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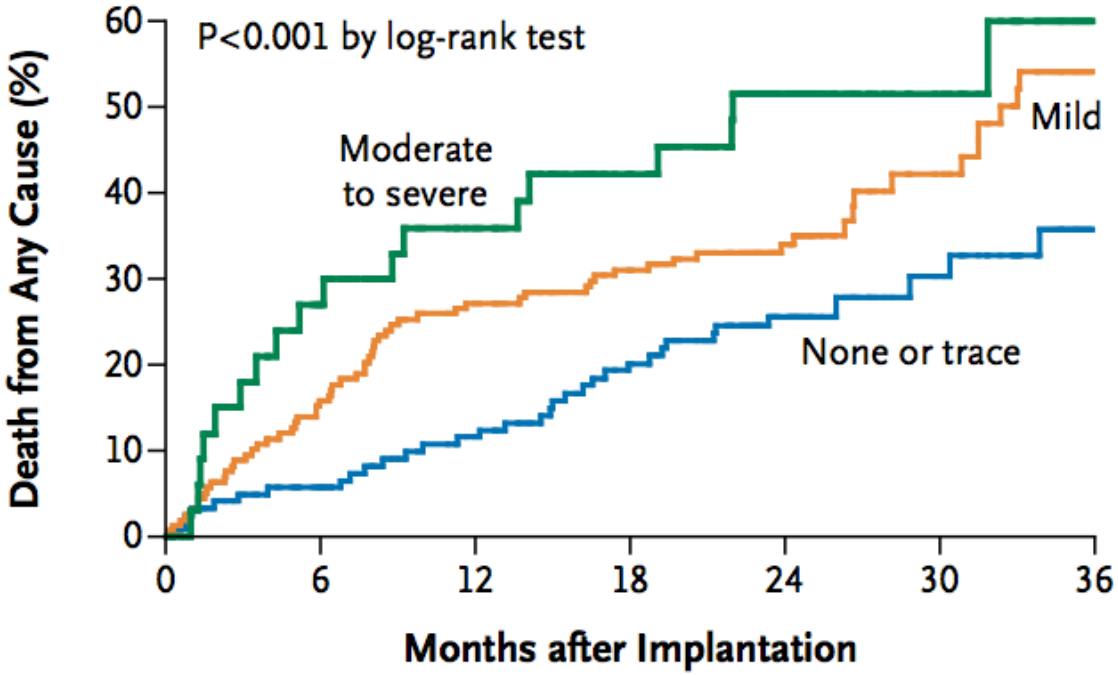
Avoidance and management of paravalvular leak after TAVI

Kentaro Hayashida MD, PhD, FESC

8th, August 2014, TAVI summit, Seoul

Mild AR impacts mortality after TAVI

D Severity of Total Aortic Regurgitation: None or Trace, Mild, or Moderate to Severe

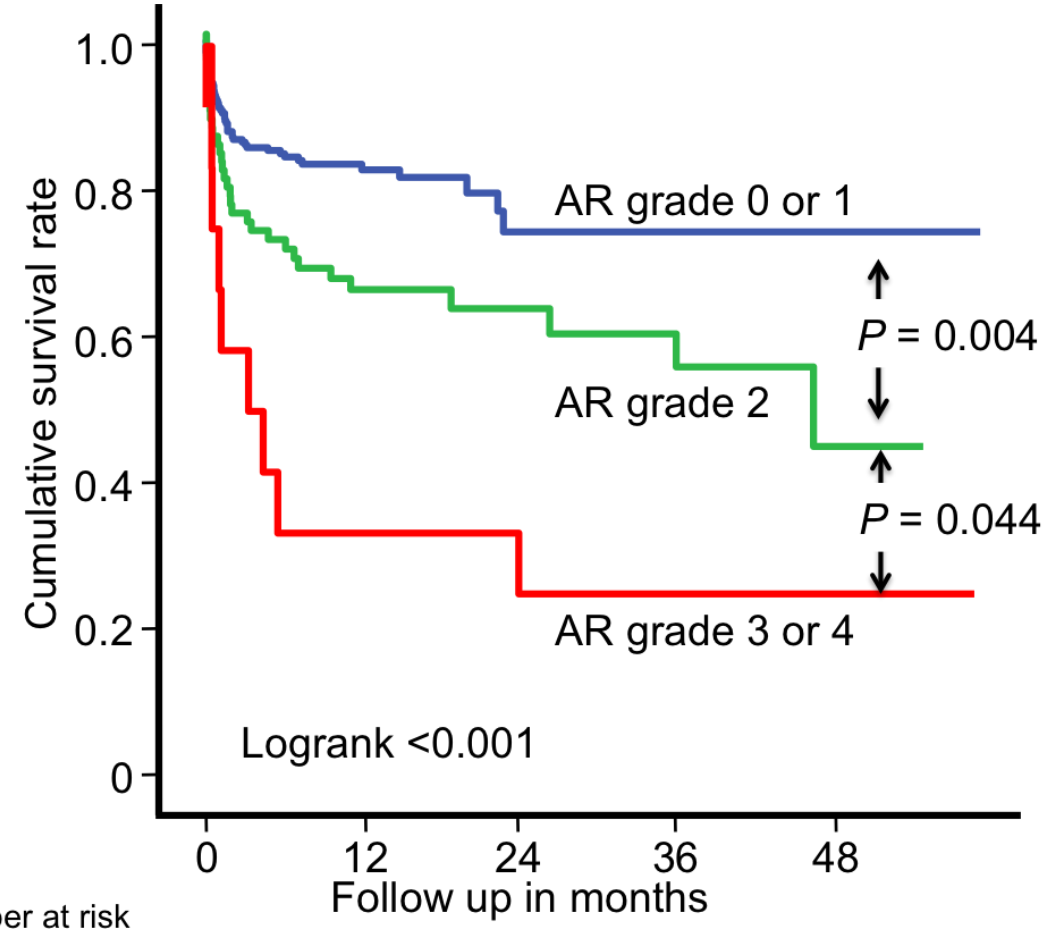


No. at Risk

None or trace	125	117	108	95	64	29	10
Mild	162	136	118	109	70	31	15
Moderate to severe	34	25	22	19	15	6	2

Kodali et al. NEJM 2012

Mild AR affects mid-long term mortality



Number at risk					
AR grade 0 or 1	299	133	45	27	3
AR grade 2	89	46	29	21	5
AR grade 3 or 4	12	4	4	3	3

