

# The Evolution of TAVR Explants

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TRANSCATHETER  
CARDIOVASCULAR  
THERAPEUTICS®



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Grant/Research Support	None
Consultant Fees/Honoraria	Medtronic Inc., Edwards Lifesciences, Artivion, Terumo Aortic, LeMaitre, LifeNet Health
Individual Stock(s)/Stock Options	None
Royalties/Patent Beneficiary	None
Executive Role/Ownership Interest	None
Other Financial Benefit	None

# Take Home Message

- Clinical relevance of TAVR explant is steeply rising
  - TAVR-first approach for younger patients is common
  - Redo TAVR is not feasible or suitable for everyone
  - Durability of redo TAVR is unknown
  - From rare procedure to common procedure
- TAVR explant is a valid post-TAVR reintervention option

## *TAVR Explant*

*What happened between 2011-2020?*

# TAVR Explant 2011-2020

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## Leaflet Thrombosis in Surgically Explanted or Post-Mortem TAVR Valves



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**LEAFLET THROMBOSIS IS CURRENTLY ONE OF THE GREATEST CONCERN RELATED TO TRANSCATHETER aortic valve replacement (TAVR). Symptomatic valve thrombosis is a rare occurrence, but reduced leaflet motion, diagnosed by computed tomography, seems to be a more common finding (1).**

We screened our pathology registries for patients with a prior TAVR who underwent a post-mortem examination or who had a TAVR device surgically explanted in an attempt to understand better the causes of TAVR failure. Of 13 valves studied, we found 4 cases of leaflet thrombosis diagnosed only on pathological examination (Figures 1 to 4, Online Videos 1, 2, and 3). Two of the patients had a valve-in-valve TAVR (Figures 1 and 3), and in 3 cases, there was incomplete expansion or asymmetry of the valve (Figures 1, 2, and 4). None of the patients were on anticoagulation. There were also 2 cases of endocarditis, 1 coronary obstruction, and 2 cases of paravalvular leak. The other 4 patients had no substantial valve findings.

TAVR valve thrombosis is underdiagnosed, and the mechanisms for its development might be associated with underexpansion and asymmetry of the valve. Valve-in-valve TAVR may be associated with these features more often and might be a risk factor for leaflet thrombosis.



Heart, Lung and Circulation  
Volume 27, Issue 4, April 2018, Pages 513-516



Original Article

## Surgical Aortic Valve Replacement Following Early Sapien-XT Valve Failure: A First

Tanveer Ahmad MCh<sup>a</sup> , Prakash Ludhani MCh<sup>a</sup>, Ronen Gurvitch FRACP<sup>b</sup>, John Goldblatt FRACS<sup>a</sup>, James Tatoulis FRACS<sup>a</sup>

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JOURNAL ARTICLE

## Transapical explantation of an embolized transcatheter valve

Parla Astarci , Quentin Desiron, David Glineur, Gebrine El Khoury

*Interactive CardioVascular and Thoracic Surgery*, Volume 13, Issue 1, July 2011, Pages 1–2,  
<https://doi.org/10.1510/icvts.2011.267757>

Published: 01 July 2011 Article history

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## Case Reports or small series

- Post-mortem setting
- Procedural failure with surgical conversion
- PVL
- Very few SVD

