JSHD
Journal of Structural Heart Disease

Case Report

Journal of Structural Heart Disease, December 2018, Volume 4, Issue 6:261-264
DOI: https://doi.org/10.12945/j.jshd.2018.011.18

Received: April 13, 2018
Accepted: August 20, 2018
Published online: December 2018

Is it Possible to Close a VSD in a Small Critically Ill Patient Without Artery Puncture Using a Cera® PDA Device?

Jesus Damsky Barbosa, MD*, Jorge Elbio Gómez, MD*, José Luis Alonso, MD*, Judith Ackerman, MD*, Roxana Chiabrando, MD

Department of Cardiology, Franchín Institution, Buenos Aires, Argentina

Abstract

Surgical residual ventricular septal deect (VSD) may lead to pulmonary hyperflow and edema in a small patient. Reoperation to address the residual defect carries high mortality, as this type of VSD may be difficult to solve and the patient is usually in congestive heart failure. Transcatheter closure becomes then an attractive approach.

We report a case in a small haemodynamically unstable patient with a residual apical VSD by transcatheter closure. TTE showed the VSD like a tunnel. A Cera®Lifetch PDA device was chosen to occlude it. The procedure was carried out without arterial puncture and guided by TTE, forming a veno-venous loop from right femoral to right jugular veins. The patient was discharged 15 days after procedure and at 6 months follow-up continues to be haemodynamically compensated.

Key Words

Apical VSD closure • Small critical patients • Noninvasive ventilation

Introduction

In 1988, James Lock first described percutaneous ventricular septal defect (VSD) closure [1]. In his publication, he described the arterio-venous loop to close a muscular VSD with the jugular venous access. International standards recommend weights over 10 kg for this procedure. However, Zatner and collaborators reported in 2014 endovascular VSD closure in patients less than 5 kg. They had even attempted closure in a 2.2 kg baby [2]. At the same time, described the veno-venous loop with the inferior cava vein.

Case report

We report a 6 months-old male patient weighing 6.1 kg who had undergone surgical closure of multiple muscular VSDs at 2 months of age. After surgery, the patient was haemodynamically unstable because of pulmonary edema and congestive heart failure requiring noninvasive ventilation. Transthoracic echocardiography (TTE) showed a residual apical VSD. It resembled a tunnel, measuring 6.5 mm at the entrance and 4.9 mm in the mid-portion. Its length was 6 mm with a significant QP/QS. TTE also revealed a patent foramen ovale.

The planned strategy was percutaneous closure guided by TTE using a veno-venous loop to avoid arterial puncture and decreasing the dose of contrast injected. At catheterization lab, the hemodynamic data showed moderate pulmonary hypertension and severe left to right shunt.

Fax +1 203 785 3346
E-Mail: jshd@scienceinternational.org
http://structuralheartdisease.org/

ISSN 2326-4004

Accessible online at:
http://structuralheartdisease.org/

* Corresponding Author:
Jesus Damsky Barbosa, MD
Department of Cardiology
Franchín Institution
461E n° 254, (1896) City Bell, Buenos Aires, Argentina
Tel. +54 11 5803 8203; Fax: +; E-Mail: jdamskyb@gmail.com

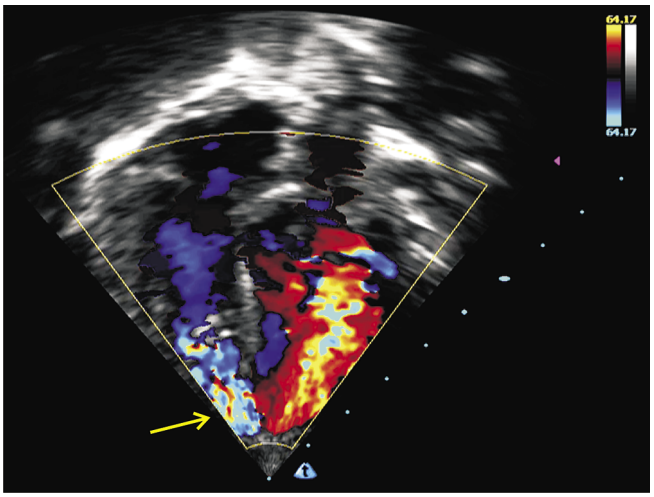

Figure 1. TTE: color-flowmapping: apical view, 4 chambers. The-arrow shows the apical VSD. Diameter: 6 mm.

TTE confirmed dimensions of the VSD (Figure 1). It also showed the absence of an adequate inferior rim to support the device.

