AORTIC VALVE REPAIR

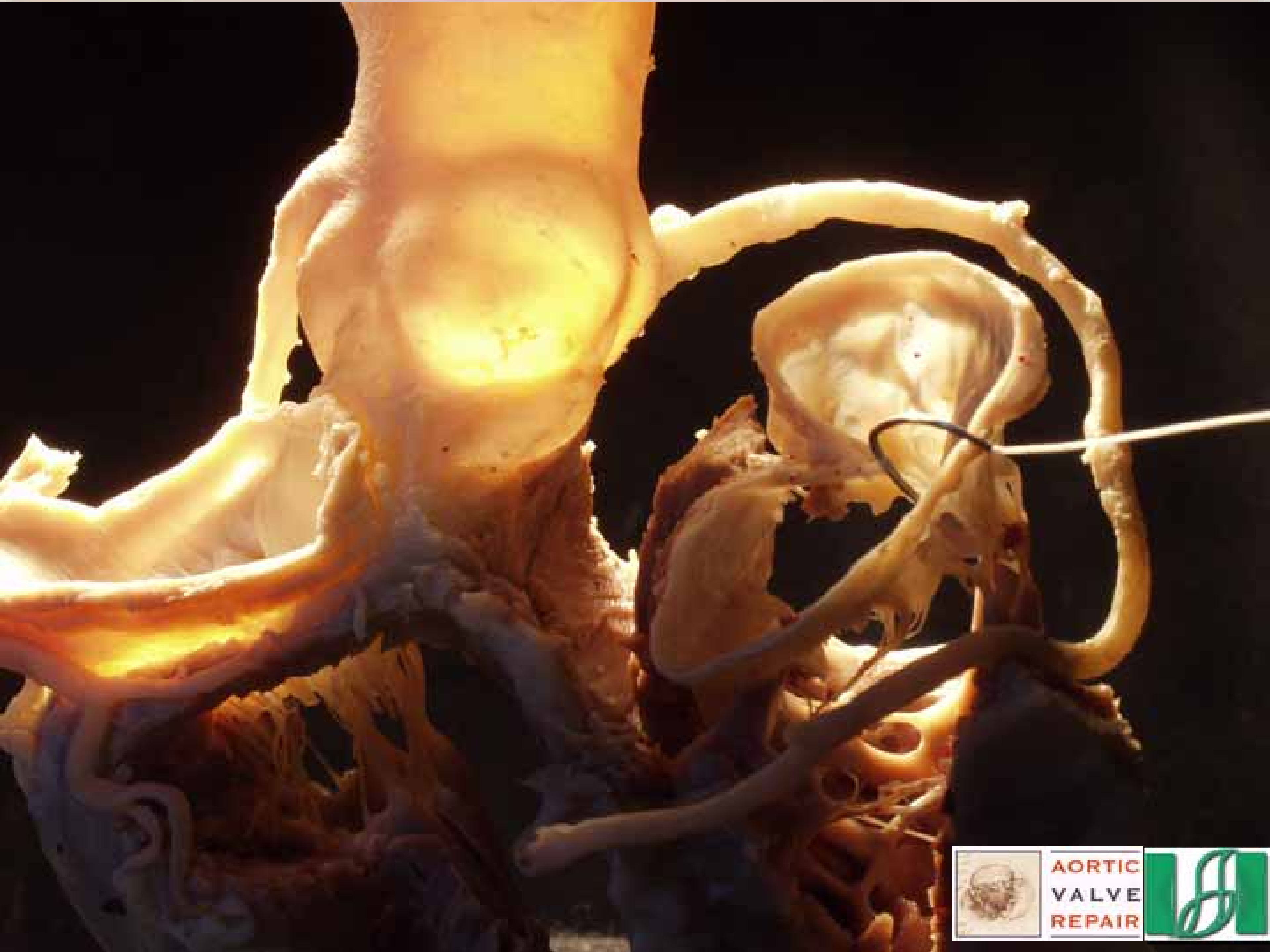
Timing dell'intervento chirurgico.

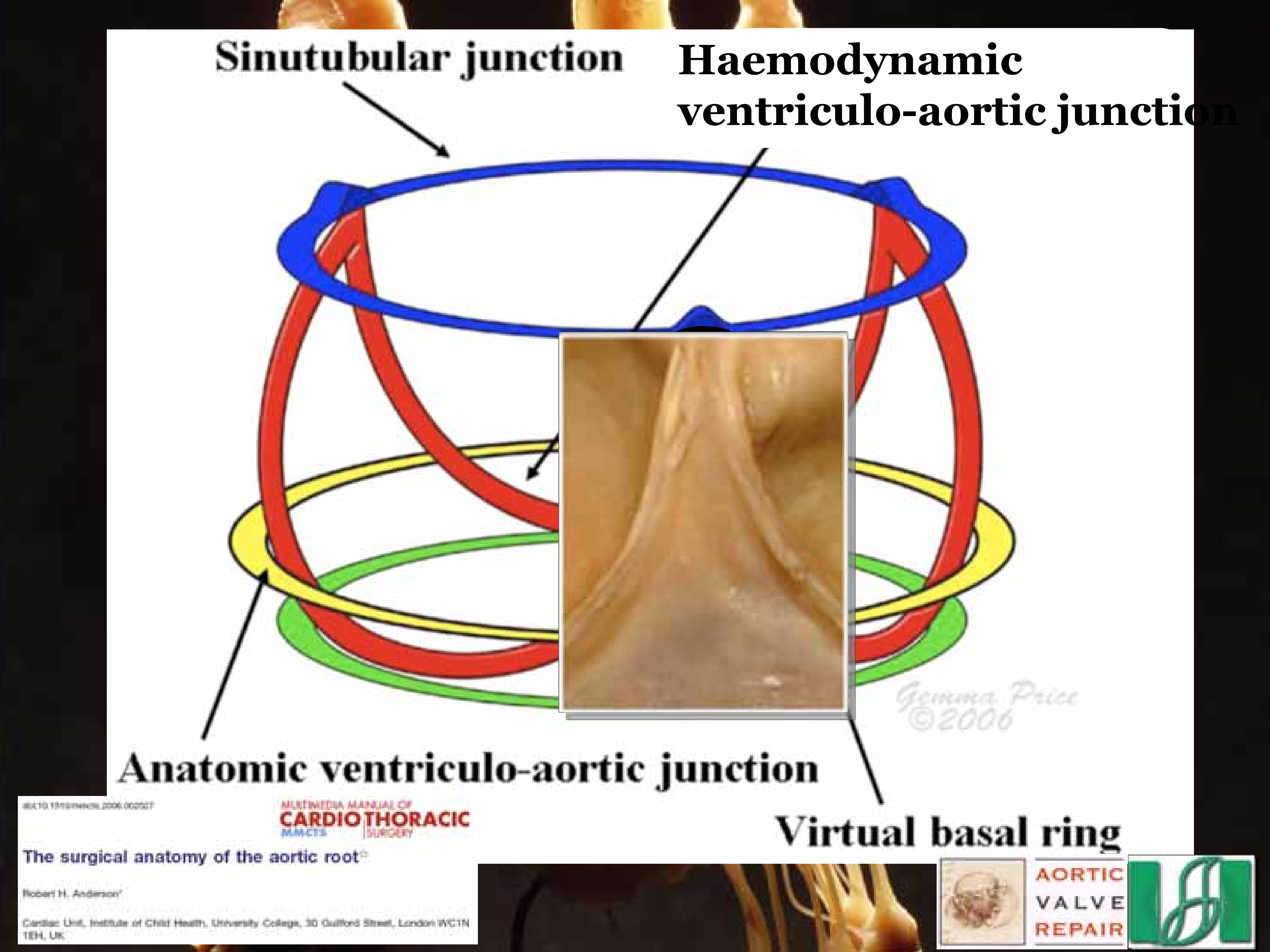
Tutte le informazioni necessarie al chirurgo per la scelta della migliore soluzione possibile: riparazione percutanea, riparazione chirurgica o sostituzione valvolare?

Andrea Mangini
Research Director
FoRCardio.Lab
Università degli Studi di Milano – Politecnico di Milano

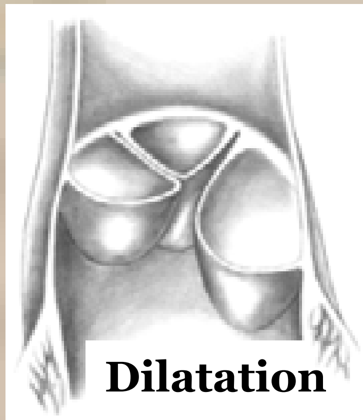
Cardiovascular Surgery Division
"L. Sacco" University Hospital
Milan, Italy

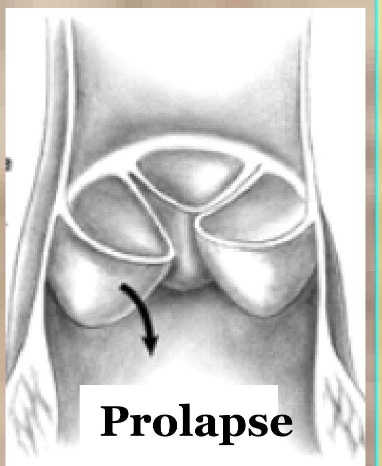
FoRCardio.Lab

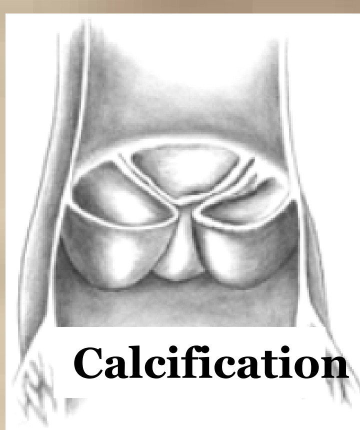

AORTIC
VALVE
REPAIR


Sinutubular junction
Haemodynamic ventriculo-aortic junction
Gemma Price ©2006
Anatomic ventriculo-aortic junction
Virtual basal ring
MULTIMEDIA MANUAL OF CARDIOTHORACIC SURGERY
MMCTS
The surgical anatomy of the aortic root
Robert H. Anderson
Cardiac Unit, Institute of Child Health, University College, 30 Guilford Street, London WC1N 1EH, UK
AORTIC VALVE REPAIR

Aortic Valve Disease







INCOMPETENCE

- Ascending Aorta Dilatation → Replacement of the Ascending Aorta by a wowen Dacron graft
- Aortic Root Dilatation → **BENTALL PROCEDURE**
- Aortic Annulus Dilatation

STENOSIS

Aortic Valve Replacemen

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B

Phil. Trans. R. Soc. B (2007) **362**, 1407–1419
doi:10.1098/rstb.2007.2124
Published online 26 June 2007

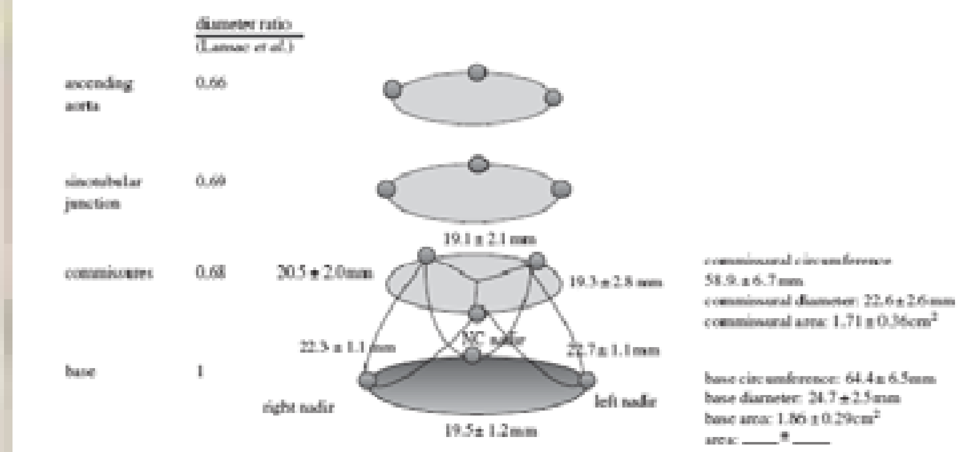
Aortic root dynamics and surgery: from craft to science

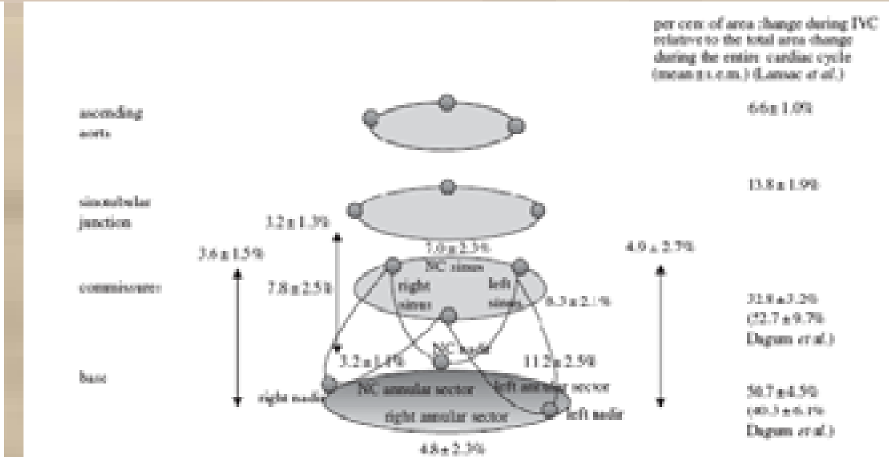
Allen Cheng, Paul Dagum and D. Craig Miller*

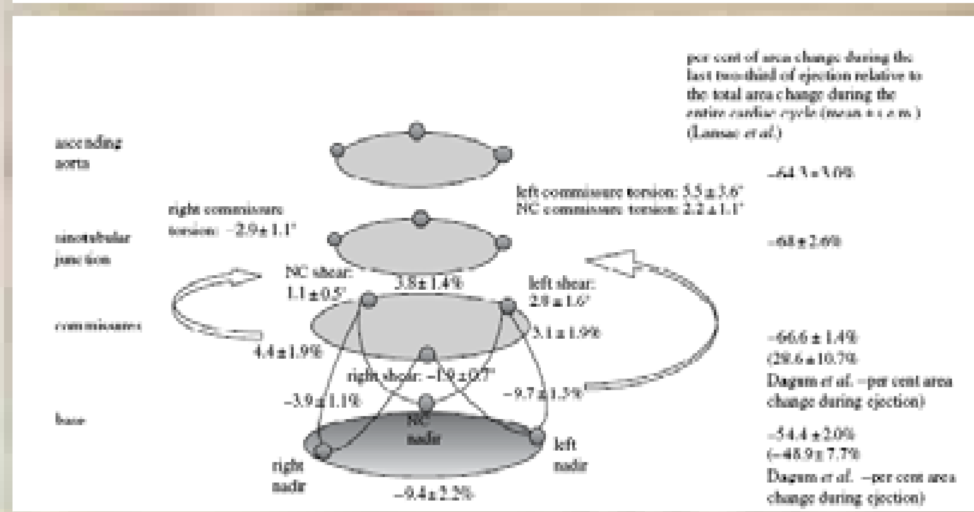
Department of Cardiovascular and Thoracic Surgery, Stanford University School of Medicine, Stanford, CA 94305, USA

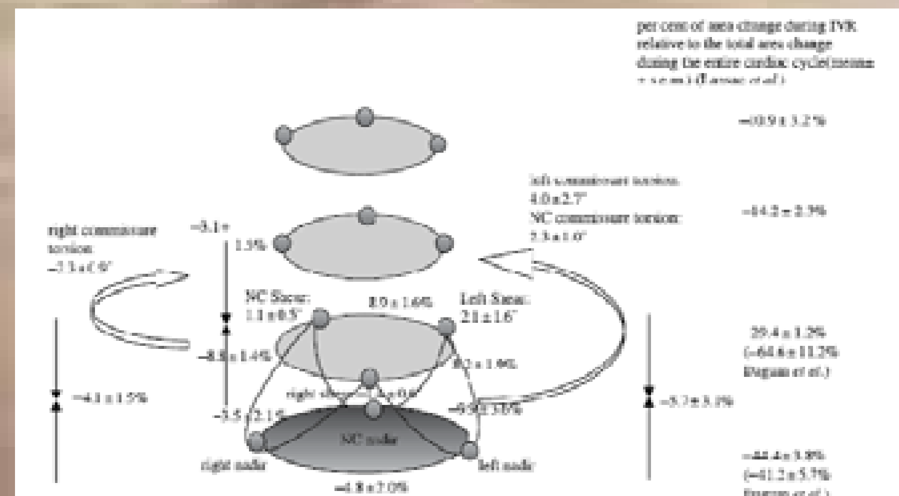
Five centuries of scientific and technological developmen now permit us today to appreciate the beautiful simplicity and incredible complexity of the aortic valve and aortic root.

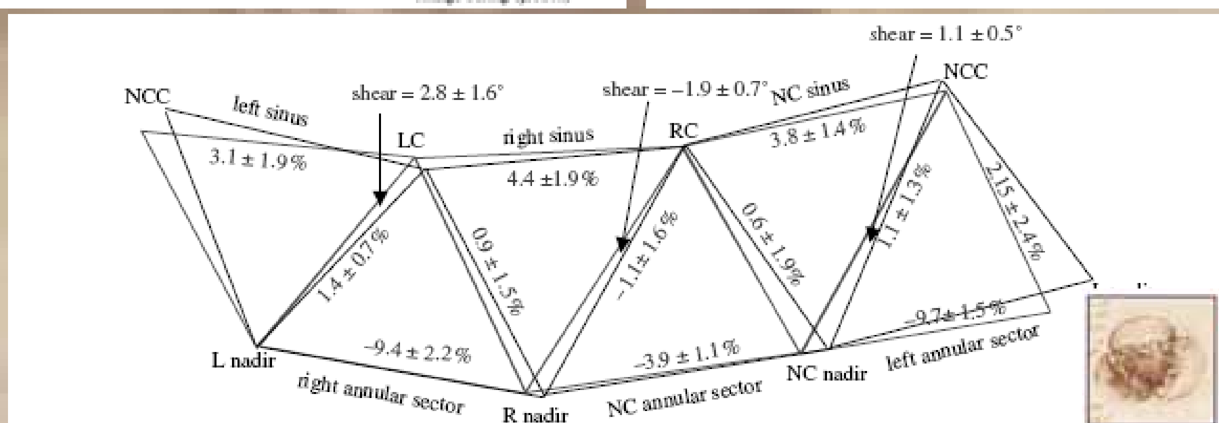
AORTIC VALVE REPAIR











AORTIC VALVE REPAIR

Aortic Valve Repair Techniques Research Project Flow Chart

Computational.Lab

Experimental.Lab

Ethical Committee

Veterinary O.R.

Cardiac O.R.