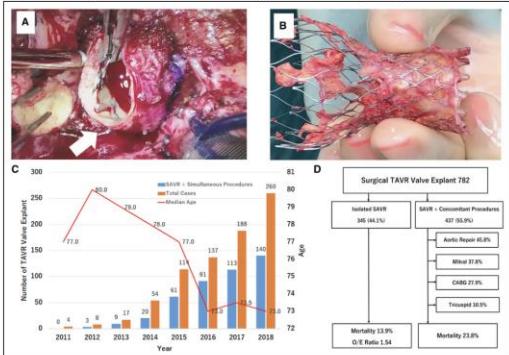
# TAVR Explant 2011-2020

## Surgical Explanation of Transcatheter Aortic Bioprostheses

An Analysis From the Society of Thoracic Surgeons Database

Shinichi Fukuhara, MD , Alexander A. Brescia, MD, MSc , and G. Michael Deeb, MD

Transcatheter aortic valve replacement (TAVR) is an established alternative to surgical aortic valve replacement (SAVR) for patients with severe aortic stenosis.<sup>1,2</sup> TAVR use has increased greatly, but the clinical impact and outcomes of surgical TAVR valve explantation and SAVR (TAVR explant) are not well understood.<sup>3</sup> Despite the feasibility of a repeat TAVR procedure, there has been an increasing need for TAVR explant as the number of TAVR implants has increased. There are reports of TAVR valves causing neoendothelialization between the device and contacting native tissue (Figure, A and B), making device explantation a more morbid procedure than originally thought.<sup>3</sup> The difficulty of SAVR after TAVR may be another consideration for the initial choice of TAVR versus SAVR in younger patients. This study was undertaken to review registry TAVR explant data to better understand the challenges and outcomes of surgical TAVR explant procedures.



## Society of Thoracic Surgeons (STS) Database

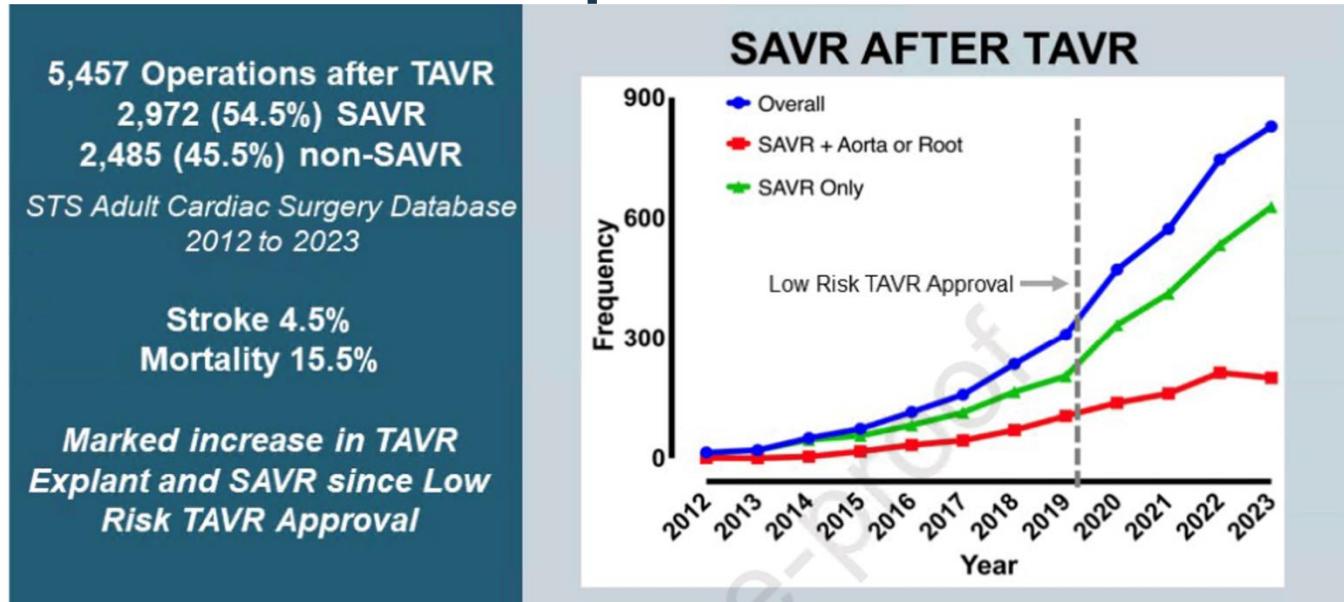
- 782 TAVR explants
- 55% SAVR with concomitant surgery (most commonly aortic repair)
- High mortality & O/E ratio
  - 13.9% for isolated SAVR
  - 23.8% for SAVR with concomitant surgery

