Mechanisms and Treatment of Paravalvular Aortic Regurgitation

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Potential Conflicts of Interest

Speaker's Name: Alain G. Cribier

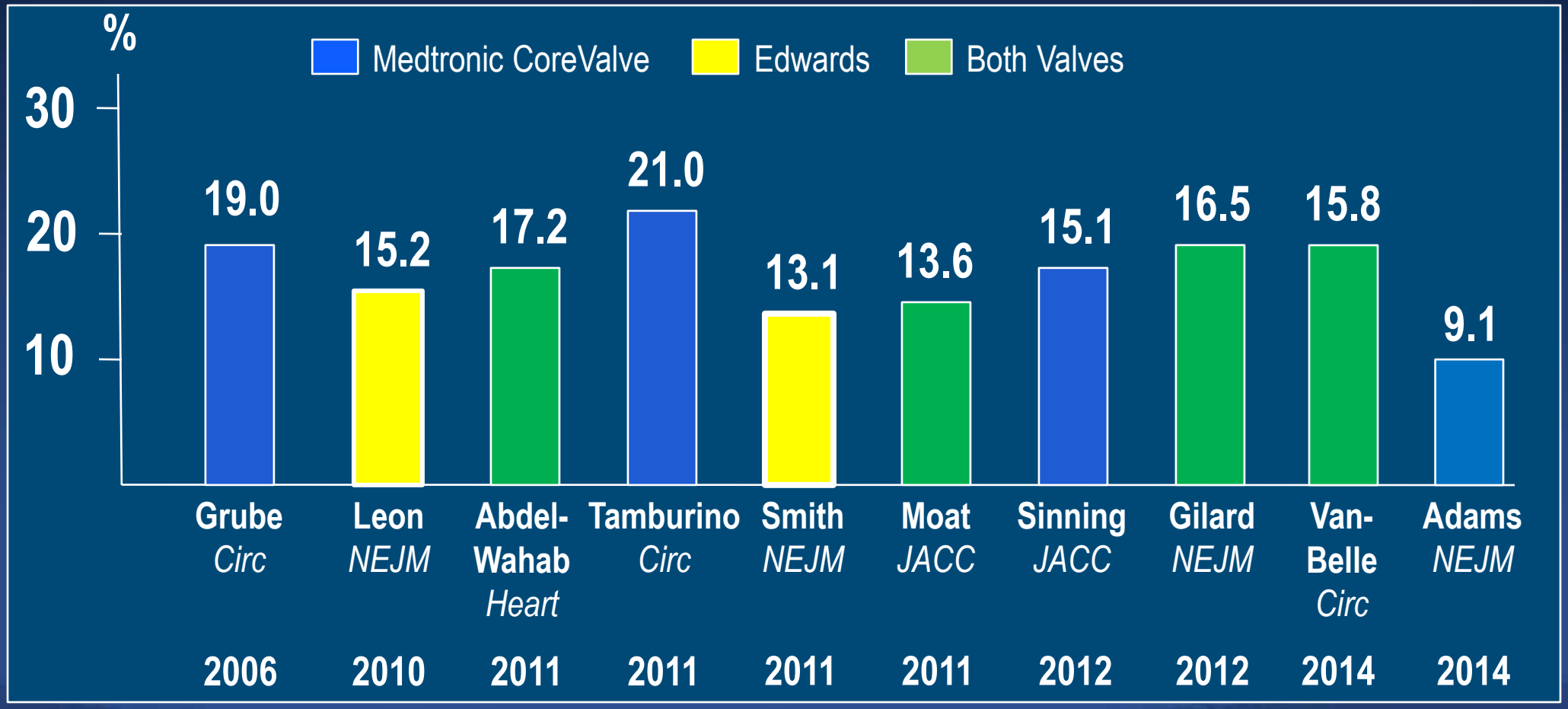
I have the following potential conflicts of interest to disclose:

Consultant / Proctor for Edwards Lifesciences

AR post-TAVI: The most common drawback

Mild AR observed in ≥ 70% of patients

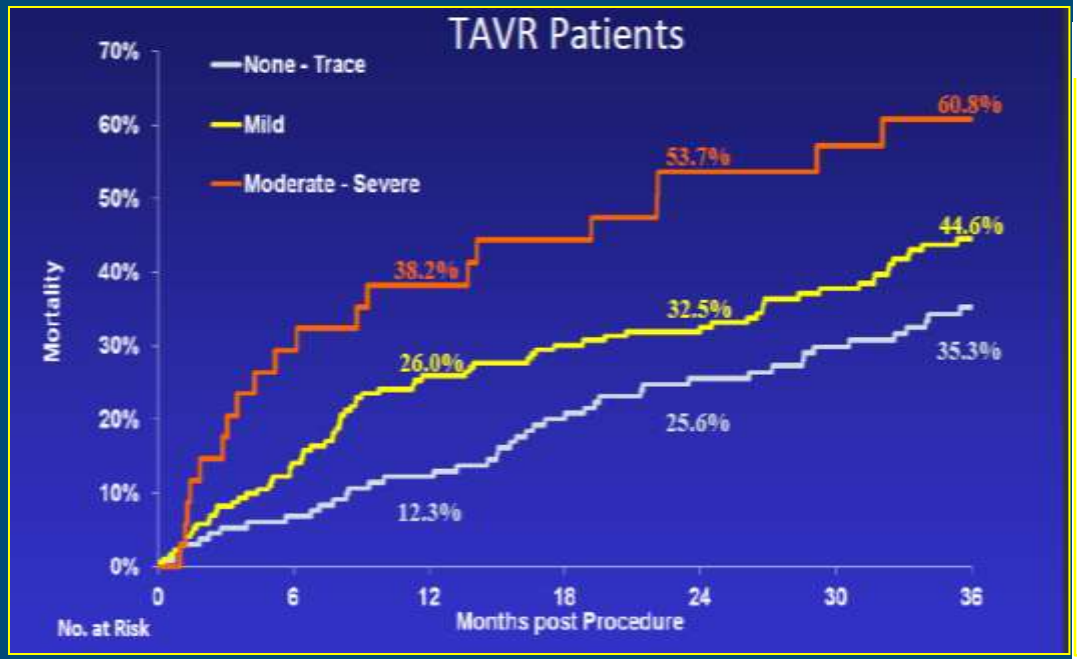
Moderate to severe AR remains a serious concern



