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Surgical Aortic Valve Repair
in the Era of TAVI

S. Chris Malaisrie, MD
Professor of Surgery
Program Director, Thoracic Surgery Residency and Fellowship
Division of Cardiac Surgery
Northwestern University Feinberg School of Medicine

Attending Cardiac Surgeon
Surgical Director, Comprehensive Aorta Center
Bluhm Cardiovascular Institute

Northwestern Medicine, Northwestern Memorial Hospital
Chicago, Illinois, USA

The Houston Aortic Symposium
Thursday, March 5, 2026

SESSION II: Aortic Root/Ascending Aorta
10:30 AM - 12:00 PM
Thursday, March 5, 2026
10:48 - 10:56 AM

Disclosures

- Edwards: research, speaker, consultant
- Medtronic: research
- Terumo: research, speaker
- Artivion: research, speaker

Surgical Aortic Valve Repair *in the Era of TAVI*

Overview

1. **Understand the context of TAVI for pure aortic regurgitation**

2. **Explain the indications for AV repair in aortic regurgitation**

3. **Perform AV repair techniques with video demonstration**

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TAVI for Pure AR

Dedicated TAVI devices for Pure AR are coming!

JenaValve Trilogy
First US implant 2023

Edwards J Valve
First US implant 2019

Anchoring mechanism: clip vs ring

TAVI trials for Pure AR

JenaValve	J-Valve
ALIGN-AR Trial - Complete **High-risk for surgery**	**JOURNEY Trial - Ongoing** **High-risk for surgery**
ARTIST Trial - Ongoing **All risk** **TAVI vs AVR, AV repair excluded**	

JenaValve trials

ALIGN-AR inclusion (Lancet article attached):

“symptomatic native aortic regurgitation considered to be at high surgical risk by the local heart team (comprising an interventional cardiologist and a cardiac surgeon)”

Single arm investigational device study of Trilogy THV

Transcatheter aortic valve implantation with the Trilogy valve for symptomatic native aortic regurgitation (ALIGN-AR): a pivotal, multicentre, single-arm, investigational device exemption study

Raj R Makkar et al.

Raj R Makkar, Vinod H Thourani, Torsten P Vahl, Pradeep K Yadav, James M McCabe, Isaac George, Lowell Satler, Stan Chetcuti, David V Daniels, Thomas Waggoner, Brian Whisenant, Mark Russo, Matthew Summers, Santiago Garcia, Tiberio Frisoli, Ravi K Ramana, Curtiss Stinis, Harsh Golwala, Firas Zahr, Adam Greenbaum, Joshua Rovin, Carlos Sanchez, Molly Szerlip, George Michael Deeb, Nicholas Amoroso, Dhairya Patel, Martin Fahy, Lauren S Ranard, Aakriti Gupta, Tarun Chakravarty, Sabah Skaf, Michael Chuang, Susheel K Kodali, Hans R Figulla, Hendrik Treede, Stephan Baldus, Duane S Pinto, Martin B Leon, on behalf of the ALIGN-AR Investigators*

Lancet 2025; 406: 2757–71

Published Online
November 16, 2025
https://doi.org/10.1016/
S0140-6736(25)02215-9

JenaValve trials

ARTIST:

SAVR vs. Trilogy TAVR randomized 1:1

Inclusion Criteria: Subject must meet ALL the following inclusion criteria:

Clinical indication for AVR for native valve predominant AR defined as:

Class I or II indication for AVR according to ACC/AHA or ESC/EACTS guidelines with moderate to severe or severe AR (Grade 3+ or 4+) on transthoracic echocardiography, transesophageal echocardiography or cardiac MRI as assessed by the core laboratory

OR

AR severity that remains indeterminate despite core laboratory review of all imaging including at least one advanced imaging modality (TEE or cardiac MRI) AND evidence of left ventricular damage* from AR with unanimous agreement from the local heart team, an independent clinical evaluation committee and the CRB that the symptomatic subject (NYHA II or greater) will benefit from SAVR for AR.

JenaValve trials

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OR (next slide)

JenaValve trials

AR severity that remains indeterminate despite core laboratory review of all imaging including at least one advanced imaging modality (TEE or cardiac MRI) AND evidence of left ventricular damage* from AR with unanimous agreement from the local heart team, an independent clinical evaluation committee and the CRB that the symptomatic subject (NYHA II or greater) will benefit from SAVR for AR.

The subject is a candidate for TAVR using the Trilogy THV system and SAVR using a commercially approved bioprosthetic heart valve.

Subject and the treating physician agree that the subject will return for all required post-procedure follow-up visits.

Subject meets the legal minimum age to provide informed consent based on local regulatory requirements.