Hayashida et al. JACC Interv 2012

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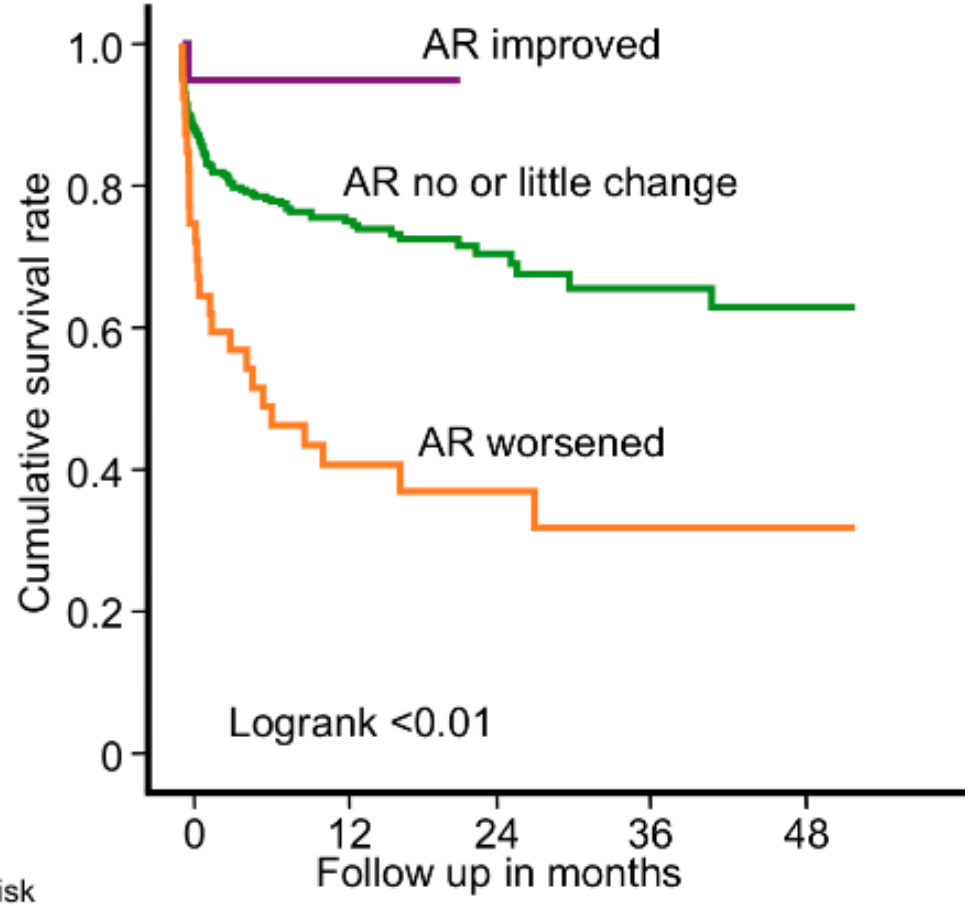
Increase of AR had a worse impact on mortality



Number at risk					
AR improved	20	10			
AR no or less change	339	157	71	46	9
AR worsened	41	16	7	5	2

Hayashida et al. JACC Interv 2012

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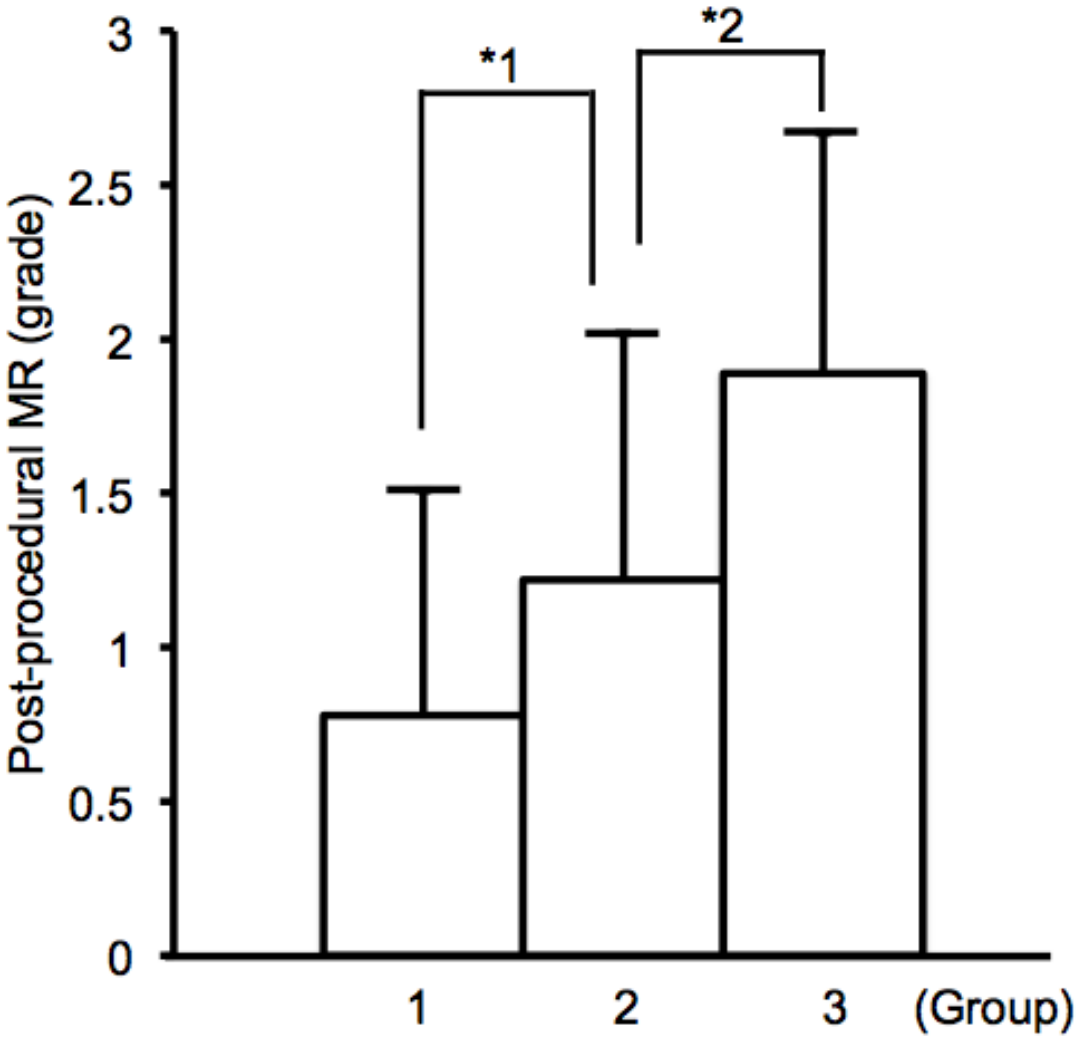
Post-procedural MR and AR



*1: p <0.001, *2: p = 0.029, (Bonferroni test).

Hayashida et al. JACC Interv 2012

CT annulus measurement is better than TEE

EXPEDITED PUBLICATION

3-Dimensional Aortic Annular Assessment by Multidetector Computed Tomography Predicts Moderate or Severe Paravalvular Regurgitation After Transcatheter Aortic Valve Replacement

A Multicenter Retrospective Analysis

Alexander B. Willson, MBBS, MPH,* John
Stephan Achenbach, MD,‡ Robert Moss, M
Christopher Thompson, MD,* James K. Min, I
Cameron J. Hague, MD,* Stefan Toggweiler, M
Rohan Poulter, MBBS,* Steen Poulsen, MD,§
Vancouver, Canada; Los Angeles, California;

JACC 2012

EXPEDITED PUBLICATION

Cross-Sectional Computed Tomographic Assessment Improves Accuracy of Aortic Annular Sizing for Transcatheter Aortic Valve Replacement and Reduces the Incidence of Paravalvular Aortic Regurgitation

Hasan Jilaihawi, BSc (Hons), MBChB,* Mohammad Kashif, MD,* Gregory Fontana, MD,†
Azusa Furugen, MD, PhD,* Takahiro Shiota, MD,* Gerald Friede, BS, MS,* Rakhee Makhija, MD,*
Niraj Doctor, MBBS,* Martin B. Leon, MD,‡ Raj R. Makkar, MD*
Los Angeles, California; and New York, New York