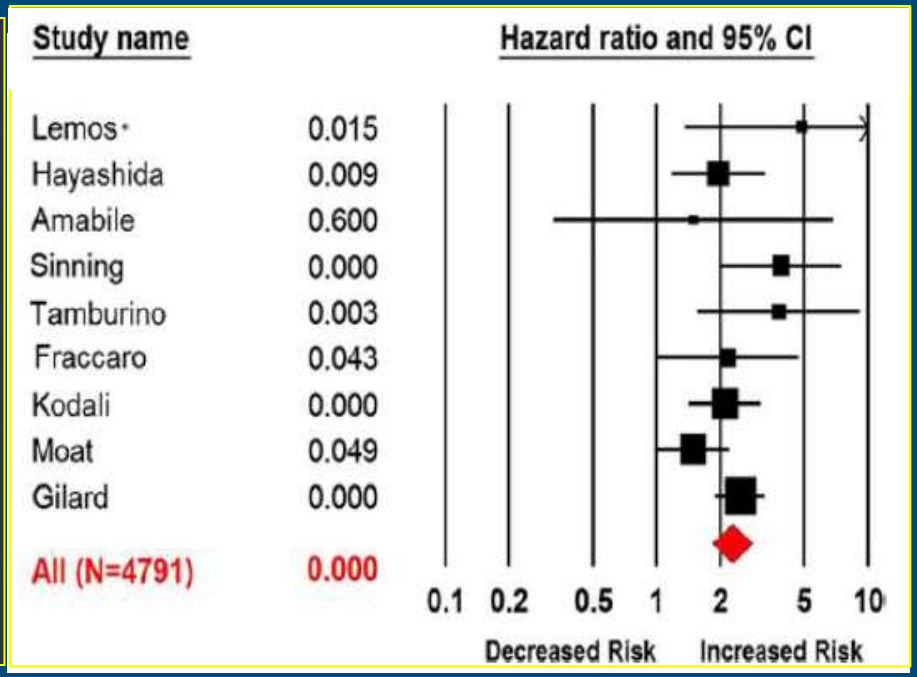
Impact of Post-TAVI / AR on Mortality

Mortality risk is doubled with moderate / severe AR

PARTNER A
Kodali et al NEJM 2012



F. Maisano, Meta-Analysis, PCR London Valve 2013



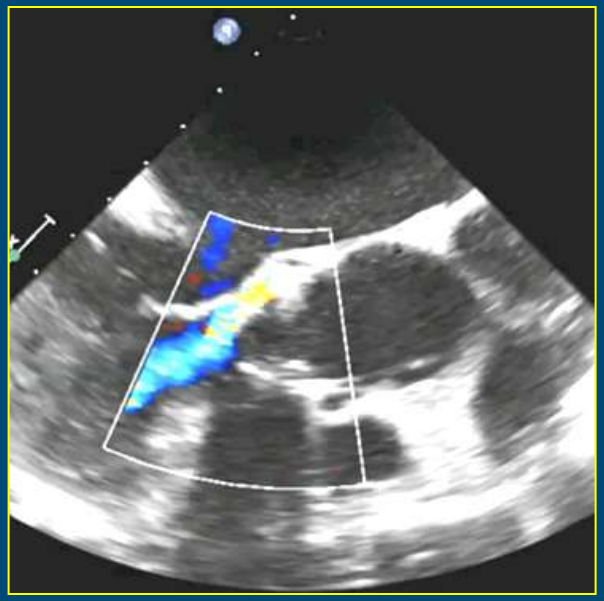
« Even mild AR may have an impact on long term mortality »

