

## Scientific letters

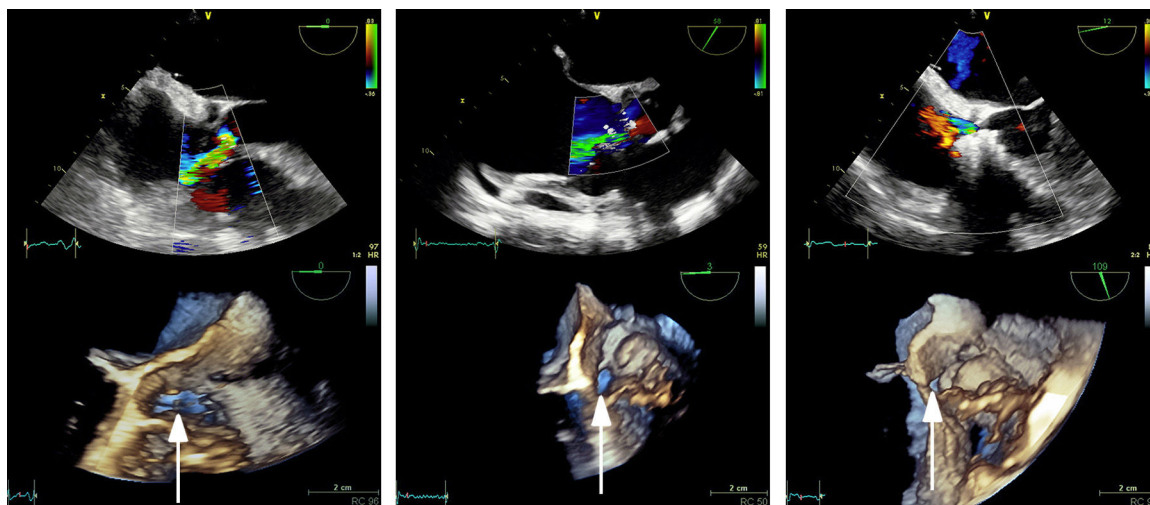
**Effect of Incomplete Closure of a Gerbode Defect With the Nit-Occlud Lê VSD Coil: Severe Hemolysis Requiring a Second Procedure****Resultado del cierre incompleto de defecto tipo Gerbode con coil Nit-Occlud Lê VSD: hemolisis grave que precisa reintervención****To the Editor,**

We present the case of a 62-year-old woman, an ex-smoker with high blood pressure and hyperthyroidism, who had been diagnosed in 1992 with tricuspid endocarditis and the Gerbode defect, a left ventricle to right atrium shunt.<sup>1</sup> The patient reported mild dyspnea on exertion, and spirometry showed moderate obstruction.

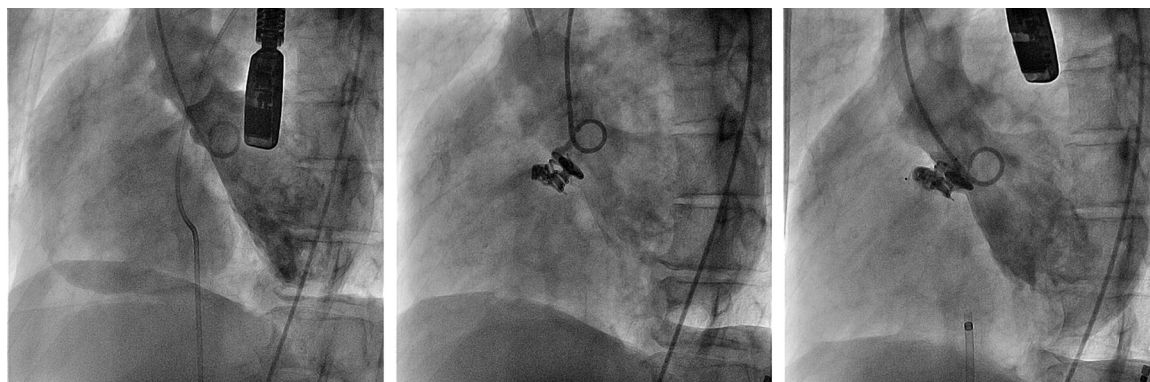
After 23 years, the patient developed symptoms of predominantly right-sided heart failure. Echocardiography and catheterization after maximum tolerated medical treatment showed dilation of the right chambers and left ventricle, moderate biventricular dysfunction (left ventricular ejection fraction = 40%), the Gerbode defect (peak velocity = 5 m/s and Qp/Qs =

2.1), and significant pulmonary hypertension (50/20/30 mmHg) with no transpulmonary gradient. The defect measured 20 × 6 mm on 3-dimensional echocardiography (Figure 1 and video 1A in Appendix B of the supplementary material) and 5.5 mm on angiography (Figure 2 and video 1B in Appendix B of the supplementary material).

