

Management of Aortic Injuries During Balloon-Expandable TAVR

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Conversion to Open Surgery in TAVR

- An analysis of the TVT registry demonstrated **1.17%** of all TAVR procedures resulted in a complication requiring conversion to open surgery
- The most common reasons for conversion (in order)
 - Ventricular Rupture
 - Prosthetic Valve Dislodgement
 - **Annular Rupture**
 - **Aortic Dissection**

Risk Factors for **Annular Rupture** in TAVR

• **Procedural Risk Factors**

- Balloon-expandable valves
- Re-ballooning for paravalvular leak
- Prosthesis oversizing $\geq 20\%$

• **Patient Risk Factors**

- LVOT/Subannular calcification
- Small aortic annulus
- Narrow aortic root

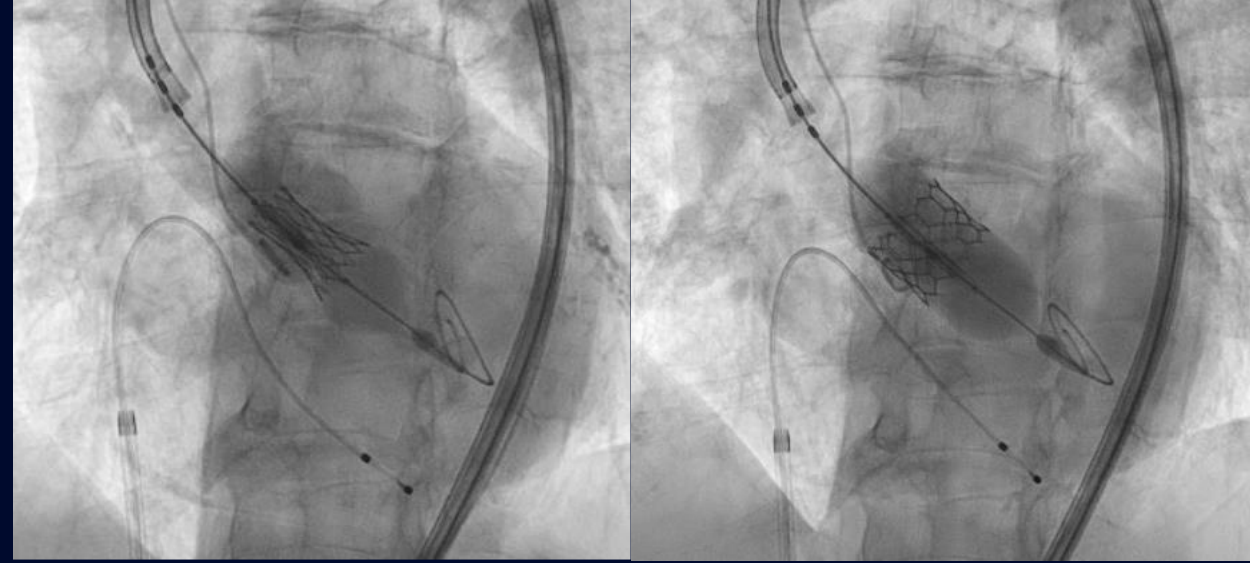
Patient A



- **84F** with CKD, CAD, smoker
- Severe calcification of aortic annulus on pre-TAVR imaging
- Planned for balloon-expandable TAVR, size 29
- Sustained **annular rupture** during balloon valvuloplasty
- Became hypotensive, echocardiogram showed effusion
- Urgent pericardiocentesis
- Patient remained hemodynamically unstable
- Underwent emergent sternotomy, Hemashield patch placement, and surgical AVR with 23mm bioprosthetic valve