Quantification of AR after TAVI: no gold standard

Angiography

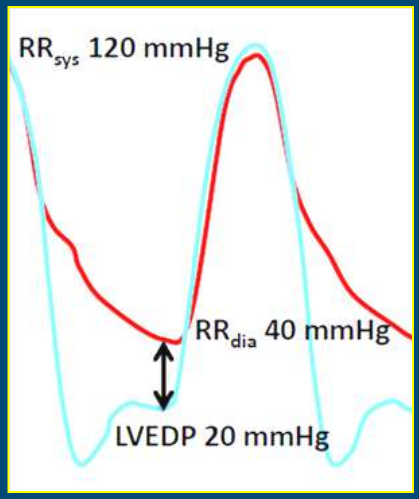
Sellers Classification

TTE / TEE



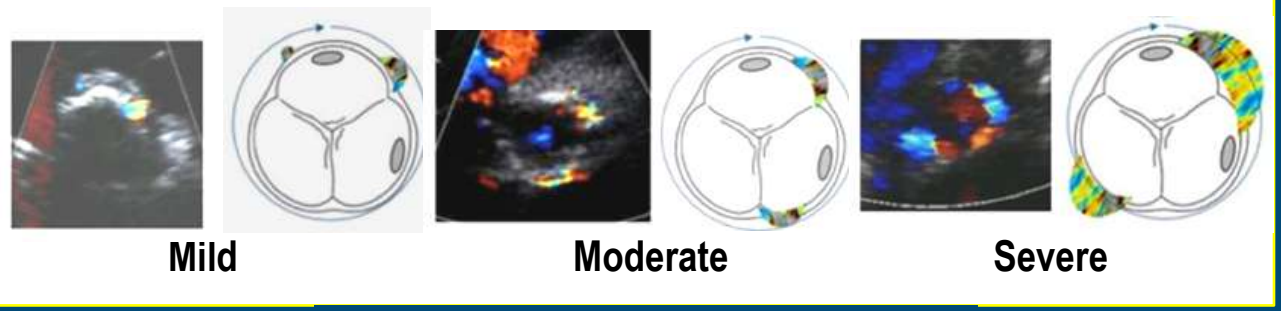
Echocardiography Guidelines

AR Index



[(RRdia-LVEDP)/Rrsys]X100

MRI Post-Procedure



Echocardiography Guidelines

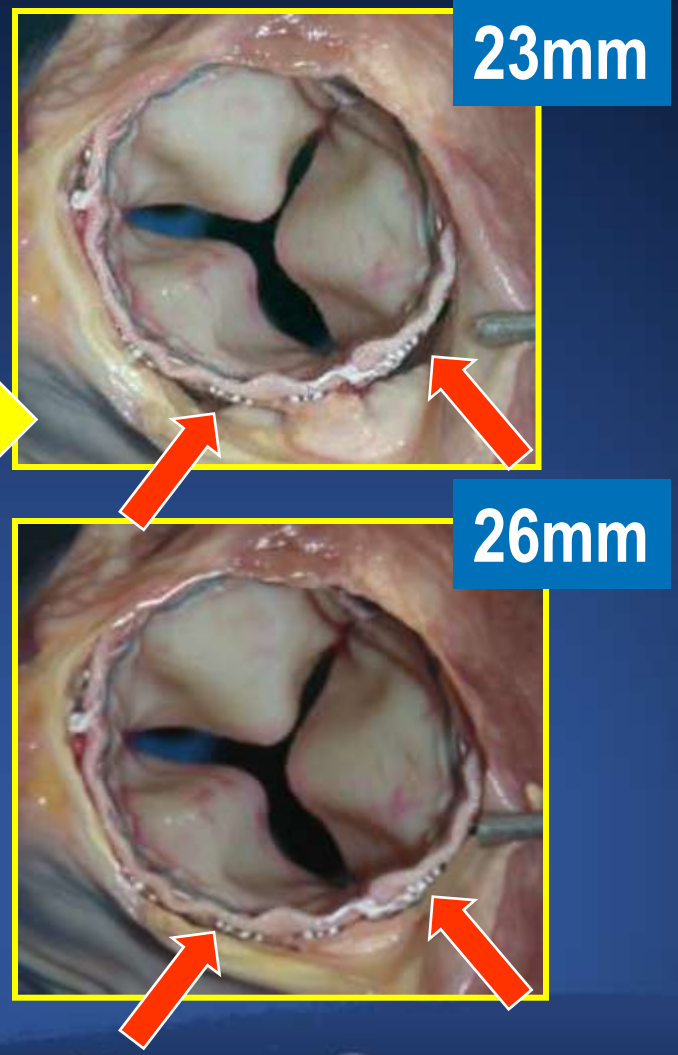
Bloomfield et al, JACC Img 2012

Origin of AR post TAVI : most commonly paravalvular

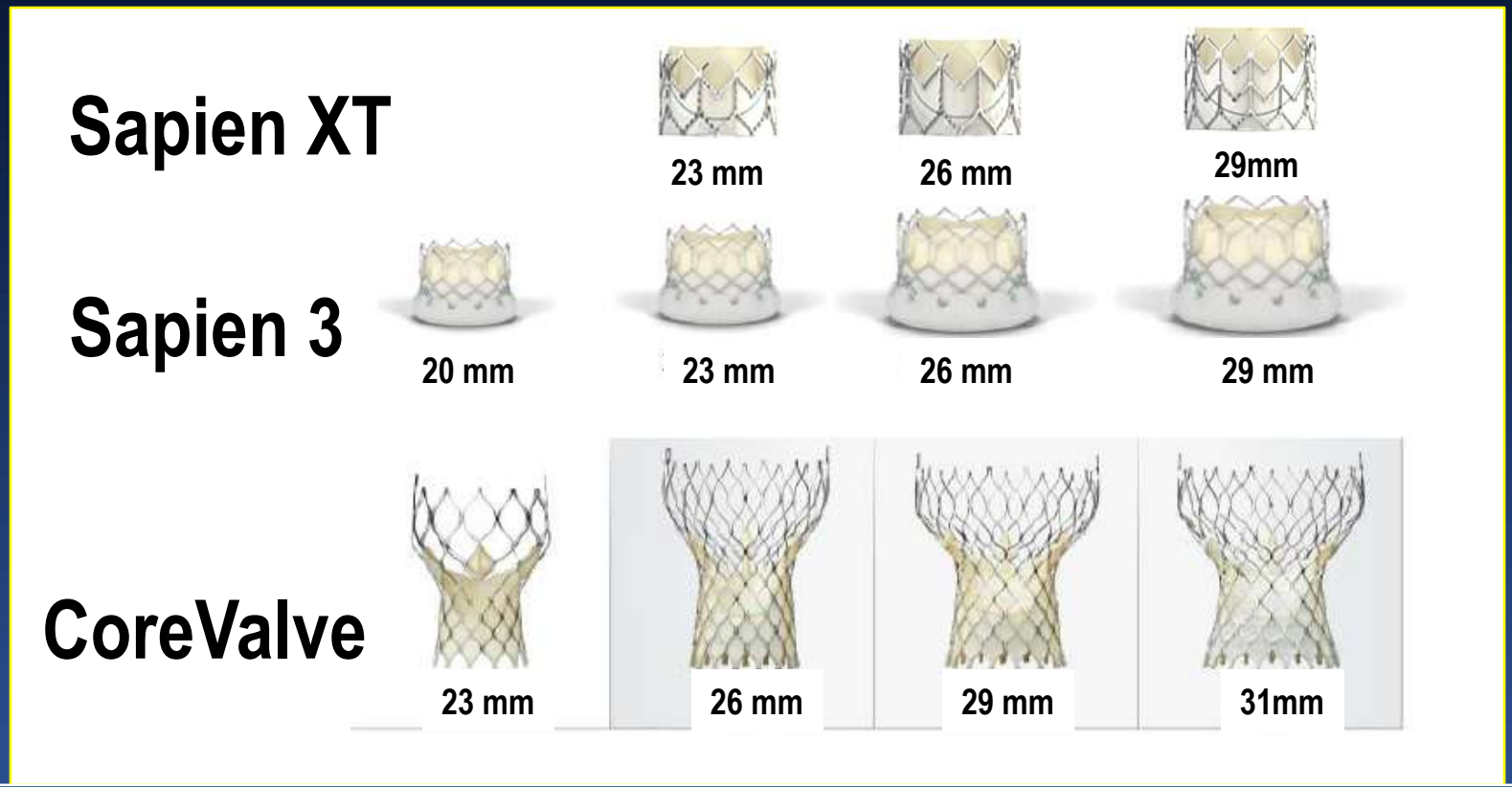
Due to incomplete sealing of the paravalvular space

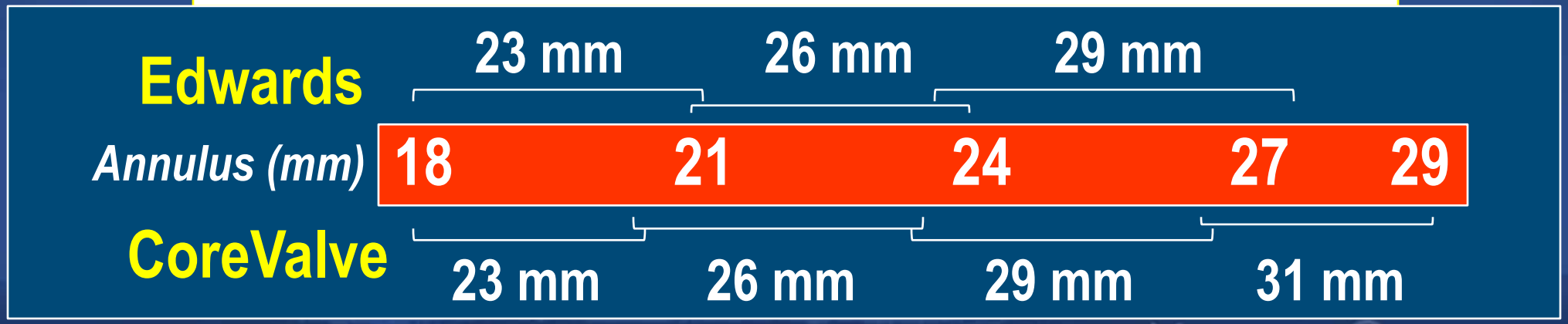
Multifactorial etiology

1) Non optimal valve size / annulus size
   Valve sizing is crucial
2) Anatomy and amount / distribution of valvular calcification
4) Prosthesis positioning
3) Valve type effect (BE vs SE vs other valves)



Multiple size options is the key

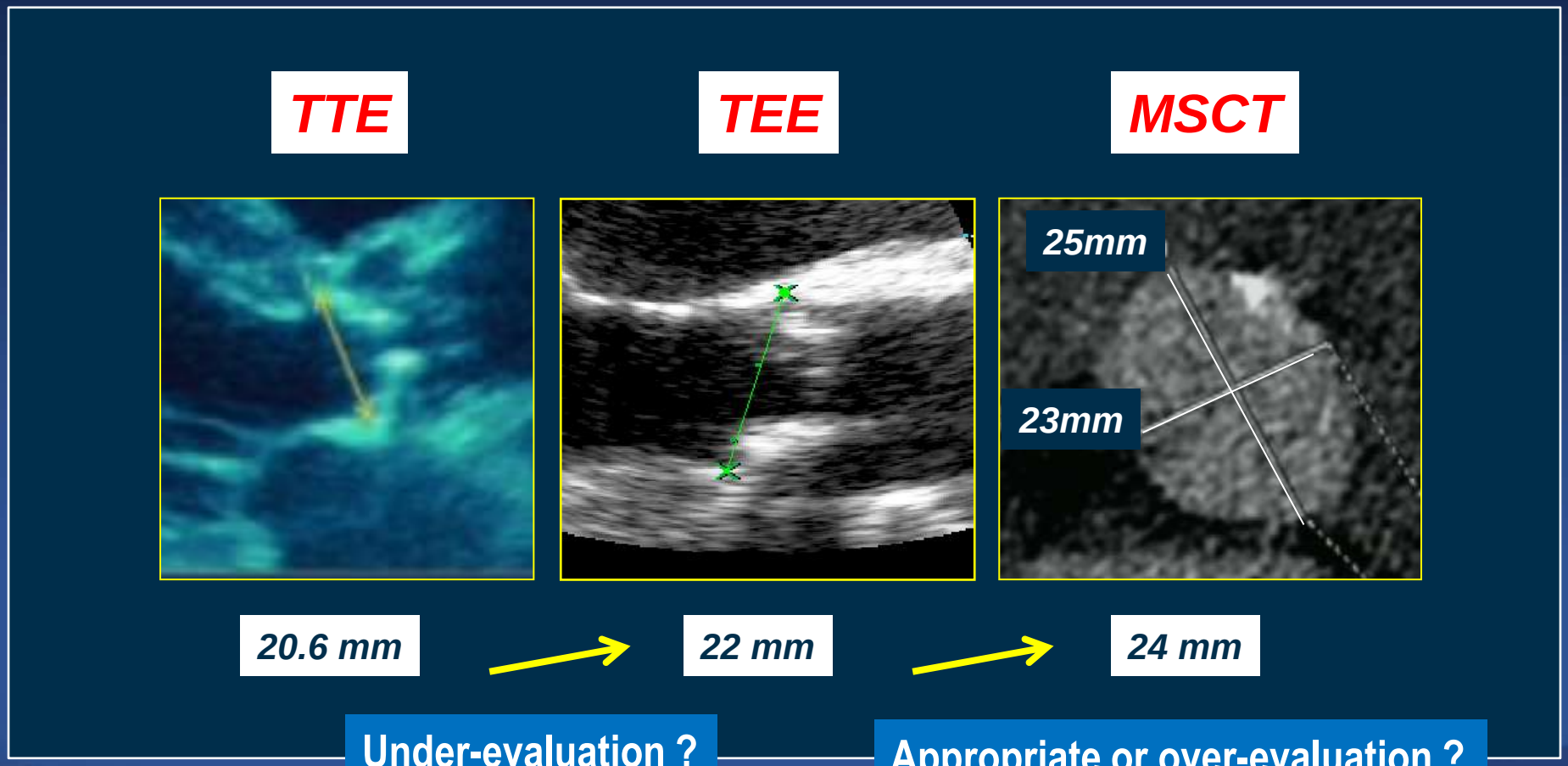




Annulus size: the key factor for approriate valve sizing

No gold standard method!