Although catheter-based closure is now the preferred treatment at many centers, surgical repair remains the norm and treatment options for this patient were first discussed in a medical-surgical session. Surgery was rejected due to the elevated comorbidity and biventricular dysfunction, and the decision was therefore taken to close the defect percutaneously with the Nit-Occlud Lê VSD coil duct occluder.<sup>2</sup> After an arteriovenous circuit was established, a 12 × 8 mm device was implanted through a 7-Fr delivery sheath (video 2A in Appendix B of the supplementary material). A notable residual defect persisted after this procedure, and a second device was therefore implanted, measuring 10 × 6 mm. Release of the 2 devices markedly reduced the short circuiting (residual defect < 5 mm) and triggered a 20 mmHg drop in pulmonary pressure (Figure 1, Figure 2, and video 2B in Appendix B of the supplementary



**Figure 1.** Color Doppler echocardiography (top) and 3-dimensional echocardiography (bottom) showing the Gerbode defect at baseline (left), after the first procedure (center), and after the second procedure (right).



**Figure 2.** Ventricular angiography showing the Gerbode defect before treatment (left), the residual defect after the first procedure with 2 Nit-Occlud Lê VSD coils measuring 12 × 8 and 10 × 6 mm (center), and the minimal defect after the second procedure with a 6 mm Amplatzer VSD device and a 4 × 4 mm ADO II device (right).

material), confirming a major contribution from pulmonary hyperflow.

The patient later developed intense choloria, with high serum levels of bilirubin and lactate dehydrogenase (LDH). Hemolysis was confirmed by undetectable serum haptoglobin, low hemopexin, and a negative Coombs test. The patient had an indolent clinical course with recurrent hemolysis requiring repeated transfusions every 48 to 72 hours and hemodialysis to treat acute kidney failure. After 1 month, the hemolytic episodes persisted, and after the surgical option was again rejected, percutaneous intervention was undertaken in a further attempt to close the small residual defect.

A 6-Fr sheath was inserted through the defect to implant a 6-mm Amplatzer VSD device (video 3 A and B in Appendix B of the supplementary material). A slight residual defect persisted, and a 0.014-inch guidewire was therefore used to position a 4-Fr sheath, through which a 4 × 4 mm Amplatzer Duct Occluder II Additional Sizes device was implanted. This resulted in a minimal residual defect, and the 2 devices were released (Figure 1, Figure 2, and videos 3B-D in Appendix B of the supplementary material). After 6 months, the patient remained asymptomatic, with no hemolysis and restored kidney function.

The Gerbode shunt was first described as a congenital defect,<sup>1</sup> but this type of defect frequently occurs as a complication of surgical or percutaneous cardiac procedures<sup>3</sup> and after tricuspid valve endocarditis.<sup>3,4</sup> Hemodynamic repercussions are an indication for defect closure, often performed via the percutaneous route. Gerbode defects are located close to the His bundle or the aortic valve, and the occluder device must therefore be selected with care to avoid interference. For our patient, we chose Nit-Occlud L<sup>®</sup> VSD coil duct occluders because of their efficacy and safety in the closure of perimembranous defects.<sup>2</sup> The high flexibility of these devices reduces the risk of tearing delicate structures; moreover, these devices adapt to complex and irregular defect morphologies and reduce the risk of interference with valve function. To our knowledge, this is the first case report of the use of this device to treat a Gerbode defect and is also the first to report simultaneous implantation of 2 devices of this type.

