Kardiologia Polska 2013; 71, 10: 1076–1078; DOI: 10.5603/KP.2013.0264 ISSN 0022–9032

OPIS PRZYPADKU / *CASE REPORT*

Right ventricular outflow tract giant pseudoaneurysm: percutaneous approach and complications

Olbrzymi tętniak rzekomy drogi wypływu z prawej komory: postępowanie interwencyjne i komplikacje

Paweł Dryżek[1], Sebastian Góreczny[1], Tomasz Moszura[1], Ludomir Stefańczyk[2], Konrad Szymczyk[2], Andrzej Sysa[1], Jadwiga A. Moll[1]

[1]Department of Cardiology, Polish Mothers' Memorial Hospital, Research Institute, Lodz, Poland
[2]Department of Radiology and Diagnostic Imaging, Medical University of Lodz, Poland

Abstract

We report a case of a 19-year-old patient with double outlet right ventricle (RV) and recurrent giant RV outflow tract pseudoaneurysm, after multiple redo surgery. The patient underwent implantation of a 10 mm Amplatzer Septal Occluder to close the pseudoaneurysm. Postinterventional echocardiography revealed dislocation of the device into the cavity of the pseudoaneurysm. Consecutive computed tomography enabled three-dimensional measurements of the pseudoaneurysm and its orifice and resulted in implantation of a 20 mm occluder.

Key words: interventional treatment, computed tomography, embolisation

Kardiol Pol 2013; 71, 10: 1076–1078

INTRODUCTION

Pseudoaneurysm of the right ventricular outflow tract (RVOT) is one of the possible complications of surgery for complex congenital heart defects requiring right ventriculotomy [1–3]. Enlargement of the pseudoaneurysm can cause compression on the nearby structures or can even lead to fatal spontaneous rupture. Therefore it requires precise diagnostic evaluation and treatment [1–4].

Here we report the case of a 19-year-old patient with double outlet RV after multiple redo surgery and recurrent giant RVOT pseudoaneurysm. The patient underwent percutaneous implantation of two Amplatzer Septal Occluders to close the pseudoaneurysm.

CASE REPORT

A 19-year-old patient with double outlet RV, pulmonary atresia and ventricular septal defect, after redo surgeries (Waterston operation, homograft insertion, homograft exchange) was admitted to our institution from elsewhere shortly after unsuccessful surgical repair of the pseudoaneurysm.

On admission, the patient presented in good general condition, with no symptoms of heart failure. The chest X-ray revealed mild cardiomegaly with widening of the cardiac silhouette in the region of the main pulmonary artery. Echocardiography showed enlargement of the RV with 1st grade tricuspid valve regurgitation (gradient: 55 mm Hg), as well as recurrent pseudoaneurysm of the RVOT (7 × 7 cm) with the dimension of the neck estimated to be 10 mm. No stenosis and 1st grade regurgitation of the homograft were noticed. Consecutive right heart catheterisation confirmed the diagnosis and additional stenosis of the right pulmonary artery with maximal pressure gradient of 50 mm Hg was revealed. Two Palmaz-Genesis stents (Cordis, Johnson & Johnson, Bridgewater, NJ, USA) were implanted to the right pulmonary artery and redilated with a high-pressure balloon: OPTA 16 × 40 mm (Cordis). The neck of the aneurysm was closed with a 10 mm Amplatzer Septal

Address for correspondence:
Sebastian Góreczny, MD, Department of Cardiology, Polish Mother's Memorial Hospital, Research Institute, ul. Rzgowska 281/289, 93–347 Łódź, Poland, tel: +48 42 271 21 84, fax: +48 42 271 14 78, e-mail: sebastiangoreczny@yahoo.pl
Received: 29.05.2012 **Accepted:** 04.07.2012