*** Ventricular damage defined as (any of below):**

Reduced Left Ventricular (LV) Function:

LV ejection fraction ≤55%[1]

Decreased (≤17%) LV global longitudinal strain (GLS)[2]

LV Dilation or Damage:

Left ventricular end systolic diameter (LVESD) >50mm[1] or LVESD index (LVESDi) >20mm/m^2[2,3]

Left ventricular end systolic volume index (LVESVi) >45 ml/m^2[2,4,5]

Increase in LVEDD into the severe range (LVEDD >65 mm)[1]

Progressive LV dilatation across a minimum of three sequential noninvasive studies separated by at least 2 months (baseline and 2 additional studies)

The coexistence of LVEDV ≥246 ml and ≥33% AR regurgitant fraction (RF) assessed by CMR[6,7]

Increased Cardiac Biomarkers Indicating LV Wall Stress: BNP ≥130 pg/ml or NT-proBNP ≥602 pg/ml (or NT-proBNP ratio ≥26.5)[8]

J-Valve Transfemoral Pivotal Study (JOURNEY)

Inclusion Criteria:
Symptomatic according to New York Heart Association (NYHA) functional class (FC) II or higher
Severe AR, defined as follows, as assessed by Imaging Core Laboratory:
A. Severe AR by Transthoracic Echocardiography (TTE) (grade 3 or 4)
B. OR, if indeterminate AR, by TTE, ANY ONE of the following:
i. Cardiac magnetic resonance imaging (CMR)-derived aortic regurgitant fraction (RF) ≥43% ii. CMR-derived RF ≥33% + left ventricular dilation (left ventricular end diastolic volume index [LVEDVi]) >105 mL/m^2 for men or LVEDVi >96 mL/m^2 for women) iii. CMR-derived RF ≥33% + LV ejection fraction (LVEF) ≤55% or left ventricular end systolic volume index (LVESVi) ≥43mL/m^2; iv. Severe AR by Transesophageal Echocardiography (TEE) (grade 3 or 4)
High risk for surgery as judged by a multi-disciplinary heart team
Suitable anatomy to accommodate the insertion, delivery, and deployment of the study devices (see anatomic exclusions below)
Written informed consent and agreement to comply with all required post-procedure follow-up visits at investigational site.

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Indications for AV repair

#STS2026

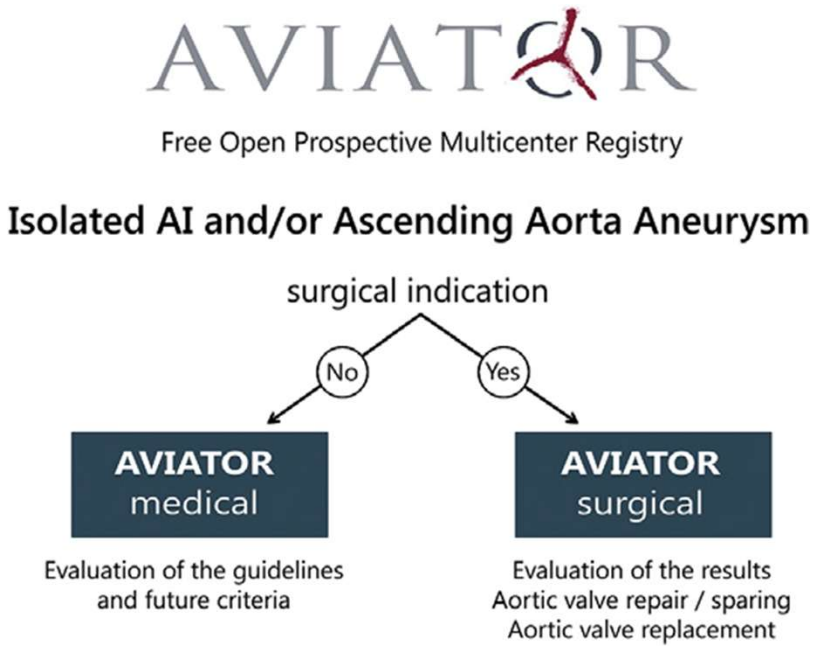
Aortic Regurgitation

AV replacement	Class I
BAV repair, experienced centers	Class IIb
TAVI, non-operable	Class III

AV replacement	Class I
AV repair, experienced centers	Class IIa
TAVI, non-operable	Class IIb

