboratories of renal, hematological, endocrine, liver function were normal, inflammatory markers were not elevated. Pharmacological management for heart rhythm control failed, requiring 200 Joules cardioversion, which was successful, facilitating cardiac CT scan imaging, for better characterization of previous findings like atrium enlargement and biological prosthesis in tricuspid position with criteria of dysfunctionality: diameter of the prosthetic ring calculated at 33 mm with an average valve diameter of 21.6 mm and 19.4 mm internal diameter with limited opening of the valves: area of 1.1 cm<sup>2</sup> and a paravalvular leak.

The heart team evaluated the case, and discarded the surgical options because of the multiple previous interventions resulting in severe chest adhesions that increased the surgical risk to a level that exceeded its benefit, so endovascular valve in valve implant was considered, but the team faced a difficult technical situation, the tricuspid valve was stenotic and they would need to expand the implant area by cracking the prosthesis annulus. As 24 mm rigid balloons are not available in Colombia, a kissing balloon technique was proposed as an alternative to solve this issue.

As soon as the patient was stabilized, with ventricular rhythm controlled, the valve in valve procedure was performed via right femoral vein, the kissing balloon technique was performed with two 14 x 20 mm ultra-non-compliant balloons under pacemaker arrest (Fig. 2) and transesophageal echocardiographic monitoring, successful rupture of the biological prosthesis ring was achieved, which allowed the successful placement of the Edwards XT # 26 implant, with a residual



**Figure 1.** 3D echoTE image of stenotic tricuspid bioprosthesis area: 0.79 cm<sup>2</sup> and annular sclerosis.

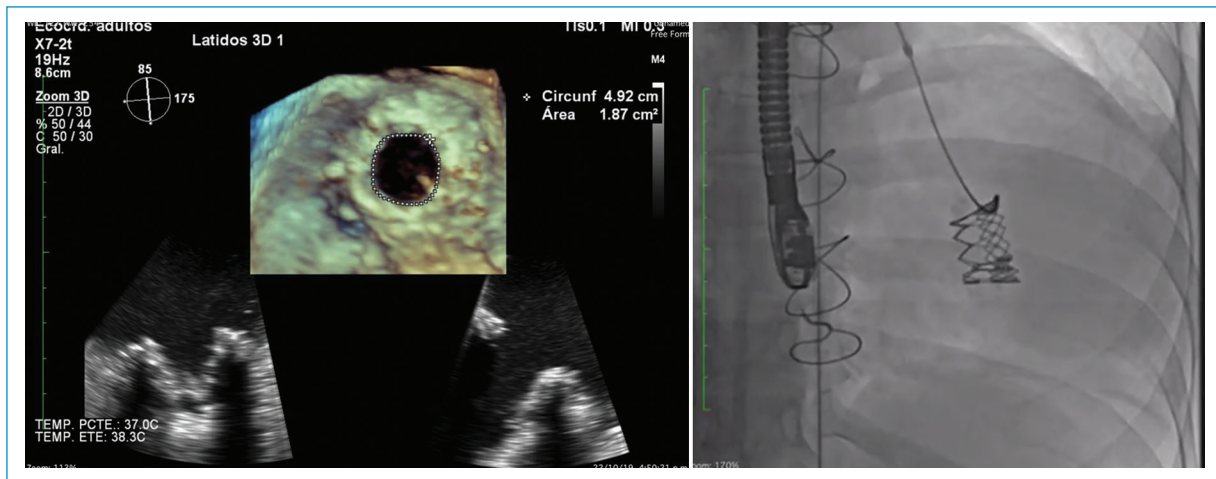


**Figure 2.** Angiographic image of kissing balloon technique using two 14x20 mm ultra-non-compliant balloons with successful annular cracking.

peak gradient of 3 mmHg and mean 1 mmHg without valvular or paravalvular insufficiency evaluated with echo-TE intraprocedural monitoring (Fig. 3).

The patient was considered to have a high risk of thrombosis due to previous medical history, therefore anti-aggregation therapy with clopidogrel during three months, along with permanent formal anticoagulation with warfarin was set to achieve INR between 2 and 3 to preserve valvular integrity.

Soon after discharge patient was back to sinus rhythm, during a year of follow up the patient remained



**Figure 3.** Final result: echocardiography and angiography image of percutaneous implant with new effective area of 1.87 cm<sup>2</sup>

asymptomatic, with variable INR within 1.7- 4 that required regular controls, echo at one year showed an implant with no signs of thrombosis, preserved measures of functionality: peak gradient 6 mmHg, mean gradient 3 mmHg, peak velocity 121 cm/s.

## Discussion

We present the case of a 40 year old patient with Ebstein's anomaly, a rare malformation of the tricuspid valve and the right heart, with an incidence of approximately 1 in 20,000 newborns, in which tricuspid valve repair is the goal of operative intervention<sup>1</sup>, the surgical treatment of the patient at an early age had stabilized her condition in terms of right ventricle enlargement, myocardial dysfunction, and tricuspid valve regurgitation, with the use of mechanical implants that lead to thrombosis and the need for multiple interventions that ended up in a hostile inoperable chest and an early need for valve replacement because of deterioration, that is an inevitable complication of tricuspid implants that have shown a durability of approximately 10 years, except in patients below 16 years of age, who present dysfunction within 5 years<sup>2,3</sup>.

Tricuspid endovascular valve in valve has been proposed as an alternative for patients with degenerated bioprosthesis who cannot go under surgery for any reason, evidence from countries where this endovascular intervention has been taking place is promising, and is considered safe and effective, but depends on many factors especially the preoperative clinical state of the patient, influenced by age, anatomical conditions,

the degree of myopathy worsened by conditions like chronic arrhythmias and ischemic disease<sup>4-6</sup>.

The main mechanism of prosthesis dysfunction is regurgitation, but in some cases, like this one, annular and leaflet fibrosis deteriorates the functionality of the prosthesis, the classical approach requires cracking of the prosthetic annulus to place an implant avoiding greater stenosis, in our case the limited commercial offer of large valvuloplasty non-compliant balloons lead to the need of using the kissing balloon technique initially reported in coronary interventions, but occasionally used for valvular annular fracture with good results.

## Conclusion

Percutaneous tricuspid valve in valve via venous femoral access, using the kissing balloon technique resulted in a life-saving procedure for this patient, who was the first case in Colombia. Given the rapid growth of endovascular therapies, it is important to make them part of the treatment possibilities since there is promising evidence that supports the use of these therapies in well-chosen, planned, and executed cases performed by highly qualified professionals, who can adapt the available resources to attempt the best possible outcome for the patient.

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## Conflicts of interest

The authors declare no conflicts of interest.

## Ethical disclosures

**Protection of humans and animals.** The authors declare that no experiments on humans or animals were performed for this research.

**Confidentiality of data.** The authors declare that they have followed their center's protocols on the publication of patient data.

**Right to privacy and informed consent.** The authors have obtained the informed consent of the patients and/or subjects referred to in the article. This document is in the possession of the corresponding author.

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