→ ***TAVR Explant is bad and feared***

## *TAVR Explant*

*What happened between 2021-2024?*

# TAVR Explant 2021-2024



2012-2023: 2972 TAVR explants, 2485 non-aortic valve operations

- Mortality 15.5%
- Stroke 4.5%

## TAVR Explant Pandemic??

# TAVR Explant 2021-2024

## Outcomes of repeat transcatheter aortic valve replacement with balloon-expandable valves: a registry study

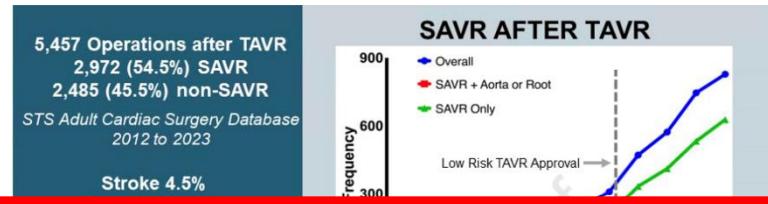
Raj R Makkar, Samir Kapadia, Tarun Chakravarty, Robert J Cubeddu, Tsuyoshi Kaneko, Paul Mahoney, Dhairyा Patel, Aakriti Gupta, Wen Cheng, Susheel Kodali, Deepak L Bhatt, Michael J Mack, Martin B Leon, Vinod H Thourani

*Lancet* 2023; 402: 1529-40

STS/TVT Registry 2011-2022  
1,320 balloon-expandable redo-TAVR

# TAVR Explant 2021-2024

Outcomes of repeat transcatheter aortic valve replacement  
with balloon expandable valves: a registry study



IS TAVR EXPLANT “ALREADY” MORE COMMON FORM OF POST-TAVR REINTERVENTION THAN REDO-TAVR?

*TVT*  
*Redo-TAVR*  
**1320 (2011-2022)**

32%

*STS*  
*TAVR Explant*  
**2765 (2012-2022)**

68%

# Choosing TAVR for Patients < 65 yo?

Concerning

The proportion of TAVR and SAVR in patients <65 years old in the states of California, New York, and New Jersey between 2013 and 2021 from 2013-2021

■ SAVR ■ TAVR



We cannot stop this trend.

*We need to shift our mindset.*

TAVR vs. SAVR	Before matching	After matching
8-year Mortality	HR: 4.75; CI: 4.05-5.58; p<0.001	HR: 2.27; CI: 1.82-2.83; p<0.001
30-day New permanent pacemakers	12% vs. 5.5%; p<0.001	10.7% vs. 6.2%; p<0.001

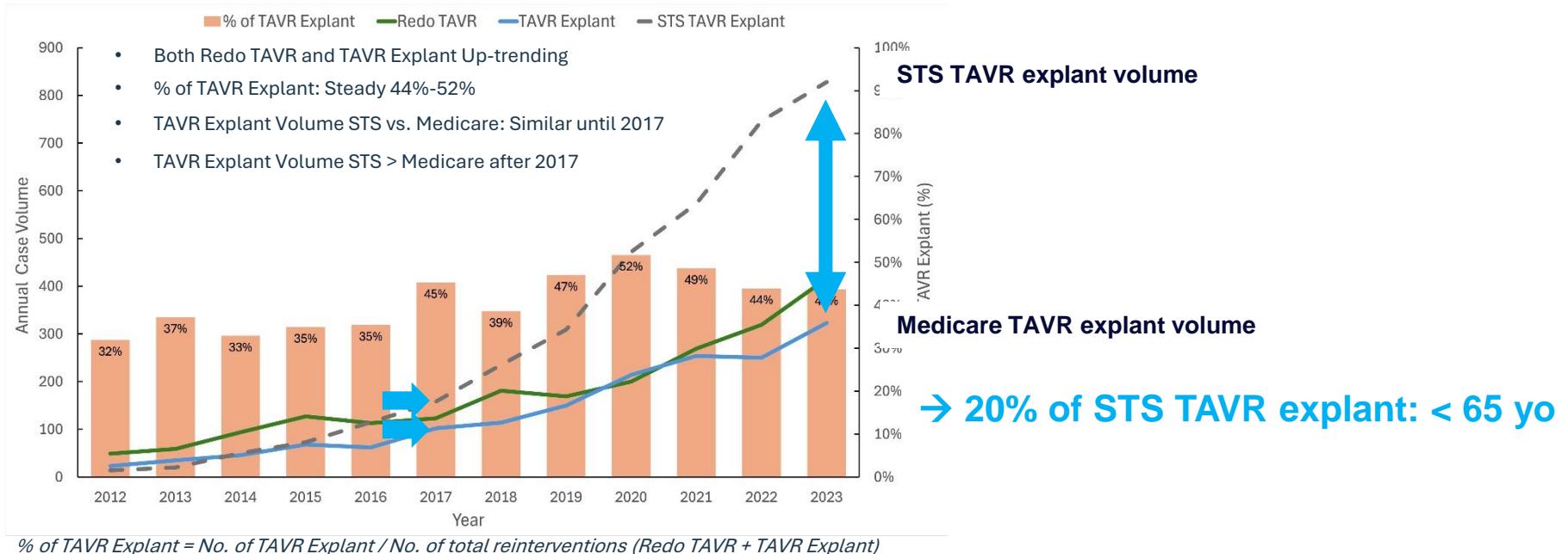
CI: Confidence Interval; RMET: Restricted Mean Event Time; SHR: Subdistribution Hazard Ratio.