CT-guided strategy decreased AR ≥2 without increase of annulus rupture

	CT-guided	TEE-guided	p value
Patient number	175	175	
Valve size, mm	**25.8 ± 2.1**	**25.0 ± 1.9**	**0.001**
AR ≥2	**27 (15.4%)**	**42 (24.0%)**	**0.044**
Annulus rupture	1 (0.6%)	3 (1.7%)	0.750

Hayashida et al., EuroIntervention, 2012

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Root shot during valvuloplasty

(Keio #5, KS)

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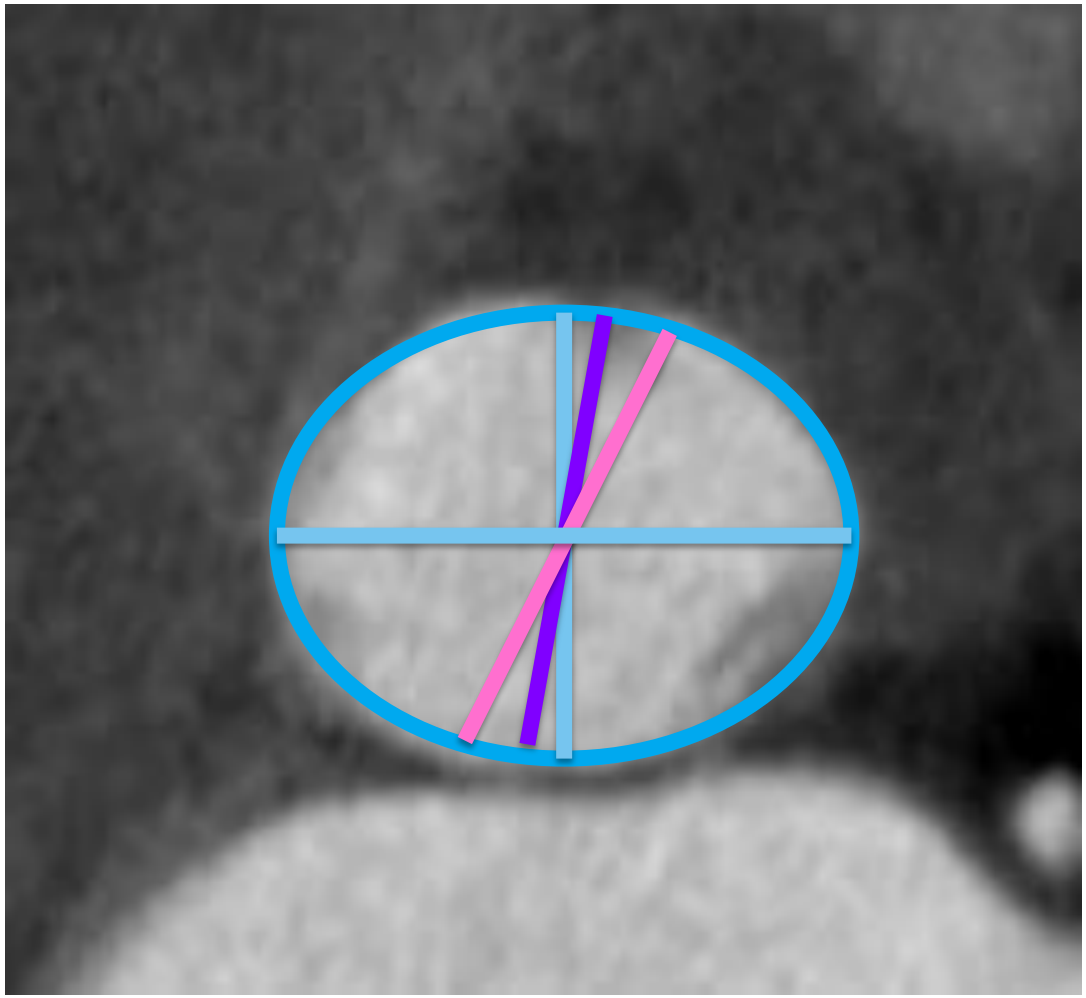
Echo and CT measured diameter