ACC / AHA Valve 2020
ESC / EACTS Valve 2025

AV repair associated with low operative mortality

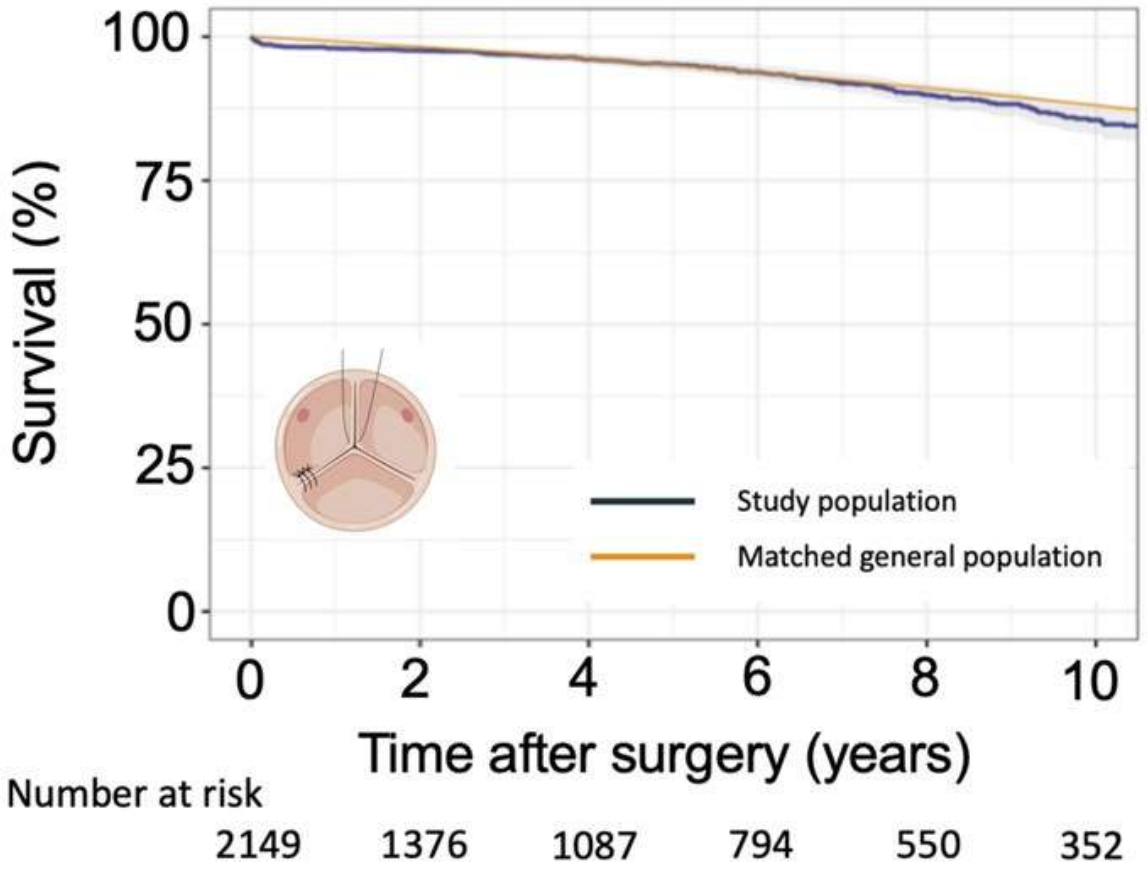


	Isolated AV surgery			
	Repair (n = 1228)		Replacement (n = 126)	
	n or median	% or IQR	n or median	% or IQR
Status at discharge				
Total*	1217	99	103	82‡
Death	6	0.5	1	1.0

AV repair vs replacement: 0.5% vs 1.0%

de Heer, F., E. Lansac, et al (2019). "AVIATOR: An open international registry to evaluate medical and surgical outcomes of aortic valve insufficiency and ascending aorta aneurysm." J Thorac Cardiovasc Surg 157(6): 2202-2211.e2207.

Isolated AV repair associated with restoration of survival



87.4% Matched Population

85.5% Isolated AV repair

AVIATOR Registry. Eur J Cardiothorac Surg, Volume 67, Issue 3, March 2025, ezaf020, https://doi.org/10.1093/ejcts/ezaf020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Techniques for AV leaflet repair
#STS2026

Timeline

Leaflet Repair

Open Commissurotomy – *Swan and Lewis (1956)*
Bicuspidization – *Garamella, Creech, and Bailey (1958)*
Patch Repair – *Bailey (1959)*
Leaflet plication – *Garamella, Starr (1960) and Spencer (1962)*
Decalcification – *Mulder (1960)*
Leaflet extension – *Harken (1960)*

Paracommissural plication – *Trusler (1973)*
Triangular resection – *Carpentier (1983)*

Free margin resuspension – *David (1999)*

1950s-1960s | **1970s-1980s** | **1990s** | **2000s-2010s**

Circumclusion – *Taylor (1958)*
Subcommissural – *Cabrol (1966)*

VSARR remodeling – *Yacoub (1982)**
VSARR reimplantation – *David (1989)**

External ring – *Lansac (2005)*
Internal ring – *Rankin (2011)*

Annuloplasty

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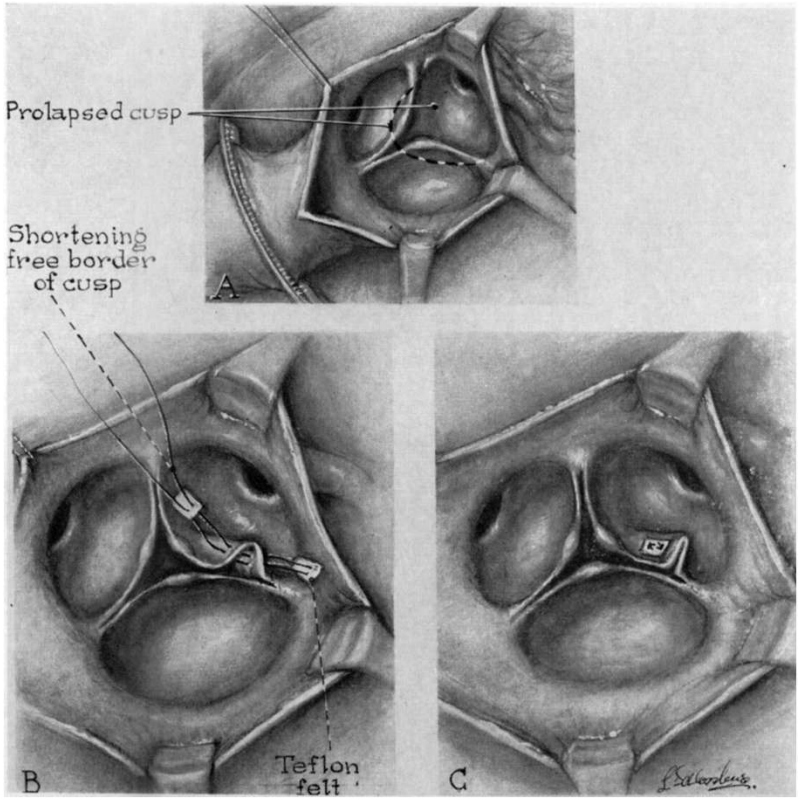
Al-Kazaz, Guduguntla, Malaisrie et al. Clinical Relevance and Best Practices of Aortic Valve Repair in Adults. Submitted for publication