Selection of the most appropriate device was based on TTE images and measurements. As the VSD was apical and resembled a tunnel, we decided to close it with a patent ductus arteriosus (PDA) Cera®Lifetech device occluder. The device selection was around twice the diameter of the VSD.

The procedure was carried out using right femoral vein and right jugular vein punctures. Through the femoral venous access a 3.5 JR catheter was advanced, crossing the patent foramen ovale and by anterograde approach through the mitral valve, a left ventricular angiogram was performed in 40° left anterior oblique and 20° cranial. The apical muscular VSD was found (Figure 2).

The VSD was crossed with the catheter and the tricuspid valve. A 0.032" Terumo guide wire was positioned in the inferior vena cava. A 20 mm snare (SeQure TM Snare System®Lifetech) was used to retrieve the guide wire from the jugular vein establishing a veno-venous loop (Figure 3).

A 7 fr sheath was advanced over the wire from the jugular vein and positioned in the left ventricle.

A 10/8 mm Cera® PDA device was advanced until opening the disk on the left ventricular side of the septum. Finally, the device was totally deployed, but not released. An angiogram was performed to assess device position. Once positioned was confirmed to be good, the device was released (Figure 4).

In the immediate post-closure assessment, a minimal residual shunt remained (Figure 5 A, B).

After the procedure, the patient recovered for 24 hours. Chest x-ray the following day revealed a decrease in the size of the cardiac silhouette. TTE revealed a minimal residual shunt. The patient was discharged home 15 days after the procedure in excellent condition. At the 6 months follow-up, the patient's weight doubled, the device was correctly positioned with a minimal residual shunt by TTE.

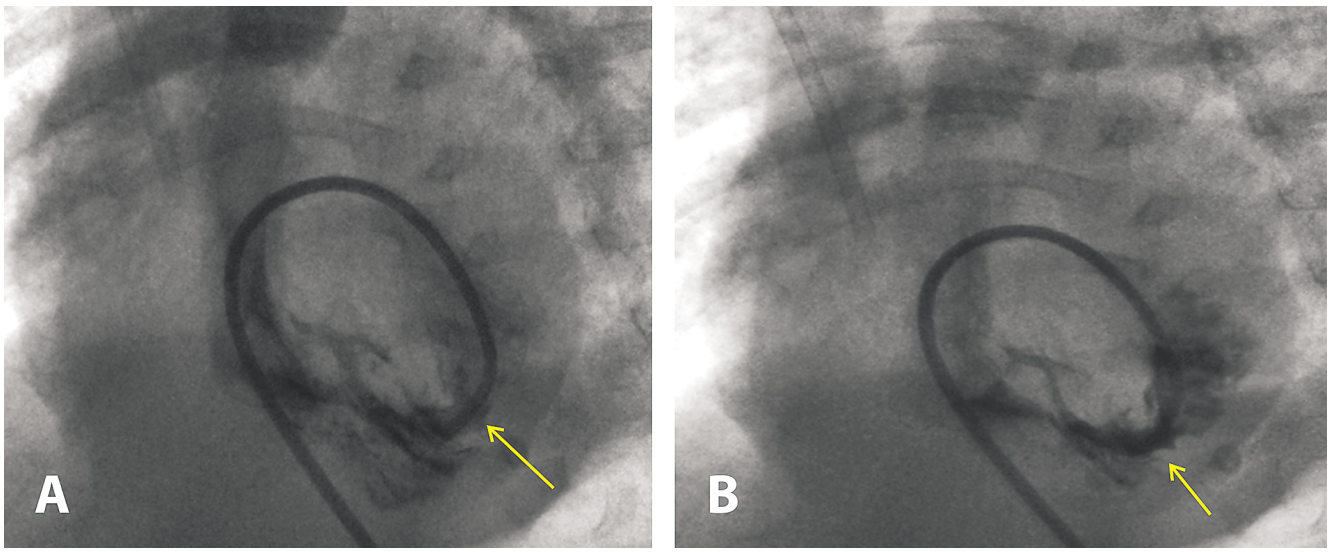

Figure 2. Angiogram was done in LV in 4 chambers where we can see the VSD like a tunnel.