In Silico

To pinpoint differeces in term of kinematic, dynamic and stresses distribution of the aortic root between different repair

In Vitro

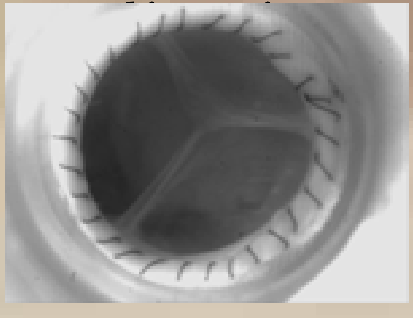
To analyze Opening and closing repaired valves characteristics associated with transvalvular gradients and interleflet triangles

In Vivo *(animals)*

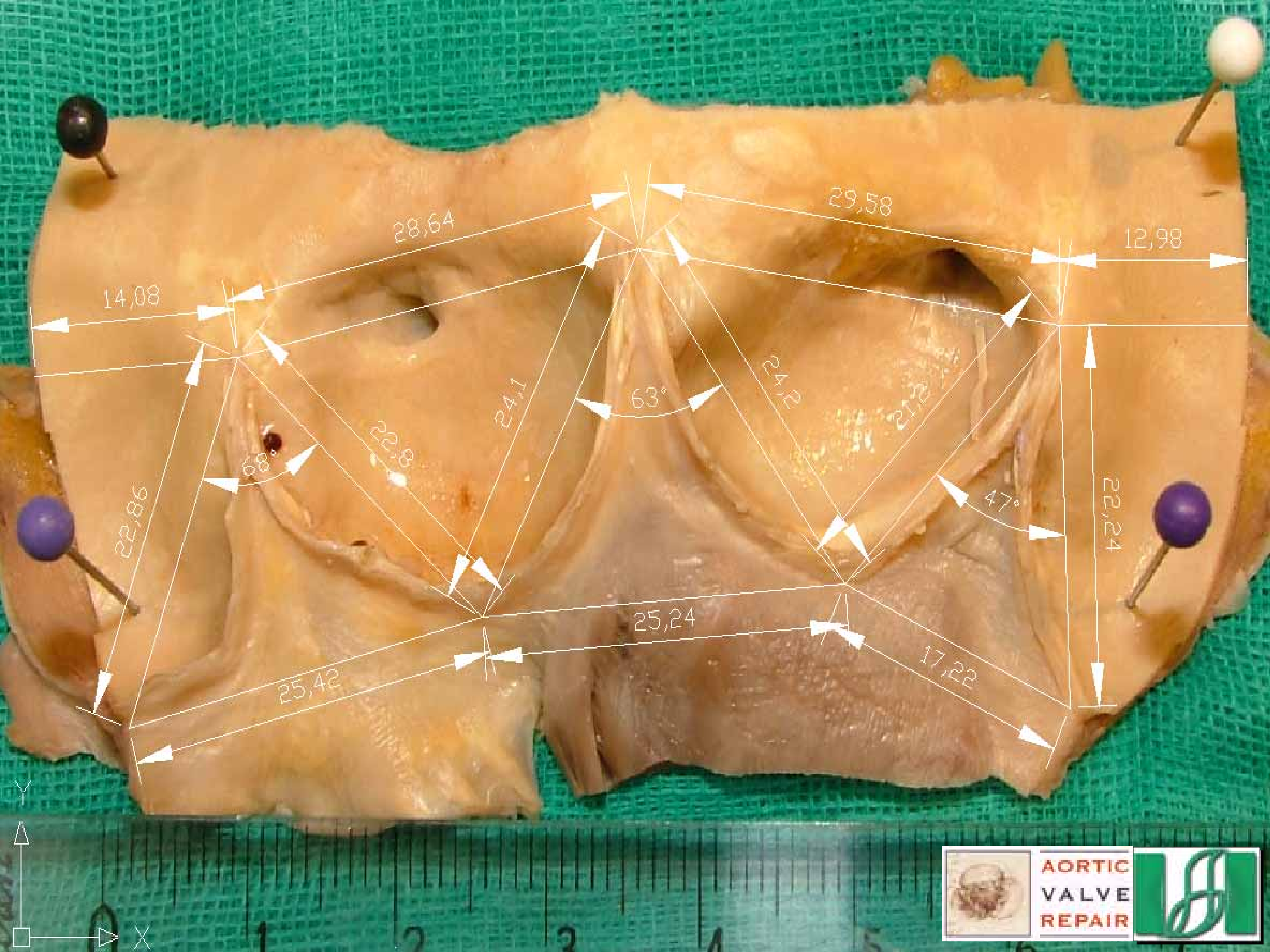
To asses the feasibility and mid term results of the repair techniques on animal models

In Vivo *(Humans)*

To verify the long term results of our surgical practice

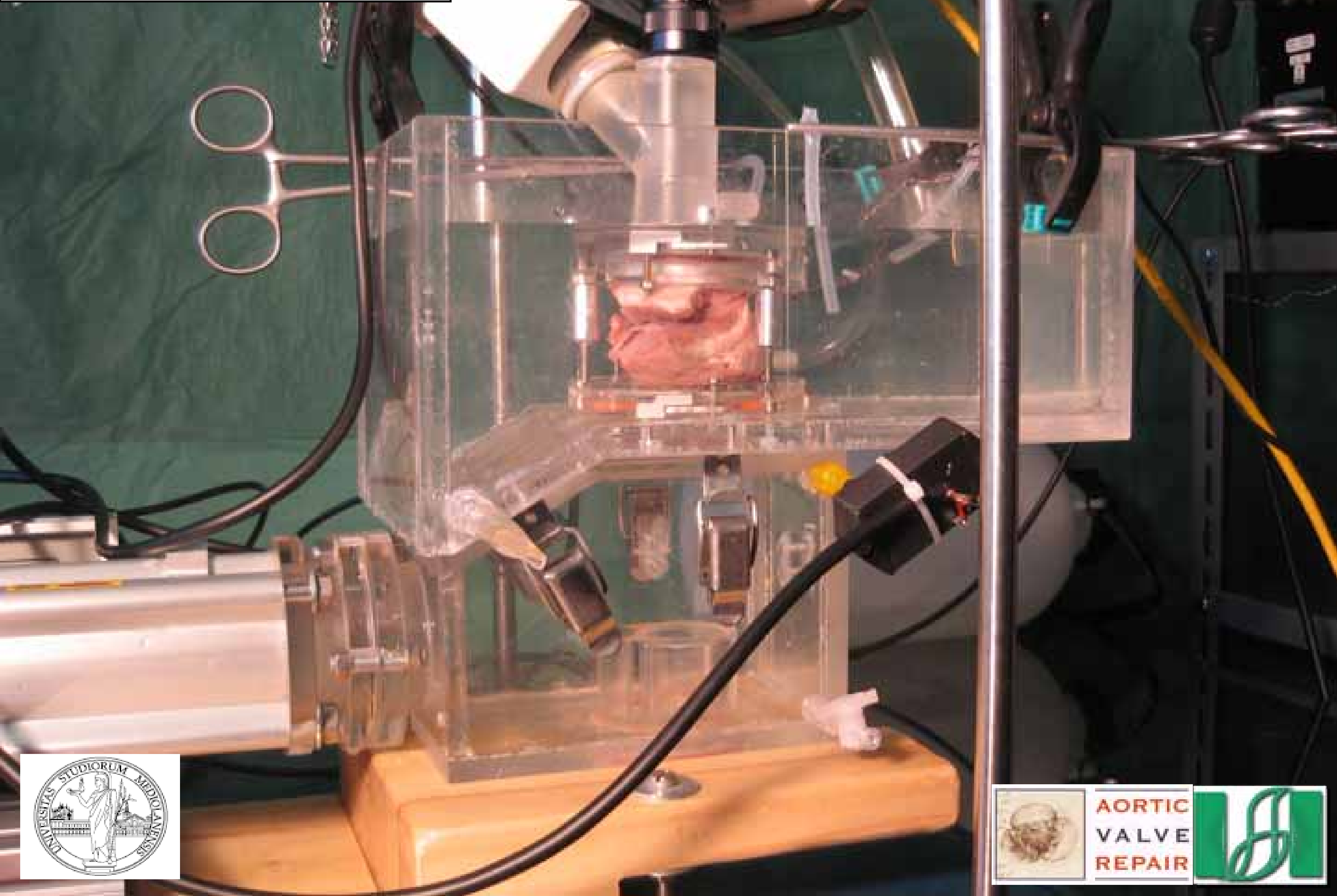


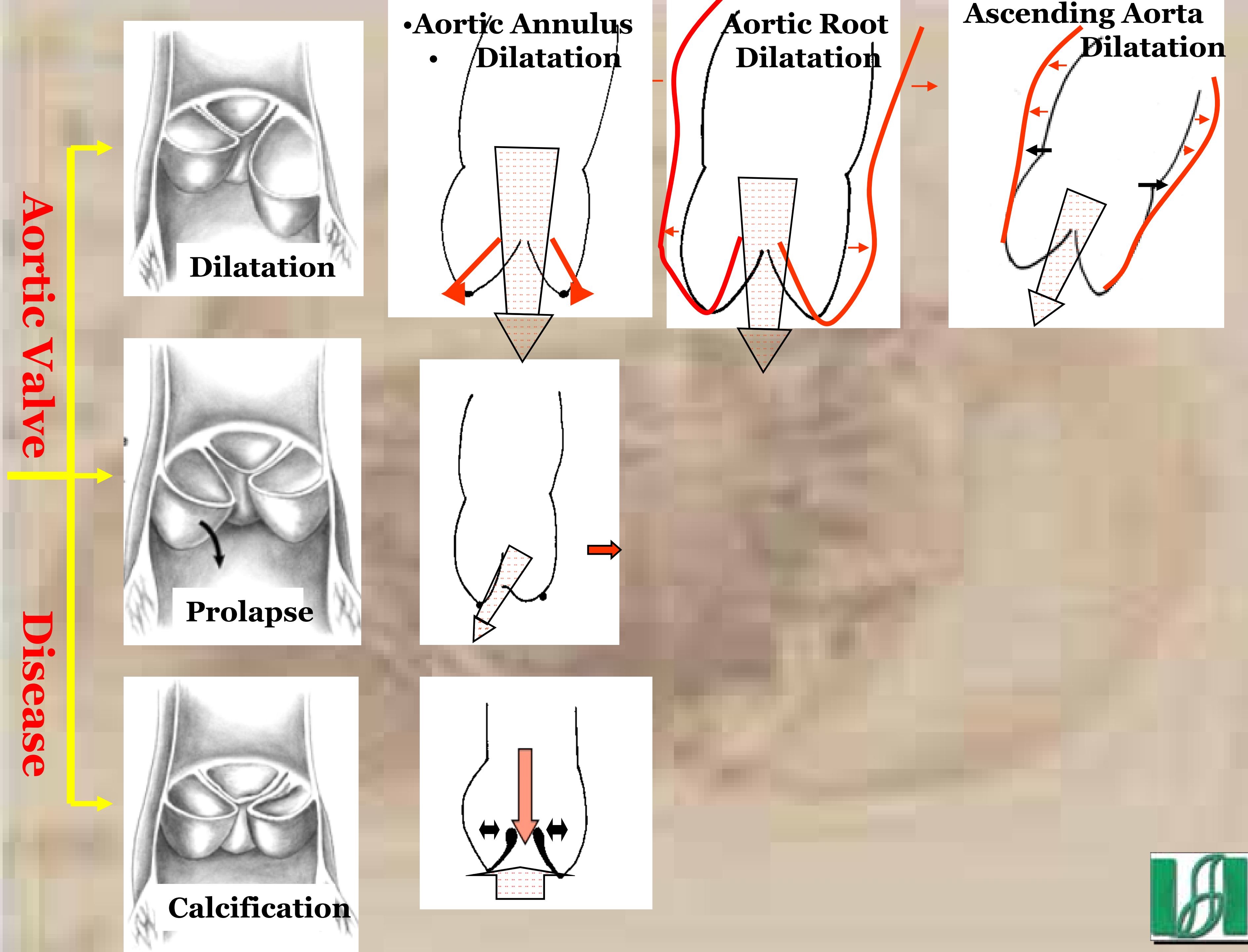
AORTIC VALVE REPAIR



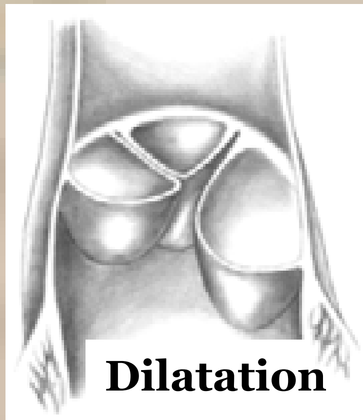
28,64
29,58
12,98
14,08
24,1
22,8
63°
24,2
21,2
68°
22,86
47°
22,24
25,24
25,42
17,22
Y
X
AORTIC
VALVE
REPAIR

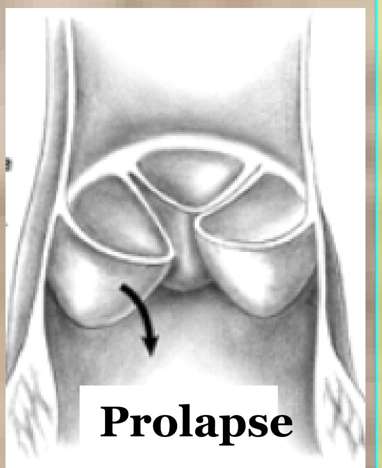
Mock Circolatory Flow Loop 1 Controller PC

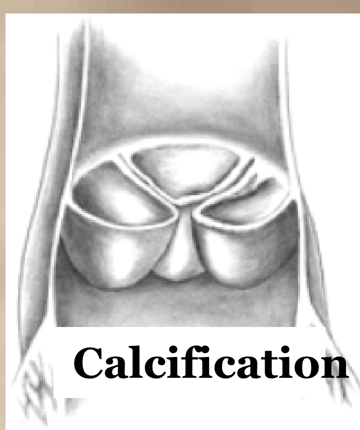



Aortic Valve Disease
Dilatation
Prolapse
Calcification
•Aortic Annulus
• Dilatation
Aortic Root
Dilatation
Ascending Aorta
Dilatation

Aortic Valve Disease







INCOMPETENCE

STENOSIS

- Ascending Aorta Dilatation → Replacement of the Ascending Aorta by a wowen Dacron graft
- Aortic Root Dilatation → **Sparing Technique**: Reimplantation, Remodelling
- Aortic Annulus Dilatation → Aortic Valve Repair

Aortic Valve Repair

Aortic Valve Replacement

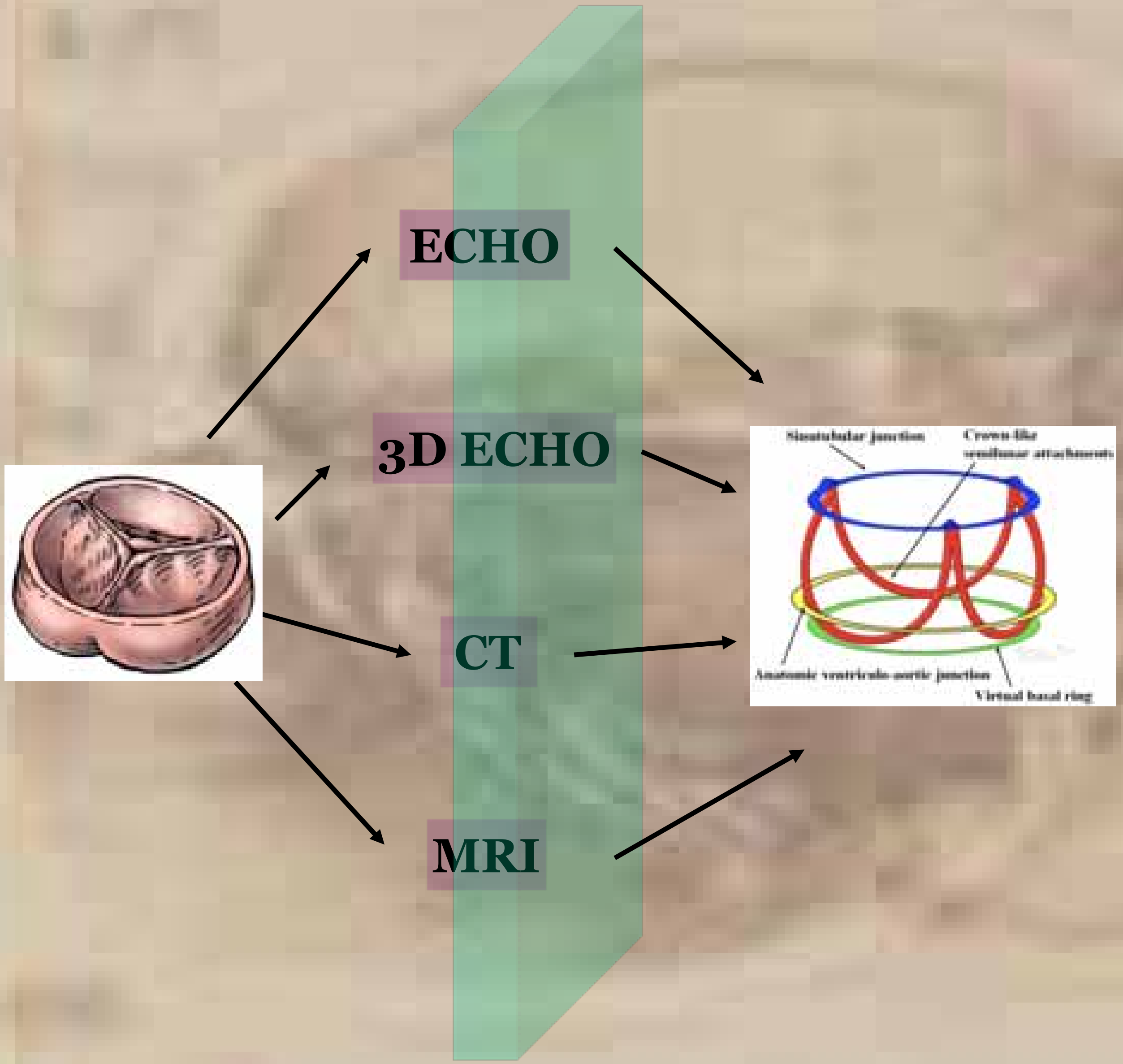
Imaging

1)To describe reality

2)To understand reality

3)To predict reality

Cardiac Imaging



- Numbers
- Relationship
- Images

from imaging techniques

Numbers transmit informations

Images
transmit ideas and feelings

AORTIC VALVE REPAIR

Circulation
JOURNAL OF THE AMERICAN HEART ASSOCIATION

American Heart Association
Learn and Live

2008 Focused Update Incorporated Into the ACC/AHA 2006 Guidelines for the Management of Patients With Valvular Heart Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Revise the 1998 Guidelines for the Management of Patients With Valvular Heart Disease): Endorsed by the Society of Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, and Society of Thoracic Surgeons

2006 WRITING COMMITTEE MEMBERS, Robert O. Bonow, Blase A. Carabello, Kanu Chatterjee, Antonio C. de Leon, Jr, David P. Faxon, Michael D. Freed, William H. Gaasch, Bruce W. Lytle, Rick A. Nishimura, Patrick T. O'Gara, Robert A. O'Rourke, Catherine M. Otto, Pravin M. Shah and Jack S. Shanewise