Free Margin Plication

Garamella et al (1960), Starr et al (1960), Spencer et al (1960)

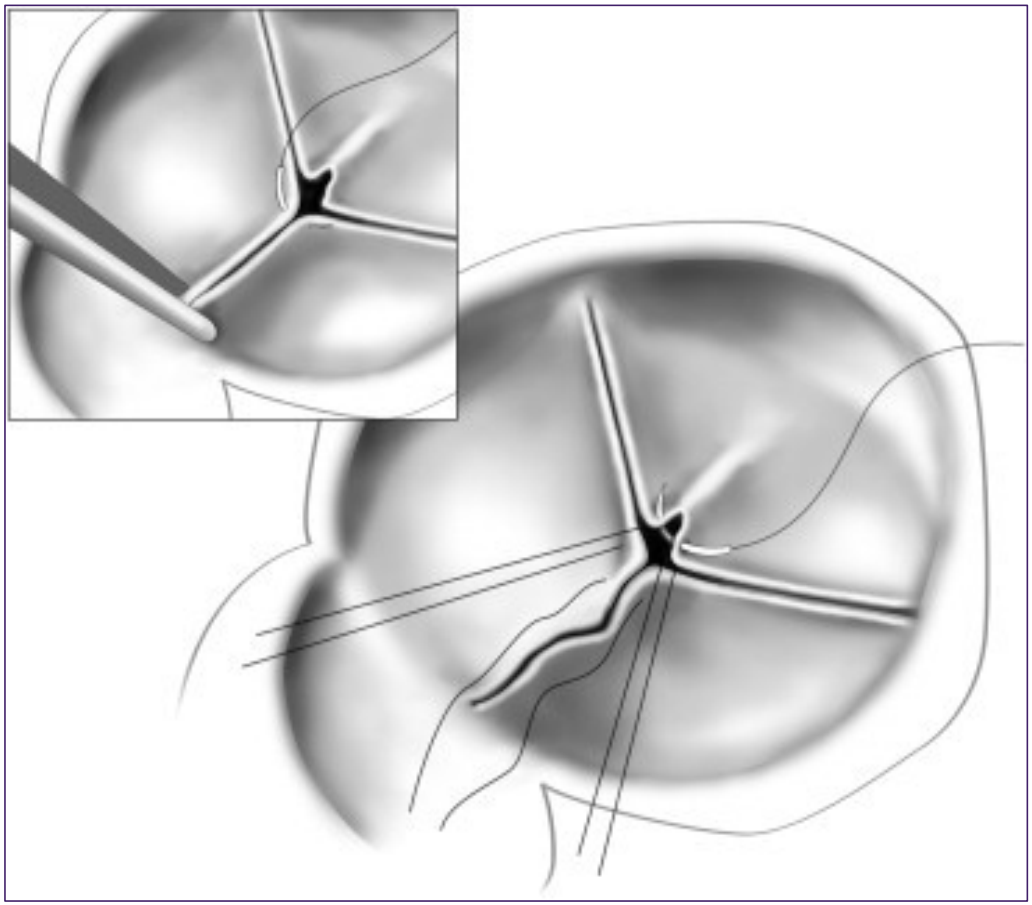


"The free edge of the elongated leaflet was shortened with sutures infolding several millimeters of the margin of the leaflet. The sutures were buttressed with Teflon." – *Spencer 1960*