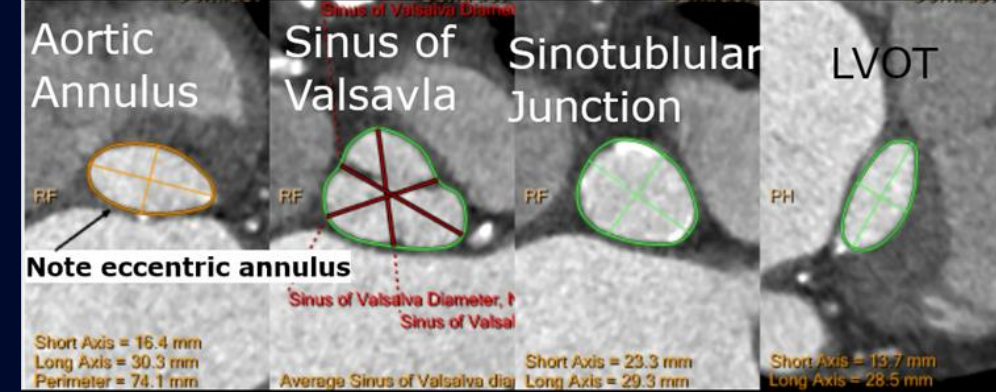
Patient B

- 82F with DM, HTN
- Planned for balloon-expandable TAVR, size 23
- Moderate annular calcification on pre-TAVR imaging
- Sustained **annular rupture** during valve expansion
- Hypotensive, echocardiogram showed effusion



- Urgent pericardiocentesis
- SURGIFLO hemostatic agent injected into pericardial space
- Repeat aortography with no contrast extravasation
- Pericardial drain placed
- Discharged home POD7

Patient C



- 88F with CAD, HTN, osteoporosis
- Significant calcification on preop imaging
- Planned for balloon-expandable TAVR, size 23
- TAVR deployed, but moderate paravalvular leak was noted, so post-dilation attempted
- **Annular rupture** sustained during post-dilation

- Echocardiogram revealed new effusion
- Pericardiocentesis performed with return of 500cc blood
- Patient's healthcare proxy declined urgent surgical intervention
- Pericardial drain was placed and drainage decreased. Remained stable

Iatrogenic Aortic Dissection

- Approximately **5%** of all Type A dissections are iatrogenic in nature
- The estimated incidence of dissection for various cardiac interventions are demonstrated below