Circulation 2008;118;e523-e661; originally published online Sep 26, 2008;
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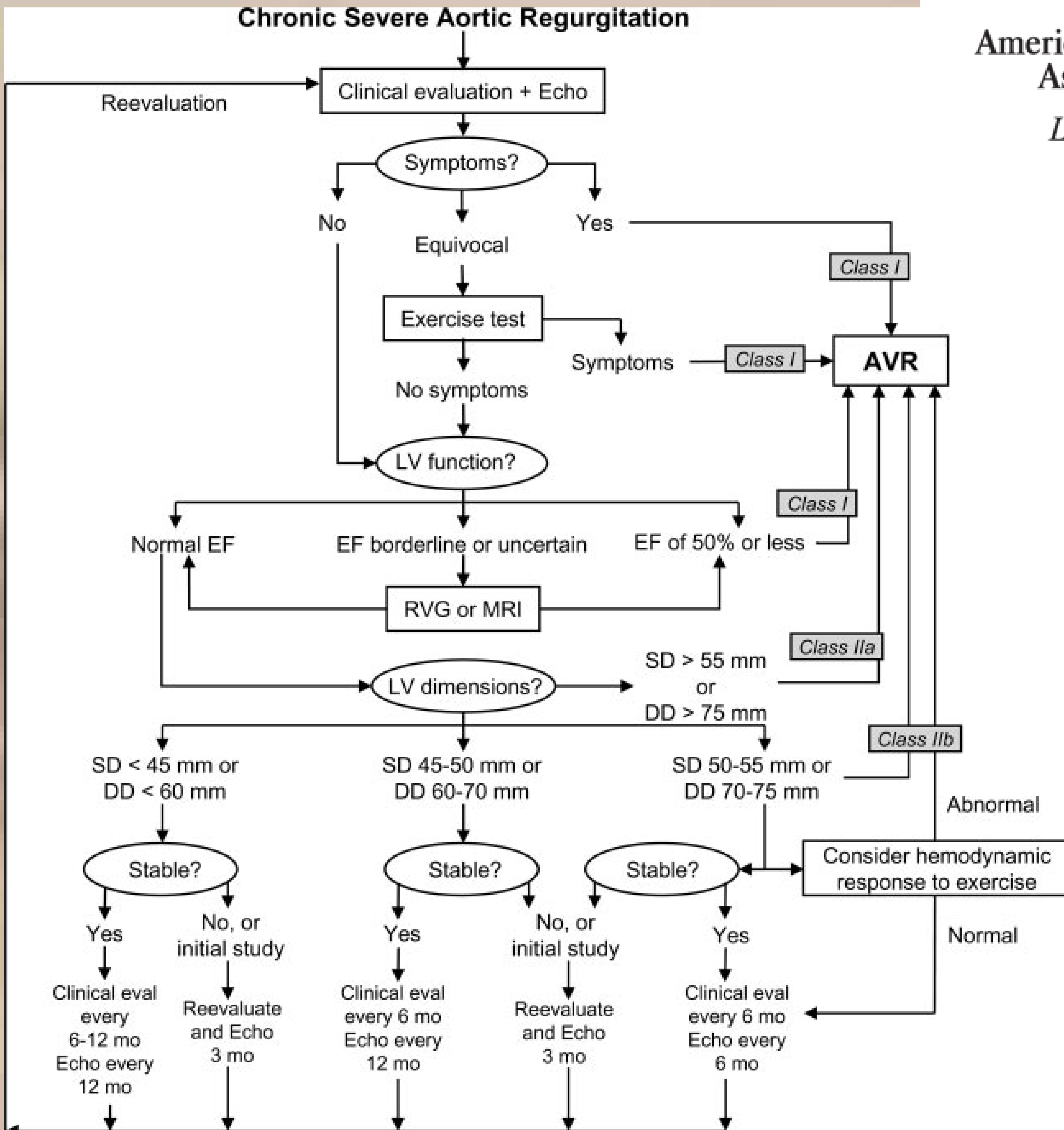
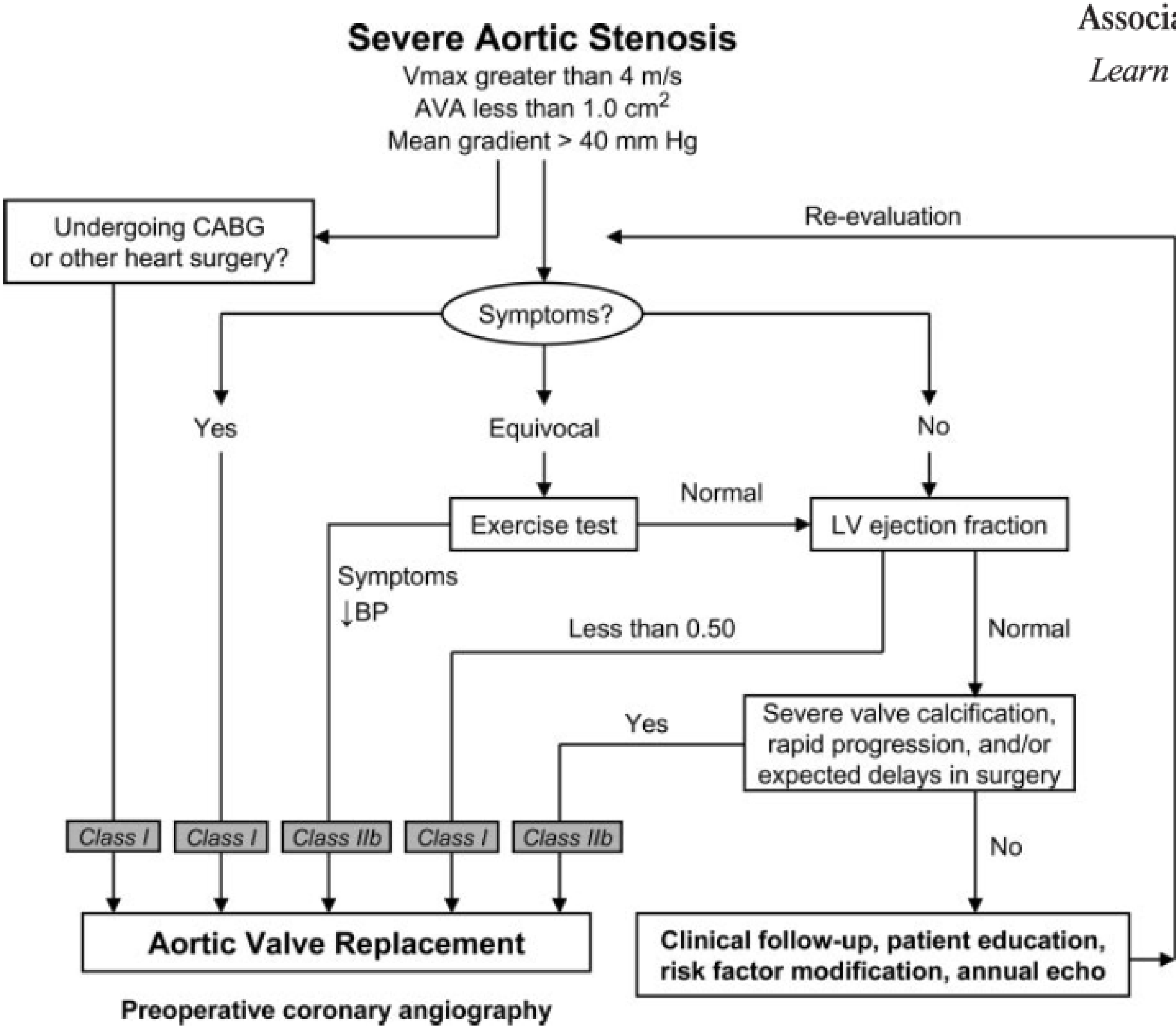
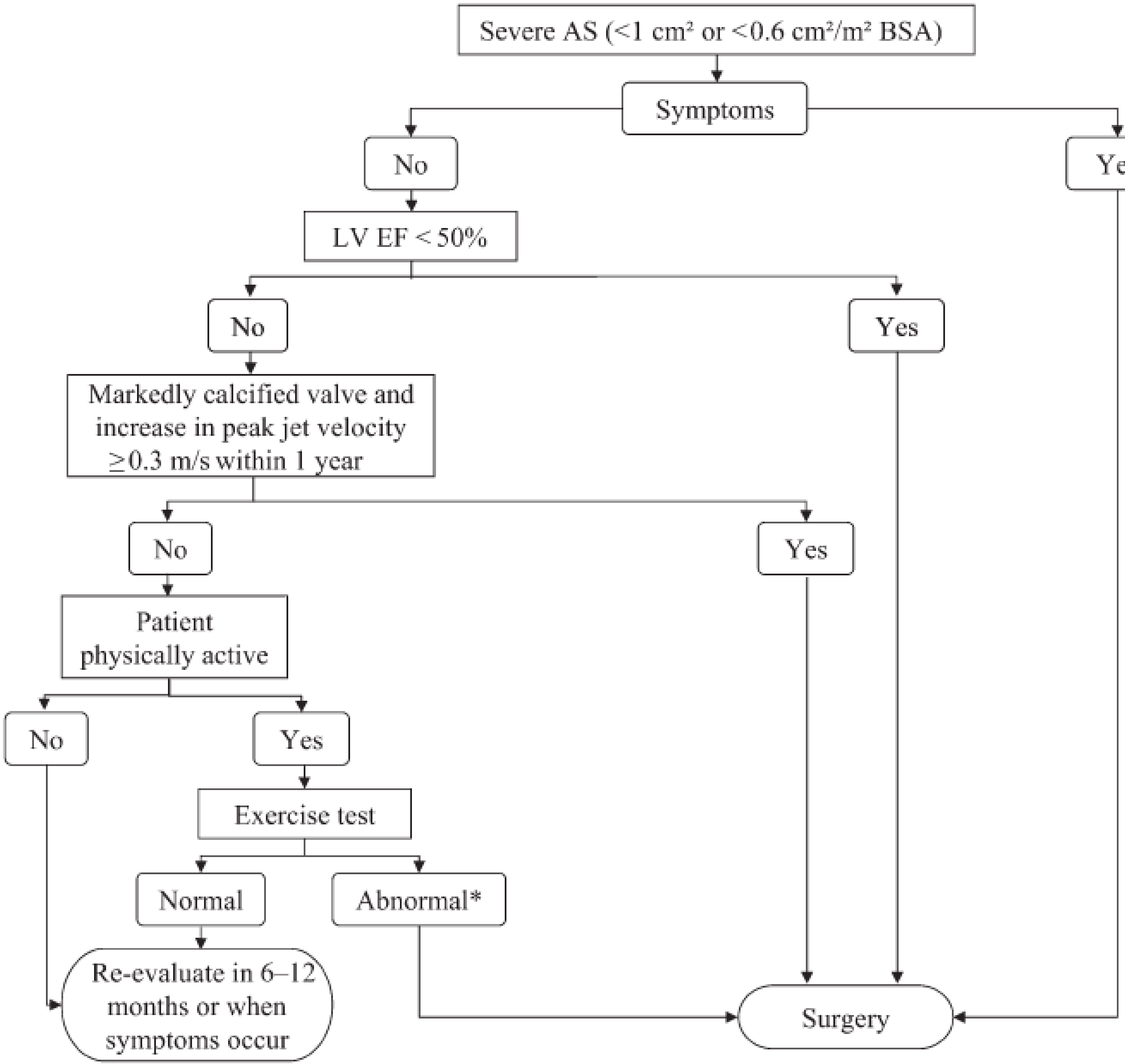

Chronic Severe Aortic Regurgitation
Clinical evaluation + Echo
Reevaluation
Symptoms?
No
Equivocal
Yes
Class I
Exercise test
Symptoms
Class I
AVR
No symptoms
LV function?
Class I
Normal EF
EF borderline or uncertain
EF of 50% or less
RVG or MRI
Class IIa
SD > 55 mm
or
DD > 75 mm
LV dimensions?
Class IIb
SD < 45 mm or
DD < 60 mm
SD 45-50 mm or
DD 60-70 mm
SD 50-55 mm or
DD 70-75 mm
Abnormal
Stable?
Stable?
Stable?
Consider hemodynamic
response to exercise
Normal
Yes
No, or
initial study
Yes
No, or
initial study
Yes
Clinical eval
every
6-12 mo
Echo every
12 mo
Reevaluate
and Echo
3 mo
Clinical eval
every 6 mo
Echo every
12 mo
Reevaluate
and Echo
3 mo
Clinical eval
every 6 mo
Echo every
6 mo
American Heart
Association
Learn and Live

American Heart Association
Learn and Live





AS = aortic stenosis
LV= left ventricle
EF = ejection fraction
BSA = body surface area

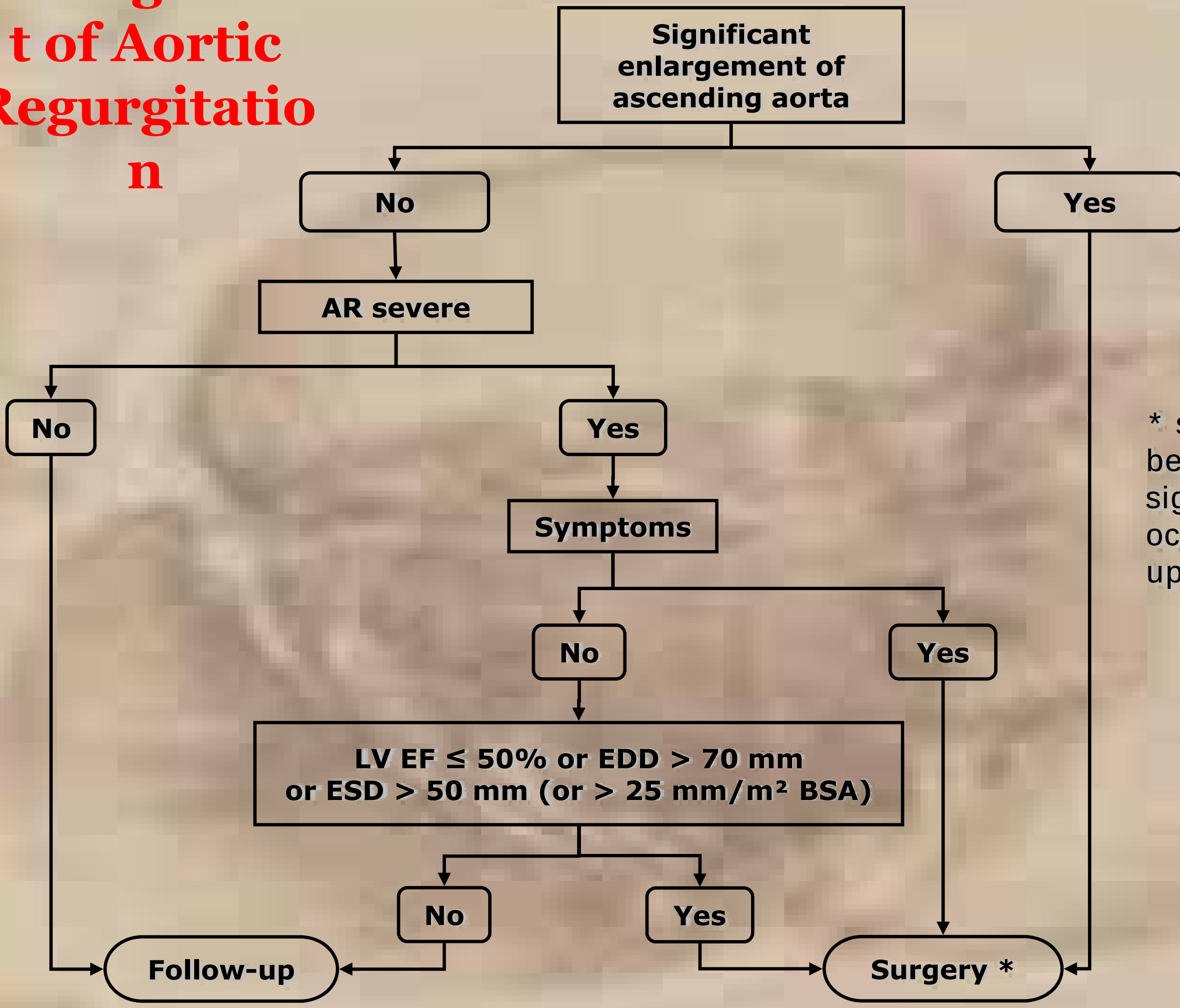
*See *Table 7* for definitions

Note: The management of patients with low gradient and low ejection fraction is detailed in the text

EUROPEAN SOCIETY OF CARDIOLOGY®

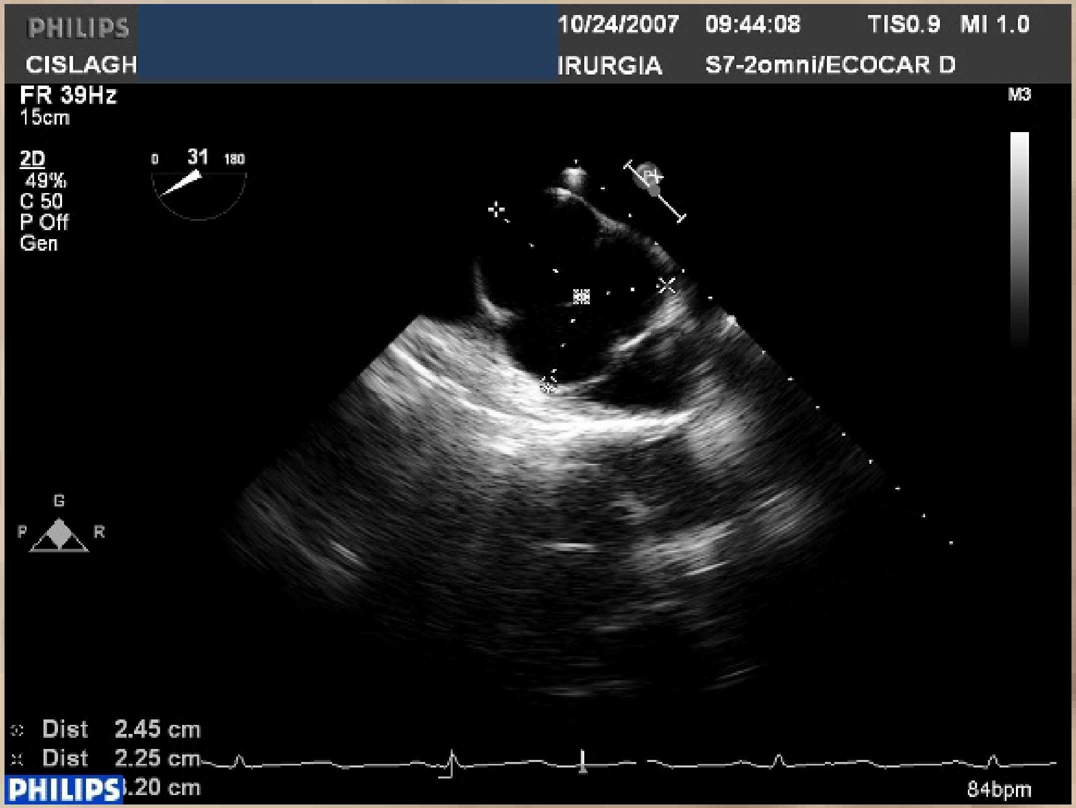
Figure 2 Management of severe aortic stenosis.

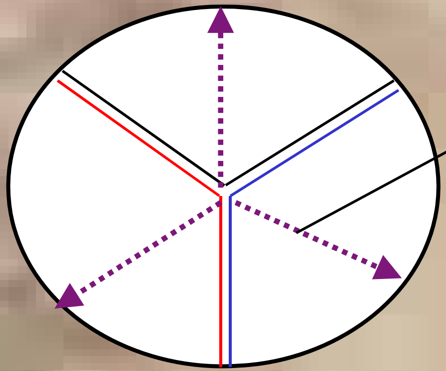
Management of Aortic Regurgitation



* surgery must also be considered if significant changes occur during follow-up

Short axis view

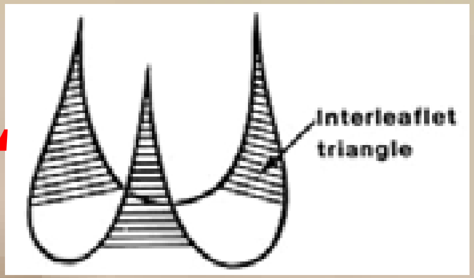




Normal valve

to measure Asymmetrical Sinuses

AORTIC FUNCTIONAL ANNULUS



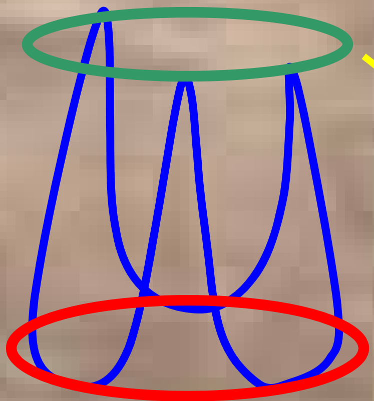
Sino-Tubular Junction

✚

Ventriculo-Arterial Junction

⬇

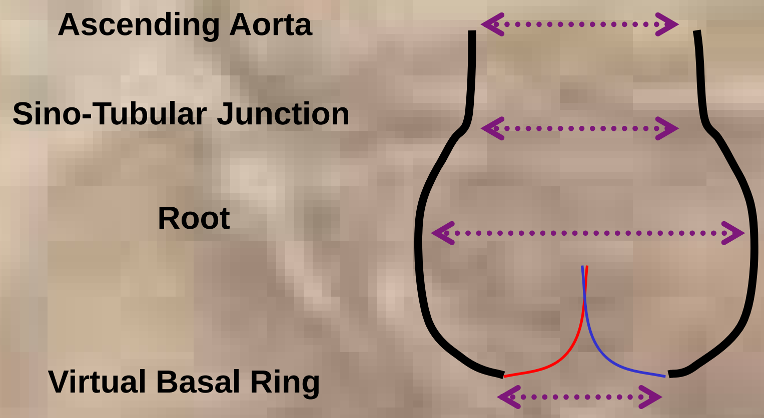
AORTIC FUNCTIONAL ANNULUS

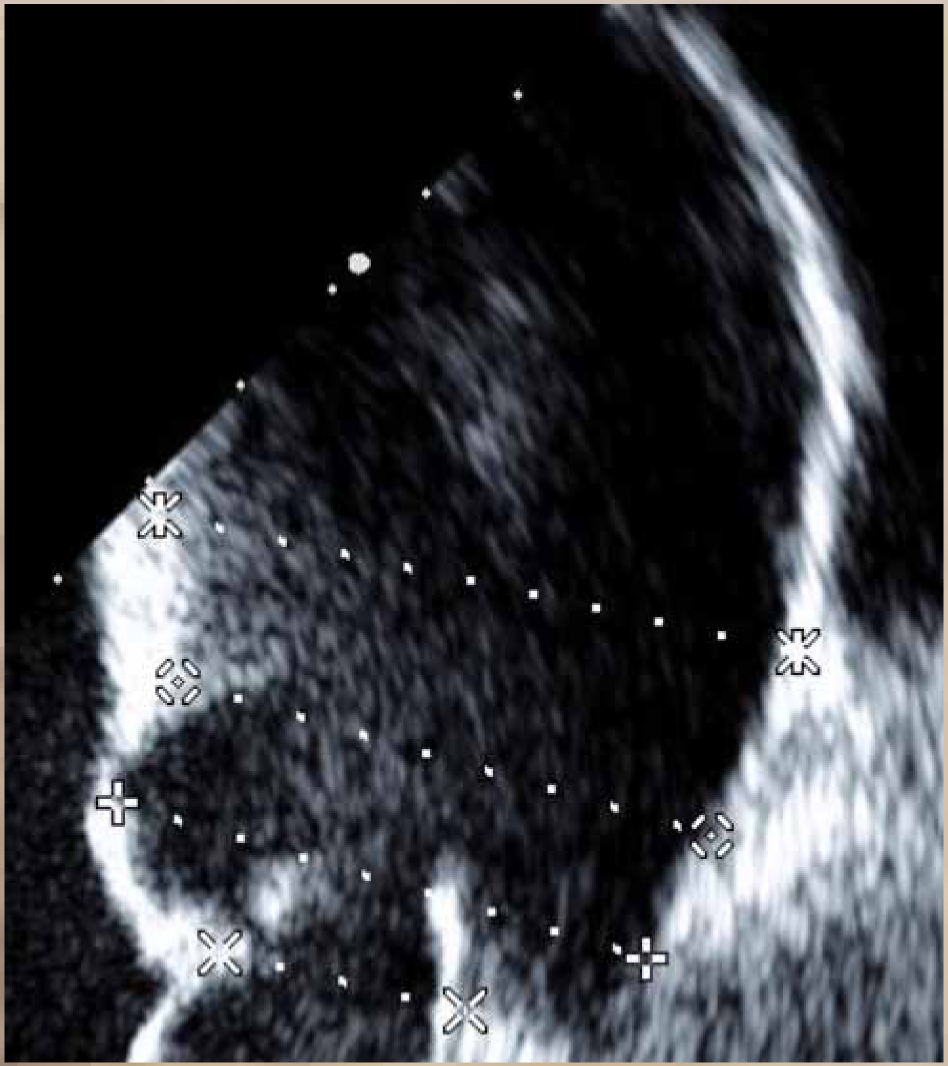


Virtual Basal Ring
(Echo-annulus)

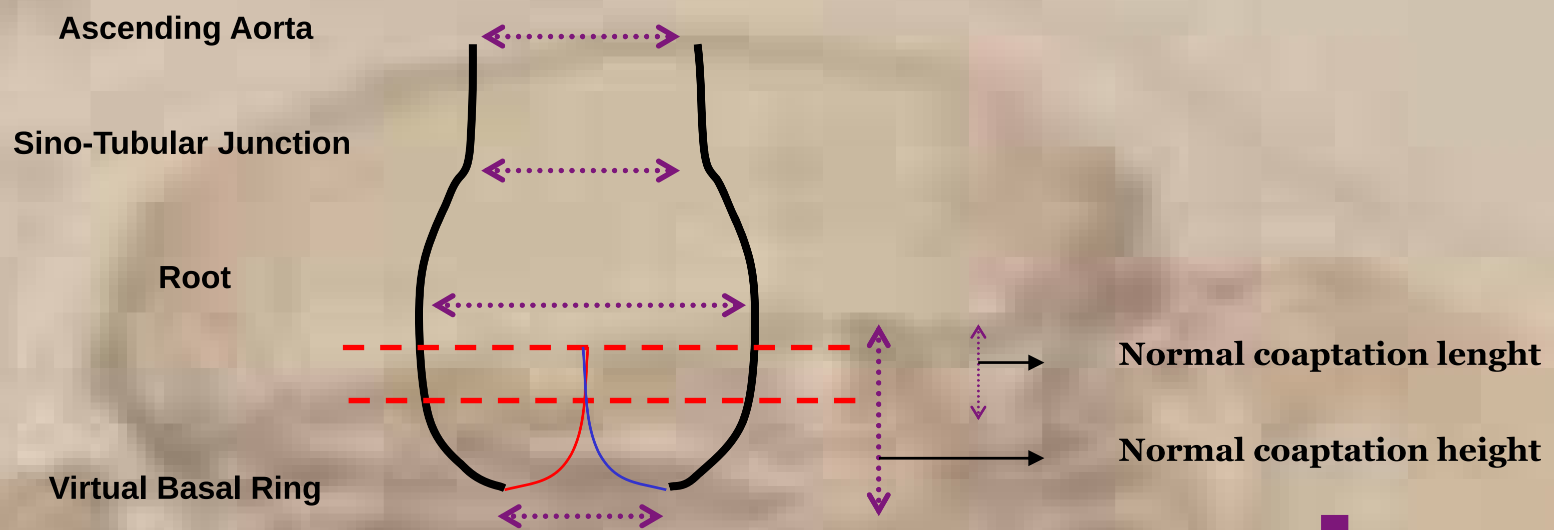
AORTIC VALVE REPAIR

Long axis view





Long axis view



FUNCTIONAL RESERVE

ASE COMMITTEE RECOMMENDATIONS

Recommendations for Chamber Quantification: A Report from the American Society of Echocardiography's Guidelines and Standards Committee and the Chamber Quantification Writing Group, Developed in Conjunction with the European Association of Echocardiography, a Branch of the European Society of Cardiology