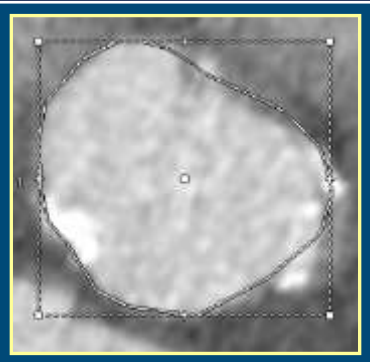
1- Diameters



No gold standard for annulus size measurement

2- Annular cross sectional area: MSCT – most accepted approach

Vancouver sizing Guidelines



Perimeter: 75.7 mm

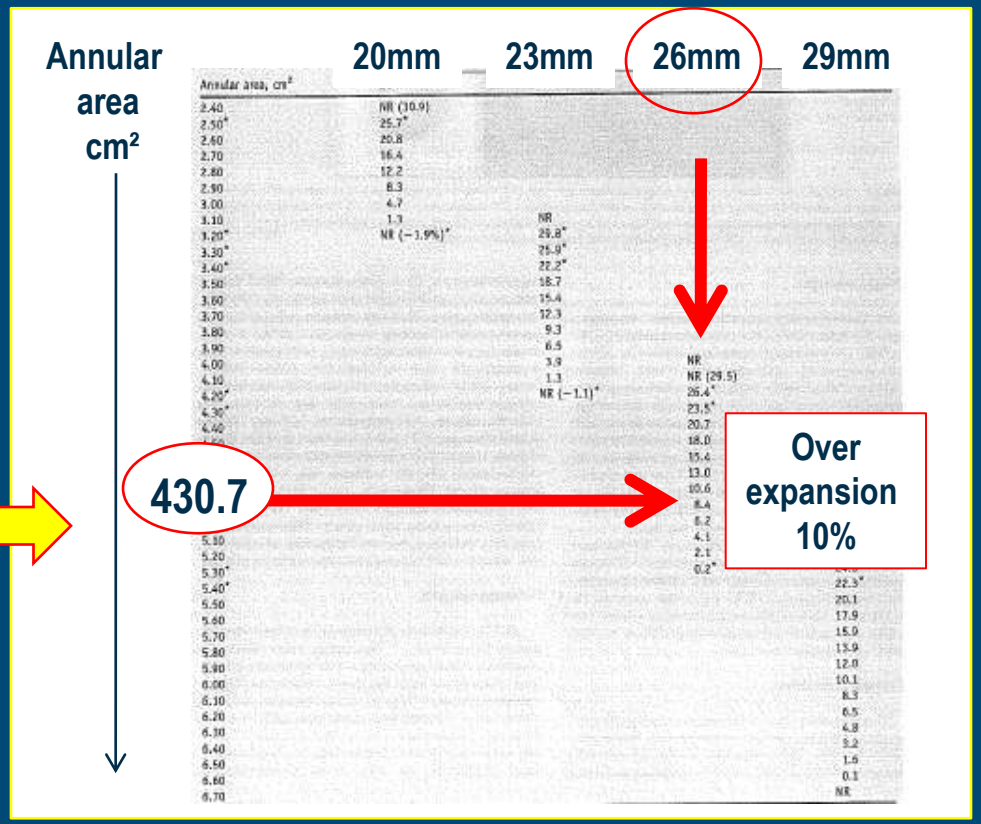
No oversizing by > 1.3% (J. Webb)

Annular Area: 430.7 mm²

- ***Optimal: oversize by 5-10%***
- ***Underfill if > 20% or >10%***

if high risk features

Valve Area



J. Webb PCR London Valve 2013

Vancouver Area Sizing Guidelines and underfilling protocole (Sapien XT)

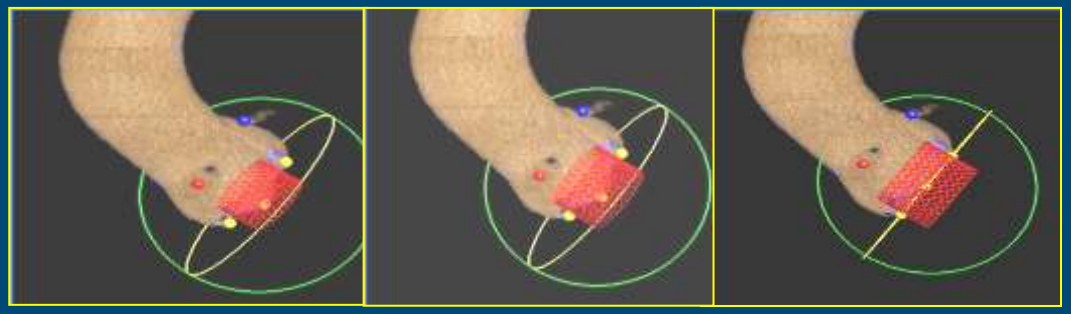
Annular Area (mm^2)	THV size (mm)
230 to 300	20
310 to 320	20 or 23 underfilled
330 to 400	23
410	23 or 26 underfilled
420 to 510	26
520	26 or 29 underfilled
530 to 660	29

SAPIEN XT	Nominal Balloon Volume	To reduce diameter by ~ 1 mm underfill by ~ 10%
23 mm	17 ml	1 ml
26 mm	22 ml	2 ml
29 mm	33 ml	3 ml

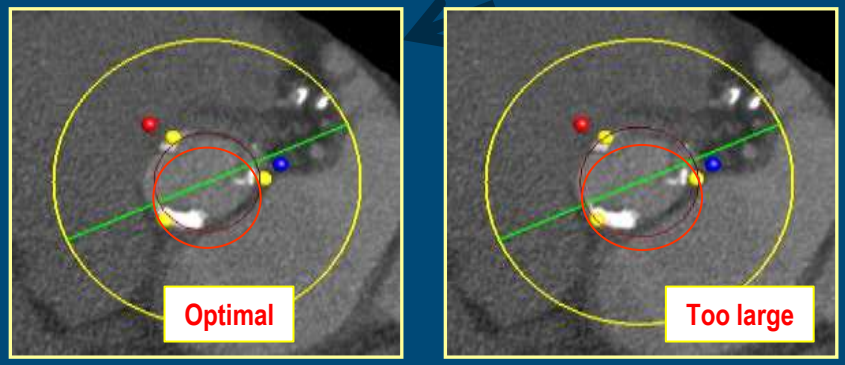
J. Webb, PCR London Valve 2013

Annulus size measurement: other approaches

Philips Heart Navigator (pre-procedure)