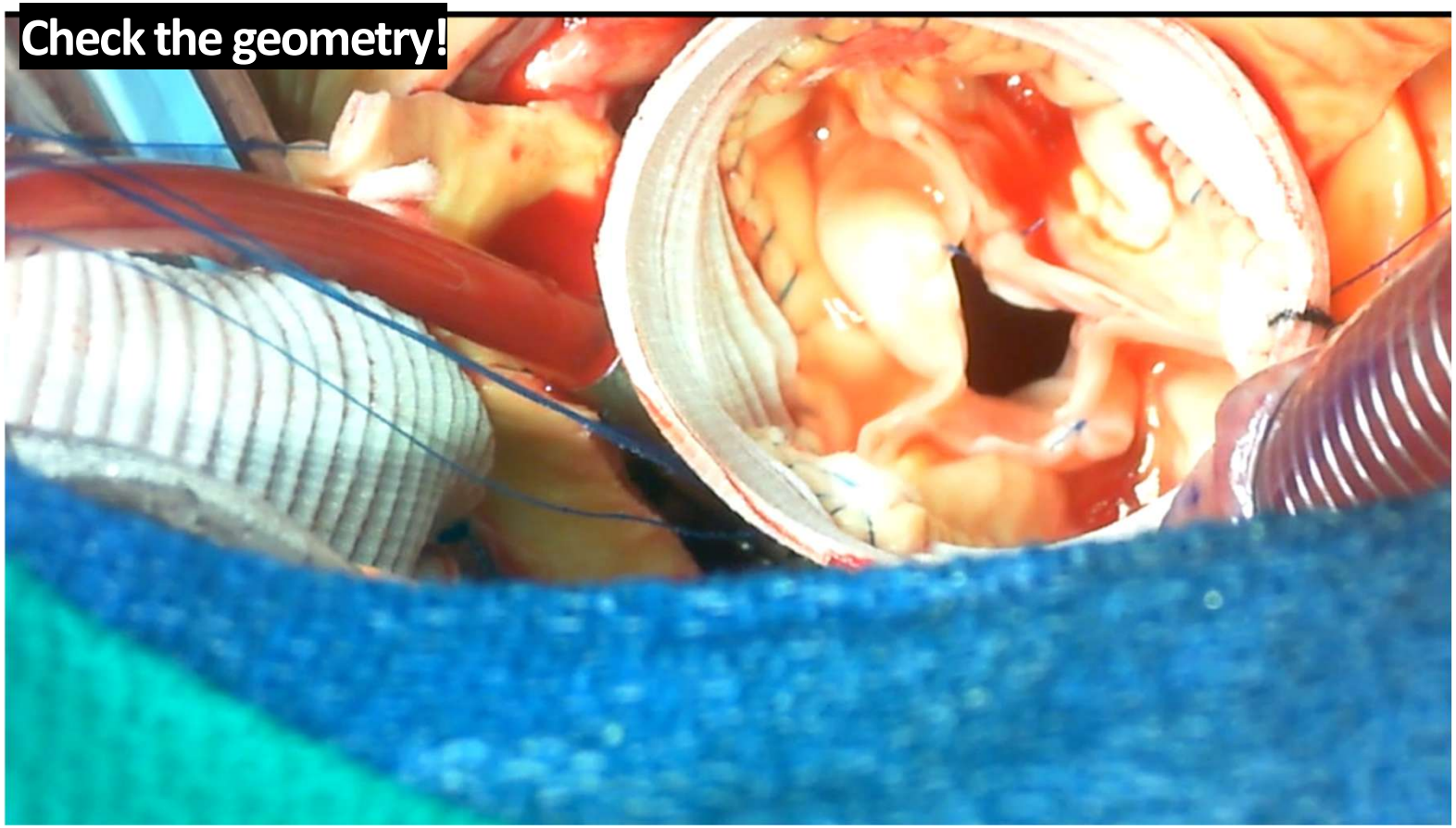
Spencer, F. C., H. T. Bahnson and C. A. Neill (1962). "The treatment of aortic regurgitation associated with a ventricular septal defect." JTCVS 43(2): 222-233.