Members of the Chamber Quantification Writing Group are: Roberto M. Lang, MD, FASE, Michelle Bierig, MPH, RDCS, FASE, Richard B. Devereux, MD, Frank A. Flachskampf, MD, Elyse Foster, MD, Patricia A. Pellikka, MD, Michael H. Picard, MD, Mary J. Roman, MD, James Seward, MD, Jack S. Shanewise, MD, FASE, Scott D. Solomon, MD, Kirk T. Spencer, MD, FASE, Martin St John Sutton, MD, FASE, and William J. Stewart, MD

Journal of the American Society of Echocardiography
Volume 18 Number 12

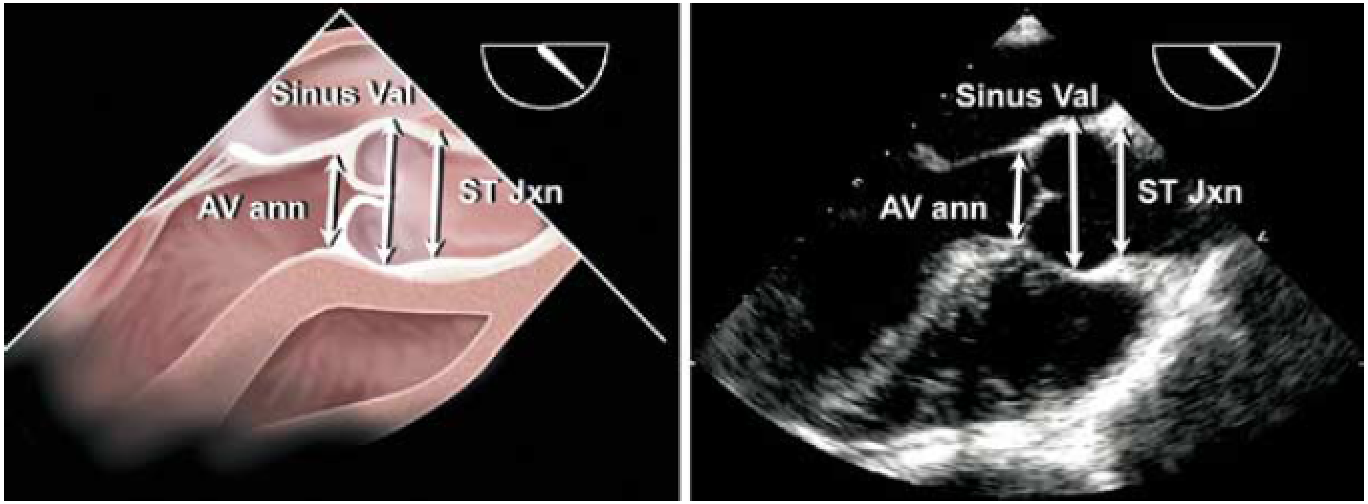
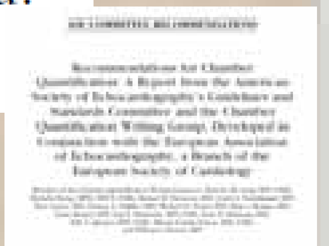


Figure 18 Measurement of aortic root diameters at aortic valve annulus (*AV ann*) level, sinuses of Valsalva (*Sinus Val*), and sinotubular junction (*ST Jxn*) from midesophageal long-axis view of aortic valve, usually at angle of approximately 110 to 150 degrees. Annulus is measured by convention at base of aortic leaflets. Although leading edge to leading edge technique is demonstrated for the Sinus Val and ST Jxn, some prefer inner edge to inner edge method. (See text for further discussion.)



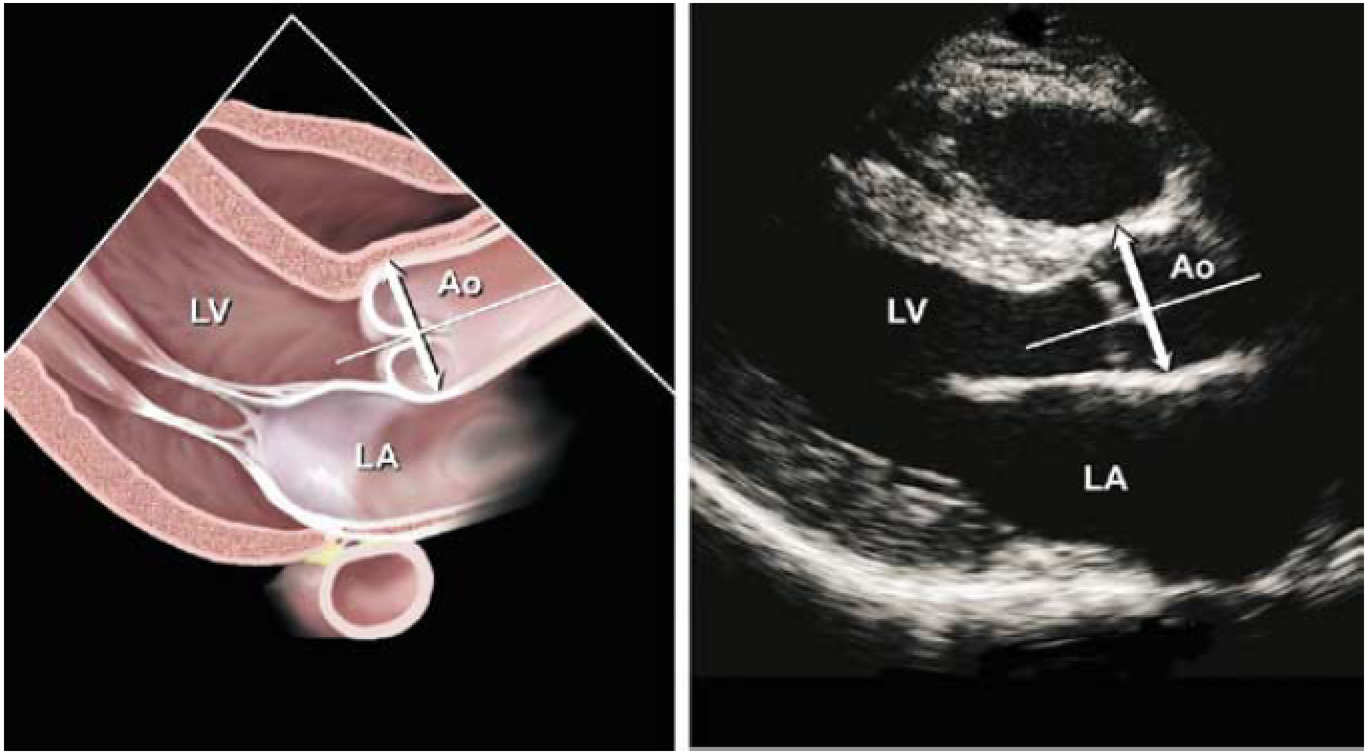
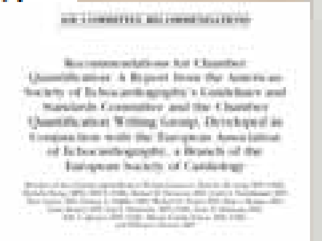


Figure 19 Measurement of aortic root diameter at sinuses of Valsava from 2-dimensional parasternal long-axis image. Although leading edge to leading edge technique is shown, some prefer inner edge to inner edge method. (See text for further discussion.)



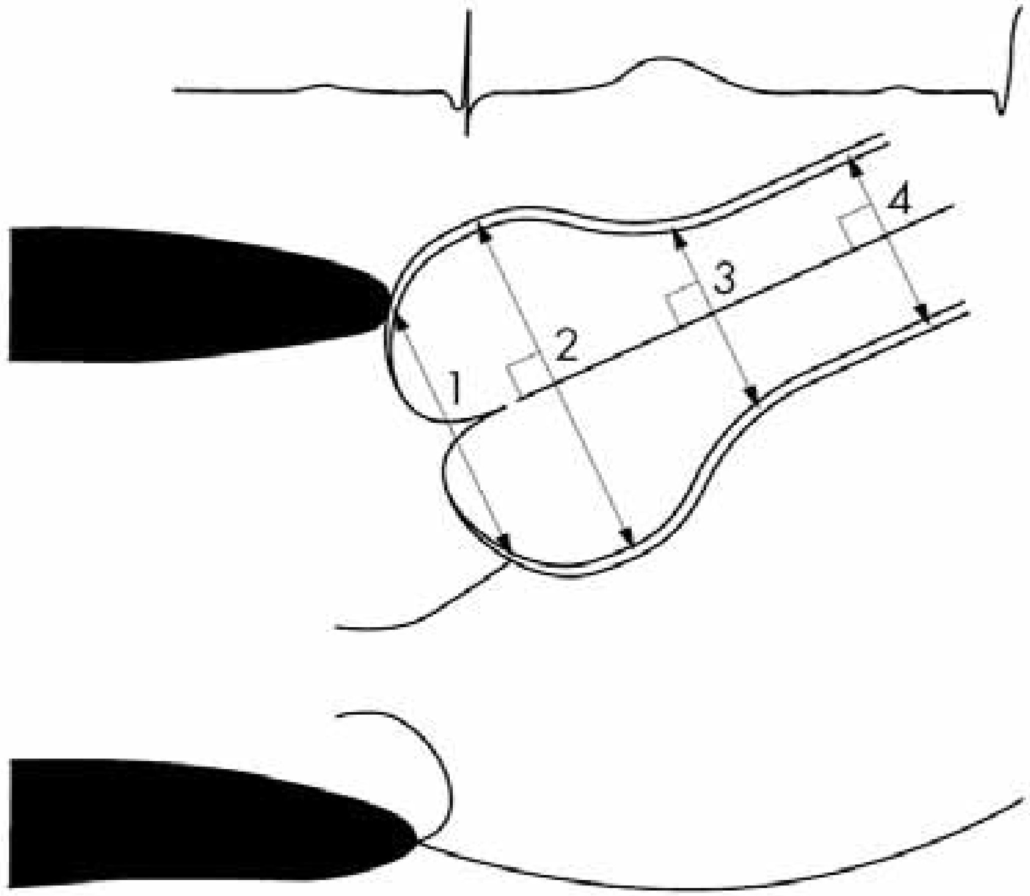


Figure 4 Echocardiographic measurement of aortic root diameters: (1) aortic annulus diameter (internal diameter); (2) sinuses of Valsalva (external diameter, comprising the aortic wall, from leading edge to leading edge); (3) sinotubular junction (external diameter, comprising the aortic wall, from leading edge to leading edge); (4) ascending aorta (external diameter, comprising the aortic wall, from leading edge to leading edge).

AORTIC VALVE REPAIR

Normal Thoracic Aorta Diameter on Cardiac Computed Tomography in Healthy Asymptomatic Adults:

Impact of Age and Gender[1]

Acad Radiol 2008; 15:827–834

Song Shou Mao, MD, Nasir Ahmadi, MD, Birju Shah, MBBS, Daniel Beckmann, Annie Chen, Luan Ngo
Ferdinand R. Flores, BS, Yan lin Gao, MD, Matthew J. Budoff, MD

Normal Ascending Aorta Diameter Measured with Echocardiography and CT

	Ascending Aorta Diameter							
	Female			Male				
Authors	n	Age	M ± SD (mm)	n	Age	M ± SD (mm)	Method	Trigger Time
Mao	500	56	31.1 ± 3.9	942	54	33.6 ± 4.1	CVCT	End-systolic
Mao	28	20–40	29.0 ± 3.3	80	20–40	30.8 ± 3.5	CVCT	End-systolic
Mao	305	41–60	30.7 ± 3.8	595	41–60	33.3 ± 3.6	CVCT	End-systolic
Mao	167	>60	32.2 ± 3.9	267	>60	35.0 ± 3.8	CVCT	End-systolic
Vasan (12)	1816	46	28 ± 3	1473	47	32 ± 3	Echo	End-diastolic
Roman (13)	67	43	27 ± 3	68	43	30 ± 4	Echo	End-diastolic
Sochowski (14)	33	45	28 ± 3	27	45	28 ± 3	Echo	End-systolic
Reed (15)	46*	21	33 ± 4	45*	21	32 ± 4	Echo	—
Reed (15)	44†	21	27 ± 3	46†	21	31 ± 3	Echo	—
Aronberg (16)	36‡	20–40	33.6	36‡	20–40	34.7	CT	No trigger time
Aronberg (16)	33‡	41–60	37.2	33‡	41–60	36.3	CT	No trigger time
Aronberg (16)	33‡	>61	35	33‡	>61	39.1	CT	No trigger time
Pearce (17)	24	49	29 ± 3.4	46	50	32 ± 5.2	CT	No trigger time

AORTIC
VALVE
REPAIR

Table 4

Changes in Ascending Aorta Diameter with Different Trigger Time and Method of Ascending Aortic Diameter Measurement

	Trigger Time		
n	35% phase	75% phase	95% phase
107	33.9 ± 4.1	32.9 ± 4.1	32.2 ± 3.9*

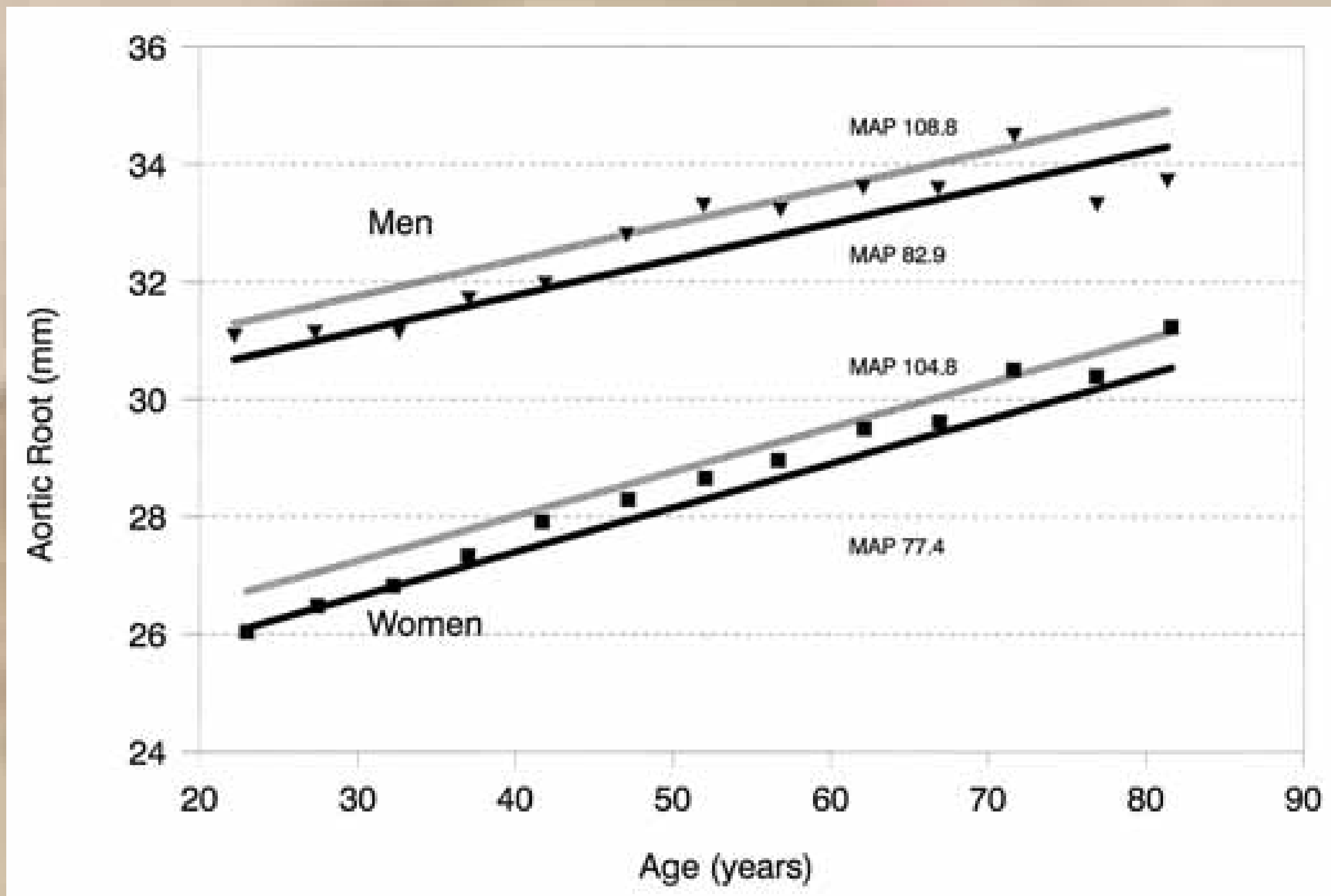
	Imaging and Measuring Method (64 MDCT)		
n	CTA (lumen)	CTA (lumen + wall)	CACS (lumen + wall)
85	32.8 ± 3.8	35.2 ± 3.8**	35.1 ± 3.8**

MDCT, multidetector computed tomography; CTA, computed tomography angiography; CACS, coronary artery calcium scanning.

Compared with 35% phase for trigger time and CTA lumen for method.

*$P < .05$; **$P < .001$.

Graph showing predicted aortic root size as a function of age and mean arterial pressure (MAP)



Vasan, R. S. et al. Circulation 1995;91:734-740

Articles

Determinants of Echocardiographic Aortic Root Size

The Framingham Heart Study

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American Heart Association

Learn and Live

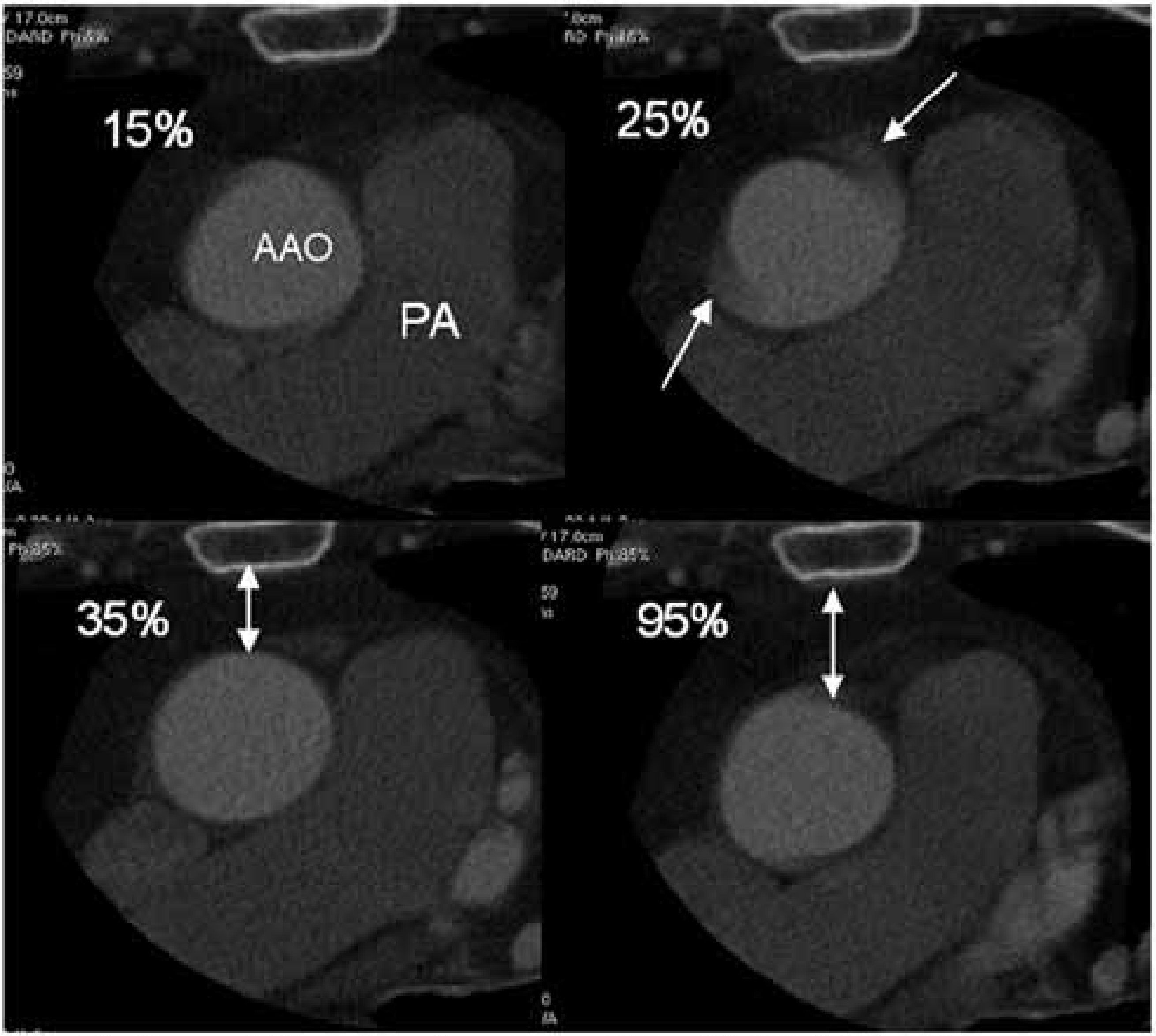


Figure 2. Changes in the aortic location, shape, and size within the RR interval. Four panel images of a multidetector computed tomography scan display the reconstructed images of the 15%, 25%, 35%, and 95% phase of the RR interval. The 35% phase is end-systolic and 95% phase is end-diastolic. The 25% phase has the most motion artifact (white arrows) and 35% phase has the most anterior location, cyclical shape, and the fewest motion artifacts. The distance between the aorta and sternal bone was 3.5 and 6.5 mm; the diameter was 31 and 29 mm in 35% and 95%, respectively (white dual arrow).