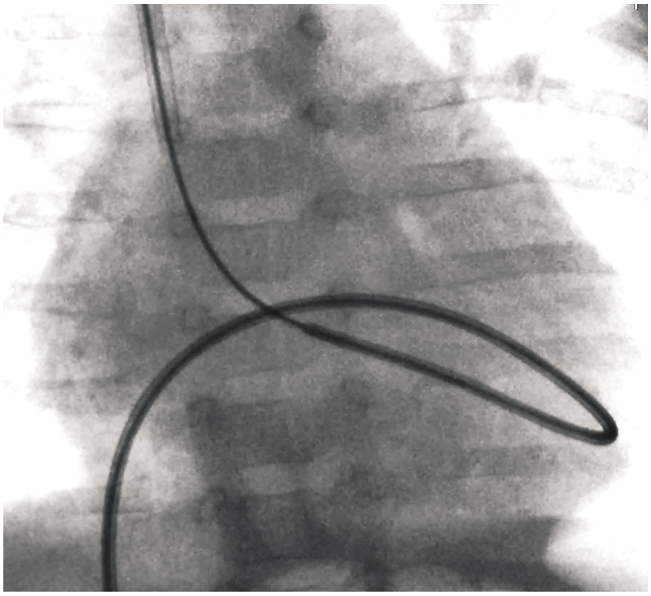

Figure 3. Venous-venous loop between femoral vein and jugular vein.

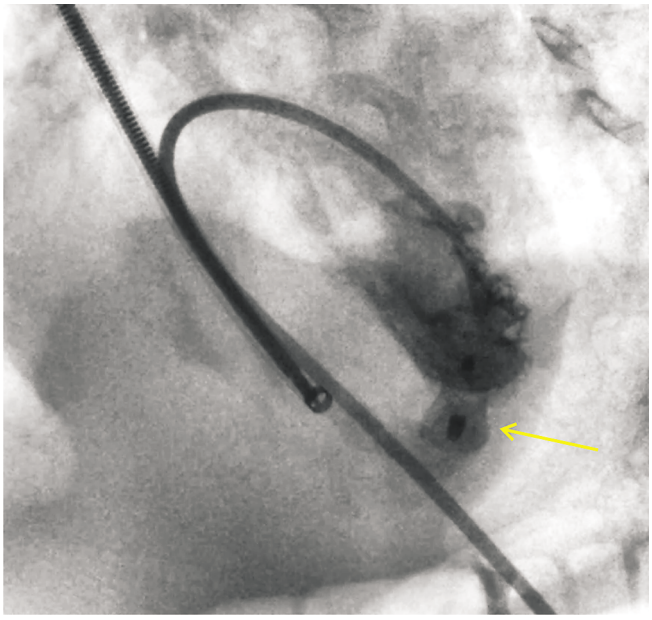

Figure 4. Immediate period: the image shows the device in good position with residual shunt.

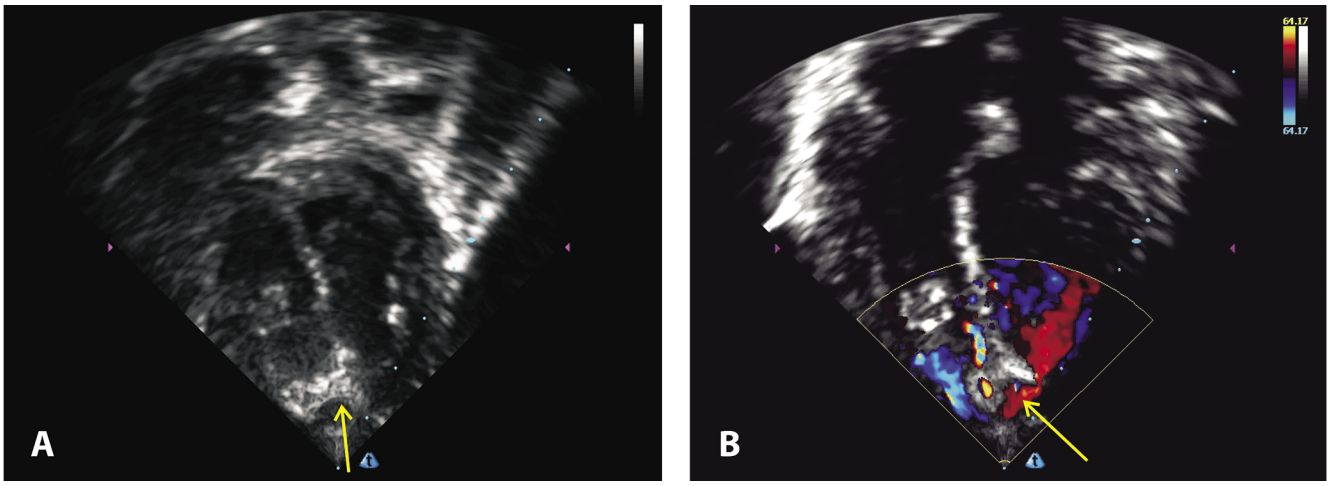

Figure 5. ***Panel A.*** TTE, 2D, apical 4-chamber view, the arrow shows the device correctly positioned. ***Panel B.*** TTE, color-flow mapping, apical 4-chamber view, the arrow shows a minimal residual shunt.