long axis

perimeter

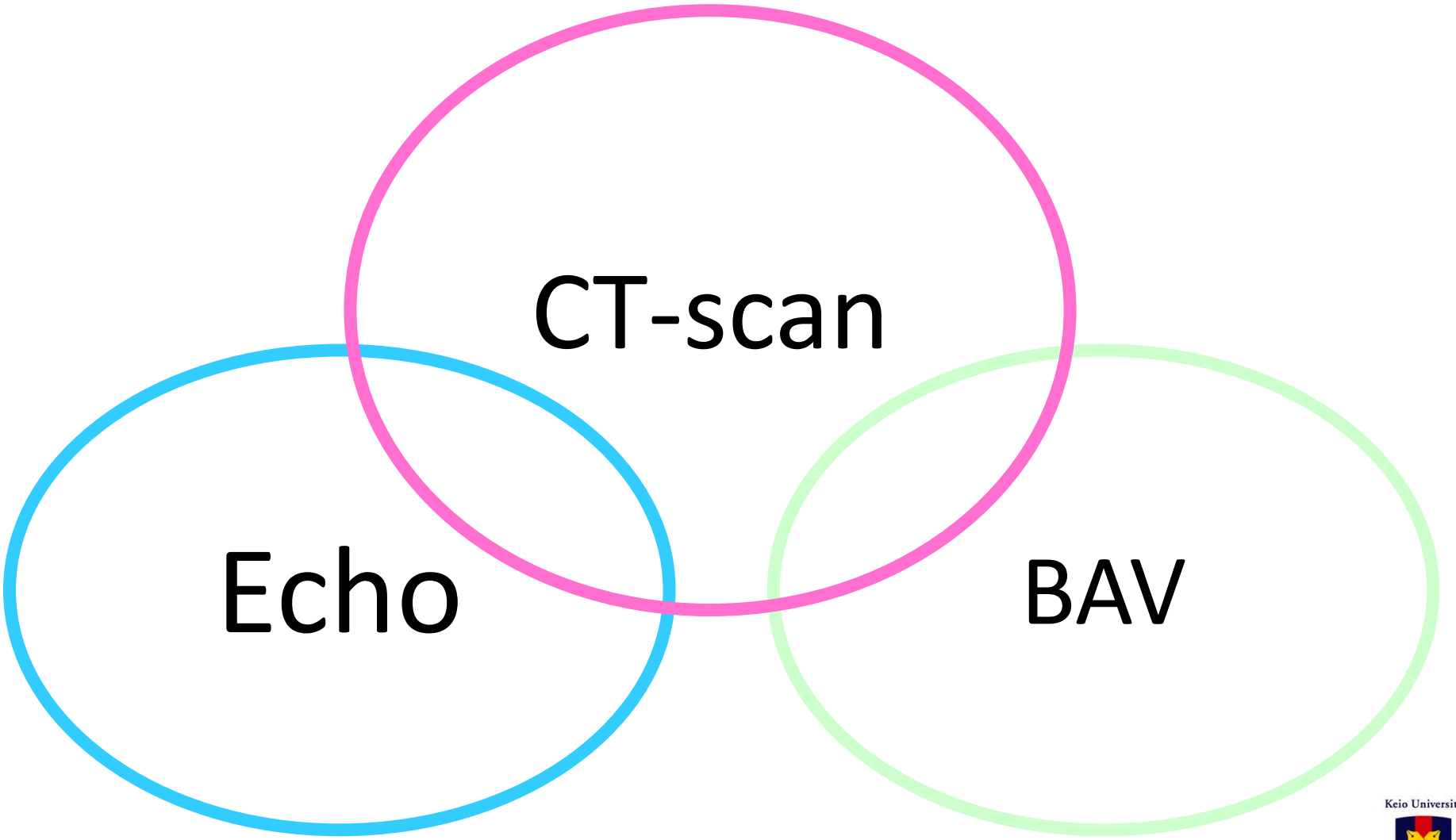
area

TEE

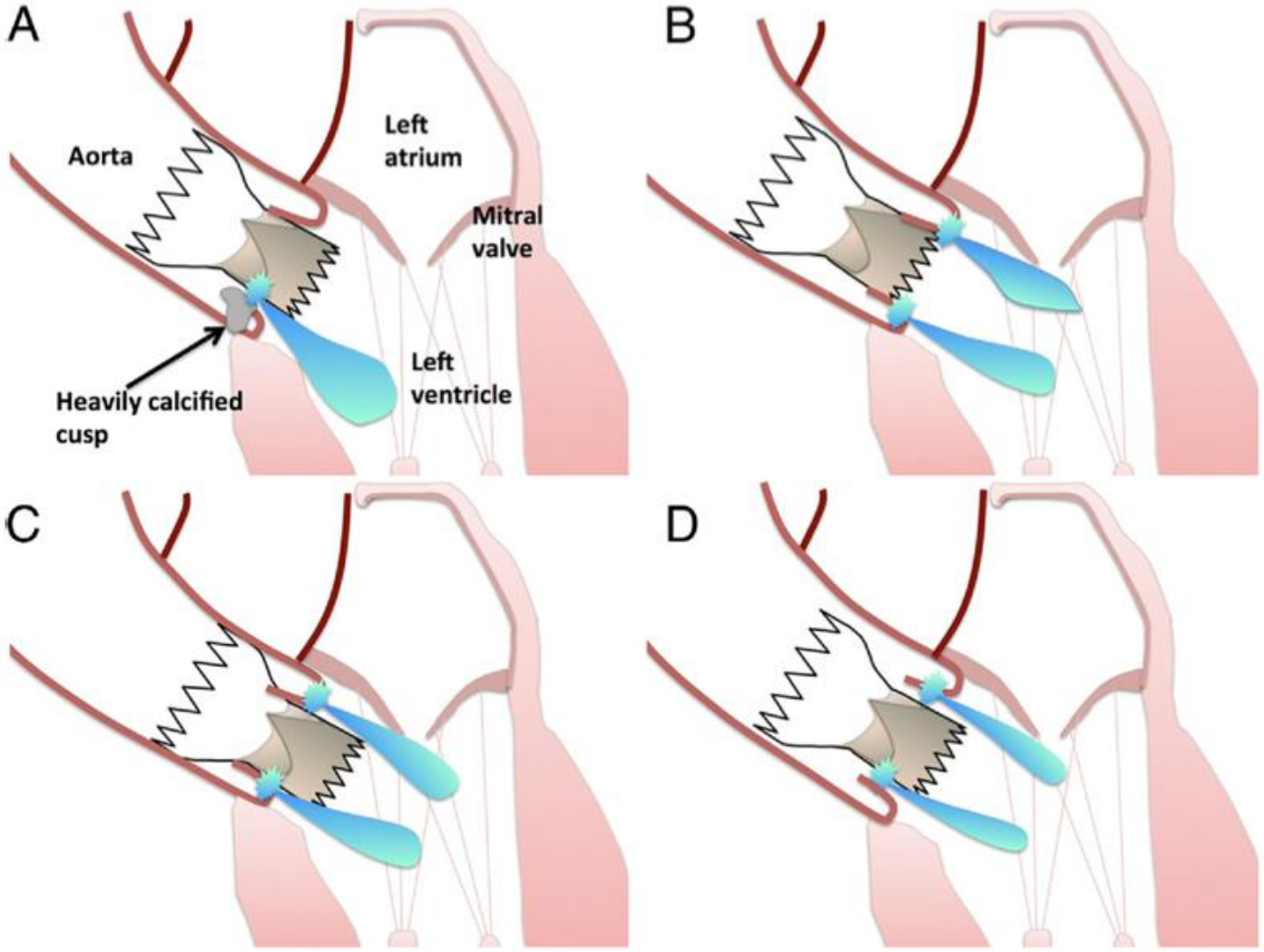
TTE

Short axis

Multimodality imaging is the key!



Mechanism of paravalvular leakage



Sinning et al. J Am Coll Cardiol 2013

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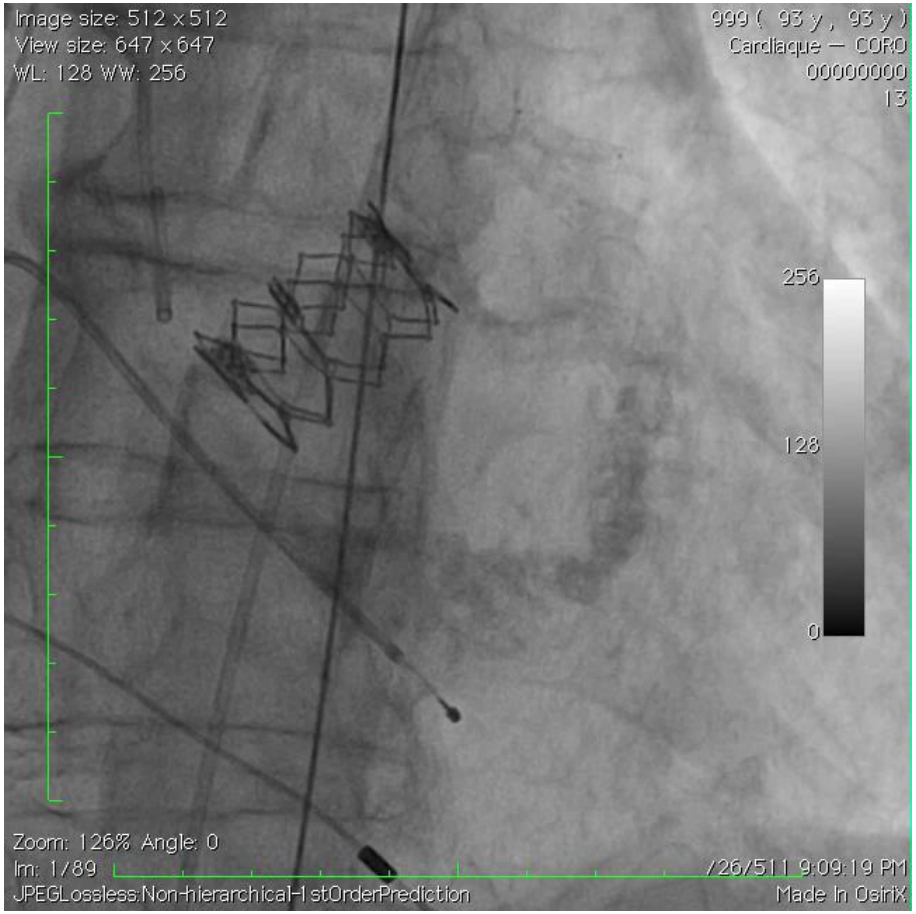
Annulus rupture and PVL