AORTIC VALVE REPAIR

Example

Mean Ascending Aorta diameter		33.5mm	+
Mean aortic wall thickness	1.2 mm x 2	2.4 mm	+
Mean Diameter differences between 35% vs 95%		1.7 mm	=
		37.6 mm	
		Mean Δ=4.1mm	
MAP		0.7 mm	+

But 50mm + 4.8mm =54.8mm ????

Measures and ***Images*** are essentials for aortic valve repair procedures

1. To measure all the Aortic Root Functional Unit Elements
2. To detect prolapse and Jet direction
3. To quantify the regurgitant volume
4. To predict the repair feasibility
5. To check the final result in term of incompetence and Functional Reserve

AORTIC VALVE REPAIR

What the surgeon want to know from the ECHO to repair an Aortic Valve?

PRE-OP.

- The Anatomy of the Aortic Valve Functional Unit
- The measures of the Aortic Valve Functional Unit
- The Aortic Valve pre-op. incompetence grade
- The incompetence mechanism

POST-OP.

- The post-operative measures
- The residual incompetence grade
- The mechanism of the residual incomptence

AORTIC VALVE REPAIR

Successful Approach

- Recognition of the exact lesions responsible for the regurgitation

- Selection of the adequate operative maneuvers to correct abnormalities

Cooperation

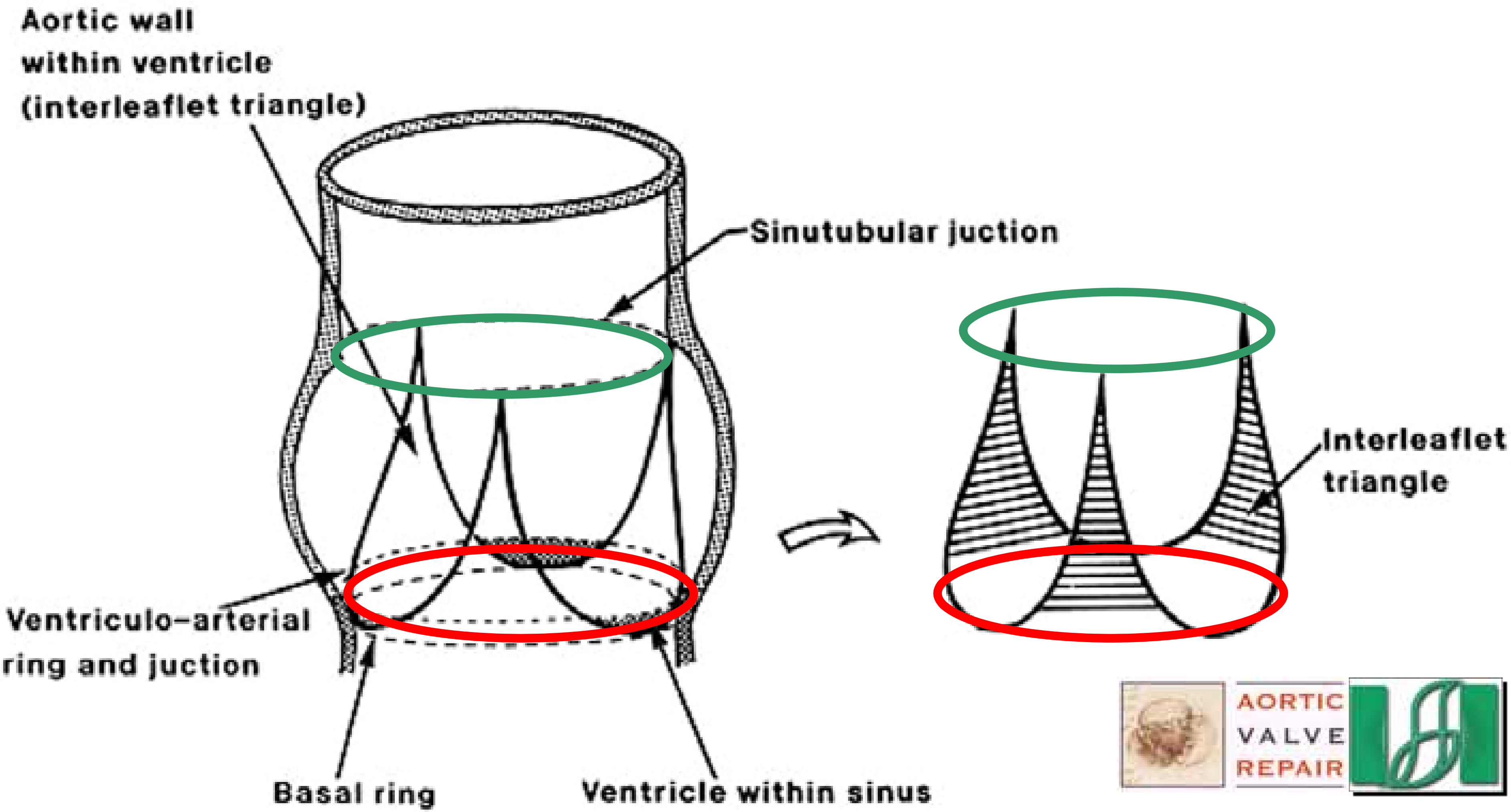
Surgical Flow-Chart for Aortic Regurgitation

Echo Valve Analysis	⇨	To analyse regurgitation mechanisms
Surgical Valve Analysis	⇨	To confirm repair feasibility and to analyse tissue characteristic
Functional Unit Repair	⇨	To repair regurgitation mechanisms
Functional Unit Stabilization	⇨	To regain F.U. continuity and to rearrange hemodynamic stresses

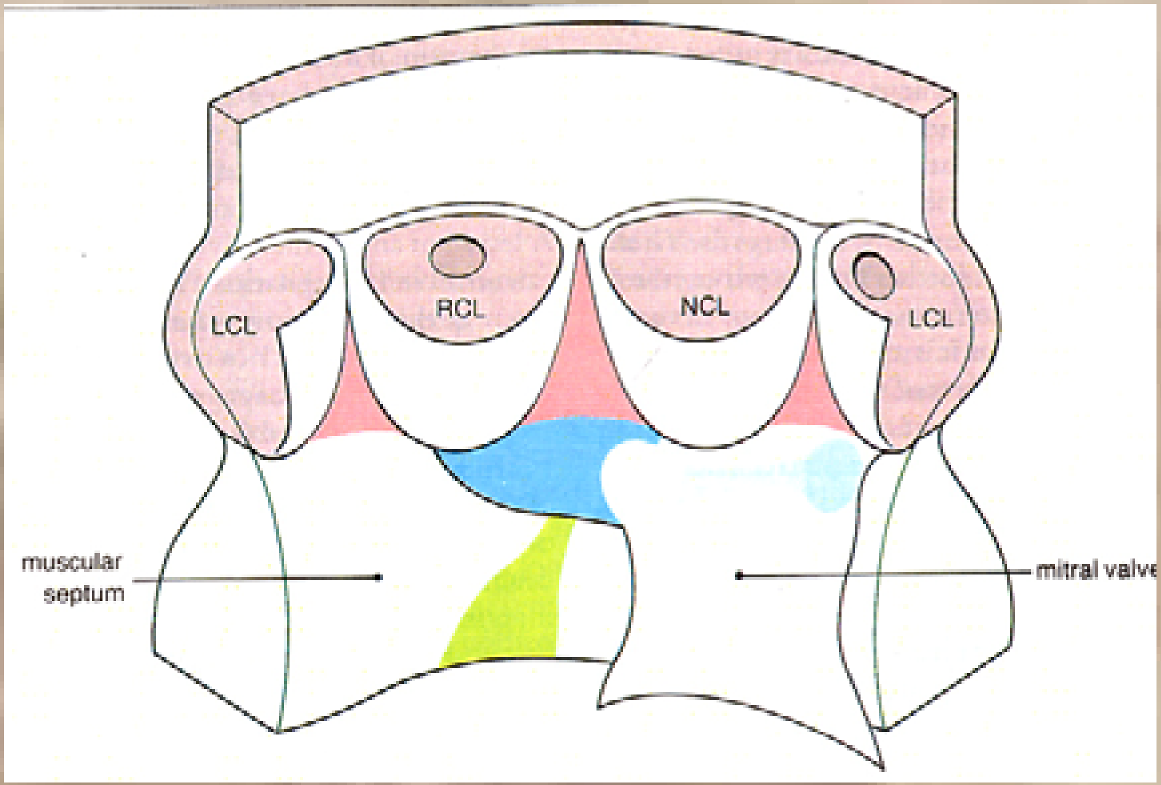
AORTIC VALVE REPAIR

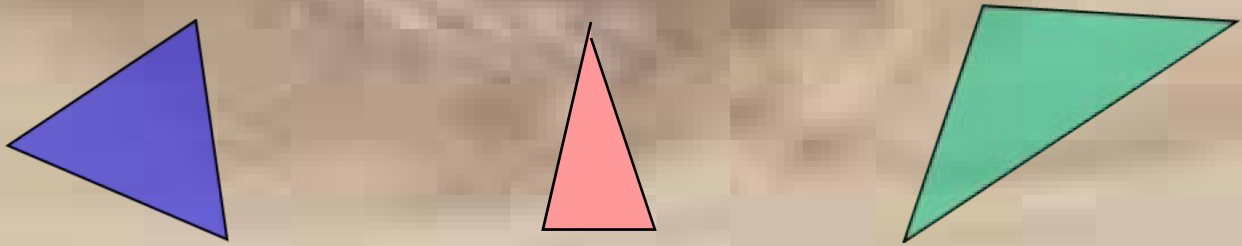
AV Repair is not always possible

AORTIC FUNCTIONAL ANNULUS



Interleaflet Triangle Analysis





Mild Dilation

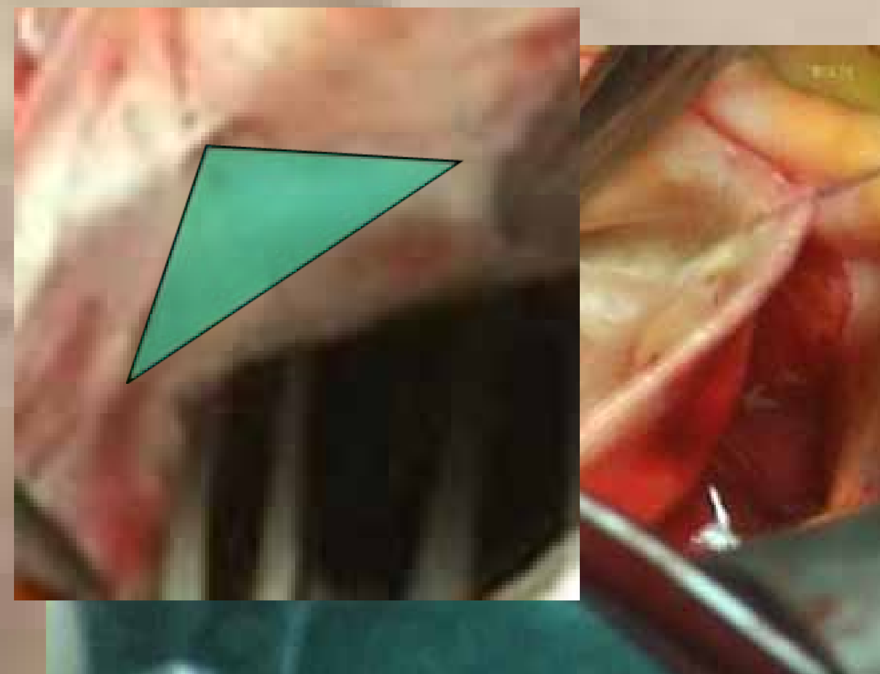
Normal

Severe Dilation

AORTIC VALVE REPAIR

Pathologic Interleaflet Triangle

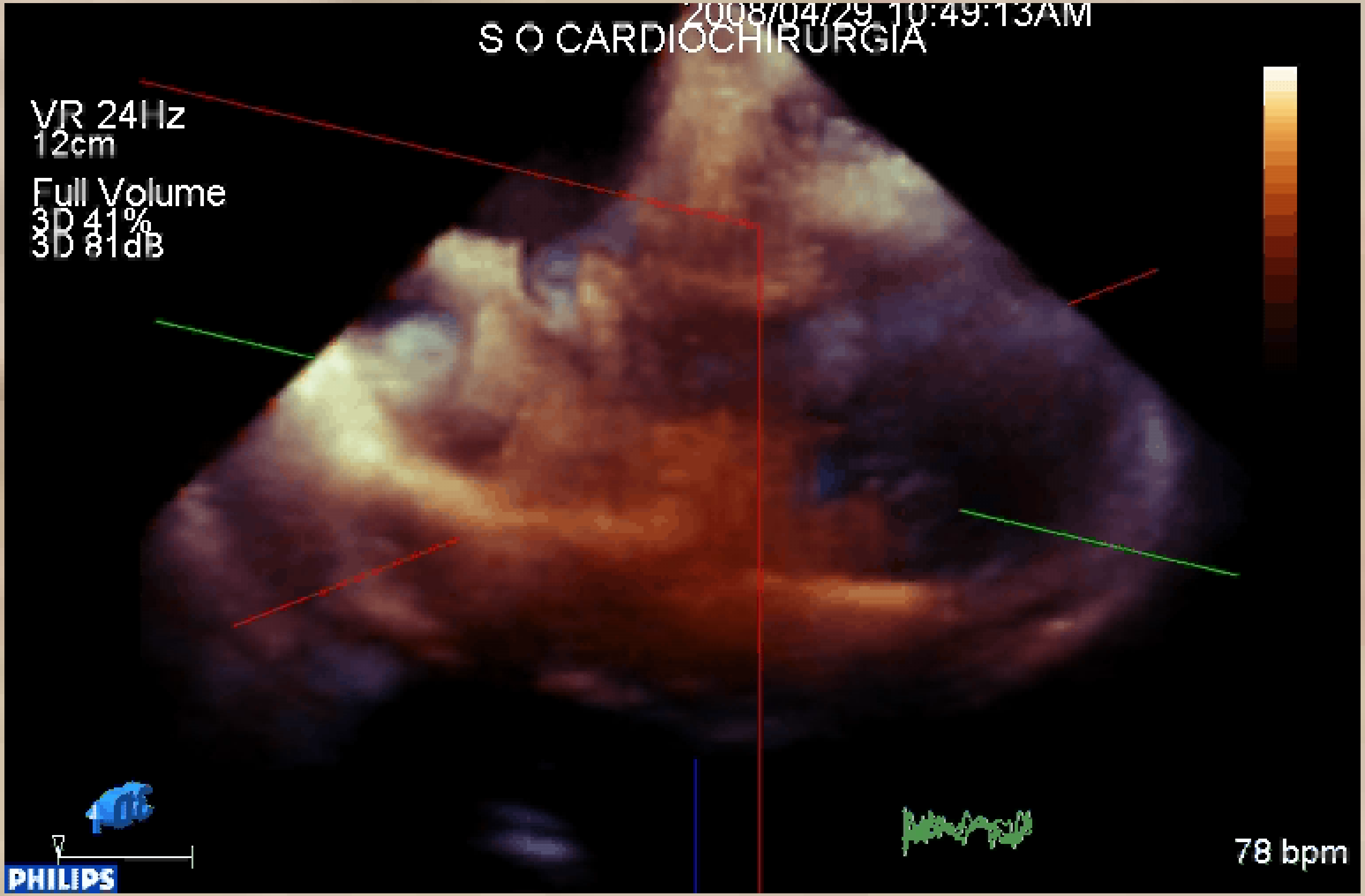
Mild Dilation



Severe Dilation

AORTIC VALVE REPAIR

Is it possible to analyze and measures these triangles?



