Mechanical interference between a closure device and the rigid stent of mitral bioprosthesis: a mechanism for closure device late dislodgement

Giuseppe Tarantini\textsuperscript{a,}, Stefania Rizzo\textsuperscript{b,}, Marco Mojoli\textsuperscript{a} and Cristina Basso\textsuperscript{b}

We report here the mechanical interference between mitral bioprostheses and devices currently adopted for percutaneous paravalvular leak closure as a possible cause for late dislodgement and embolization of successfully implanted and apparently stable closure devices. The images included in this study demonstrate that the topographical relationship of the target leak with the bioprosthetic valve posts may be a major obstacle for device stability after percutaneous paravalvular leak closure procedures.

An 85-year-old man with previous mitral valve replacement with a 33 mm St Jude Epic bioprosthesis for rheumatic disease was admitted for heart failure. Echocardiography showed massive mitral regurgitation due to a large anteroseptal paravalvular leak (PVL). Because of high surgical risk, percutaneous implantation of three Amplatzer Vascular Plug III devices was performed under echocardiographic guidance. The stability of all the devices was assessed with a vigorous ‘tug test’ and confirmed by fluoroscopy (Fig. 1a). The final angiography showed trivial residual mitral regurgitation. After the procedure, the patient showed a significant improvement in symptoms and exercise tolerance. Three months after the procedure, the patient was readmitted for a sudden onset of heart failure, suggesting a late procedural complication. Three-dimensional (3D)-echocardiography revealed recurrence of mitral regurgitation due to dislocation of the intermediate occluder (Fig. 1b). The patient refused further procedures and died a few days later due to ventricular fibrillation. At autopsy, two plugs appeared well anchored (Fig. 1c and d), as confirmed by post mortem radiography of the specimen (Fig. 1e). The embolized occluder was found at the aortic carrefour (Fig. 1f). The autopic examination of the leak from a ventricular view (Fig. 1d, arrowhead) revealed a strict anatomic relationship between the support structure (so-called ‘stent post’) of the bioprosthetic valve and the gap left by the occluder.

The embolization of the closure devices after the treatment of PVLs is a rare event. In the two largest series of percutaneous PVL closure procedures (136 and 57 procedures, respectively), only four acute embolizations have been described, whereas no late embolizations have been observed.\textsuperscript{1,2} To date, late detachment and embolization of closure devices for the treatment of PVLs was described only in three single case reports, and the mechanisms for this unusual complication are uncertain.\textsuperscript{3–5} In the present case, the patient suddenly complained of symptoms of heart failure 3 months after the procedure, which is consistent with a late occurrence of the embolization. On the basis of autopic examination, we hypothesize that the stability of the embolized device may have been impaired due to the presence of the neighboring prosthetic valve post, with suboptimal deployment of the device and a compromised anchoring on the ventricular side. Preprocedural planning should take into account this eventuality by means of topographic (e.g. computed tomography or echocardiographic) evaluation of the target leak with respect to the position of the valve posts.

Keywords: Amplatzer Vascular Plug III, device, embolization, mitral bioprosthesis, paravalvular leak

\textsuperscript{a}Cardiology Clinic and \textsuperscript{b}Cardiovascular Pathology, Department of Cardiac, Thoracic and Vascular Sciences, University of Padua, Padua, Italy

Correspondence to Giuseppe Tarantini, MD, PhD, Cardiology Clinic, Department of Cardiac, Thoracic and Vascular Sciences, Policlinico Universitario, Via Giustiniani, 2, 35128 Padua, Italy

Tel: +39 049 8211844; fax: +39 049 8212309; e-mail: giuseppe.tarantini.1@gmail.com

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\textsuperscript{*}Giuseppe Tarantini and Stefania Rizzo contributed equally to the writing of this article.
Fig. 1

(a) Angiography: three well deployed Amplatzer Vascular Plug devices. (b) 3D echocardiography: residual gap (arrowhead) between two AVP III. (c, d) Autopsy specimen: atrial and ventricular views of mitral valve (arrowhead shows the gap left by the embolized occluder). (e) Post-mortem radiography, arrow shows the gap left by the embolized occluder. (f) Autopsy specimen: posterior view of aorta, with an embolized AVP at the aortic carrefour.

References