Annulus rupture with cardiac tamponade

Hayashida et al. JACC Intev, 2013

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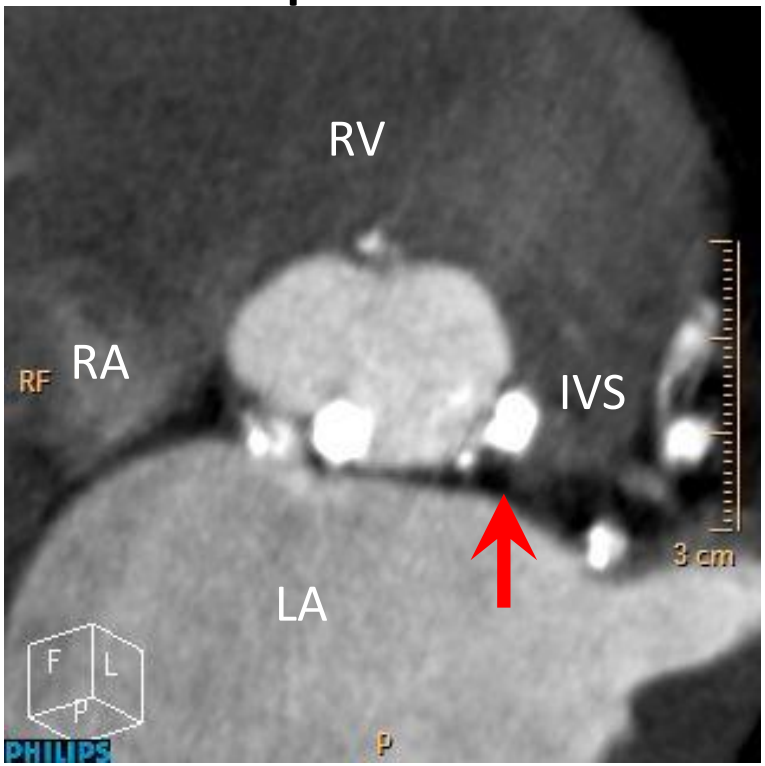
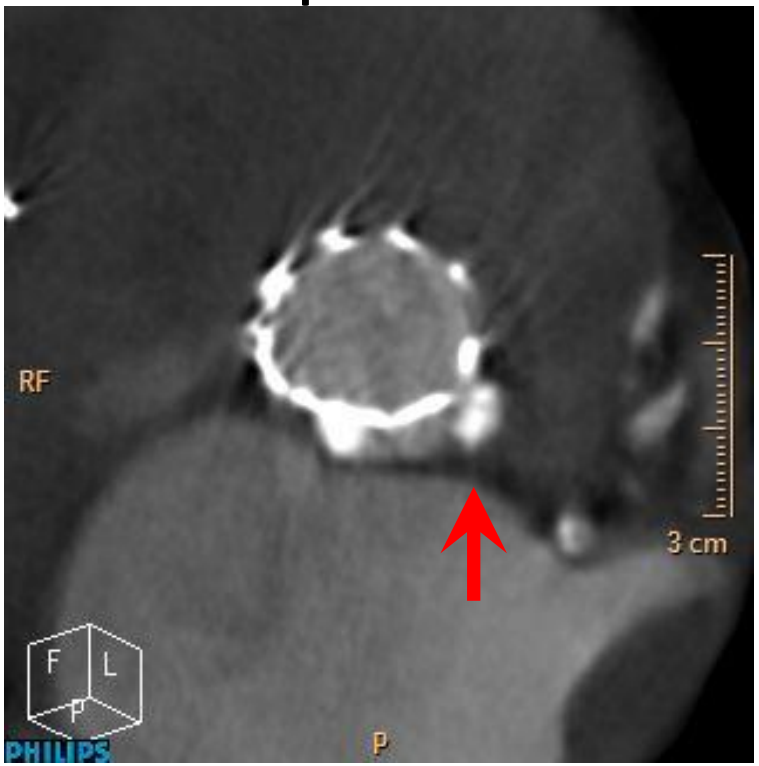
Annulus rupture