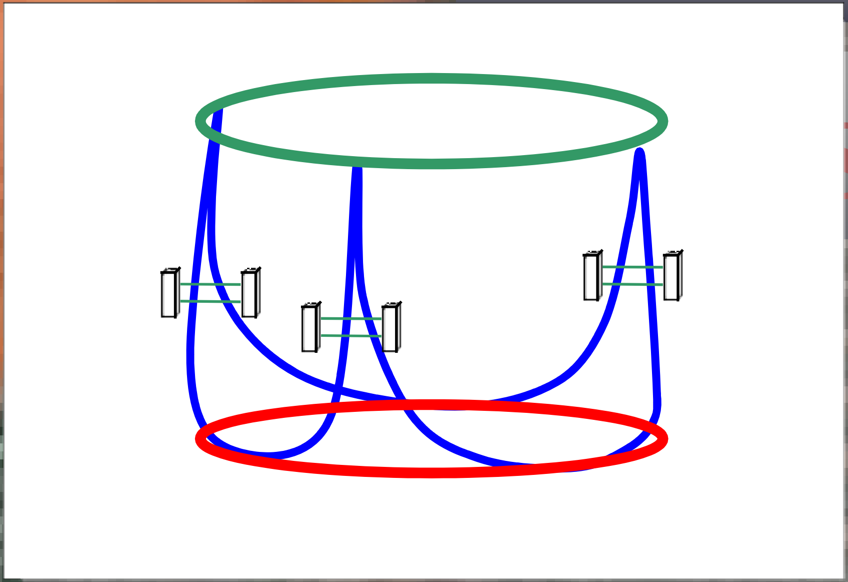
Interleaflet triangles

open **closed**

AVR

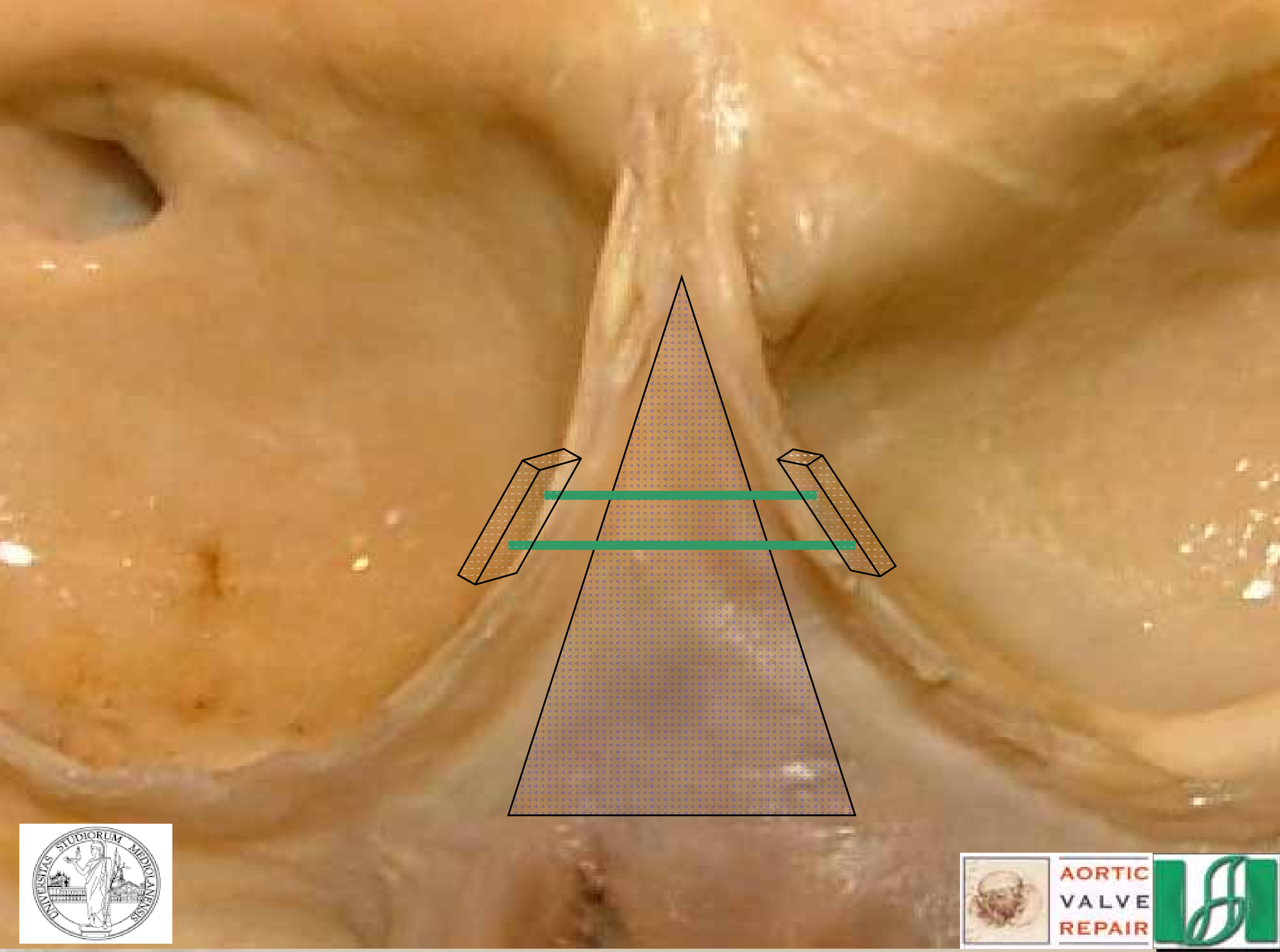
MVR

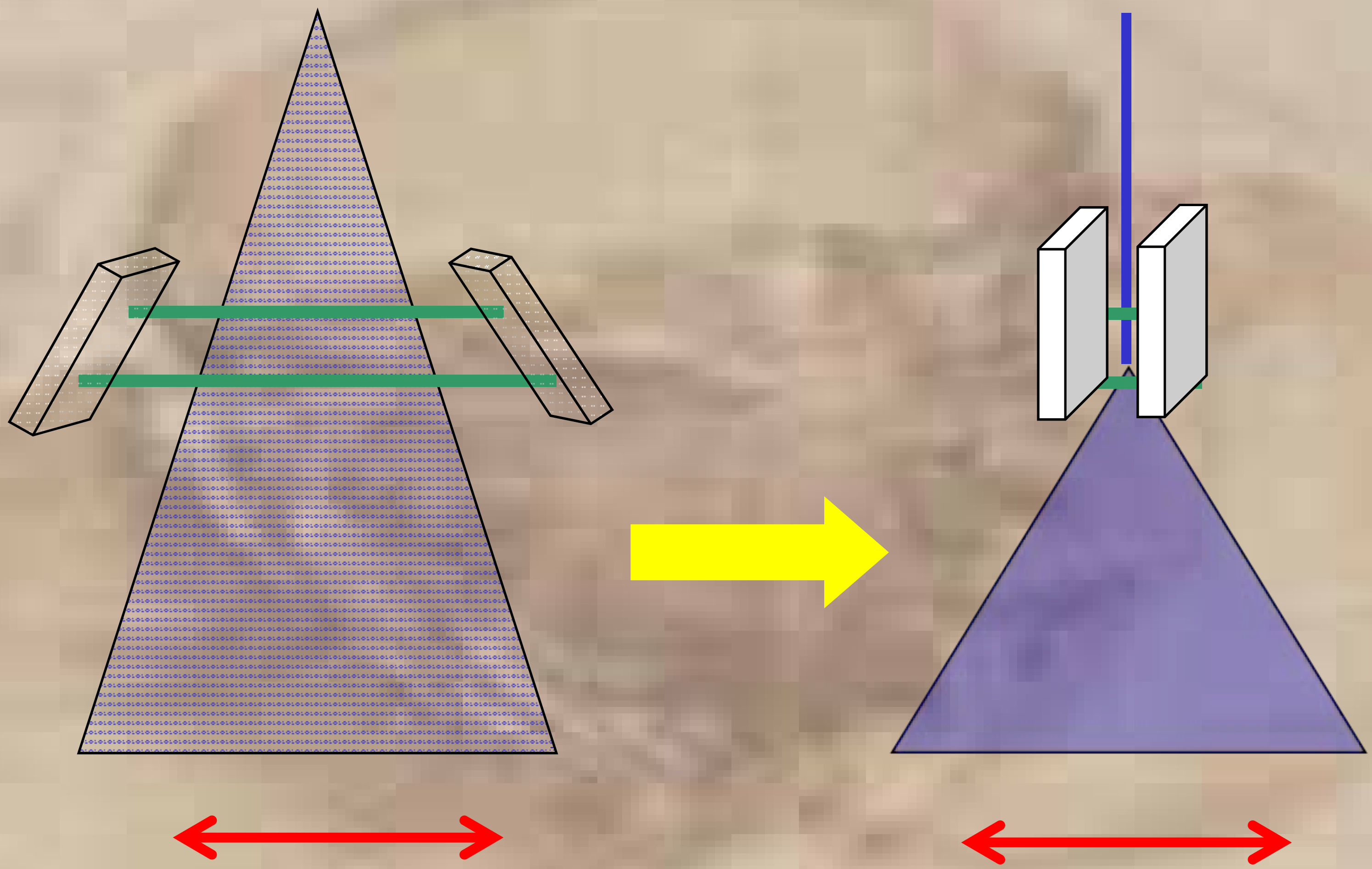
fix the



sub-commissural annuloplasty

ring annuloplasty

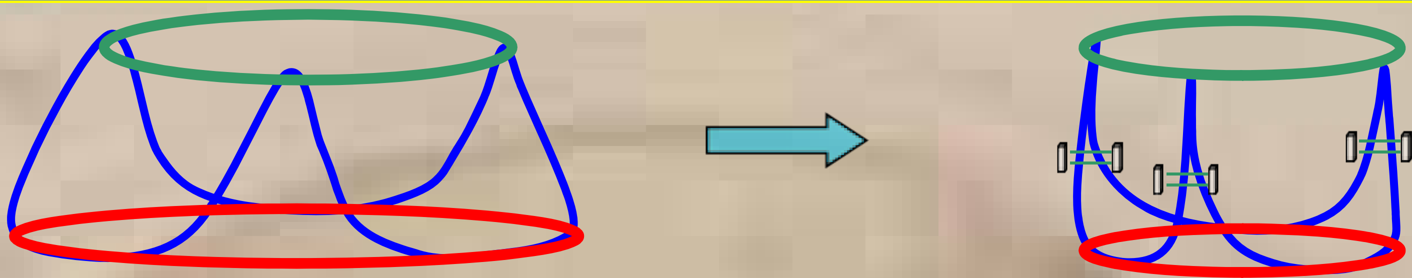

AORTIC
VALVE
REPAIR

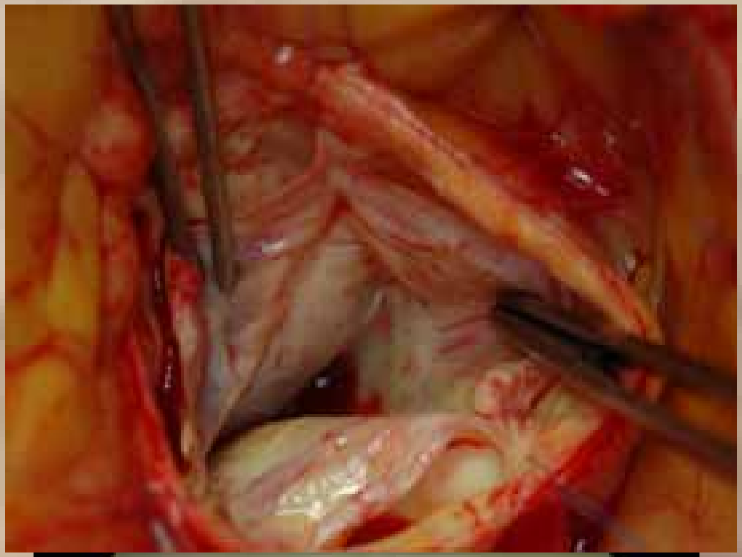


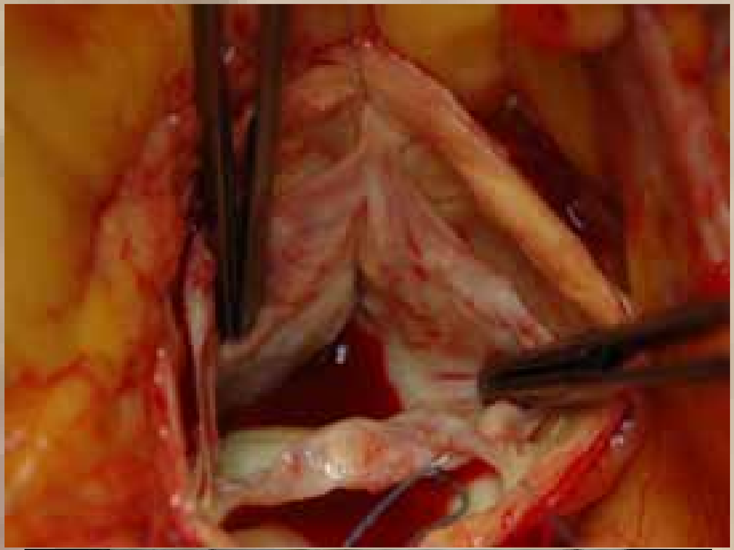
triculo-Arterial Junction Movements Preserved

AORTIC
VALVE
REPAIR

FAA Repair





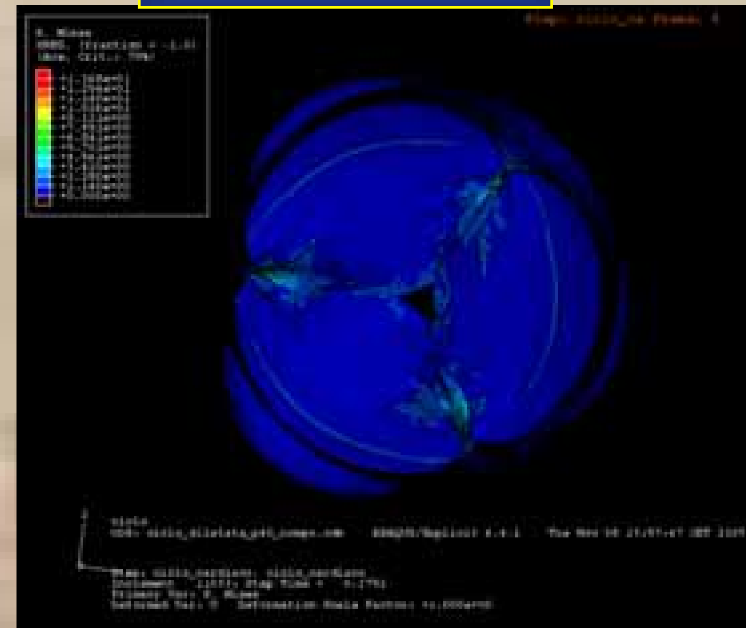


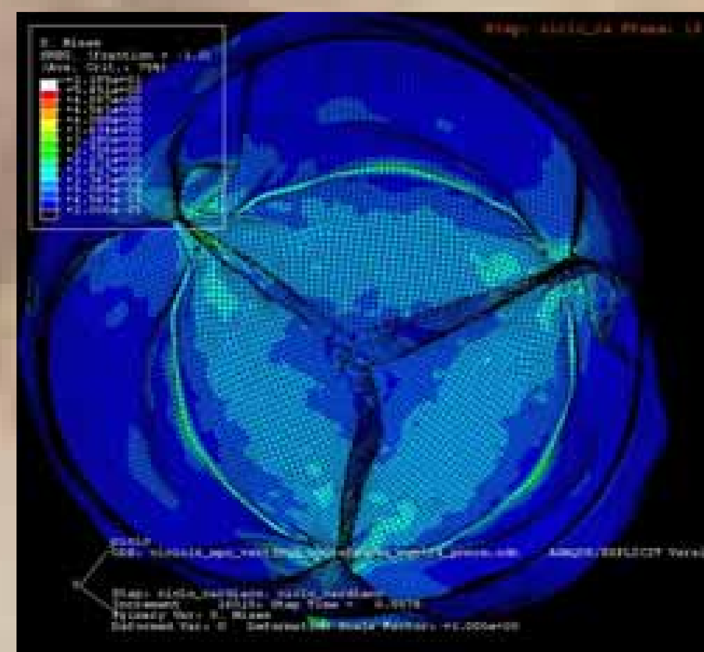
AORTIC VALVE REPAIR

Epicardial 3D-Echo

Endoscopic View

LAB Simulation

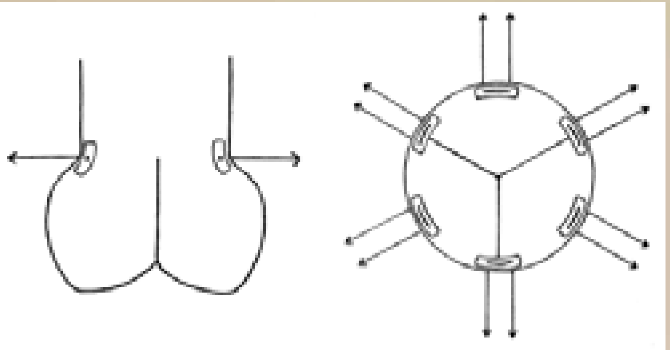




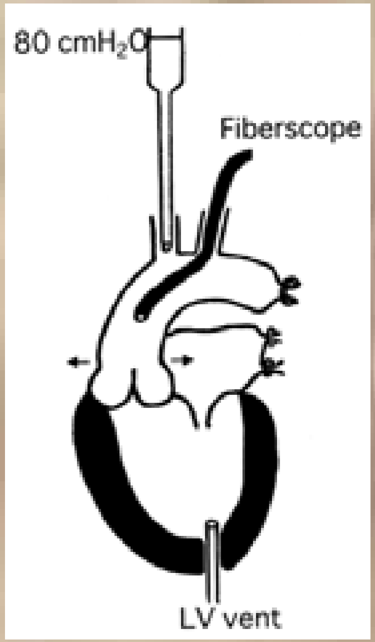
Does Dilatation of the Sinotubular Junction Cause Aortic Regurgitation?

Kojiro Furukawa, MD, Hitoshi Ohteki, MD, Zhi-Li Cao, MD, Kazuyoshi Doi, MD, Yasushi Narita, CE, Naoki Minato, MD, and Tsuyoshi Itoh, MD

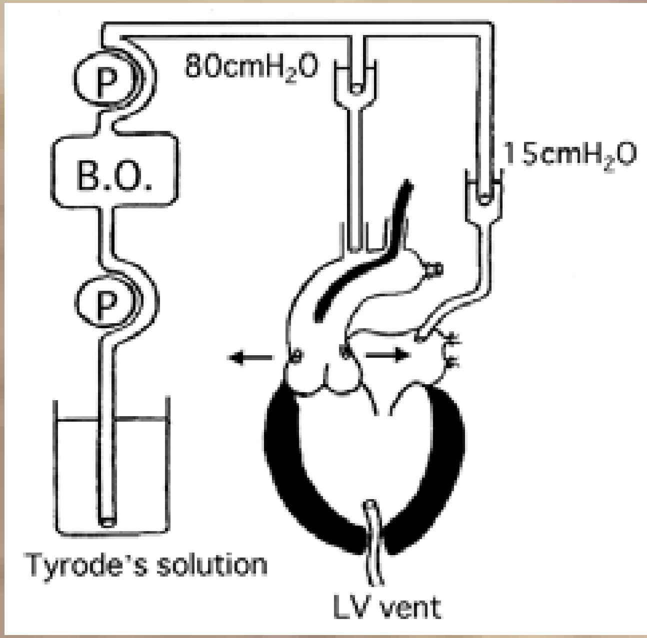
Department of Cardiovascular Surgery, Saga Prefectural Hospital, Koseikan, and Department of Thoracic and Cardiovascular Surgery, Saga Medical School, Saga, Japan



6 horizontal mattress sutures



Beating Model (6 dogs)



Resting Model (6 dogs)

Test

- All 6 sutures
- 3 commisures
- 3 sinuses

Does Dilatation of the Sinotubular Junction Cause Aortic Regurgitation?

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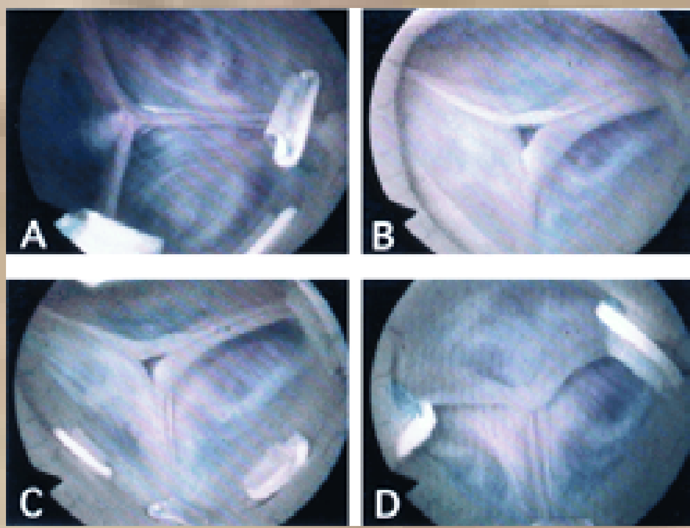
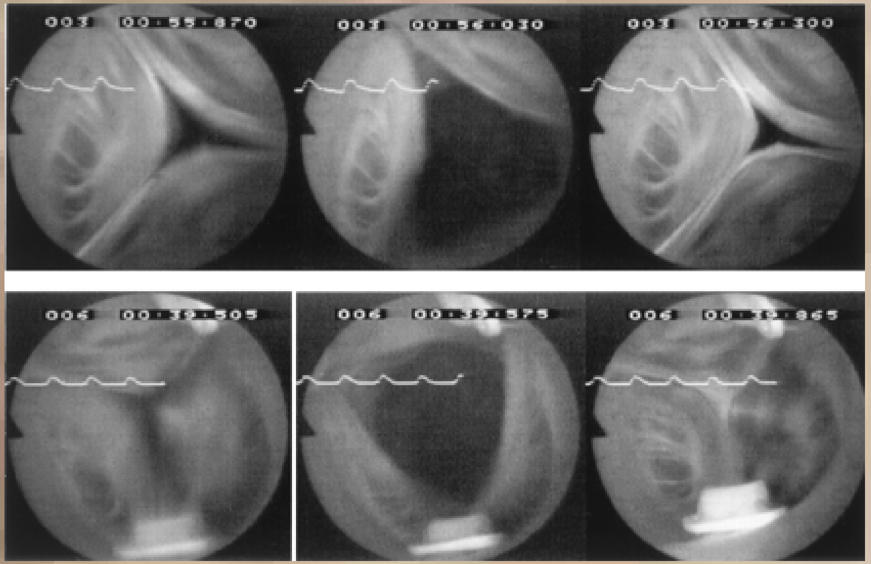
Department of Cardiovascular Surgery, Saga Prefectural Hospital, Koseikan, and Department of Thoracic and Cardiovascular Surgery, Saga Medical School, Saga, Japan

Resting Heart Model



(A) no sutures retracted
(B) 6 sutures retracted
(C) 3 commissure retracted
(D) 3 sinuses retracted

Beating Heart Model



<u>Upper</u>: commissures
<u>Lower</u>: sinuses

AORTIC VALVE REPAIR

STJ Diameter Importance

Ascending Aortic Aneurism
Severe AVR

AORTIC VALVE REPAIR

REVIEW

Three-dimensional imaging of the aortic valve and aortic root with computed tomography: new standards in an era of transcatheter valve repair/implantation

Paul Schoenhagen*, E. Murat Tuzcu, Samir R. Kapadia, Milind Y. Desai, and Lars G. Svensson

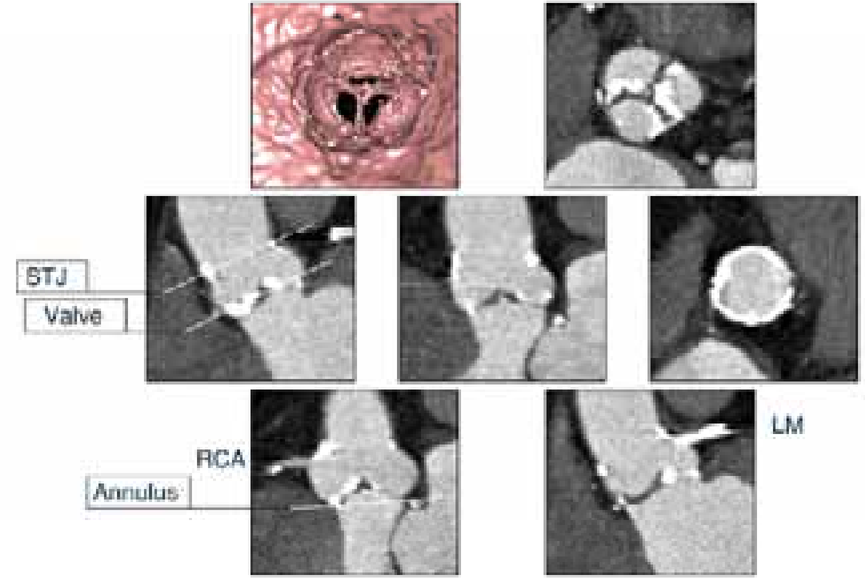


Figure 4 This figure shows computed tomography images of the calcified leaflet margins of a stenotic aortic valve (upper right panel), the sinotubular junction (STJ) with dense, circumferential calcification (right middle panel), and the level of the aortic annulus (left lower panel). The ostia of the coronary ostia (RCA, right coronary artery; LM, left main) are seen in the lower panels.