Central free margin plication

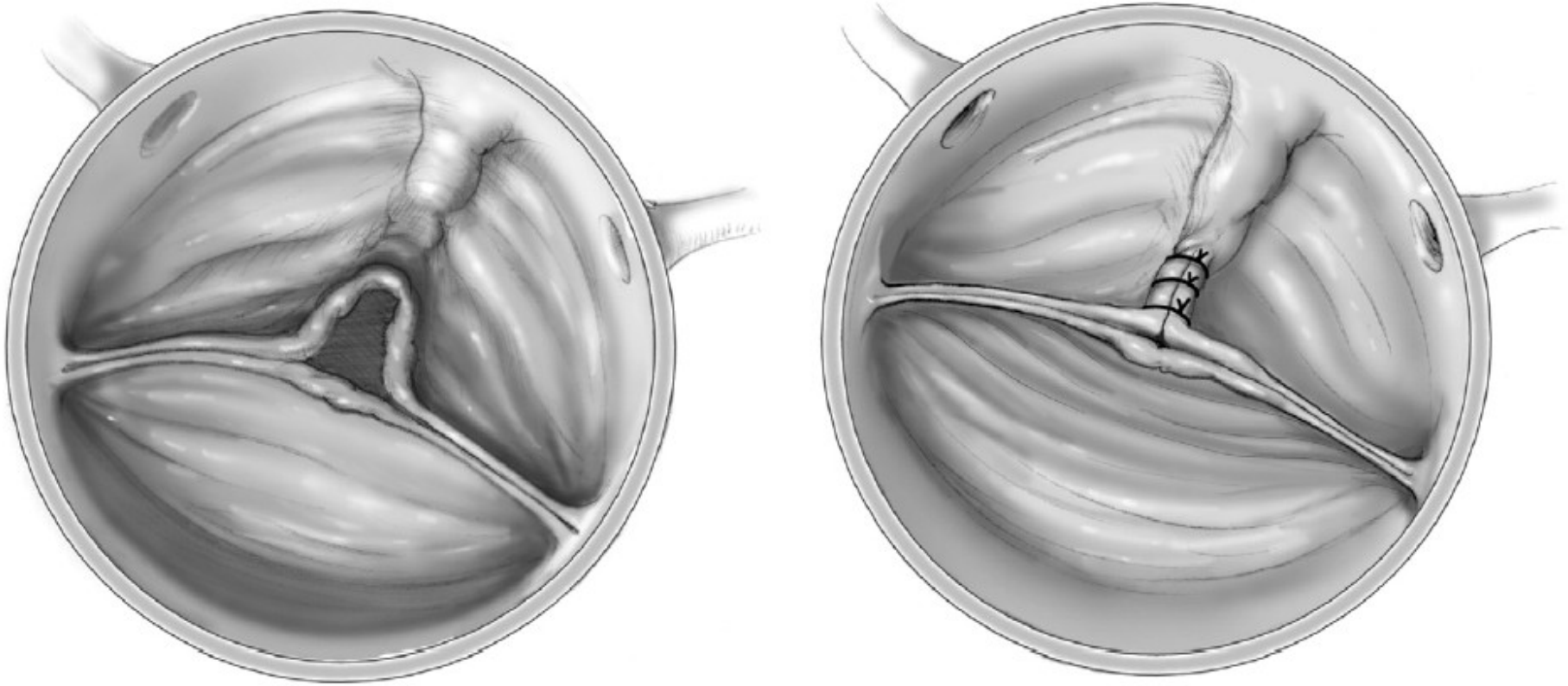
Leaflet prolapse



Central free margin plication



Cleft closure of conjoint leaflet



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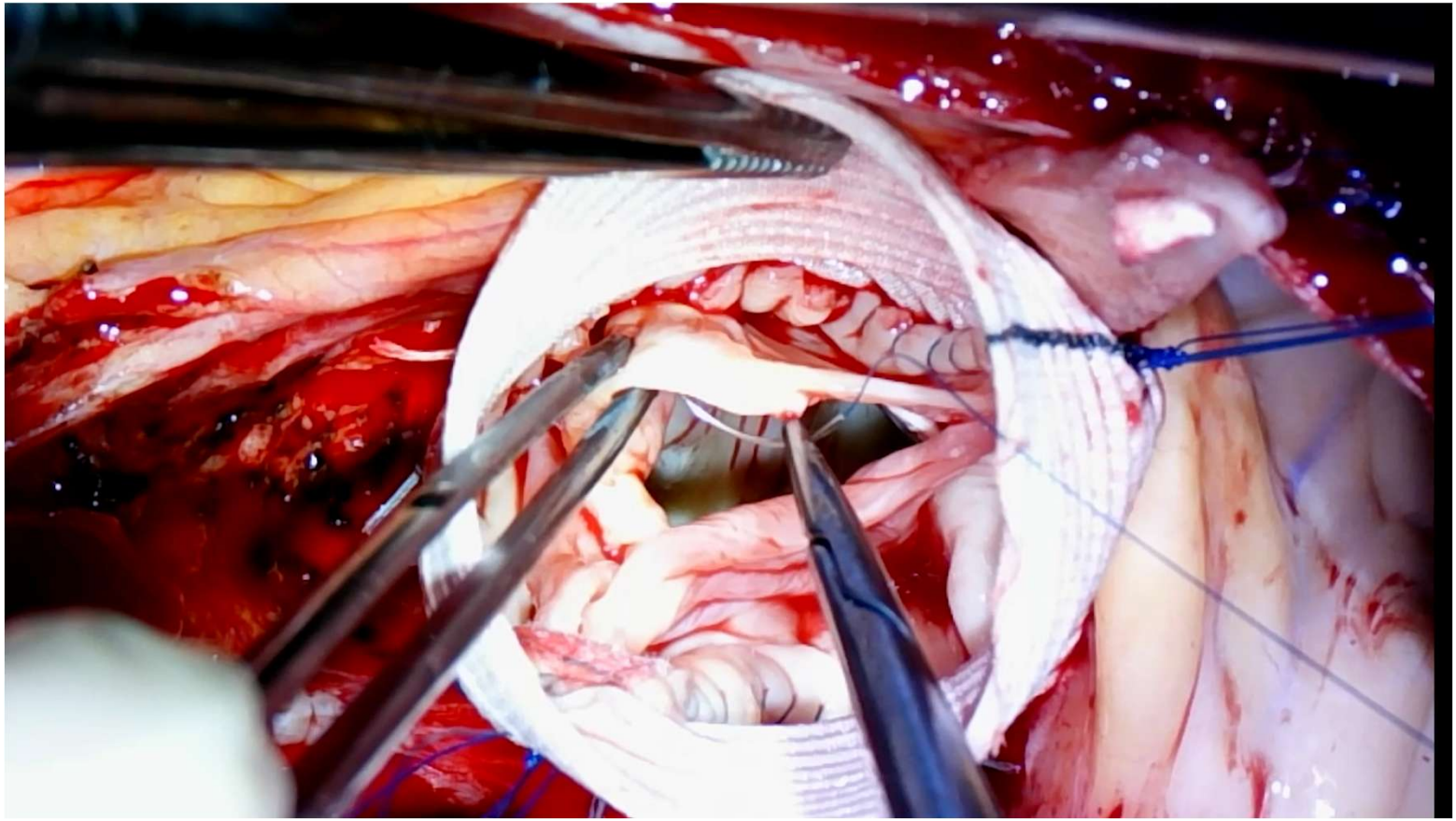
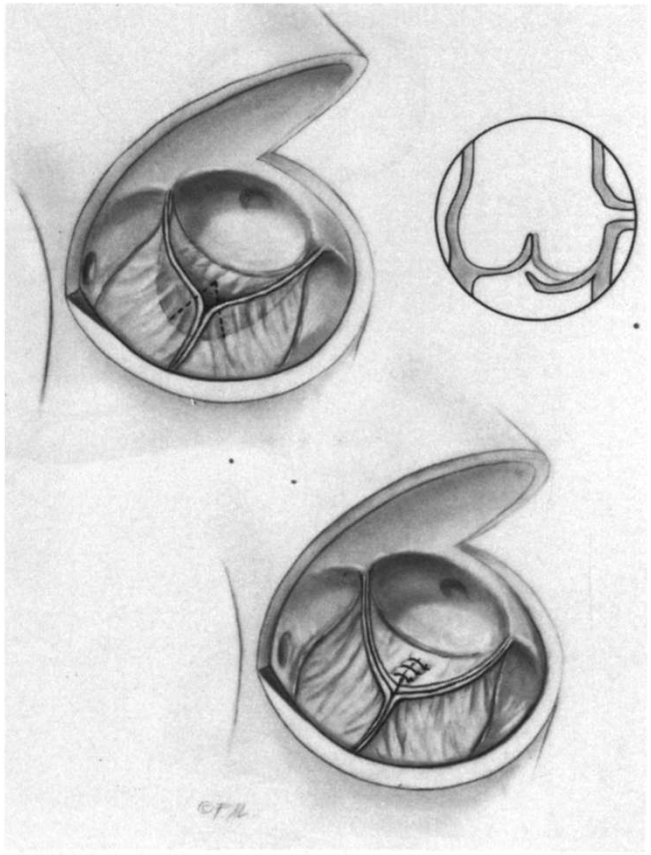
Pettersson G, et al. Toward Predictable Repair of Regurgitant Aortic Valves. *JACC.* 2008 Jul, 52 (1) 40–49.