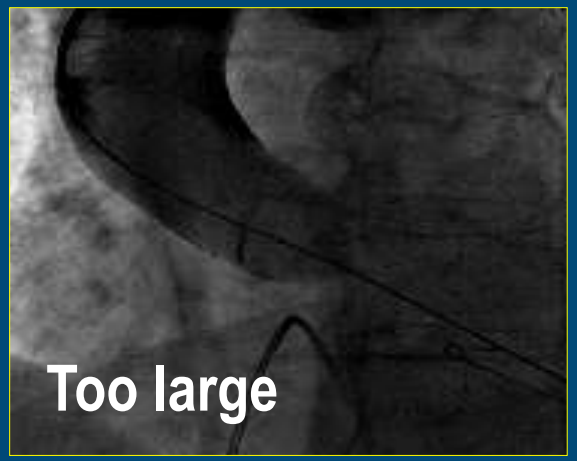


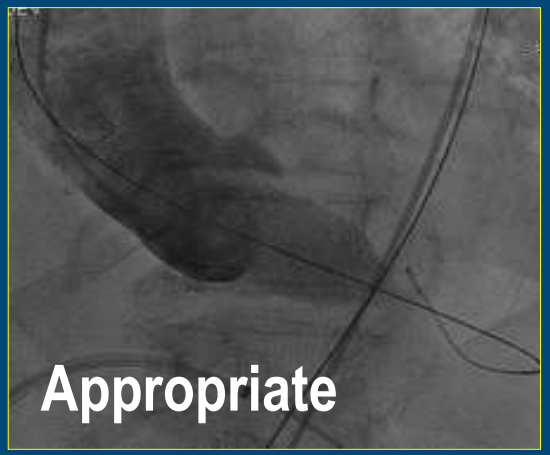
23mm 26mm 29mm

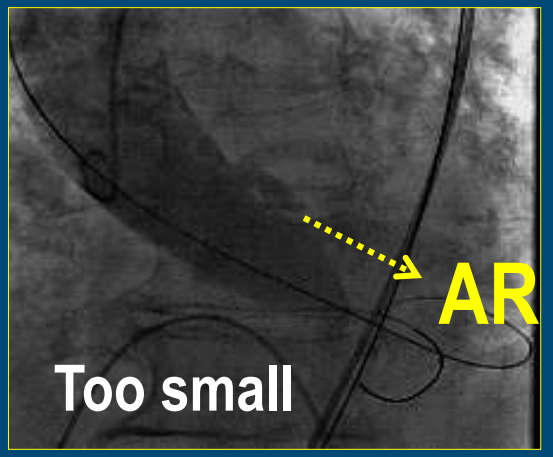


26mm 29mm

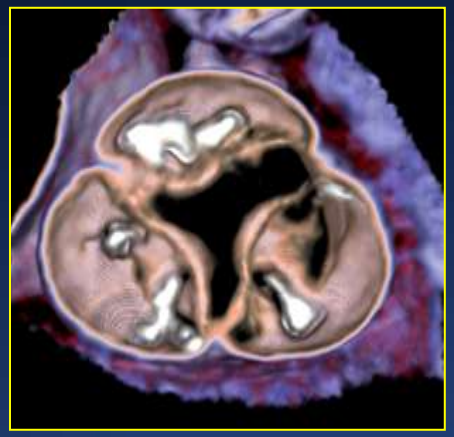
The final touch: Balloon Sizing (per-procedure)

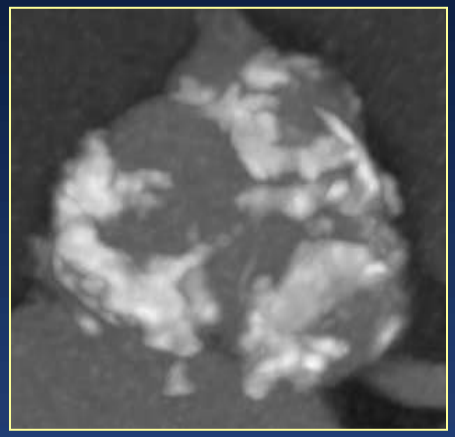




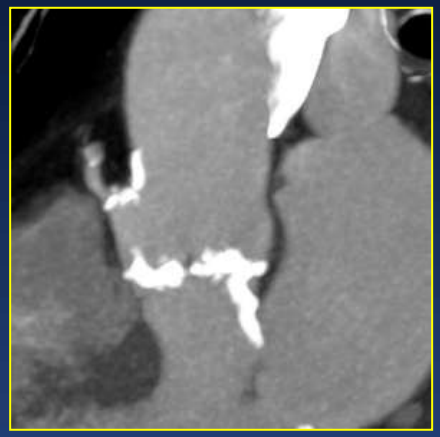


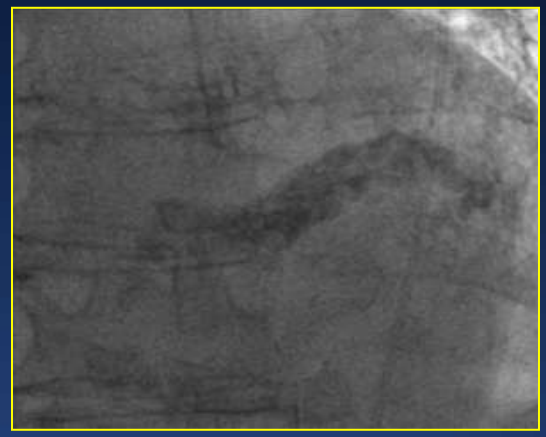
Assessment of aortic valve anatomy and Amount / Distribution of valvular calcification