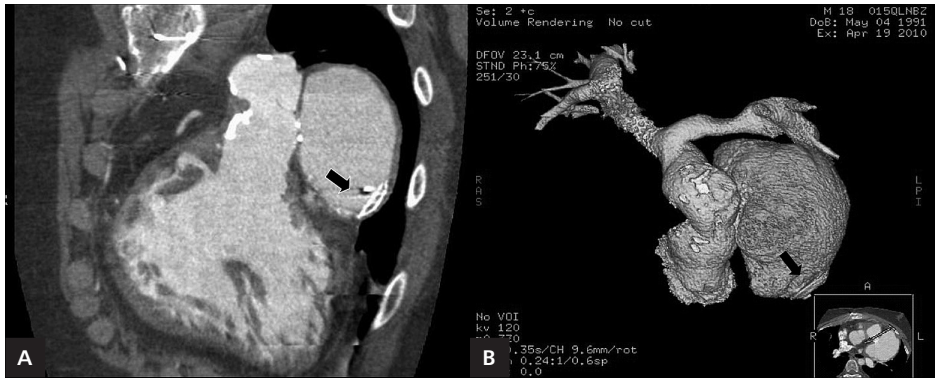

Figure 1. Multislice computed tomography scan (**A**) with three-dimensional reconstruction (**B**). The first implanted Amplatzer Septal Occluder adheres to the wall of the aneurysm (black arrow)

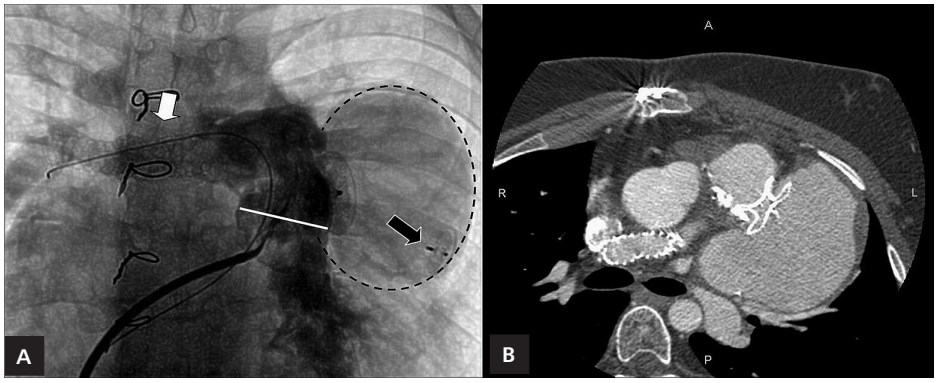

Figure 2. **A**. Angiography in the antero-posterior projection of the right ventricle after implantation of a 20 mm Amplatzer Septal Occluder; black arrow — the previously implanted Amplatzer Septal Occluder; white arrow — stents in the right pulmonary artery; white line — wide right ventricular outflow tract; black dotted line — the perimeter of the aneurysm; **B**. Multislice computed tomography scan after implantation of the second Amplatzer Septal Occluder to exclude the aneurysm (two stents in the right pulmonary artery also visible)

Occluder (AGA Medical, St. Jude, Plymouth, MN, USA). Control angiography showed properly implanted device in the neck of the aneurysm. However, several hours later, control echocardiography revealed dislocation of the occluder into the cavity of the pseudoaneurysm. No attempts at retrieval were made as the device adhered firmly to the wall of the pseudoaneurysm. The patient was scheduled for chest computed tomography (CT), and in the meantime control ambulatory echocardiographic studies showed gradual enlargement of the pseudoaneurysm and the RVOT with I/II grade regurgitation of the homograft.

A 64-slice CT with three-dimensional reconstruction was performed to scrutinise diameters of the pseudoaneurysm's neck (18 × 17 mm) and body (85 × 60 × 55 mm) before the next intervention (Fig. 1A, B).

In the consecutive catheterisation, restenosis in the previously implanted stents and the pseudoaneurysm were treated. To close the orifice of the pseudoaneurysm, a 20 mm Amplatzer Septal Occluder was chosen. Both transthoracic echocardiography and angiography, prior to and after unscrewing of the device, confirmed the proper position (Fig. 2A). Discharge echocardiography confirmed the correct position of the device with no regurgitation of the homograft (flow velocity: 1.6 m/s).

One month later, stable Amplatzer Septal Occluder position in the neck of the pseudoaneurysm was evidenced by CT (Fig. 2B). A small residual leakage through the device was observed as well. A further 22 months of follow-up were uneventful, with proper function of the homograft, stable dimensions of the RV and the outflow tract, and no residual flow through the device.

DISCUSSION

Right ventriculotomy and implantation of a patch, conduit or homograft during surgical reconstruction of the RVOT can result in the formation of a pseudoaneurysm [1–3]. The threat of the aneurysm rupturing, and of infectious or thromboembolic complications and compression on the nearby structures necessitate prompt diagnosis and intervention [1–4].