We entered “> 50% TAVR era” in 2021 for patients < 65 yo

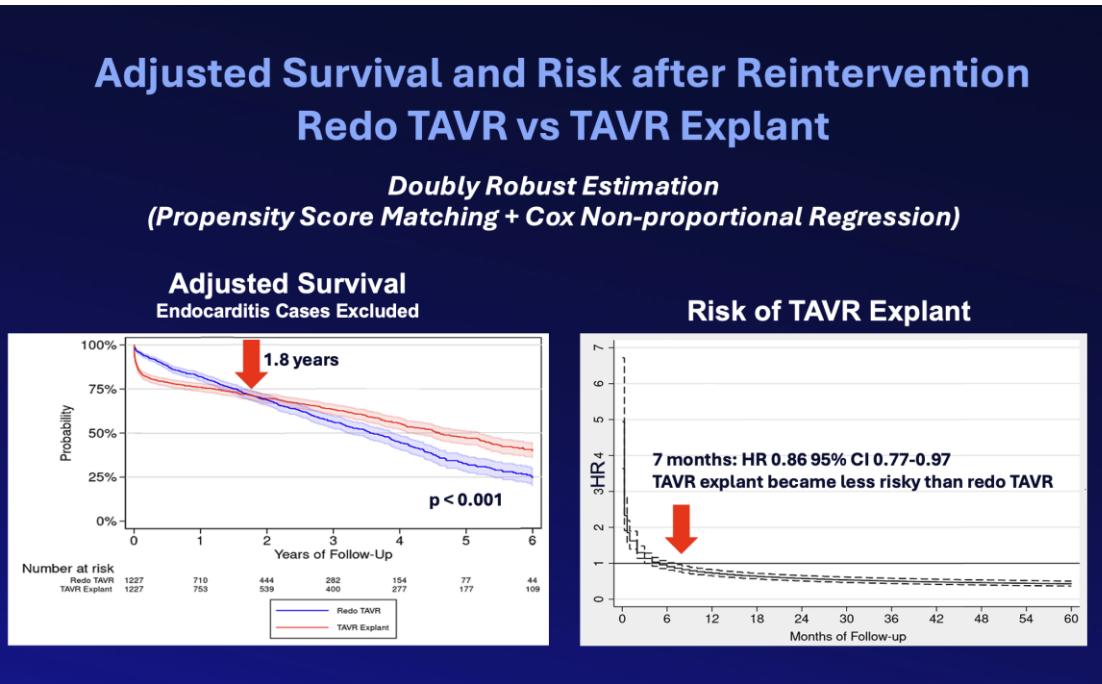
# *TAVR Explant*

*What is happening now?*

# Trend of Post-TAVR Reintervention Medicare Fee-For-Service Data



# TAVR Explant: What's New



Long-term survival: TAVR EXPLANT > Redo TAVR

# TAVR Explant: What's New

University of Michigan

Overall 6.0% mortality  
(10 out of 166 TAVR  
explants)