Degree of calcification, distribution

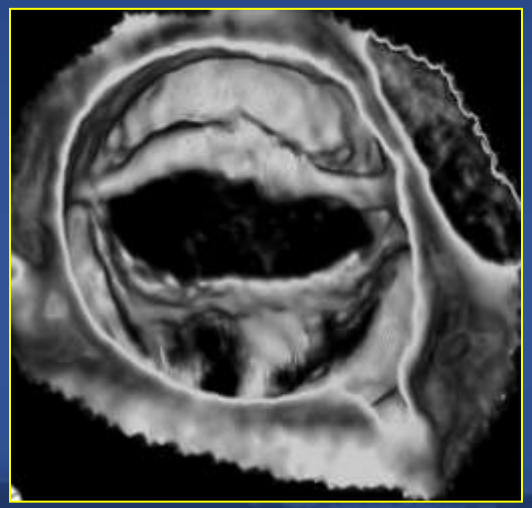


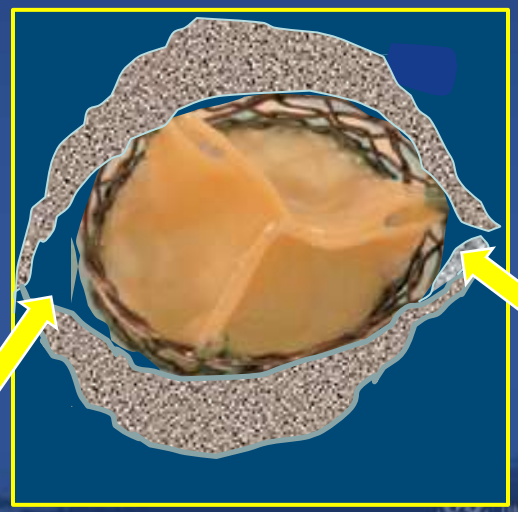


Extensive calcification: septum, mitral valve

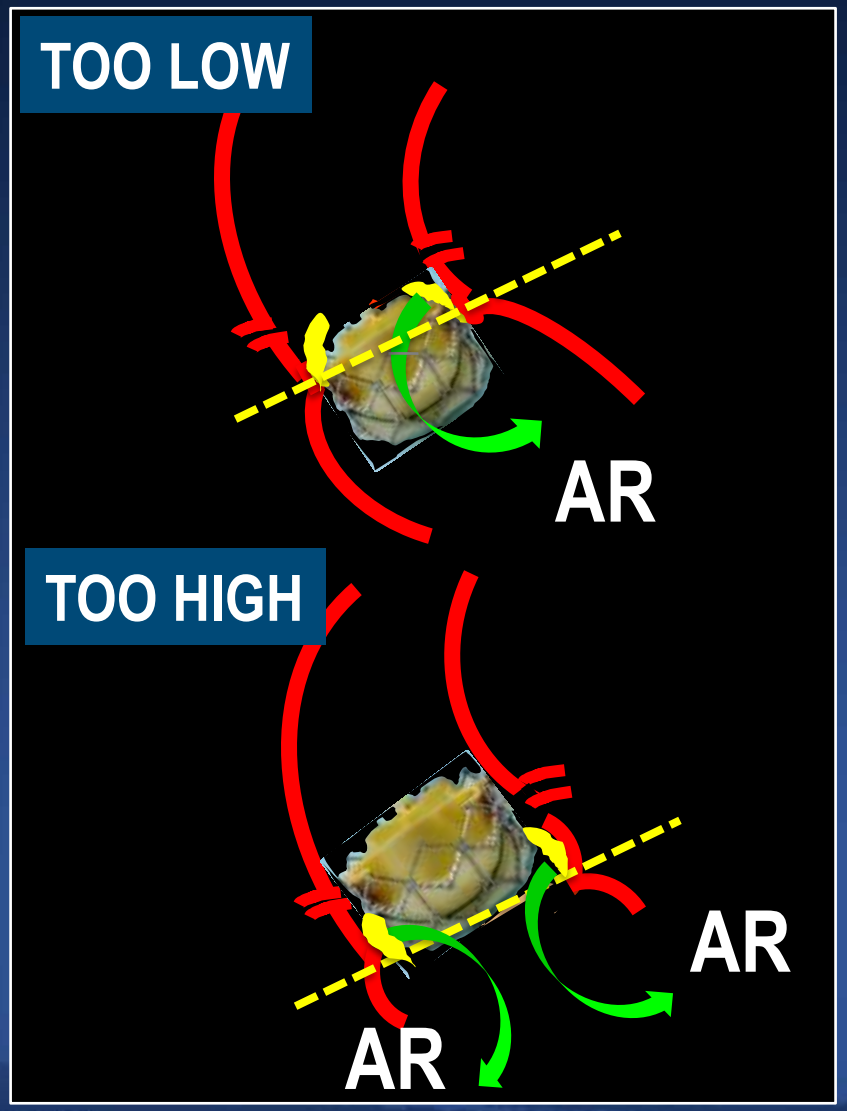
Valve anatomy: Echo, MSCT

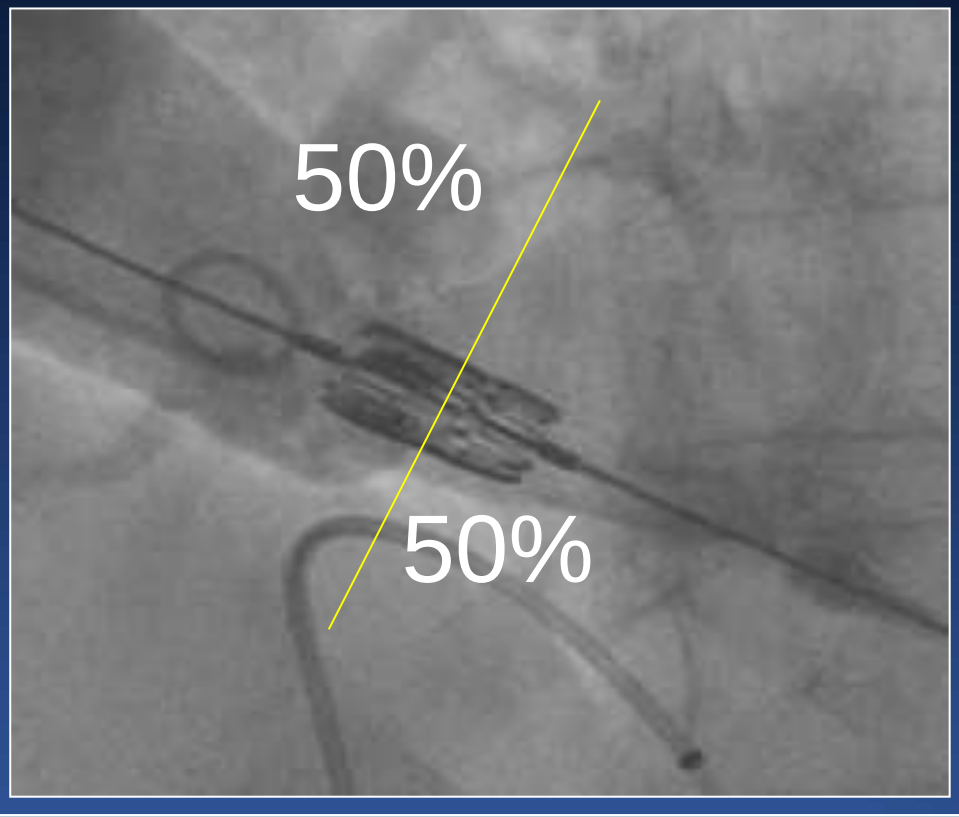
Bicuspid Valve





Peri-procedural factors: Valve positioning: Edwards

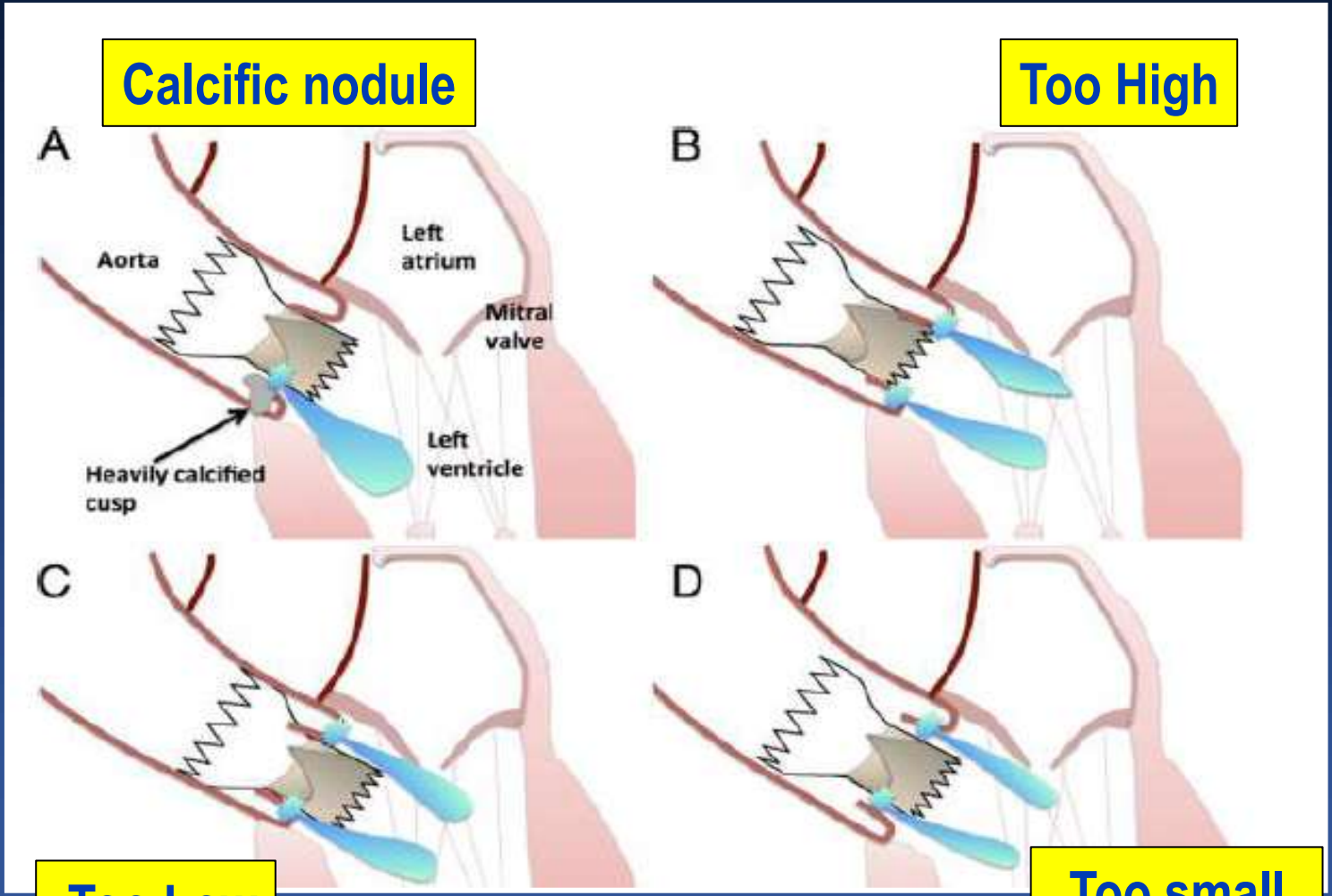




1) Be coaxial !