Pre-procedure



Large calcified nodule (red arrow) located in **a vulnerable area**

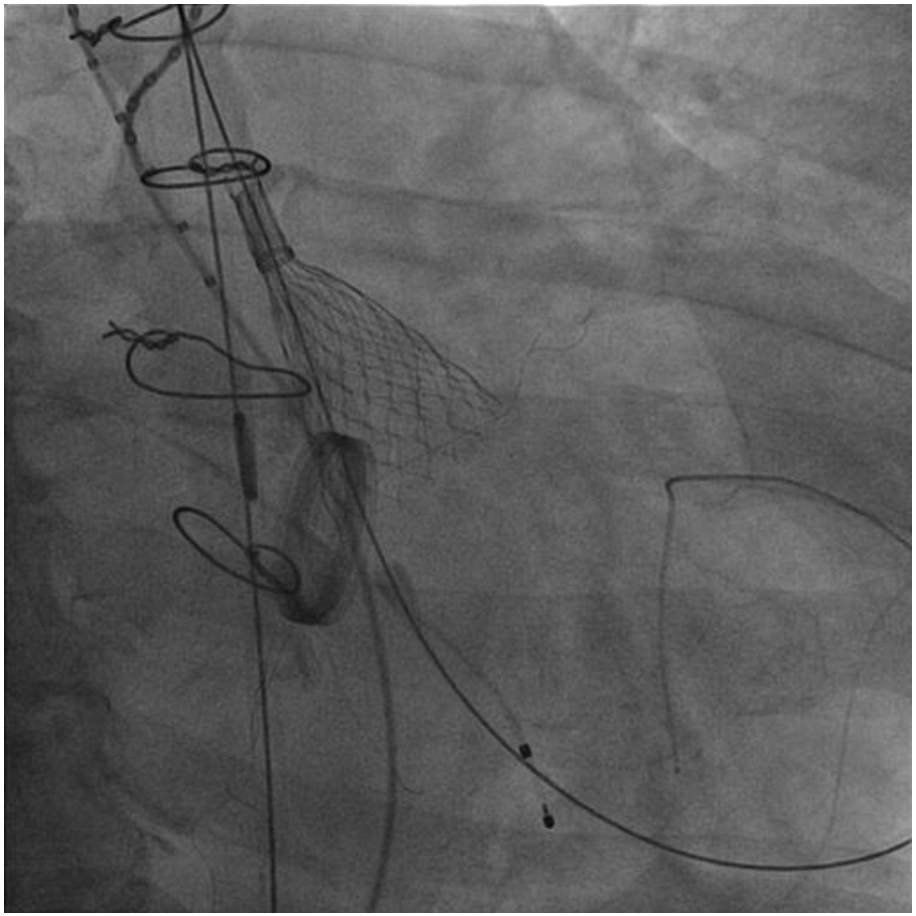
Post-procedure

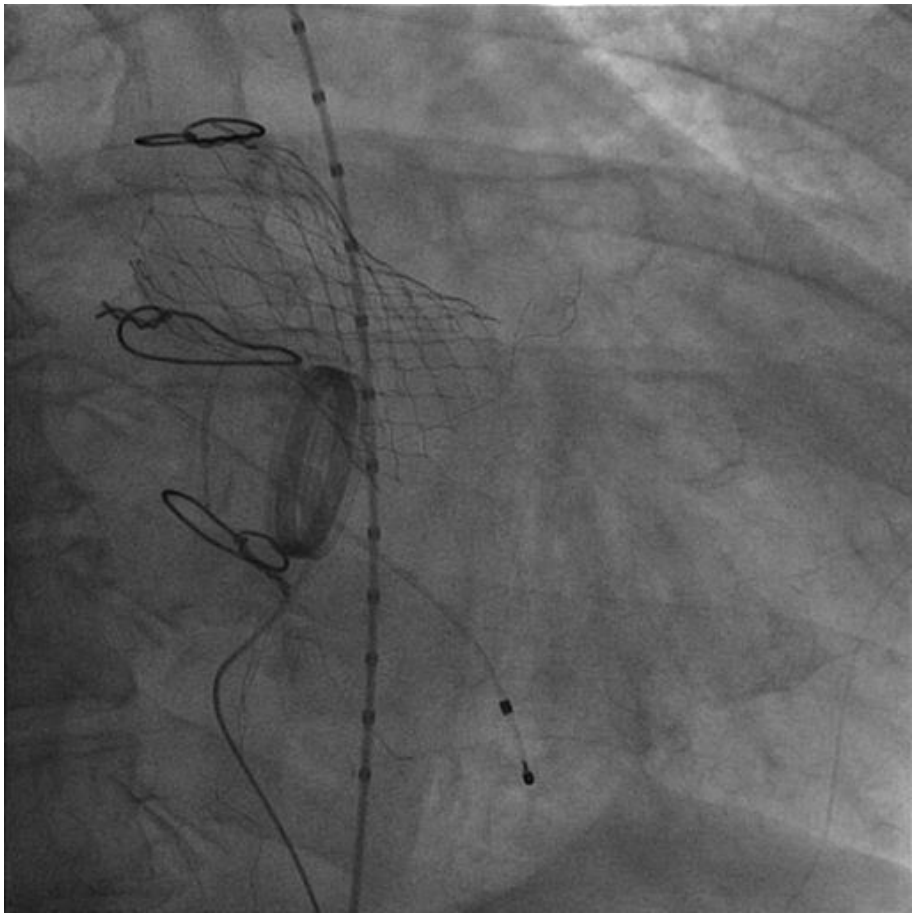


Inadequate apposition of the stent to the aortic annulus between 2 large calcifications