Cleft closure of fused L/R leaflets



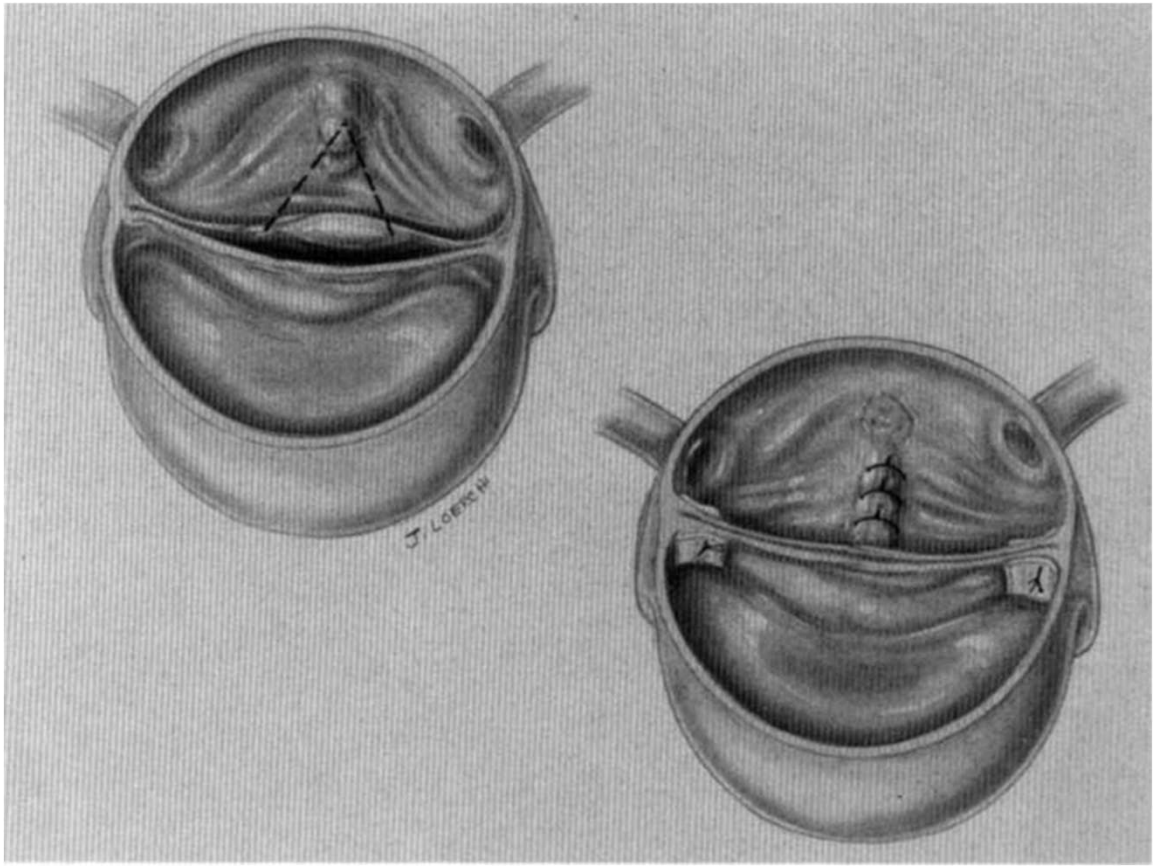
Triangular resection of AV leaflet



Leaflet prolapse is repaired by a triangular resection of the middle part of the distended cusp so as to restore normal length to the free edge" - *Carpentier 1983*

Carpentier, A. (1983). "Cardiac valve surgery--the "French correction"." J TCVS 86(3): 323-337.