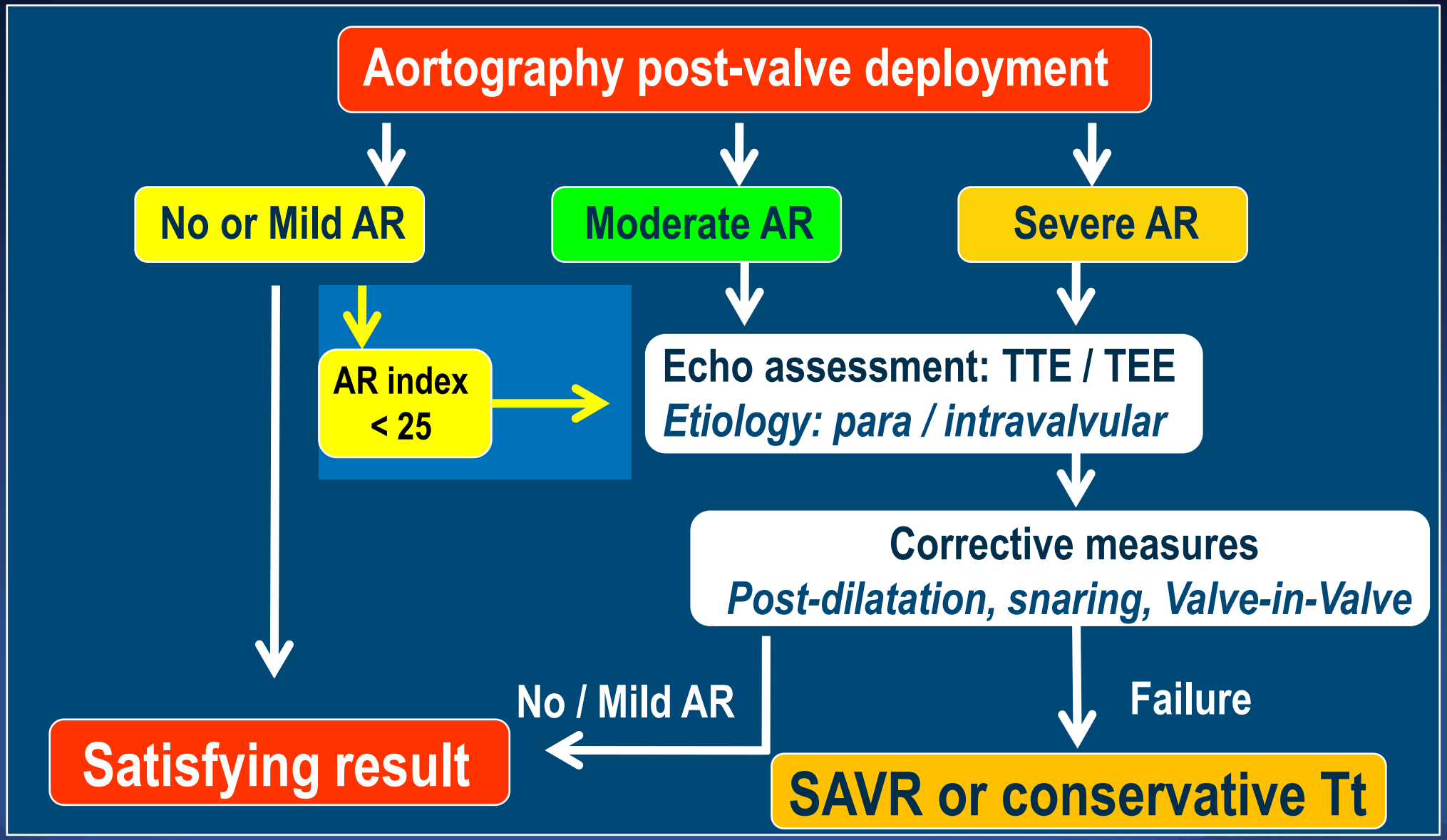
2) Final touch of positioning with rapid pacing

The issue of valve positioning: Medtronic CoreValve



Sinning et al, JACC Vol 59, 1140

Proposed organigram in AR post-TAVI



From Sinning et al, London PCR 2013

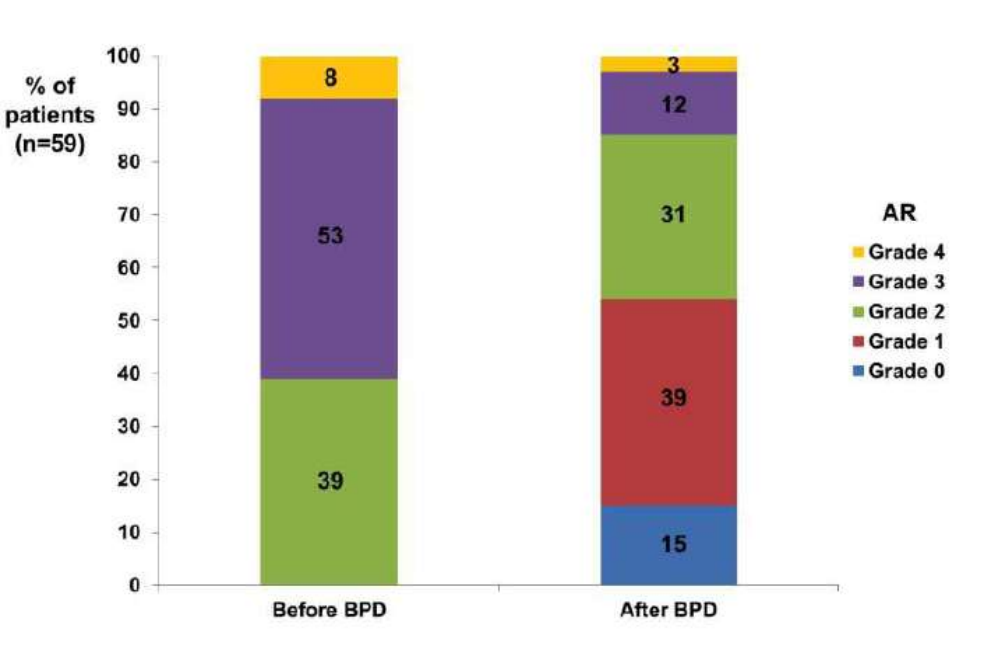
Different valves / Different strategies in AR post-TAVI

Malposition or under-expansion of the prosthesis

Too low	Too High	Under expanded
Pull maneuvers SE Valve-in Valve BE	Pull-out maneuvers Valve -in-Valve SE BE	Sapien XT

Balloon post-dilatation and AR

Decreased AR by one grade

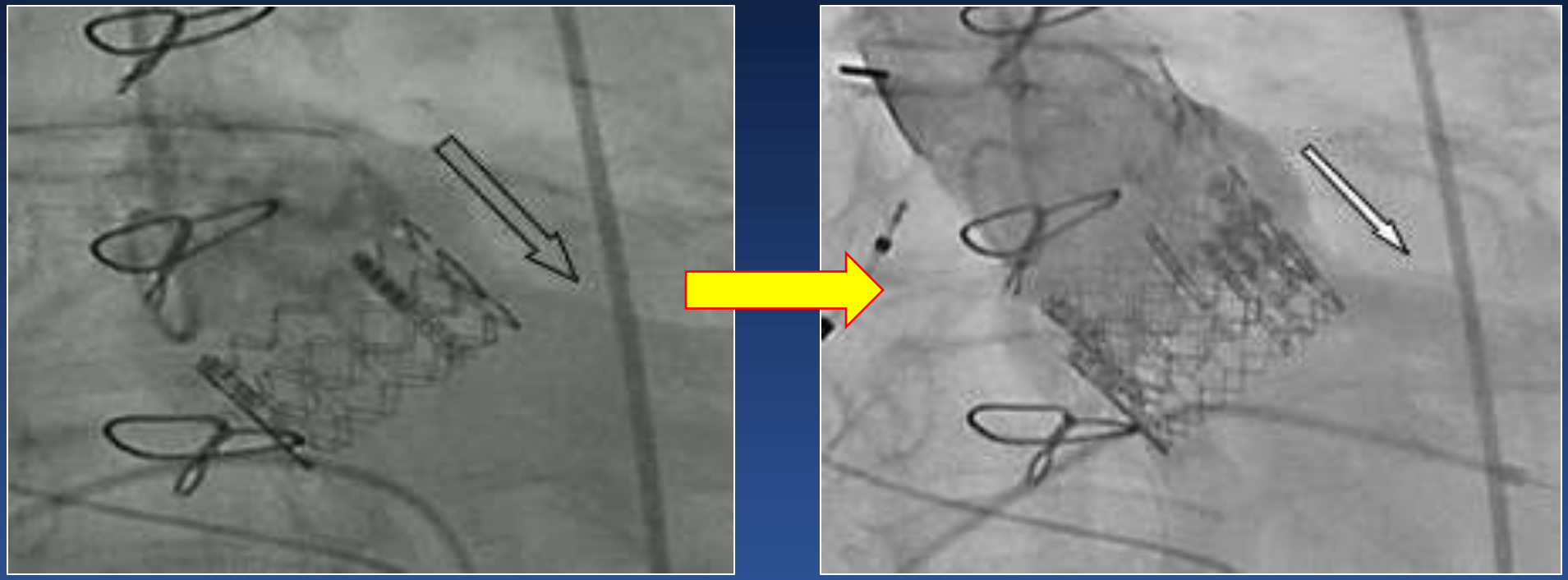


5 studies (2 SE, 3 BE), 1000 pts

- Increased risk :
  - ➢ New LBBB
  - ➢ *Independent predictor of CV event*
- No deleterious effect on valvular structure