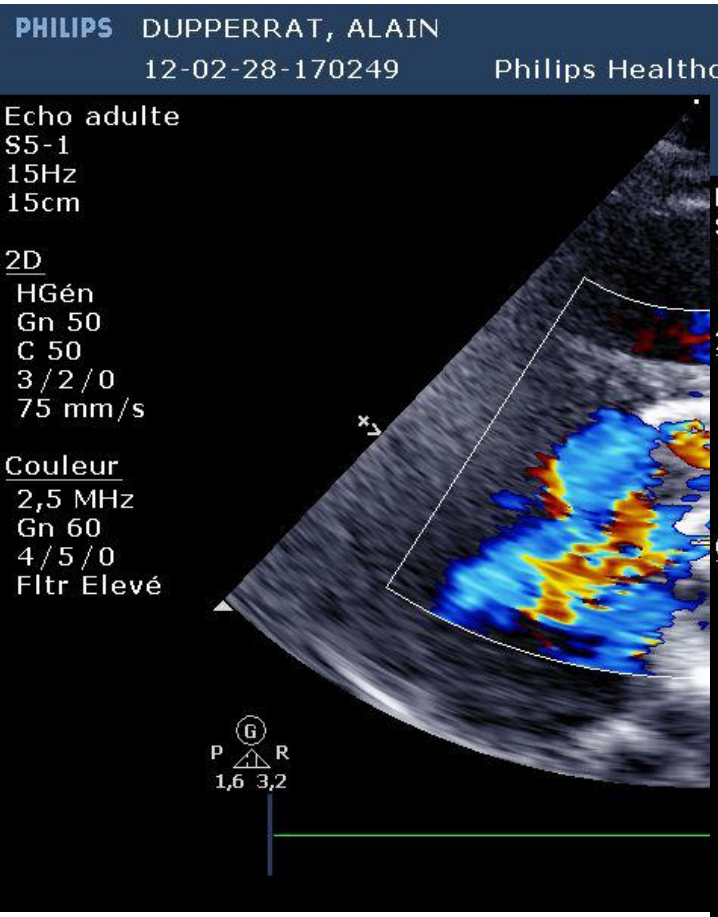
Hayashida et al. CCI 2013

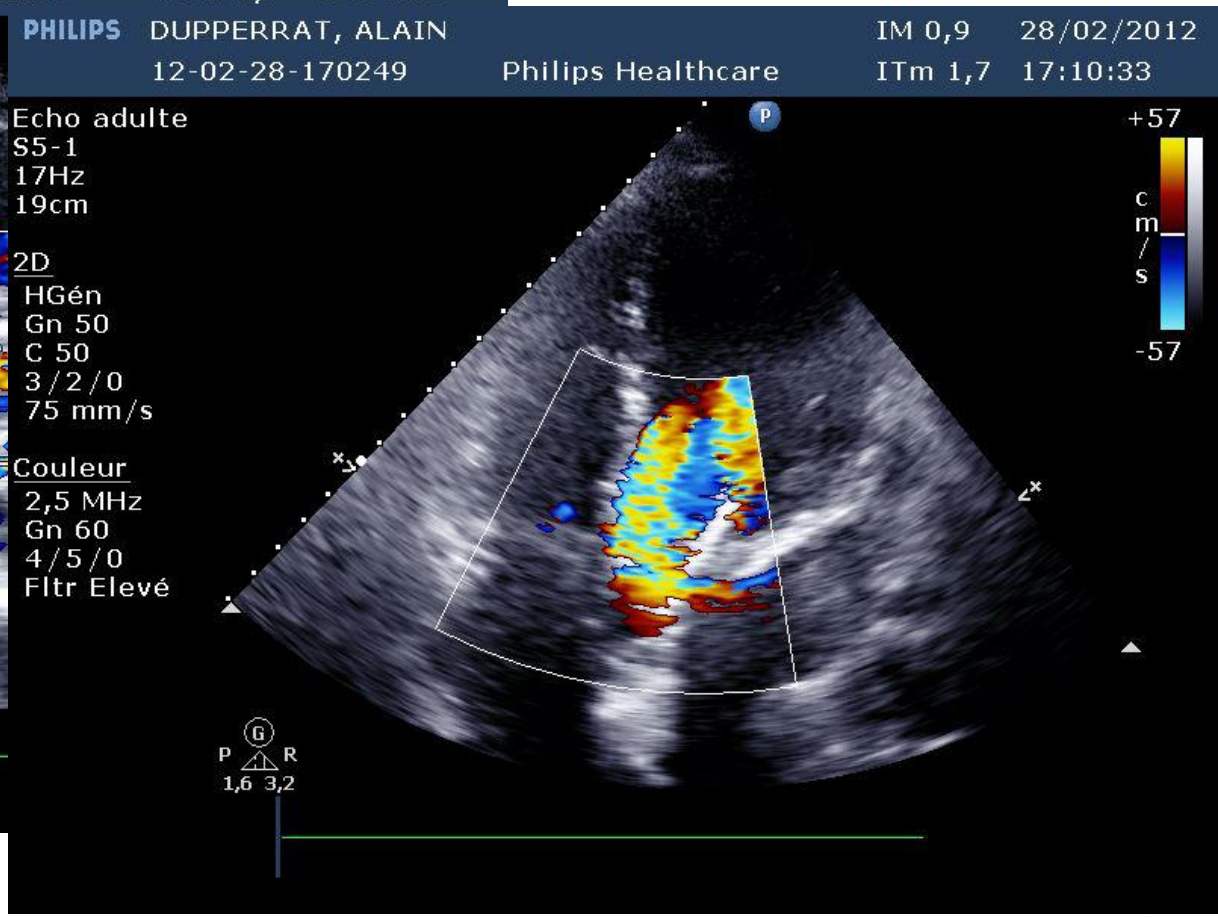
CoreValve 31 mm





Post-procedural AR





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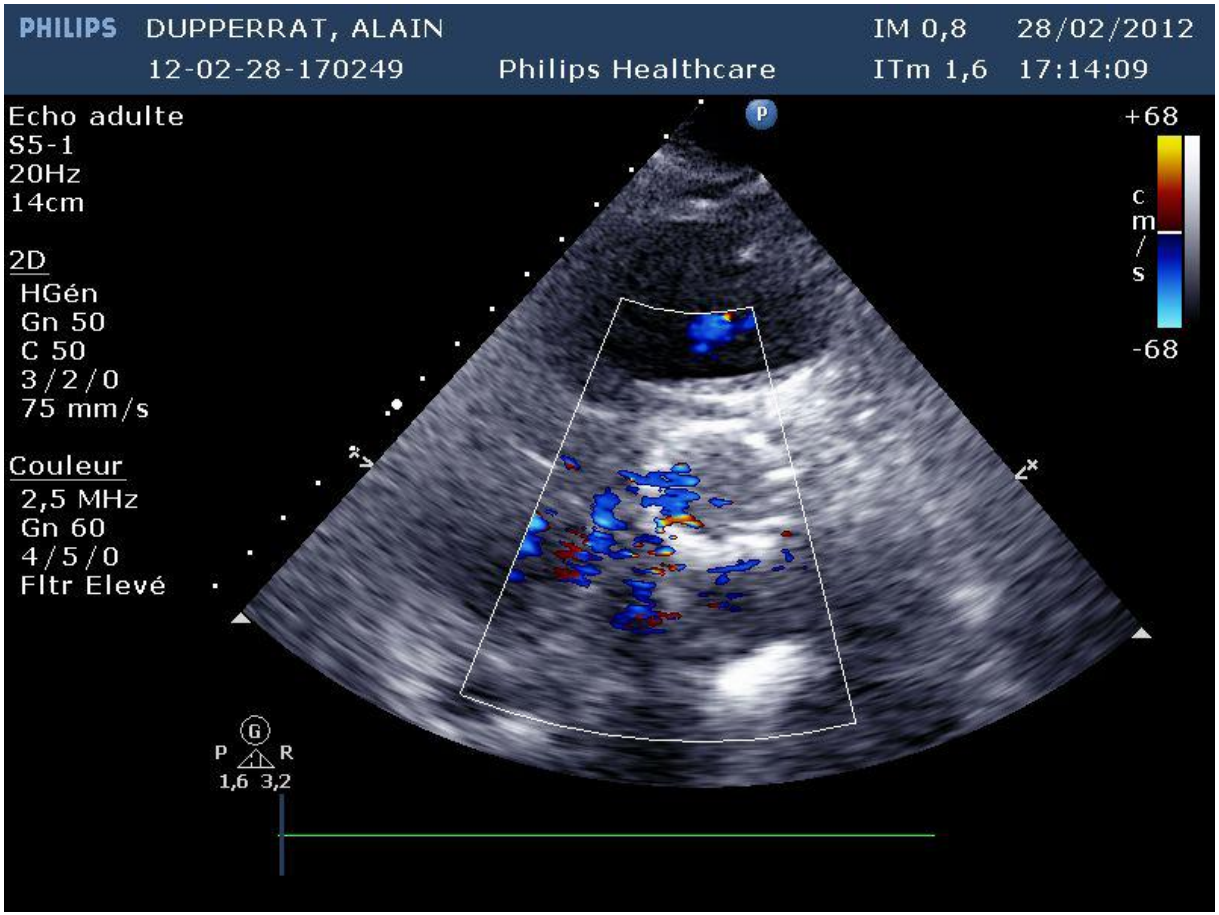
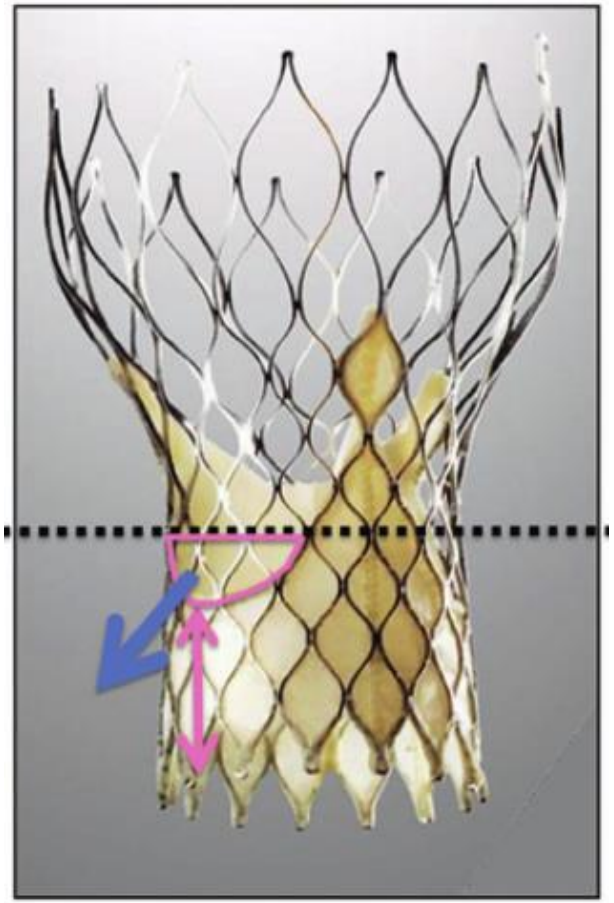
Post-procedural AR





Hayashida et al., EuroIntervention, 2012

How to quantify post-AR?

Prosthetic aortic valve regurgitation			
	Mild	Moderate	Severe
Semi-quantitative parameters			
Diastolic flow reversal in the descending aorta – PW	Absent or brief early diastolic	Intermediate	Prominent, holodiastolic
Circumferential extent of prosthetic valve paravalvular regurgitation (%)¶¶	<10%	10-29%	≥30%
Quantitative parameters‡			
Regurgitant volume (ml/beat)	<30 ml	30-59 ml	≥60 ml
Regurgitant fraction (%)	<30%	30-49%	≥50%
EROA (cm^2)	0.10 cm^2	0.10-0.²9 cm^2	≥0.30 cm^2

*In conditions of normal or near normal stroke volume (50-70 mL); ¶ These parameters are more affected by flow, including concomitant aortic regurgitation; ‡ For LVOT >2.5 cm, significant stenosis criteria is <0.20; ¶ Use in setting of BSA ≥1.6 cm^2 (note: dependent on the size of the valve and the size of the native annulus); § Use in setting of BSA <1.6 cm^2; **Use in setting of BMI <30 kg/cm^2; ¶¶ Use in setting of BMI ≥30 kg/cm^2; ¶¶ Not well-validated and may overestimate severity compared to quantitative Doppler; PW: pulsed wave; EROA: effective regurgitant orifice area