Hemolysis is a recognized complication of surgical and percutaneous procedures for closing heart defects. The risk of hemolysis is increased by incomplete closure, and although it can be transient,<sup>2,5</sup> hemolysis often persists, a situation that requires reintervention.<sup>6</sup> The high prevalence of hemolysis associated with small residual septal defects is explained by the large pressure difference between the heart chambers. It is also possible that the structure of the devices used might contribute to this complication; however, this hypothesis is not supported by the published data, as the incidence of hemolysis requiring reintervention is < 5%.<sup>2</sup>

Due to concerns about possible interference with aortic valve motion, we selected a smaller device than indicated by initial modeling. This may have contributed to the persistence of the defect; however, we cannot distinguish the potential influence of device size from effects due to defect morphology, tissue tearing, or the device design itself. For the second procedure, concerns about

device design prompted us to select an Amplatzer VSD device because of the small size of its closing disks and an Amplatzer Duct Occluder II Additional Sizes device because of its minimal profile.

It is often wise to apply Voltaire's aphorism "perfect is the enemy of good enough"; however, for the closure of Gerbode defects, we must insist on excellence, in the form of the most complete closure possible, in order to avoid complications.

## CONFLICTS OF INTEREST

J.L. Zunzunegui Martínez is a proctor for PFM Medical and St. Jude Medical.

## SUPPLEMENTARY MATERIAL



Supplementary material associated with this article can be found in the online version available at <http://dx.doi.org/10.1016/j.rec.2016.12.019>.

Armando Pérez de Prado,<sup>a,\*</sup> José Luis Zunzunegui Martínez,<sup>b</sup> Raúl Carbonell de Blas,<sup>a</sup> Miguel Ángel Rodríguez García,<sup>a</sup> Tomás Benito González,<sup>a</sup> and Felipe Fernández Vázquez<sup>a</sup>

<sup>a</sup>Servicio de Cardiología, Hospital Universitario de León, León, Spain

<sup>b</sup>Servicio de Cardiología Pediátrica, Hospital Universitario Gregorio Marañón, Madrid, Spain

\* Corresponding author:

E-mail address: [aperez@secardiologia.es](mailto:aperez@secardiologia.es) (A. Pérez de Prado).

Available online 19 January 2017

## REFERENCES

1. Gerbode F, Hultgren H, Melrose D, Osborn J. Syndrome of left ventricular-right atrial shunt; successful surgical repair of defect in five cases, with observation of bradycardia on closure. *Ann Surg.* 1958;148:433–446.
2. Odemis E, Saygi M, Guzelbas A, et al. Transcatheter closure of perimembranous ventricular septal defects using Nit-Occlud<sup>®</sup> Le VSD coil: early and mid-term results. *Pediatr Cardiol.* 2014;35:817–823.
3. Taskesen T, Prouse AF, Goldberg SL, Gill EA. Gerbode defect: Another nail for the 3 D transesophageal echo hammer? *Int J Cardiovasc Imaging.* 2015;31:753–764.
4. Prifti E, Ademaj F, Baboci A, Demiraj A. Acquired Gerbode defect following endocarditis of the tricuspid valve: a case report and literature review. *J Cardiothorac Surg.* 2015;10:115.
5. Rothman A, Galindo A, Channick R, Blanchard D. Amplatzer device closure of a tortuous Gerbode (left ventricle-to-right atrium) defect complicated by transient hemolysis in an octogenarian. *J Invasive Cardiol.* 2008;20:E273–E276.
6. Ngu PJ, Harper RW, Nasir A. Percutaneous repair of acquired Gerbode defect complicated by hemolysis and acute kidney injury. *Int J Cardiol.* 2016;204:37–39.

<http://dx.doi.org/10.1016/j.rec.2016.12.019>

1885-5857/

© 2016 Sociedad Española de Cardiología. Published by Elsevier España, S.L.U. All rights reserved.

## New Model of Integration Between Primary Health Care and Specialized Cardiology Care



### Nuevo modelo de consulta externa de cardiología integrado con atención primaria

#### To the Editor,

Population aging and the higher prevalence of chronic diseases have forced health systems to rethink the way they offer services to

make them more effective. Often primary care (PC) and specialized care (SC) do not join forces due to lack of motivation, commitment, and mutual coordination. This has a negative impact on the continuity of care and inefficiencies in resource use, and also brings into question the system itself.<sup>1</sup> Our hospital serves a population of 548 223 inhabitants. It caters to outpatients in specialized units (hospital) and general clinics in 2 PC centers (25 patients per clinic). When echocardiograms are requested, the patients are usually referred to the hospital. Overall, 31.5% of the specialists' time is dedicated to general outpatient clinics.