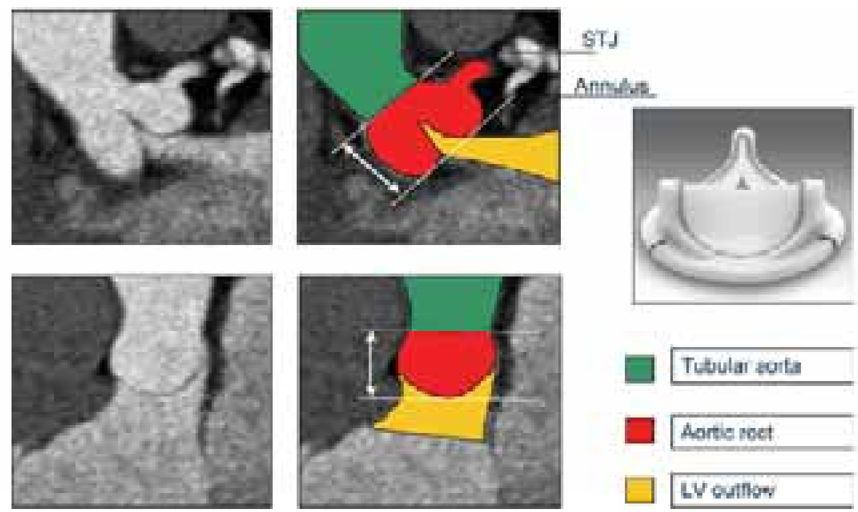
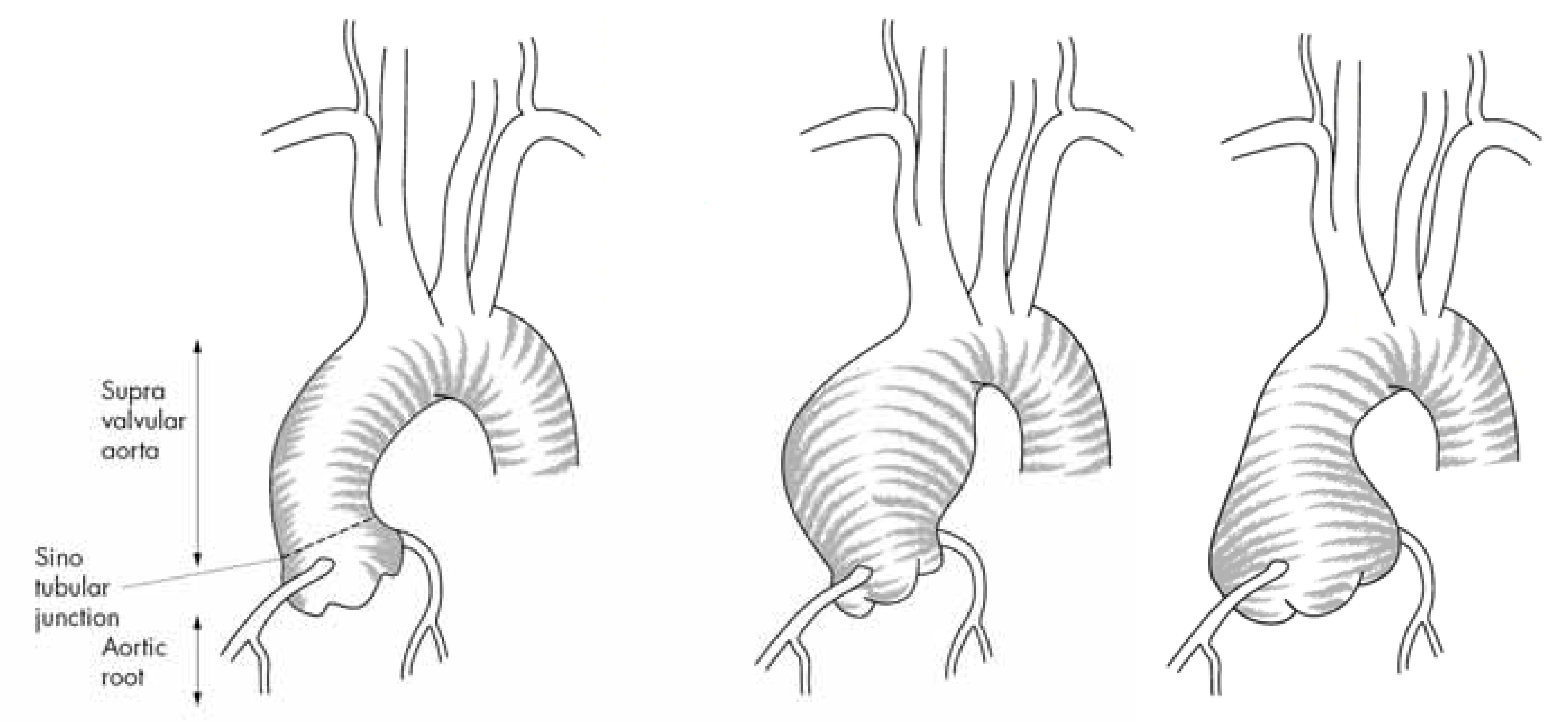
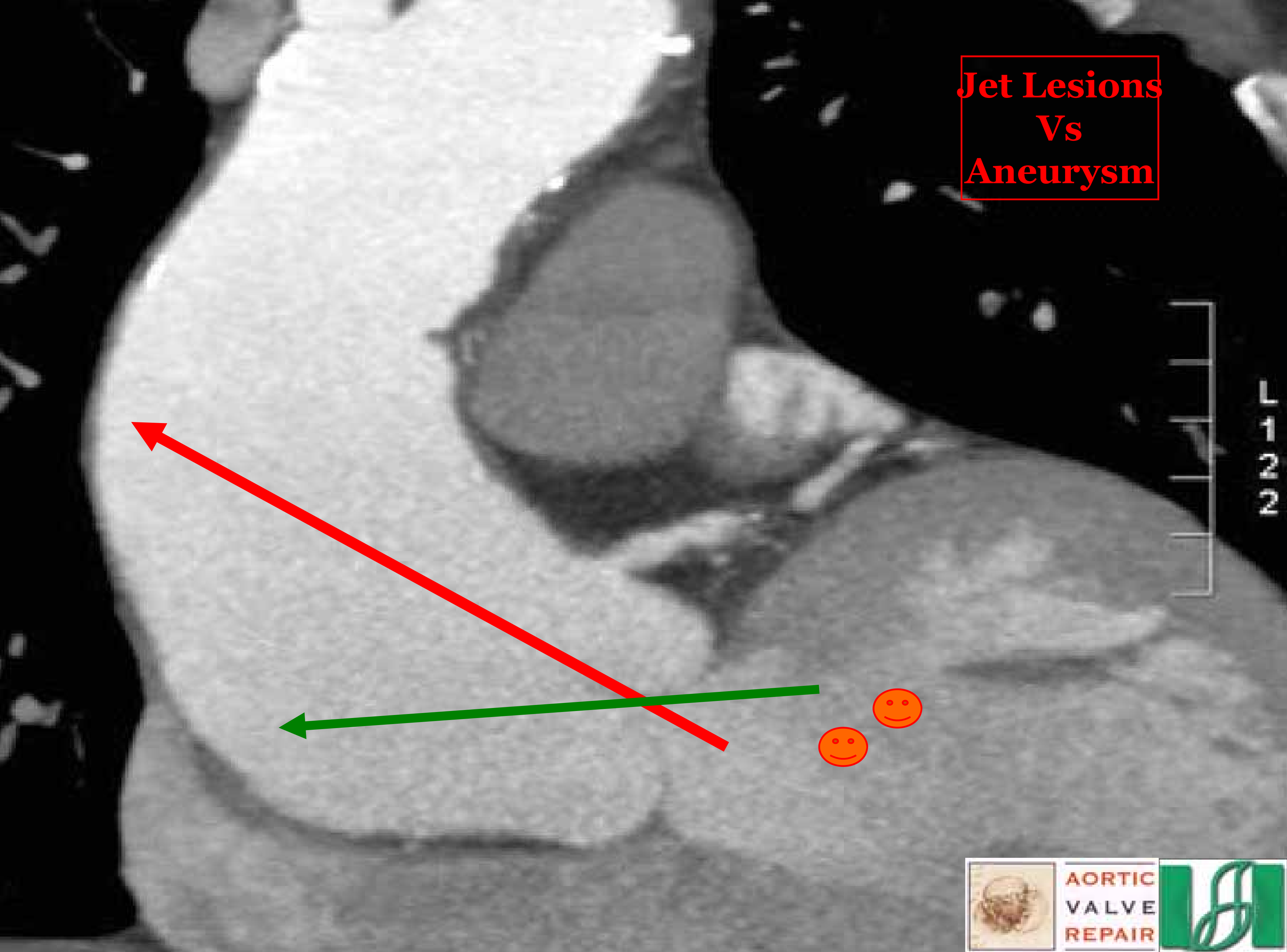


Figure 5 The aortic annulus describes the interface between the left ventricular outflow tract and the aortic root and is defined by the hinge-point/commisures of the aortic valve leaflets. Although the clinical terminology suggests a ring-shaped structure, the commisures extend upwards into the aortic root, describing the shape of a crown, similar to the struts of a bioprosthetic valve.



AORTIC
VALVE
REPAIR


Jet Lesions
Vs
Aneurysm
L
1
2
2
AORTIC
VALVE
REPAIR

to replace an aortic valve the surgeon needs from imaging:

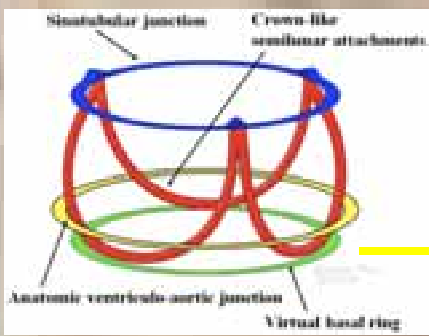
Numbers (Informations)

1. Virtual Basal Ring diameter.

2. Mismatch between STJ and VBR

AORTIC VALVE REPAIR

Virtual Basal Ring diameter



< 19mm

Minimally invasive procedures ??
Annulus enlargement procedures?

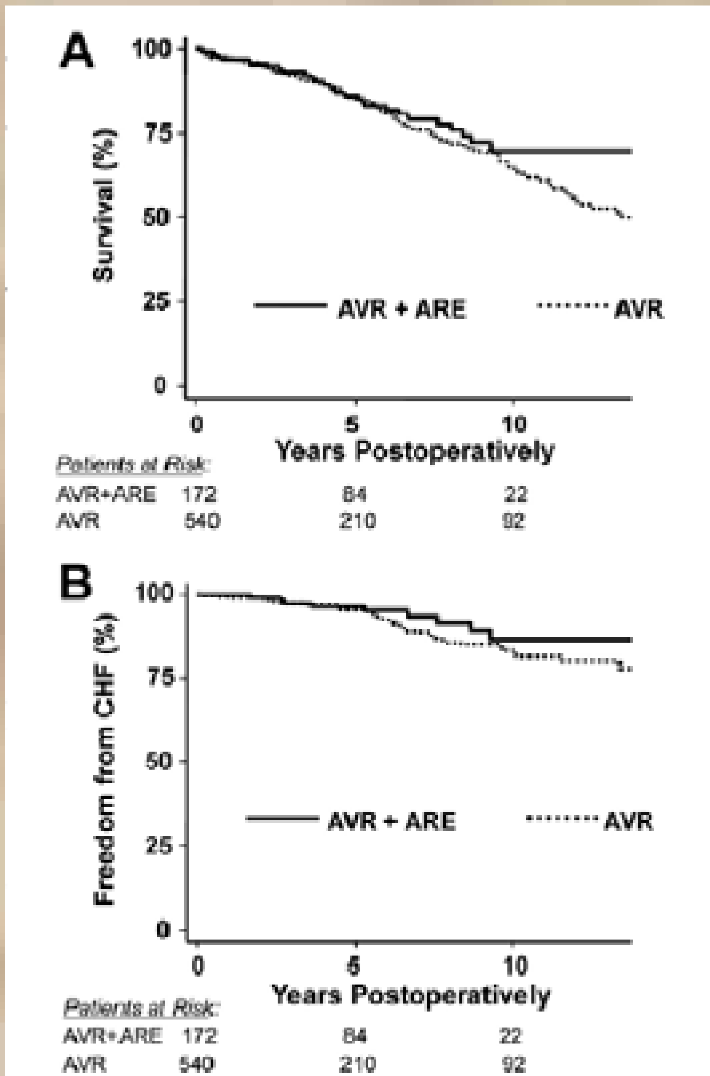
≥ 19mm

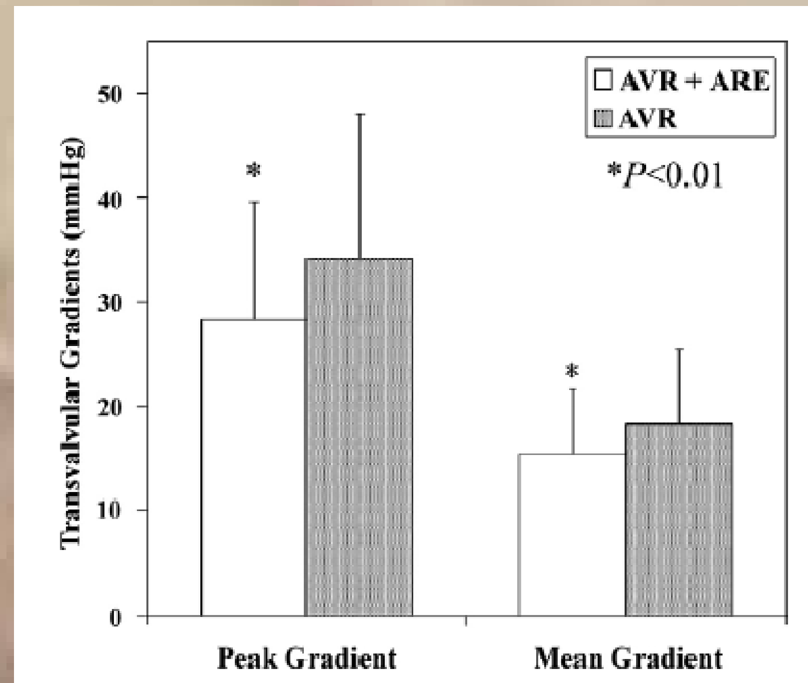
PPM (Patient/Prothesis Mismatch)
Choice of the prosthetic device
and the implantation technique

Enlargement of the Small Aortic Root During Aortic Valve Replacement: Is There a Benefit?

Alexander Kulik, Manal Al-Saigh, Vincent Chan, Roy G. Masters, Pierre Bédard, B.-Khanh Lam, Fraser D. Rubens, Paul J. Hendry, Thierry G. Mesana and Marc Ruel

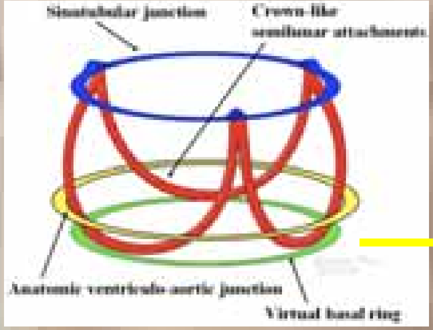
Ann Thorac Surg 2008;85:94-100





Conclusions. For patients with small aortic roots, ARE at the time of AVR is a safe procedure that reduces postoperative gradients and the incidence of prosthesis-patient mismatch. However, ARE does not appreciably improve long-term clinical outcomes.

Virtual Basal Ring diameter



< 19mm

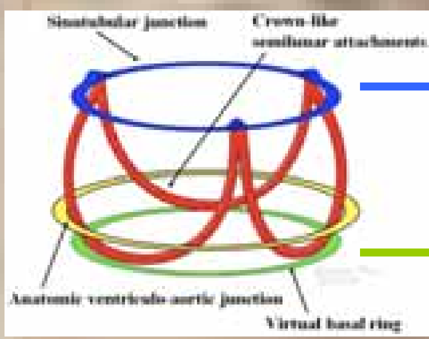
Minimally invasive procedures ??
Annulus enlargement procedures?

≥ 19mm

PPM (Patient/Prothesis Mismatch)
Choice of the prosthetic device
and the implantation technique

AORTIC VALVE REPAIR

Mismatch between STJ and VBR



ΔSTJ/VBR <2 mm

Stented (B/M)
Porcine Stentless
Pericardial Stentless
Homograft
Autograft
Sutureless

ΔSTJ/VBR ≥2 mm

Stented (B/M)
Pericardial Stentless ??

AORTIC VALVE REPAIR

Images are essentials for replacement procedures

1. **Presence of Fibrosis and Calcifications on:**
   - Aortic Valve leaflet
   - Ventricular-Aortic Junction
   - Aortic wall

→ **Increased risk**

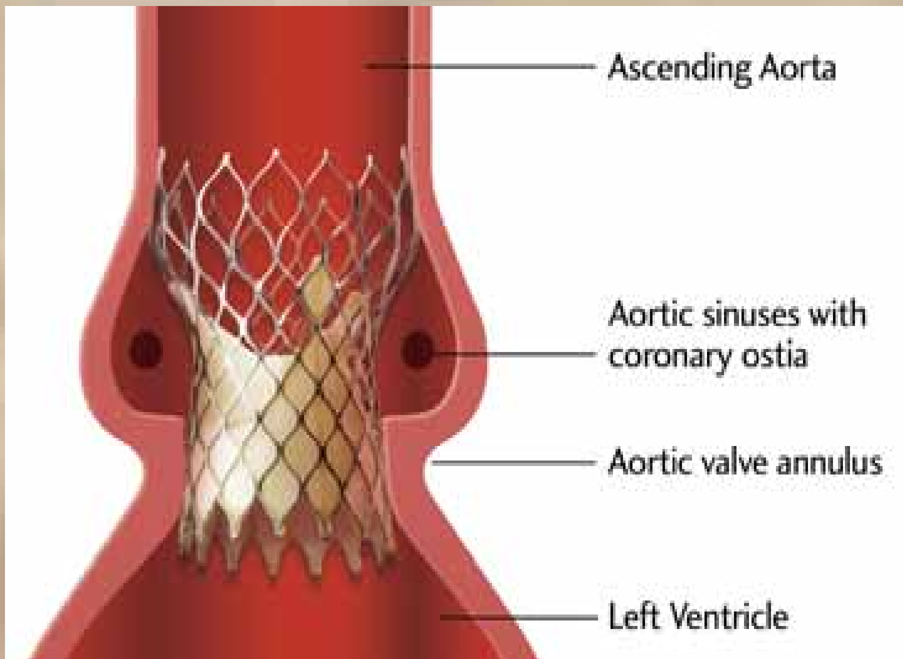
2. **Aortic valve geometry**
   1. Bicuspid vs tricuspid
   2. Coronaric Ostia localization
   3. Root Geometry

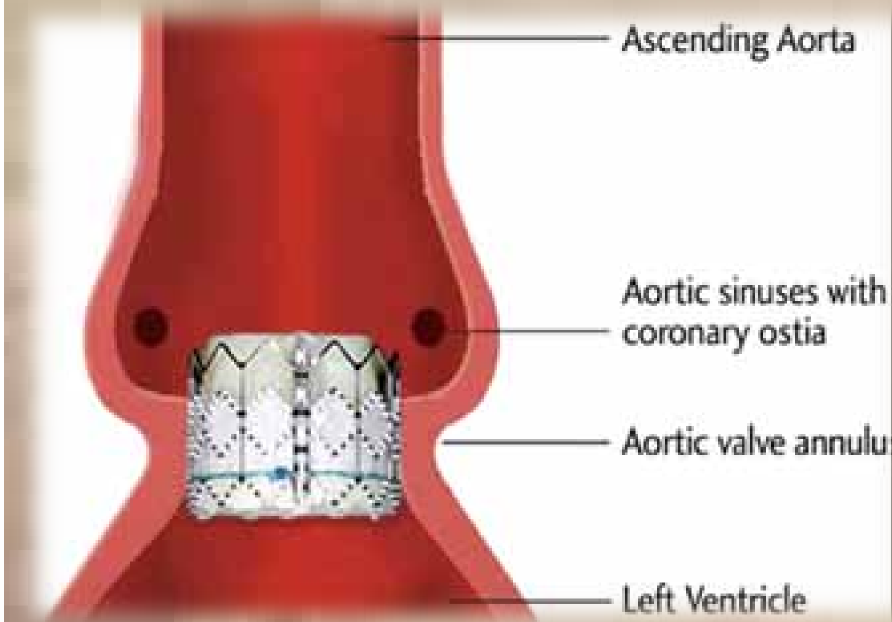
→ **Technique Choice**

AORTIC VALVE REPAIR

Trans-catheter Aortic Valve Implantation

TAVI





COREVALVE

Edwards Lifesciences

Medtronic

Inclusion Criteria

- Patologia della valvola aortica nativa
  Severa AS: AVAI ≤ 0.6 cm^2/m^2
- 20mm ≤ AV anulus ≤ 27mm
- **Aorta ascendente ≤ 43mm**

Età ≥ 75 anni

Logistic EuroSCORE ≥ 15%

Età ≥ 65 anni

1 o 2 (ma non più di 2)

- Cirrosi epatica - classe Child A-B
- Insufficienza polmonare: FEV < 1L
- Precedente intervento cardiochirurgico
- PHT: PAP>60mmHg
- PE ricorrente
- Scompenso ventricolo destro
- Hostile thorax (radiation, burns,etc)
- Severa patologia del tessuto connettivo
- Cachessia

COREVALVE
THE REVALVING TECHNOLOGY

COREVALVE

Patient Selection Matrix

	Non-Invasive		Angiography				Selection Criteria		
Anatomy	Echo	CT / MRI	LV gram	AO gram	Coronary Angiogram	AO & Runoffs	**Preferred**	**Borderline**	**Not Acceptable**
Atrial or Ventricular Thrombus	X						**Not Present**		**Present**
Mitral Regurgitation	X						≤ Grade 1	Grade 2	**> Grade 2**
LV Ejection Fraction	X		X				> 50%	30% to 50%	**< 20%**
LV Hypertrophy (wall thickness)	X						Normal to Mild (0.6 to 1.3 cm)	Moderate (1.4 to 1.6cm)	**Severe (≥ 1.7cm)**
Sub-Aortic Stenosis	X	X					**Not Present**		**Present**
Annulus (width)	X	X					20 to 23mm → 26mm device 24 to 27mm → 29mm device		**< 20mm or > 27mm**
Annulus-to-Aorta (angle) †		X	X	X			< 30°	30° to 45°	**> 45°**
AO Root (width)		X	X	X			≥ 30mm	27 to 29mm	**< 27mm (if Sinus < 15mm)**
Sinuses of Valsalva (height)		X	X	X	X		≥ 15mm	10 to 14mm	**< 10mm**
Coronary Ostia Position (take-off)					X		High	Mid-Sinus Level	**Low**
Coronary Disease					X		None	Mid or Distal Stenosis < 70%	**Proximal Stenosis ≥ 70%**
Ascend Aorta (width)		X	X	X			≤ 40mm → 26mm device ≤ 43mm → 29mm device		**> 43mm**
AO Arch Angulation		X		X		X	Large-Radius Turn		**High Angulation or Sharp Bend**
Aorta & Run-Off Vessels (Disease) ‡		X				X	None	Mild	**Moderate to Severe**
Iliac & Femoral Vessels (diameter)		X				X	≥ 7mm	Non-Diabetic ≥ 6mm	**< 6mm**