2023-2025: 2.6%

2013-2017

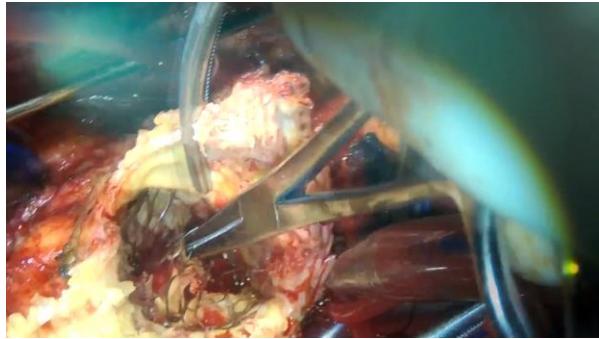
2018-2021

2022-2024

STS Database

New Data coming  
→ Clinical outcomes improving

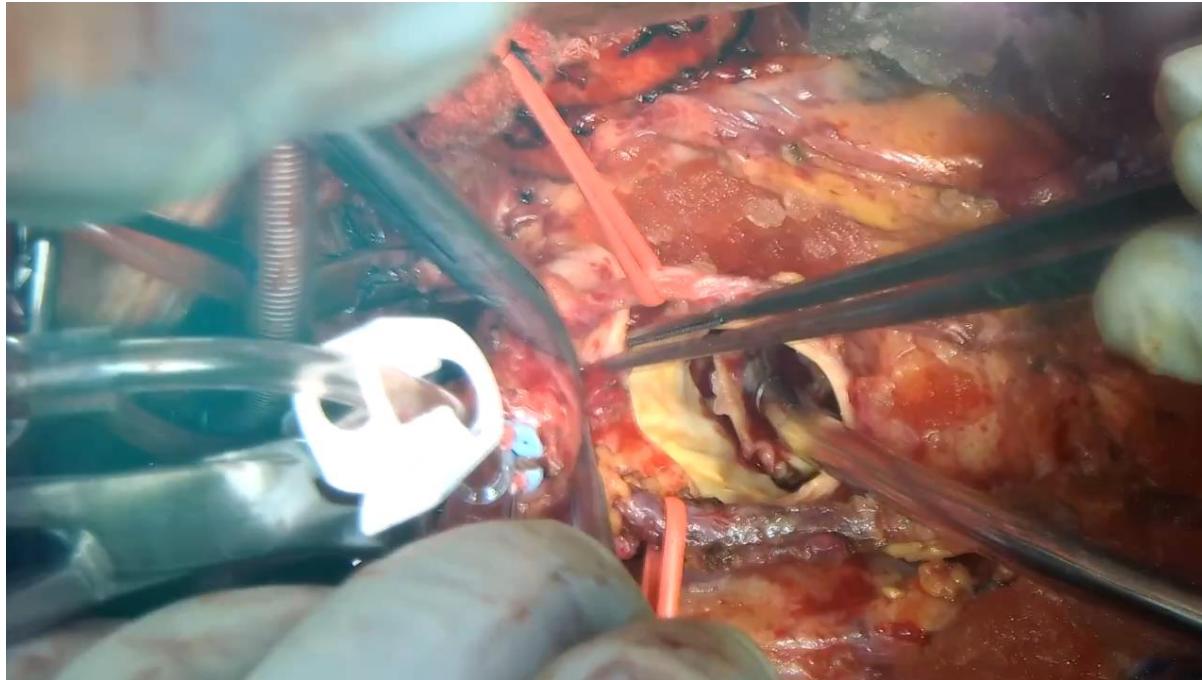
Explanting TAVR valve is straightforward in 85-90% cases



But

Real problem is often not the procedure itself

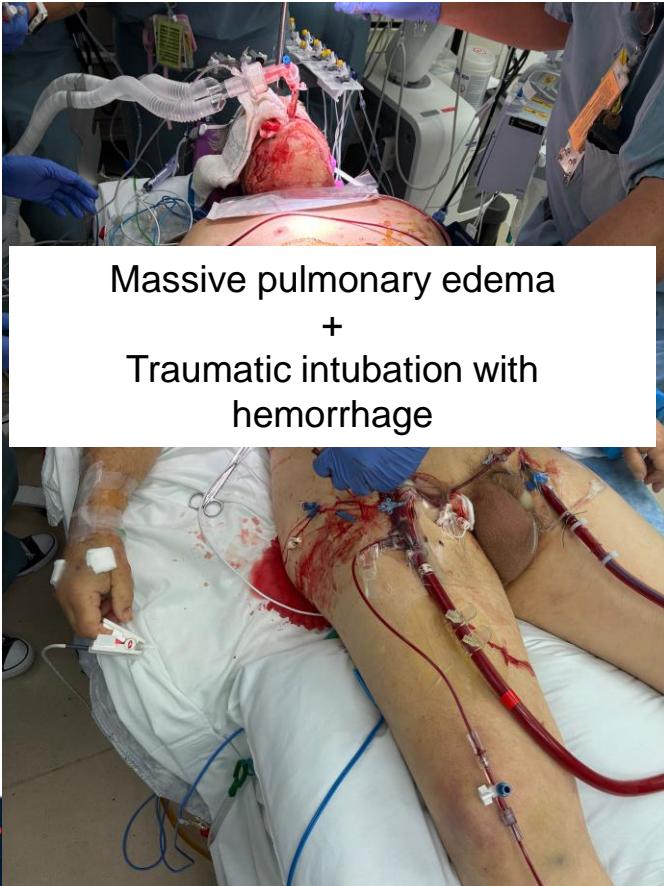
# Importance of Understanding Redo TAVR Limitations



