

“Unlucky punch”: unexpected annular rupture during TAVR and successful treatment

Martin Geyer MD¹  | Alexander Tamm MD¹  | Daniel-S. Dohle MD² |
 Angela Kornberger MD² | Boris Schnorbus MD¹ | Andres Beiras-Fernandez MD¹ |
 Thomas Münzel MD¹ | Ralph Stephan von Bardeleben MD¹

¹Department of Cardiology, Cardiology I, University Medical Center Mainz (Johannes Gutenberg-University Mainz), Mainz, Germany

²Department of Cardiothoracic and Vascular surgery, University Medical Center Mainz, (Johannes Gutenberg-University Mainz), Mainz, Germany

Correspondence

Martin Geyer, Department of Cardiology, Cardiology I, University Medical Center Mainz, Langenbeckstr. 1, 55131 Mainz, Germany.
 Email: martin.geyer@unimedizin-mainz.de

Abstract

Although rare, annular rupture in TAVR is a feared and often unpredictable complication with relevant impact on in-hospital prognosis. Severe annular calcification is a common risk factor for annular rupture. We report on a case of annular rupture during TAVR with a balloon-expanded prosthesis in the absence of any annular calcification in the planning CT scan and illustrate the proposed pathomechanism as well as its successful immediate surgical management.

KEY WORDS

annular rupture, complication management, interdisciplinary heart team, planning CT scan, TAVR

An 83-year-old gentleman with severe symptomatic aortic valve stenosis (mean gradient 49 mm Hg) was referred to our Heart Valve Center. CT scan showed a severely calcified tricuspid aortic valve in the absence of annular or left ventricular outflow tract calcification (Figure 1 Panel A-C). After evaluation by our interdisciplinary heart team, decision was taken in favor of TAVR (transcatheter aortic valve repair) with respect to the patient's age, anatomic feasibility, and moderately elevated risk (logistic EuroSCORE I 16.6%).

After predilatation (23-mm balloon), a 29 mm Edwards® Sapien 3 prosthesis was implanted in optimal height (Figure 1D). Directly after implantation, pericardial tamponade (Figure 1E) evolved with urgent necessity for centesis. After drainage of 600 mL and antagonizing anticoagulation, hemodynamics stabilized at first; yet, recurrence of pericardial tamponade forced urgent thoracotomy under cardiopulmonary bypass established via femoral cannulation. An annular and ventricular rupture underneath the right-non and

the non-left commissure was successfully reconstructed using two infracommissural pericardial patches, and an Edwards® Perimount 23 mm bioprosthesis was surgically implanted. Despite complicated by a minor stroke, the patient recovered fast and was discharged in good condition.

The most suggestive explanation for this unexpected major complication in a nonsclerotized annulus is revealed by fluoroscopy during implantation (Figure 1F and Movie S1): a massive commissural calcium deposit on the noncoronary cusp protruded into the non-coronary sinus, causing to form a tenting situation which lead to an annular rupture (arrows). Our case illustrates that—though rare in the absence of annular calcification—unexpected annular rupture has always to be taken into account, and strengthens the significance of optimal pre- and periinterventional imaging as well as a synergistic approach by an interdisciplinary heart team enabling maximum security for all TAVR procedures.

Martin Geyer and Alexander Tamm contributed equally.

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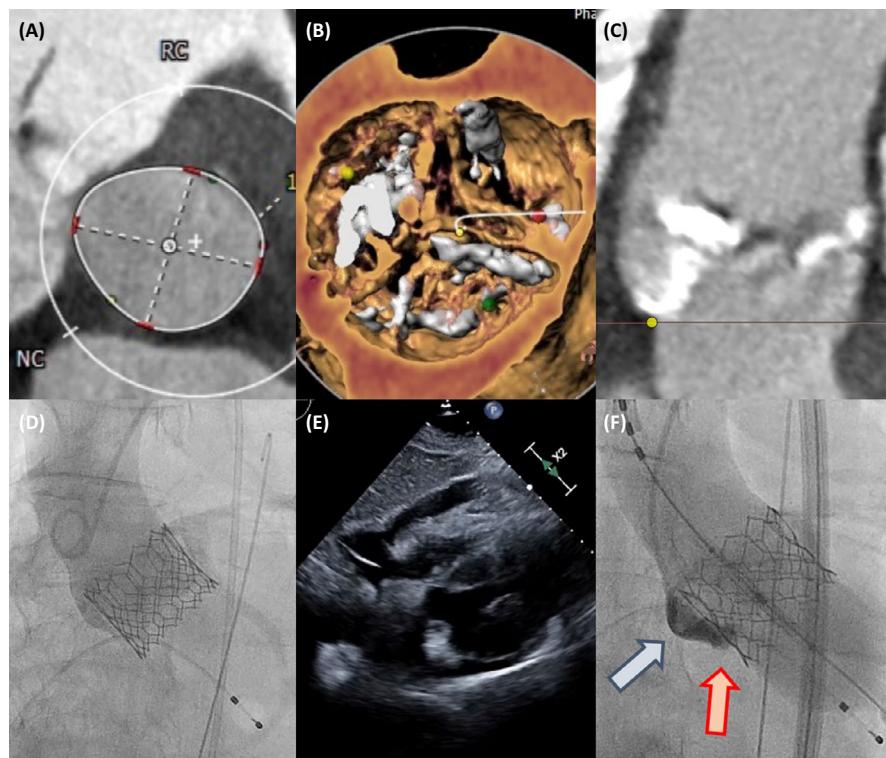


FIGURE 1 Reconstructions from planning CT scan (A-C), periinterventional images (D-F). A, Systolic annulus planimetry, no annular calcification, annulus area 615 mm^2 , and eccentricity ratio 1.18:1. B, Three-dimensional aspect of the aortic valve before TAVR: severely calcified leaflets (noncoronary cusp orientated to the upper left). C, 2D CT reconstruction of aortic root showing commissural calcium in noncoronary cusp (yellow marker in annular plane of noncoronary cusp). D, Fluoroscopic aspect/aortography directly after TAVR implantation. E, Echocardiography: pericardial tamponade. F, Fluoroscopic aspect during balloon expansion/TAVR deployment, illustrating the proposed pathomechanism of the unexpected annular rupture: solid calcium deposit on the noncoronary cusp forming a tenting situation in the noncoronary sinus (blue arrow) facilitating an annular rupture by tension (red arrow). For details, see text.

CONFLICTS OF INTEREST

Ralph Stephan von Bardeleben reports having received consultancy and lecture honoraria from Abbott Structural Heart, Cardiac Dimensions, Edwards Lifesciences. The other authors have no conflict of interest to declare.

DATA AVAILABILITY STATEMENT

Not applicable.

ORCID

Martin Geyer  <https://orcid.org/0000-0002-9935-8293>

Alexander Tamm  <https://orcid.org/0000-0003-2017-094X>

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

Movie S1. Fluoroscopy during balloon dilatation of the TAVR prosthesis under rapid pacing. For details, see text and figure.

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