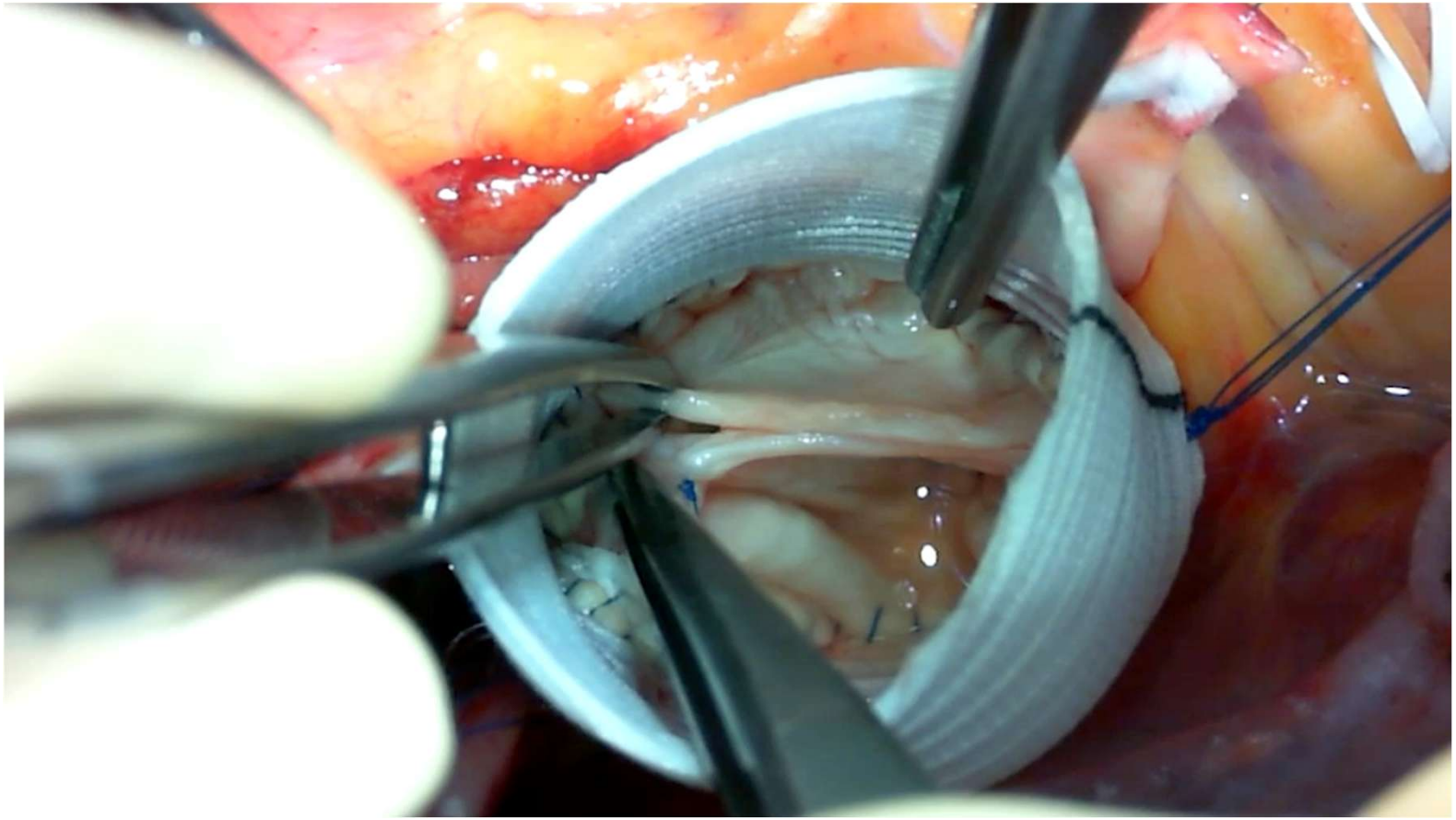
Triangular resection



"This technique was amended, leaving additional thickened tissue in the center portion of the cusp and using continuous double-layer running suture to reapproximate the tissue" – *Cosgrove 1996*

Cosgrove and Fraser. Aortic Valve Repair. Operative Techniques Cardiac & Thoracic Surgery, 1996, 1 (1): 30-37

Triangular resection



Surgical Aortic Valve Repair *in the Era of TAVI*

Conclusions

1. **Randomized clinical trial randomize AR patients to TAVI or AVR, not AV repair**

2. **AV repair is a class II recommendation for pure AR**

3. **AV repair has a long history and is repeatable**


STS–ASCVTS
Aortic Summit
2024
The Society of Thoracic Surgeons &
the Asian Society for
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Surgery Aortic Summit
2024
Date : November
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Venue : Hamamatsucho Convention Hall &
Hybrid Studio, Tokyo
Congress
President : Yutaka Okita
Kobe University/
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Takehiro Building 205, 1-4-9 Tokiwacho, Chuo-ku, Osaka 540-0028, Japan Phone: +81-6-6133-5653 Fax: +81-6-6133-5623 E-mail: sts-ascvts2026@kwcs.jp
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Thank You
S. Chris Malaisrie, MD
malaisrie@northwestern.edu