Numbela-Franco, JACC 2012

Valve in Valve for malpositioning and severe AR



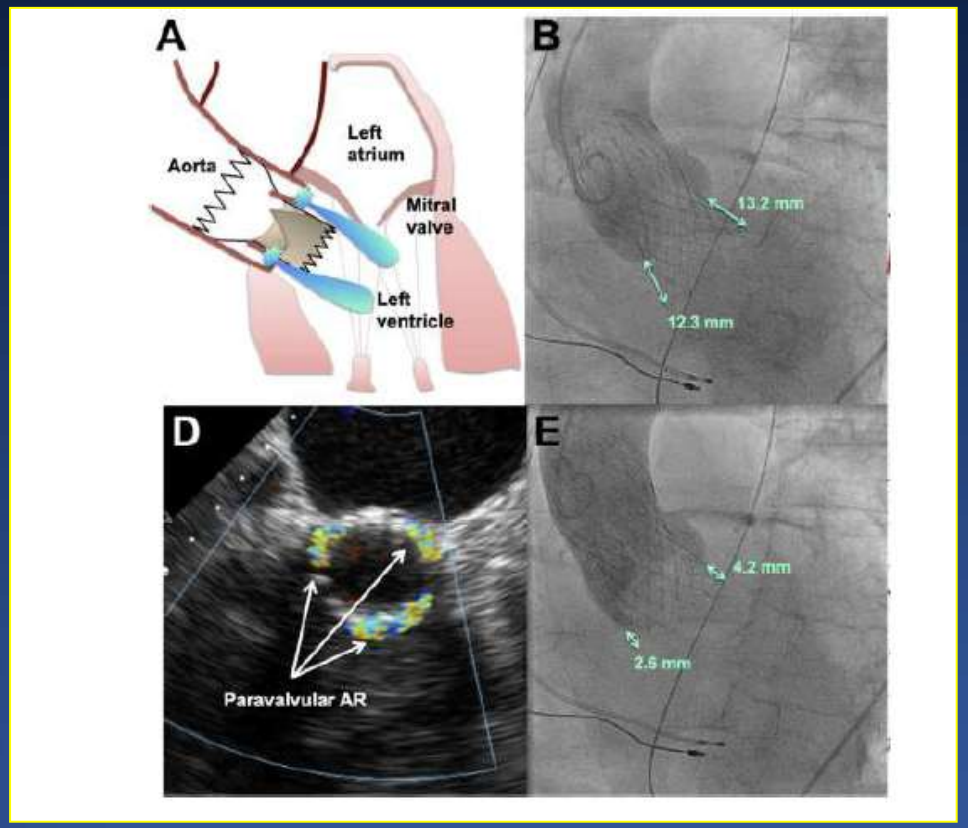
Too low: severe AR

V-in-V: mild AR

High risk of prosthesis migration in LV !

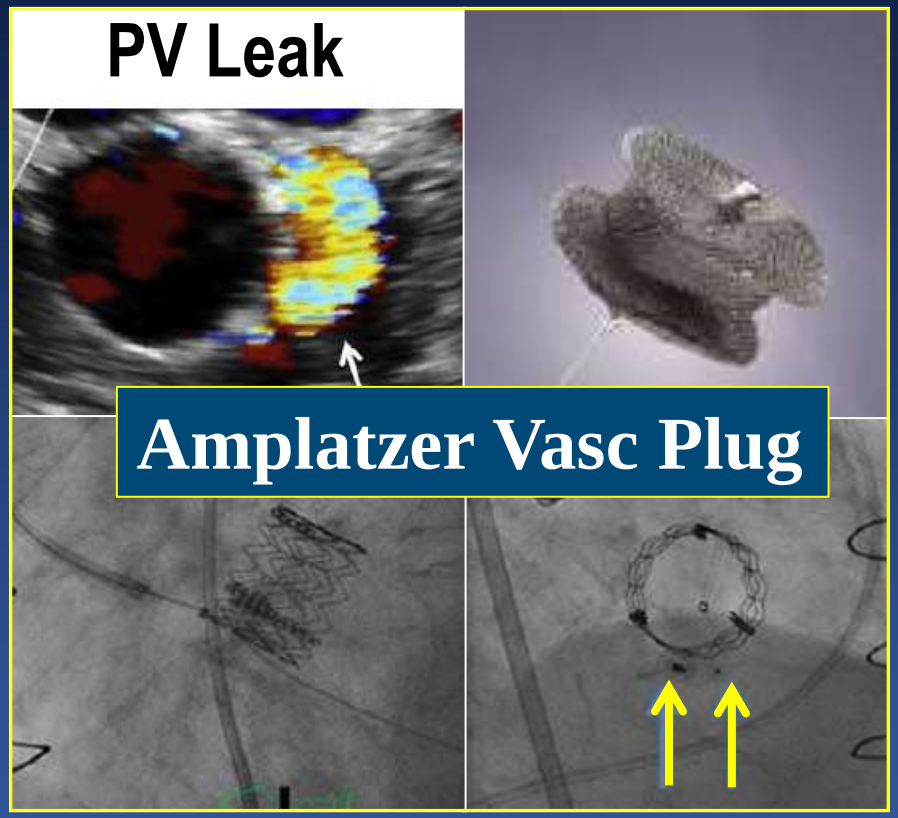
Other strategies for AR post-TAVI

Snaring



J. Webb
PCR London Valve 2013

Device closure ?



Whisenant B et al,
Cath and Cardiovasc Interv 2013

AR post-TAVI: any valve type effect?

J Am Coll Cardiol. 2013 Apr 16;61(15):1585-95. doi: 10.1016/j.jacc.2013.01.047.

Incidence, predictors, and outcomes of aortic regurgitation after transcatheter aortic valve replacement: meta-analysis and systematic review of literature.

Athappan G[1], Patvardhan E, Tuzcu EM, Svensson LG, Lemos PA, Fraccaro C, Tarantini G, Sinning JM, Nickenig G, Capodanno D, Tamburino C, Latib A, Colombo A, Kapadia SR.

45 studies - 12 926 patients 2002-2012

Moderate to severe AR

Medtronic CoreValve **16.0%** vs Edwards **9.1%** (p=0.005)

E. Van Belle et al, Circulation 2014

From FRANCE 2 registry

AR ≥ Grade 2 (Echo)

CV (n= 897) vs Ed (n= 1872)

21.5 % vs **13.0%** (p=0.0001)

Abdel-Wahab et al, JAMA 2014

CHOICE Randomized Trial

More then mild AR (Angio)

CV (n= 120) vs Ed (n= 121)

18.3 % vs **4.1%** (p=0.01)

New prosthesis design should limit this complication

Edw Sapien 3

External cuff

DF medical

BS Sadra

SJ Portico

Repositionable, retrievable

Edw Centera

Accurate

Self seating features

Jena Valve

Engager

Native leaflets incorporated

CONCLUSIONS

- Post-TAVI paravalvular AR is common with first generation devices

- Moderate to severe AR is associated with excessive mortality

- Efforts should be made to minimize AR by careful valve sizing and meticulous procedural execution. The importance of multi-imaging modalities at the time of screening must be emphasized

- Improved device design and implantation techniques should considerably help limiting this complication in the next future