Rescue atrial septal defect closure with the new GORE® cardioform atrial septal defect occluder

Alessandra Pizzuto, Magdalena Cuman, Massimiliano Cantinotti, Eliana Franchi, Giulia Corana, Cecilia Viacava, Nadia Assanta, Giuseppe Santoro
Department of Pediatric Cardiology and GUCH Unit, Heart Hospital “G. Pasquinucci”, National Research Council Tuscany Region “G. Monasterio”, Massa, Italy

ABSTRACT
Atrioventricular block (AVB) is an infrequent but life-threatening complication of transcatheter closure of atrial septal defect (ASD), accounting for 0.1%–6.2% of cases in large series. It has been related to unfavorable defect anatomy as well as size and intrinsic stiffness of the occluding device. In this setting, the new GORE® cardioform ASD occluder (GCA) device could be an appealing technical advance in ASD treatment. We report a case of complete AVB after ASD closure with an Amplatzer septal occluding (Abbott, Plymouth MN, USA) device successfully treated by its percutaneous retrieval and “rescue” deployment of GCA device few months later.

Keywords: Atrial septal defect, device, interventional cardiac catheterization

INTRODUCTION
Transcatheter closure is nowadays considered as the first-line therapeutic option of ostium secundum atrial septal defect (ASD).1 To date, large defects can be treated only with self centering devices (Amplatzer septal occluder [ASO] or Amplatzer like devices), however these prosthesis have greater intrinsic stiffness, which is responsible for the vast majority of complications, such as arrhythmias, atrioventricular block (AVB), and cardiac erosion.2-4 In particular, AVB following ASO® device (Abbott, Plymouth MN, USA) deployment has been reported in up to 6.2% of cases.5,6 The new GORE® cardioform ASD occluder (GCA) device (WL Gore and Associates, Flagstaff, AZ, USA) has been claimed as a significant technical advance since it could close large defects at low mechanical stress on the surrounding structures.7

This paper reports a case of early complete AVB after ASD closure with ASO device, successfully treated by its percutaneous retrieval and “rescue” GCA device deployment some few months later.
without significant residual shunt, neither impact on the nearby structures nor pericardial effusion. Since the patient was asymptomatic and hemodynamically stable, a short trial of methylprednisolone (25 mg/day i.v.) was started, resulting in just a mild improvement of conduction (2nd-degree AVB with long periods of complete AV dissociation after 7 days of therapy). After counseling, the parents refused any surgical option. Thus, transcatheter removal of the device was planned, to attempt a further percutaneous procedure with the forthcoming marketed GCA device. The device was easily removed using a goose-neck catheter (ev3, Plymouth, Minnesota, USA) [Figure 2b], with sudden improvement of intracardiac conduction (1st-degree AVB with PR interval of 300 ms) that completely normalized in a few months. Then, the interventional procedure was rescheduled after a few months. At this second attempt, dynamic sizing confirmed the ASD diameter (23–24 mm), which was potentially treatable with either 37-mm or 44-mm large device based on the company’s indications. However, the larger device was preferred due to perceived instability of the smaller one after several attempts of deployment [Figure 3]. After the final release, transient brief periods of advanced conduction delay were recorded and quickly replaced by stable sinus rhythm with 1st-degree AVB. Thus, she was discharged under oral methylprednisolone (16 mg/day) for a few weeks, with the device nicely positioned and without residual shunt [Figure 4]. At the 6-month follow-up evaluation, she remained asymptomatic without corticosteroid therapy, in sinus rhythm, and without conduction anomalies at EKG monitoring.

DISCUSSION

To date, AVB is a major adverse event of ASD closure with all marketed self-centering devices, accounting for 0.1%–6.2% of cases in large series.[2,4,6,8] The risk of this unpredictable complication seems to be higher in patients with deficient posteroinferior rims,[6] due to proximity between device and AV node that potentially causes local inflammatory response by mechanical pressure and/or friction.[5,9] AVB has also been related to size and intrinsic stiffness of the device, so advising, as a general rule, careful ASD sizing, and the use of undersized devices.[2]

The recently marketed GCA device, combining high softness and compliance, typical of nonself-centering devices, with the potential to close large defects thanks to an interdisc “adaptable” waist, could overcome this concern. These mechanical properties were crucial in our case, in which the local anatomy seemed favorable and the AVB was presumably due to intrinsic stiffness of the device possibly promoted by its size, resulting from a generous dynamic sizing. Despite this complication and the evolving trend[10] of percutaneous ASD closure only based on echocardiography, in our opinion, balloon sizing provides more accurate information about the real size of the defect and the dynamic sizing should be preferred to the static stop-flow technique since it more accurately details the texture of the defect rims, mainly in the case of floppy septum.

Finally, the relevance of the device stiffness as a cause of this complication could be further confirmed by the lack
of local impact on the conduction pathway of a similarly oversized GCA at the second procedure.

**CONCLUSIONS**

AVB is an infrequent but serious complication of ASD closure. In high-risk clinical/anatomic settings or as a rescue approach, the new GCA device could be a safer and innovative tool in alternative to the available technology.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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**Conflicts of interest**

GS is Proctor Abbott, Italy, WL Gore, Italy, Occlutech, Italy.

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