TAVR



# Importance of Understanding Redo TAVR Limitations



Massive pulmonary edema  
+  
Traumatic intubation with hemorrhage

73 yo with failed 29 mm SEV TAVR  
(67 yo at the time of TAVR)

Seeking 2<sup>nd</sup> & 3<sup>rd</sup> opinions at different health systems

NYHA Class II → III symptoms  
Started on Apixaban for possible HALT

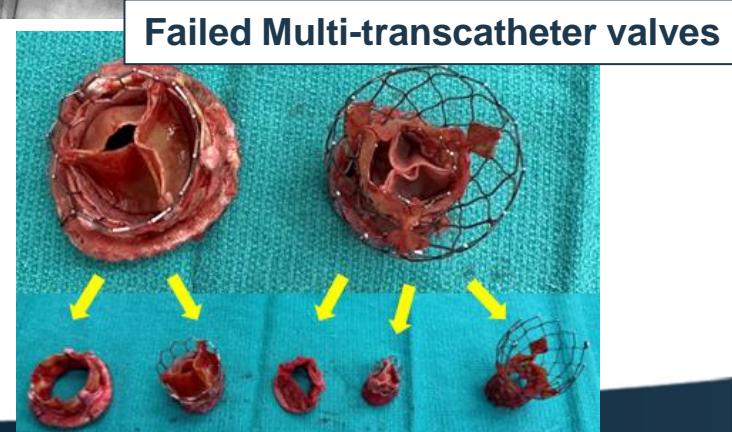
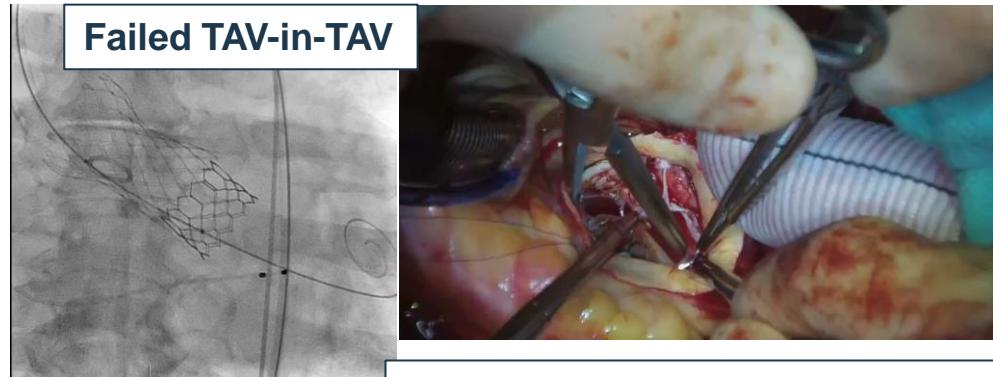
P/w heart failure, placed on VA-ECMO → continued pulmonary edema → switched to LAVA-ECMO

# TAVR Explant: What's New

## New Era of Extreme TAVR Explant

### U of Michigan experience

- Failed TAV-in-TAV (n=7)
- TAVR explant with snorkel coronary stents (n=6)
- Transcatheter multivalve failure (n=19  
Commando operations)



# Summary: Evolution of TAVR Explants

- One of most common procedures within 10 years.
- Outcomes are improving.
- *From rare life-threatening procedure to common safe procedure with favorable long-term outcomes.*
- Tsunami of new normal anticipated: multiple failed transcatheter valves, snorkel coronary stents, failed TAV-in-TAVs.