Discussion

While surgery is the gold standard for VSD closure, in the context of multiple muscular and apical VSDs the risk of residual defects is high. VSD's account for 5 to 25% of all cases of congenital heart disease [3, 4]. A residual shunt after VSD closure may lead to pulmonary overflow, left atrial and left ventricular dilatation and congestive heart failure. Therefore, this kind of residual VSDs (hemodynamically significant ones) must be closed to avoid left ventricular volume overload, ventricular dilatation, dysfunction, arrhythmias, aortic regurgitation, pulmonary arterial hypertension and/or endocarditis. Reoperation is associated with increased morbidity and mortality. In our case, the residual VSD was apical and would have been very difficult for surgical approach.

Percutaneous closure is an attractive alternative approach, as it can avoid redo sternotomy and need for a second run of cardiopulmonary bypass and aor-

tic cross-clamping in a critically ill patient. Although low patient's weight can be challenging for percutaneous closure of such defects, the procedure has been done in patients less than 10 kg using only venous approach, avoiding arterial puncture [2].

Presence of foramen ovale facilitated access to the left ventricule and crossing the VSD with eventual snaring from the juguilar vein forming a venovenous loop.

The use of TTE to assess the VSD and guide closure steps was of paramount importance. It allowed us continuous assessment during various steps of closure and in assessment of final device position and shunt closure.

The use of a PDA device was also helpful since it has a retention disk in left side, a stenting force on the walls of the tunnel and absence of a right disk. Finally, a 7fr sheath was used which was well accommodated in the jugular vein without any vascular injury.

Conclusions

Percutaneous closure of an apical residual VSD appeared to be safe and effective alternative approach in a small patient. The patent foramen ovale allowed us to carry out a veno-venous loop avoiding arterial puncture. TTE images were good to guide the procedure. Finally, the use of a PDA device was good for the kind of VSD that this patient had.

Conflict of Interest

The authors have no conflict of interest relevant to this publication.

Comment on this Article or Ask a Question

References

1. Lock JE, Block PC, McKay RG, Baim DS, Keane JF. Transcatheter closure of ventricular septal defects. Circulation. 1988;78:361-368. DOI: 10.1161/01.CIR.78.2.361
2. Zartner P, Christians C, Stelter J, HraskaV, Schneider M. Transvascular Closure of Single and Multiple Muscular Ventricular Septal Defects in Neonates and Infants < 20 kg. Cathet Cardiovasc Interven. 2014;83:564–570. DOI: 10.1002/ccd.25177
3. Wollenek G, Wyse R, Sullivan I, Elliott M, de Leval LM, Stark J. Closure of muscular ventricular septal defects through a left ventriculotomy. Eur J Cardiothorac Surg. 1996;10:595–598. DOI: 10.1016/S1010-7940(96)80371-X
4. Serraf A, Lacour-Gayet F, Bruniaux J, Ouaknine R, Losay J, Petit J, et al. Surgical management of isolated multiple ventricular septal defects. Logical approach in 130 cases. J Thorac Cardiovasc Surg. 1992;103:437–442. PMID: 1545542
5. Kitagawa T, Durham LA, III, Mosca RS, Bove EL. Techniques and results in the management of multiple ventricular septal defects. J Thorac Cardiovasc Surg. 1998;115:848–856. DOI: 10.1016/S0022-5223(98)70366-6
6. Zhu G, Huang Y, Wei D, Shi Y. Efficacy and safety of noninvasive ventilation in patients after cardiothoracic surgery: A PRISMA-compliant systematic review and meta-analysis. Medicine. 2016;95:e4734. DOI: 10.1097/MD.0000000000004734

Cite this article as: Damsky Barbosa J, Gómez JE, Alonso JL, Ackerman J, Chiabrando R. Is it Possible to Close a VSD in a Small Critically Ill Patient Without Artery Puncture Using a Cera® PDA Device? Structural Heart Disease. 2018;4(6):261-264. DOI: https://doi.org/10.12945/j.jshd.2018.011.18