Two-dimensional transthoracic echocardiography and colour-flow mapping allow for the diagnosis. However, in some patients accurate measurements of the diameters of the pseudoaneurysm and its neck or visualisation of the anatomical relations to the nearby structures are insufficient [5, 6]. Transoesophageal echocardiography has similar limitations in this setting. However, multislice CT allows for accurate, multiplanar evaluation of the pseudoaneurysm and surrounding structures [6]. It aids proper selection of the type and size of the device, and therefore in the successful closure of the pseudoaneurysm. Magnetic resonance imaging has also been reported to be reliable in the evaluation of these structures [7].

In the presented patient, multiple surgeries in the RVOT because of homograft malfunction resulted in the formation of a pseudoaneurysm. An unsuccessful previous attempt at resection of the pseudoaneurysm, and the risk of its rupture during the next surgical intervention due to anterior localisation, led us to choose percutaneous treatment.

It has been reported that percutaneous closure of a left ventricular free-wall rupture or false aneurysm of the RV could be a reasonable option to surgery in high-risk patients [6, 8, 9]. In the presented patient, two options of treatment were considered: neck closure with a detachable device or implantation of a covered stent. Enlarged RVOT (35 mm) precluded the latter method, and so we chose the first one.

The first unsuccessful attempt at closure of the pseudoaneurysm was related to echocardiographic underestimation of the neck's dimensions and the concern of malfunction of the homograft's valve in case of a bigger device implantation. Dynamic changes of the diameters of the neck during the heart cycle could also have contributed.

The device adhered firmly to the wall of the pseudoaneurysm, formed by the pericardium, pleura, adhesions and other nearby structures. Therefore no attempts at retrieval were made, as it was considered too risky.

Successful implantation of the second, bigger Amplatzer Septal Occluder to the neck of the pseudoaneurysm decreased the risk of massive bleeding due to possible injury of its wall during sternotomy and resulted in cessation of the homograft's valve regurgitation, thereby postponing the need for surgery.

CONCLUSIONS

Percutaneous closure of a RVOT pseudoaneurysm is a feasible alternative treatment, especially in the case of a patient with a history of repeated surgical interventions. Our report also highlights the need for meticulous evaluation of a pseudoaneurysm's anatomy and exact three-dimensional measurements in order to avoid dislocation of the device due to the Amplatzer Septal Occluder undersizing or possible dynamic changes of the pseudoaneurysmal orifice diameters during the heart cycle.

Conflict of interest: *Dr Paweł Dryżek is proctor for St. Jude Medical.*

References

1. Antal AD, Cikirikcioglu M, Myers PO et al. Respiratory distress after surgery of RVOT pathologies: a word of caution on pseudoaneurysm development. Thorac Cardiovasc Surg, 2010; 58: 356–358.
2. Levine JC, Mayer JE, Keane JF et al. Anastomotic pseudoaneurysm of the ventricle after homograft placement in children. Ann Thorac Surg, 1995; 59: 60–66.
3. Yeo TC, Malouf JF, Oh JK, Seward JB. Clinical profile and outcome in 52 patients with cardiac pseudoaneurysm. Ann Intern Med, 1998; 15: 299–305.
4. Vlodaver Z, Coe JI, Edwards JE. True and false left ventricular aneurysms. Propensity for the latter to rupture. Circulation, 1975; 51: 567–572.
5. Sadiq M, Fenton AC, Firmin RK. False aneurysm of the right ventricular outflow tract after total correction of tetralogy of Fallot: diagnosis by echocardiography and successful repair by neck canulation for cardiopulmonary bypass. Br Heart J, 1994; 71: 566–568.
6. Agnoletti G, Iserin L, Rizzo E, Mousseaux E. Percutaneous closure of a false aneurysm of the right ventricle in a congenital heart disease patient. Circulation, 2007; 115: e400–e402.
7. Murashita T, Hatta E, Imamura M, Yasuda K. Giant pseudoaneurysm of the right ventricular outflow tract after repair of truncus arteriosus: evaluation by MR imaging and surgical approach. Eur J Cardiothorac Surg, 2002; 22: 849–851.
8. Gladding PA, Ruygrok PN, Greaves SC et al. Percutaneous closure of a left ventricular free-wall rupture site. Circulation, 2006; 113: e748–e749.
9. Lurz P, Taylor A, Bonhoeffer P. Percutaneous treatment of a giant right ventricular outflow tract pseudo-aneurysm and severe pulmonary regurgitation. Eur Heart J, 2007; 28: 2086.