VARC-2 definition

Kappetein et al. EuroIntervention 2012

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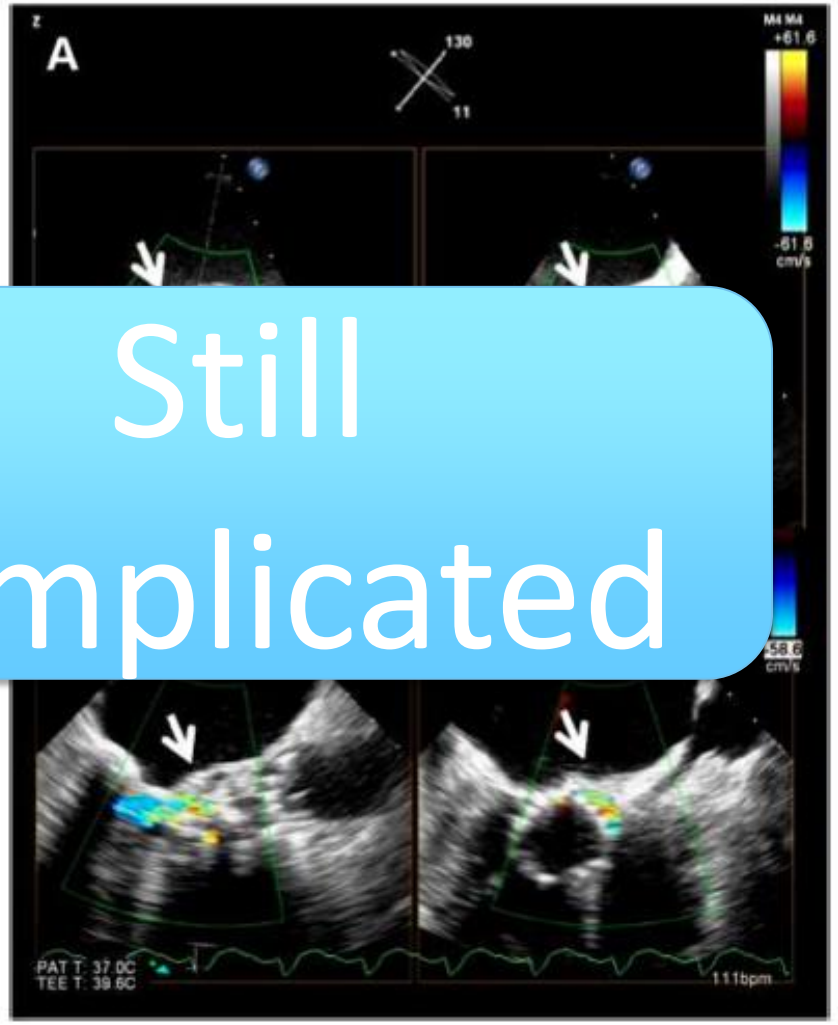
Quantification of paravalvular leak

<10% circumferential extent



Still complicated

>20% circumferential extent

Does “mild” AR really impact mortality?

ORIGINAL ARTICLE

Two-Year Outcomes after Transcatheter or Surgical Aortic-Valve Replacement

Susheel K. Kodali, … aig R. Smith, M.D., Lars G. Svensson, … aj R. Makkar, M.D., Gregory P. Fontana, … H. … Augusto D. Pichard, M … W… Scott Lim, M.D. … ei… S. Chris Malaisrie, M… ec… Brian Whisenant, M.D., Alan Zajarias, M.D., Duolao … Jodi J. Akin, M.S., William N. Anderson, Ph.D., and Marti… for the …

“Mild”

Our “Mild”

??

Impact of Pos… Regurgitation on Mortality A… Aortic Valve Implantation

Kentaro Hayashida, MD, PhD, Thierry Lefèvre, MD, Bernard Chevalier, MD, Thomas Hovasse, MD, Mauro Romano, MD, Philippe Garot, MD, Erik Bouvier, MD, Arnaud Farge, MD, Patrick Donzeau-Gouge, … Marie-Claude Morice, MD

Massy, France

“Grade 2”

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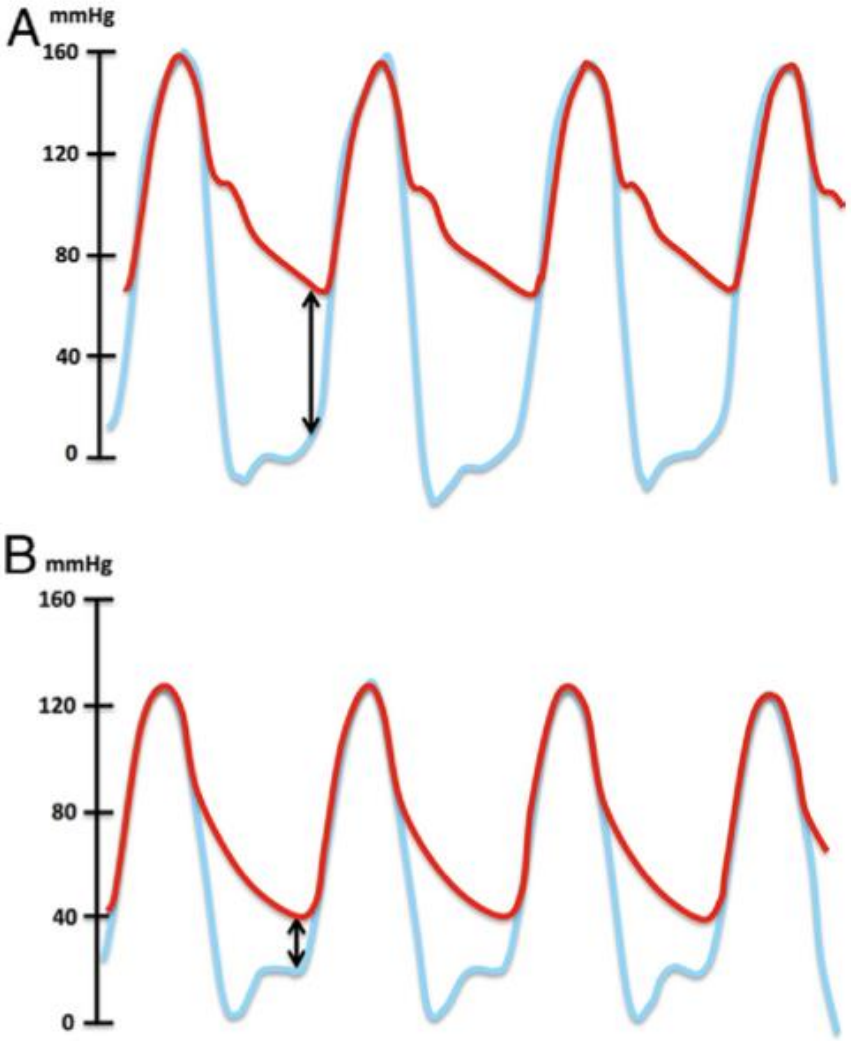
AR index: Hemodynamic parameter



$$\frac{100 \times (DBP - LVEDP)}{SBP}$$

< 25: Worse outcome

Sinning et al. J Am Coll Cardiol. 2012

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Post-dilate or not??

- Mechanism of PVL
- Age, sex…
- ADL before procedure
- Pre-existing AR

Conclusions

- Preprocedural screening (annular measurement, evaluation of calcification) and optimal bioprosthesis sizing
- Understanding of the mechanism of AR
- Applying optimal solusion for each mechanism (post dilatation, 2nd valve and vascular plug etc…)