Cardiac Surgery

- **0.06%**

- Williams M, et al. *Ann Thorac Surg.* 2010

Cardiac Catheterization

- **0.01-0.06%**

- Leontyev S, et al. *Eur J Cardiothorac Surg.* 2012

- Núñez-Gil, et al. *Circulation.* 2015

TAVR

- **0.1-0.3%**

- von Aspern K, et al. *Aorta.* 2022

- Langer N, et al. *Circ Cardiovasc Interv.* 2017

- Walther T, et al. *J Am Coll Cardiol.* 2015

Risk Factors for Type A Dissection in TAVR

• Procedural Risk Factors

- Oversizing a delivery balloon
- Pre-and post- dilation

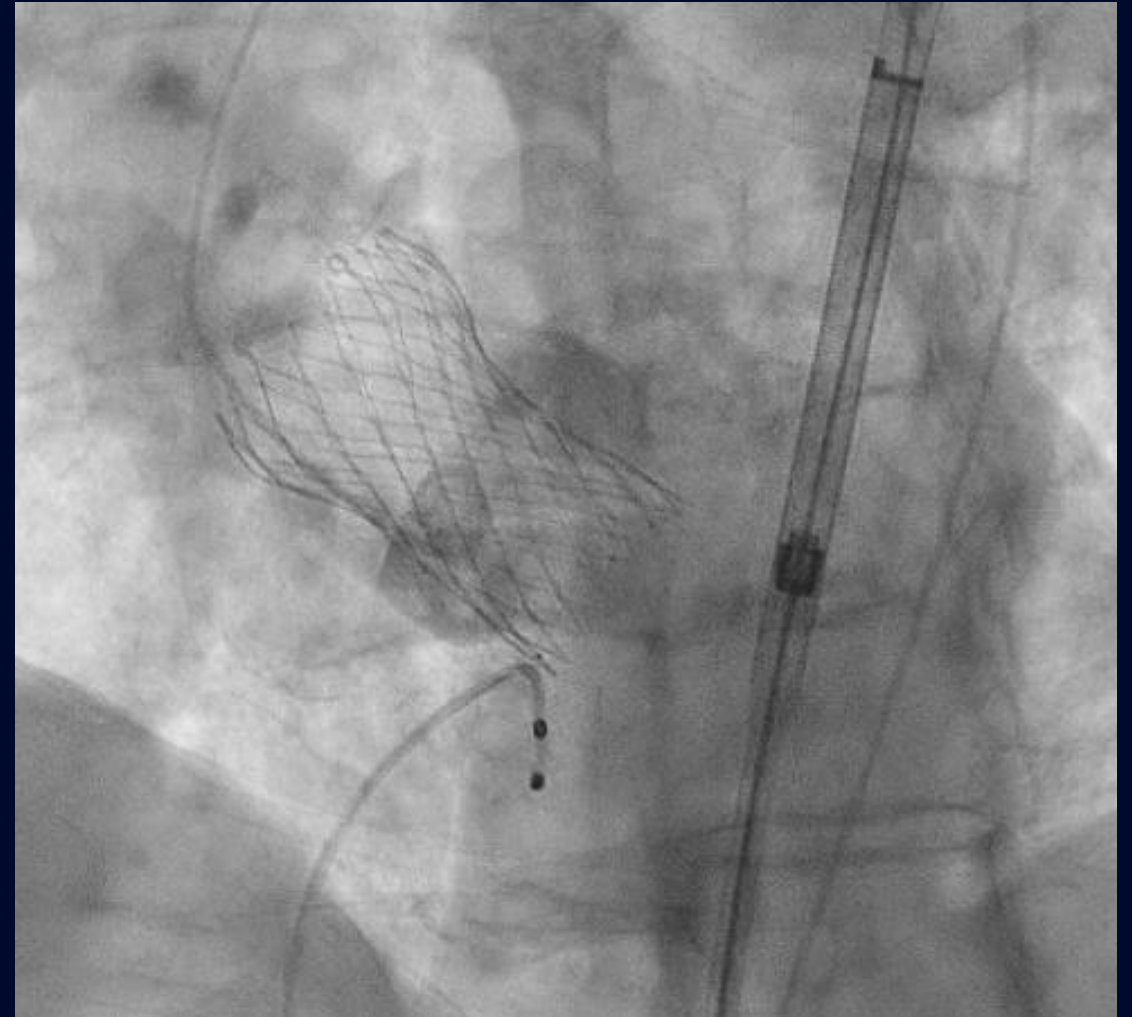
• Patient Risk Factors

- Steroid use
- Atherosclerosis
- Thoracic aortic aneurysm
- Female sex

Yashima F, et al. *Catheter Cardiovasc Interv.* 2023
Pontious M, et al. *JACC Case Rep.* 2020
Kassis N, et al. *Catheter Cardiovasc Interv.* 2021.

Patient D

- 75F OSA, DM, CKD, PE, chronic prednisone
- No significant calcifications on pre-operative CT
- Planned for balloon-expandable TAVR, size 29 (19% oversizing)
- Valve implanted with no obvious complications initially, no abnormalities on aortography
- Patient developed new onset left facial droop, left UE weakness and chest pain
- CT angio revealed extensive dissection



Patient D

- Patient taken to the OR emergently
- Axillary arterial cannulation and right femoral venous cannulation
- Antegrade and retrograde cerebral perfusion with core temperature 24C degree body circulatory arrest
- Hemiarch repair was performed
- TAVR valve explanted, replaced with 23mm bioprosthetic valve
- Patient recovered well following surgery with minimal residual neuro deficits



Conclusions

- Prompt recognition of complication allowed for the successful management of all four patients
- A team-based multidisciplinary approach to recognition and management of complications is necessary
- Further research into procedural and patient-related risk factors for aortic complications of TAVR is necessary