† *Within the first 7cm of the ascending aorta versus a perpendicular line across the aortic valve.*
‡ *Evaluate for evidence and degree of calcification, obstruction, tortuousity, and ulceration.*

Caution: The CoreValve ReValving™ System is not available in the USA for clinical trials or commercialization.
This document is not intended to be a substitute for attending a training program for any of the products mentioned. For detailed operator training / inservice support on the CoreValve ReValving™ System, please contact your local CoreValve representative.
REVALVING™ is a trademark of CoreValve, Inc. © Copyright, 2007, CoreValve, Inc. All rights reserved.
PN 090404 V1 June 2007

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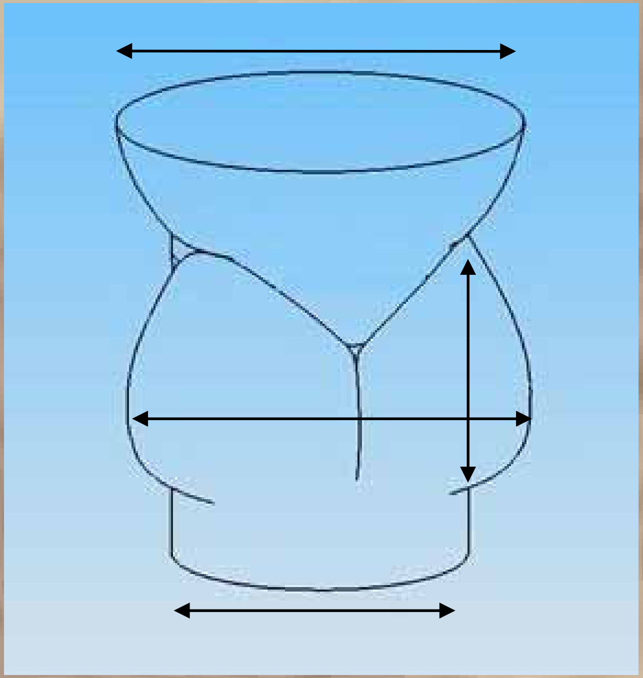
0050

Misure e Dimensioni

Aorta ≤ 40 mm for 26 mm device
Aorta ≤ 43 mm for 29 mm device



Sinus of Valsalva:

≥ 15 mm height

≥ 30 mm width

Annulus: 20 – 23 mm for 26 mm device
Annulus: 24 – 27 mm for 29 mm device

CoreValve

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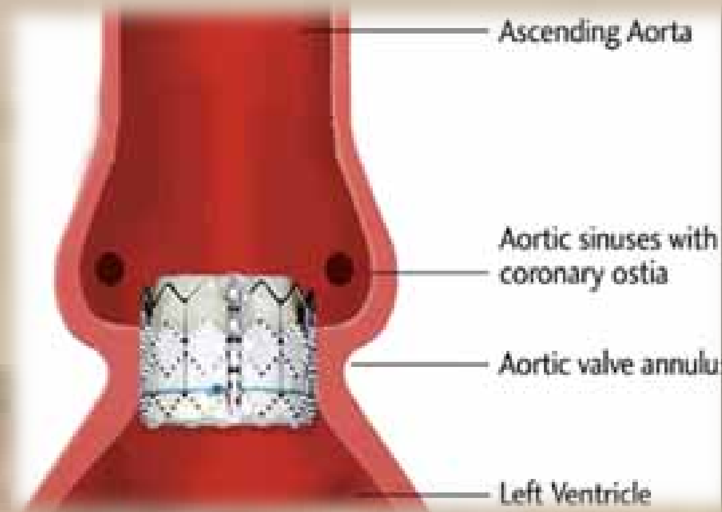
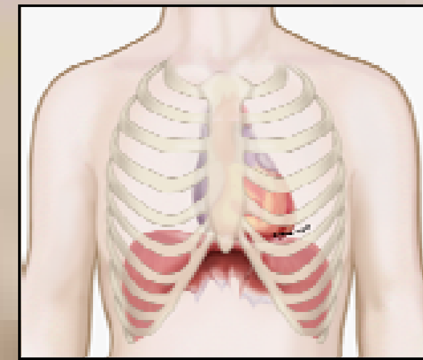
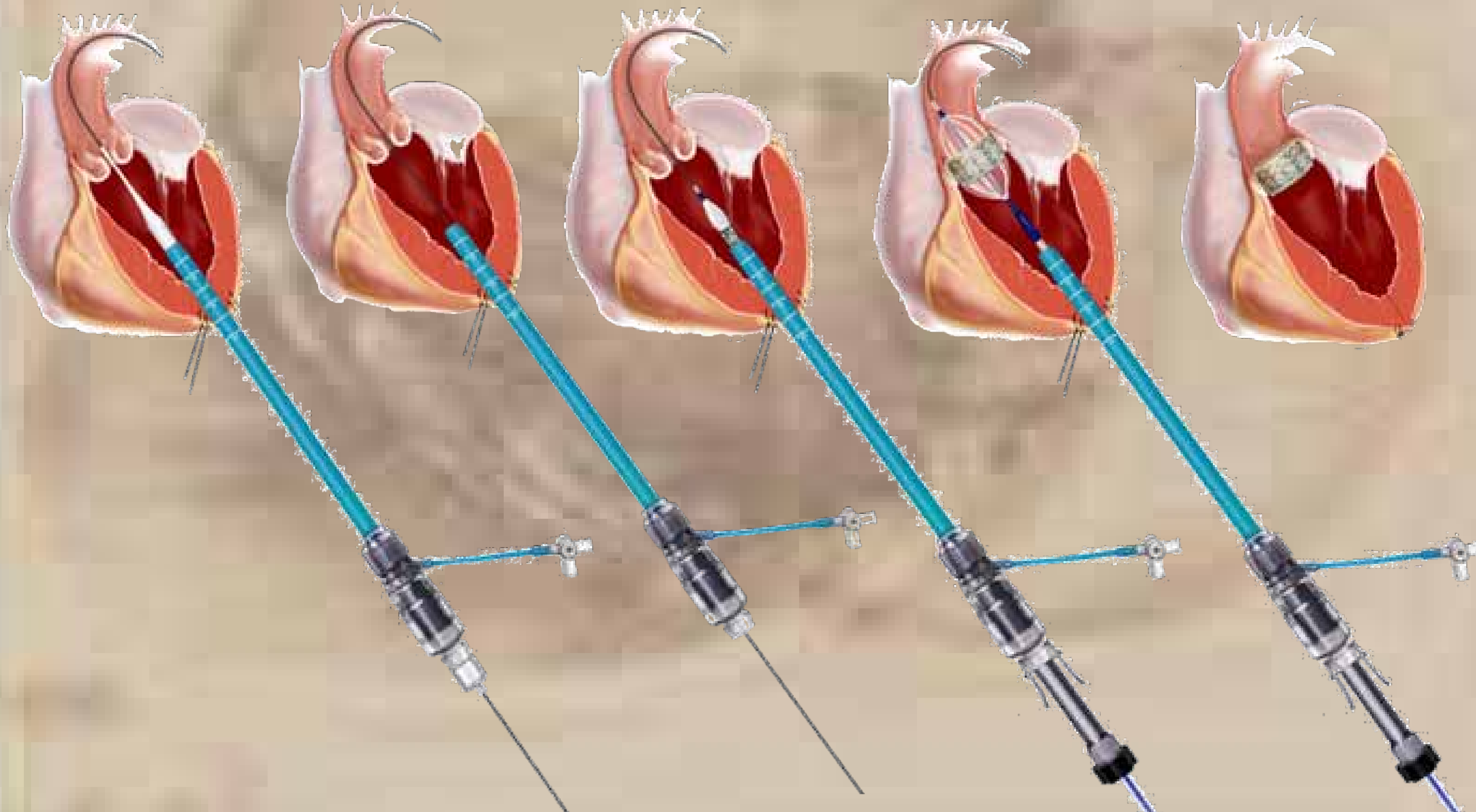


Modello #	Diametro Annulus (Range, mm)	Introduttore TRANSFEMORALE (Fr, mm)
23	18-21	22 Fr interno- 25 esterno = 8.3 mm
26	21-25	24 Fr interno- 27 esterno = 9 mm

Edwards SAPIEN™ THV (Edwards Lifesciences, Irvine, CA, USA)

Edwards Lifesciences



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3D 41%
3D 81dB
78 bpm
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EJCTS-7437; No of Pages 6

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European Journal of Cardio-thoracic Surgery xxx (2010) xxx–xxx

EUROPEAN JOURNAL OF CARDIO-THORACIC SURGERY

www.elsevier.com/locate/ejcts

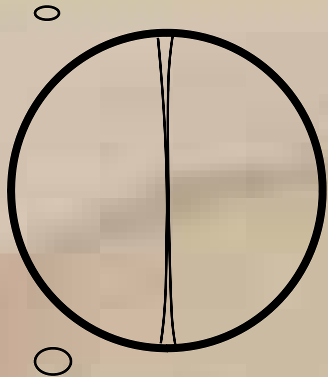
Bicuspid aortic valve: differences in the phenotypic continuum affect the repair technique☆

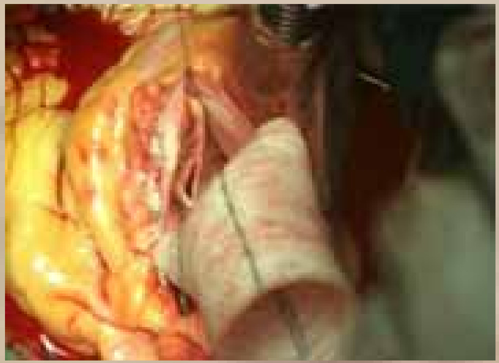
Andrea Mangini*, Massimo Lemma, Monica Contino, Matteo Pettinari, Guido Gelpi, Carlo Antona

Department of Cardiovascular Surgery, "Luigi Sacco" University General Hospital, Via G.B. Grassi 74, Milan 20157, Italy

Received 17 August 2009; received in revised form 24 November 2009; accepted 26 November 2009

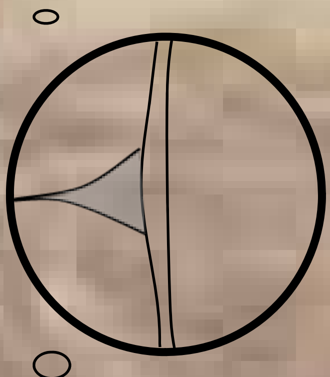
Type 1



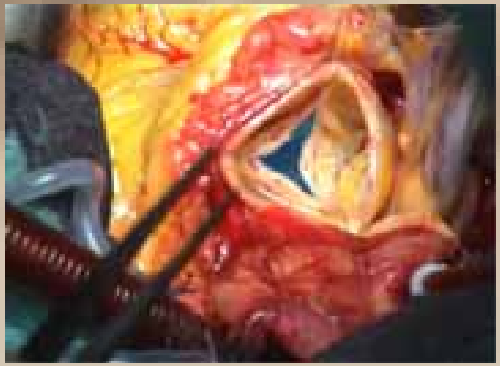


Phenotypic continuum

Type 2

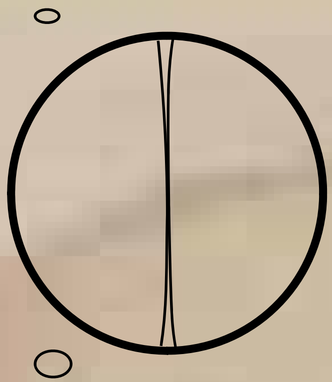


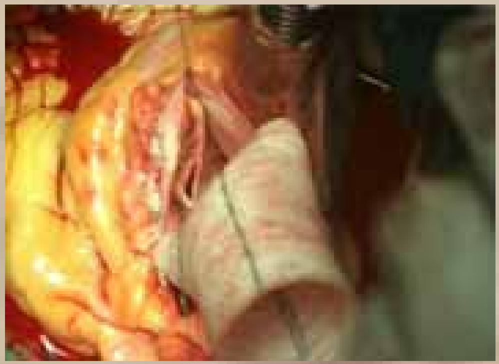
Type 3



AORTIC VALVE REPAIR

Type 1

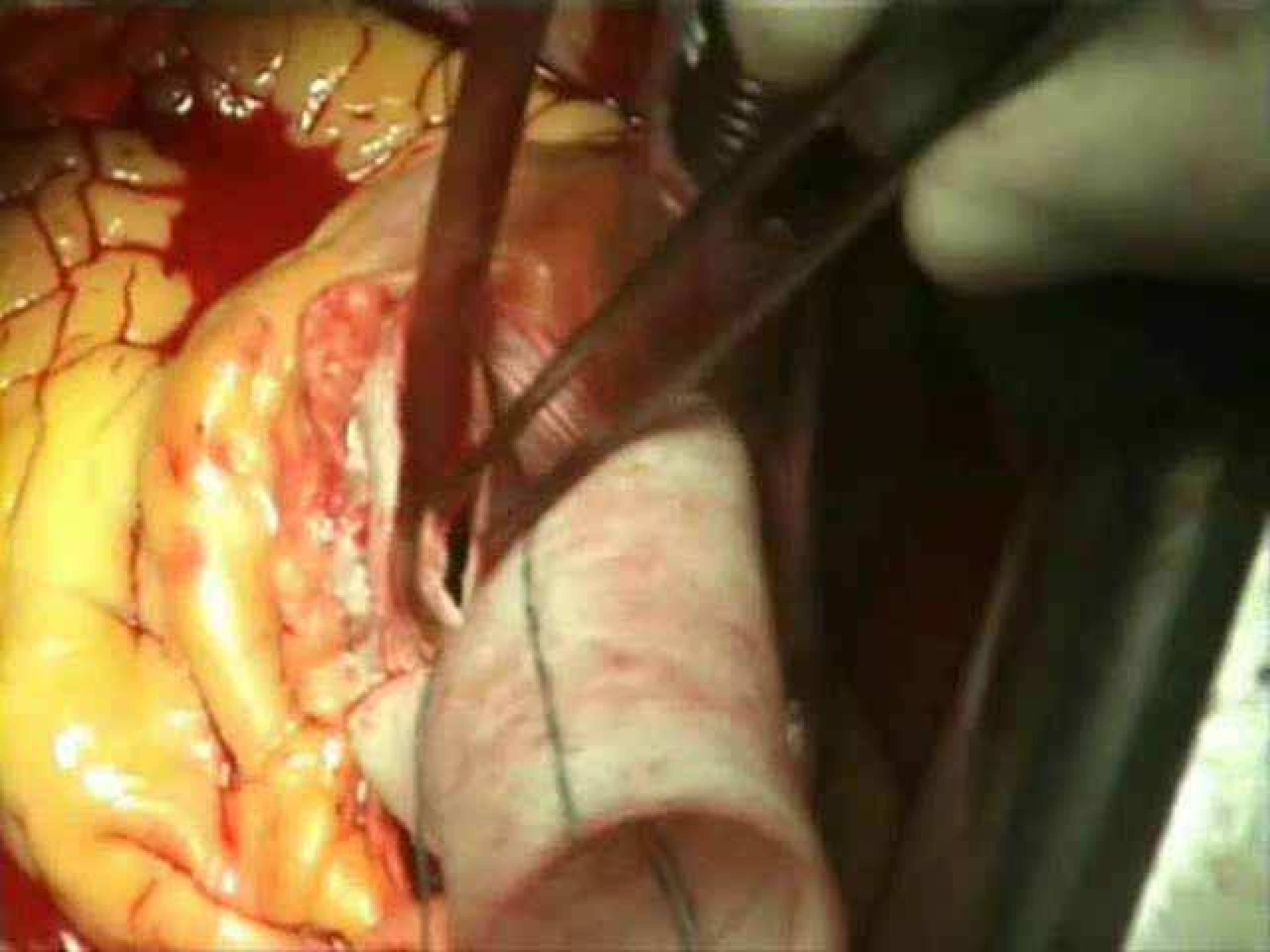




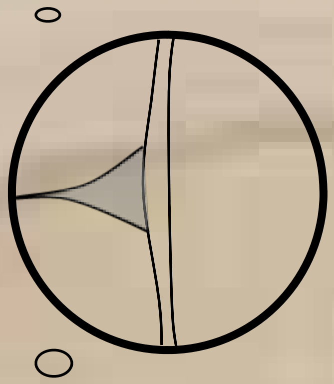
- **Real bicuspide valve with two complete leaflet, usually of the same lenght and without raphe or commisure;**
- **two sinuses structure**

Incompetence mechanism:
Prolapse of one leaflet causing an eccentric jet

AORTIC
VALVE
REPAIR



Type 2



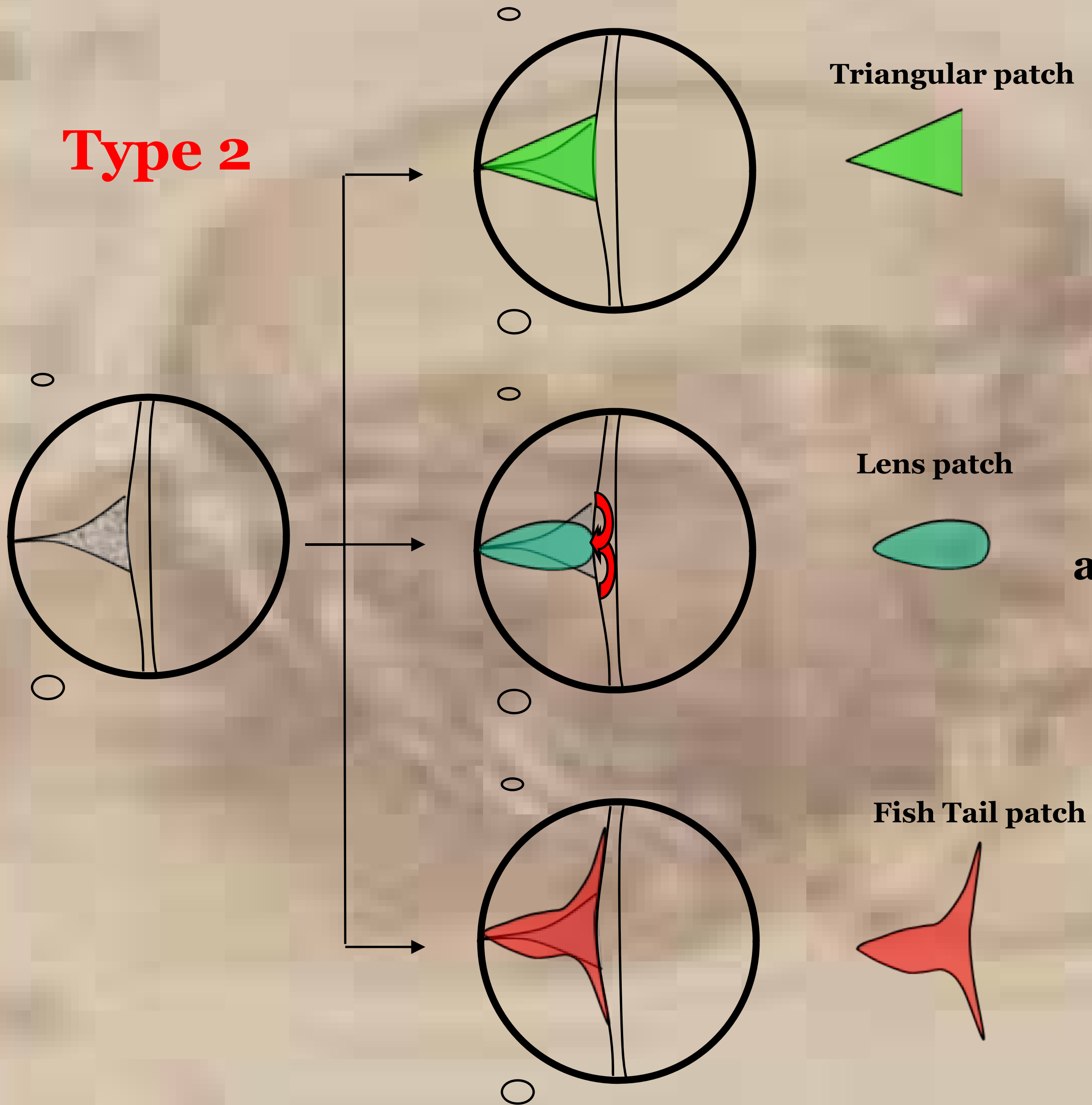
- Bicuspide valve with a fibrotic or calcified raphe usually hampering the normal leaflet motion or retracting the free edge towards the anulus in the middle portion of the leaflet;
- two or three sinuses structure

Incompetence mechanism:

Pseudo-prolapse of the other leaflet causing an eccentric jet or incomplete coaptation due to the calcified raphe generating a central jet

AORTIC VALVE REPAIR

Type 2



Raphe replacement

Raphe replacement and prolapsing leaflet

Raphe replacement and free edge fibrosis


COSTENARO, ANTONIE
05/03/29:094018
29 Mar 05
IT1 0.5
IM 0.50
CARDIOLOGIA
MPT7-4 CardA/ECtus
09:42:50
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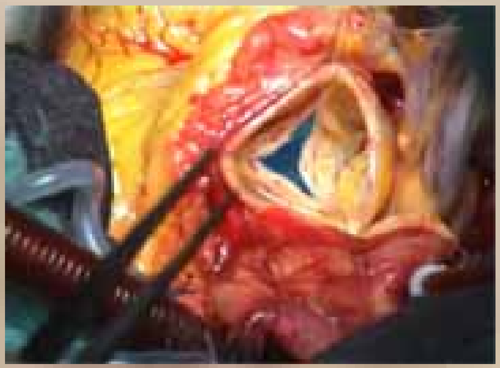
Type 3



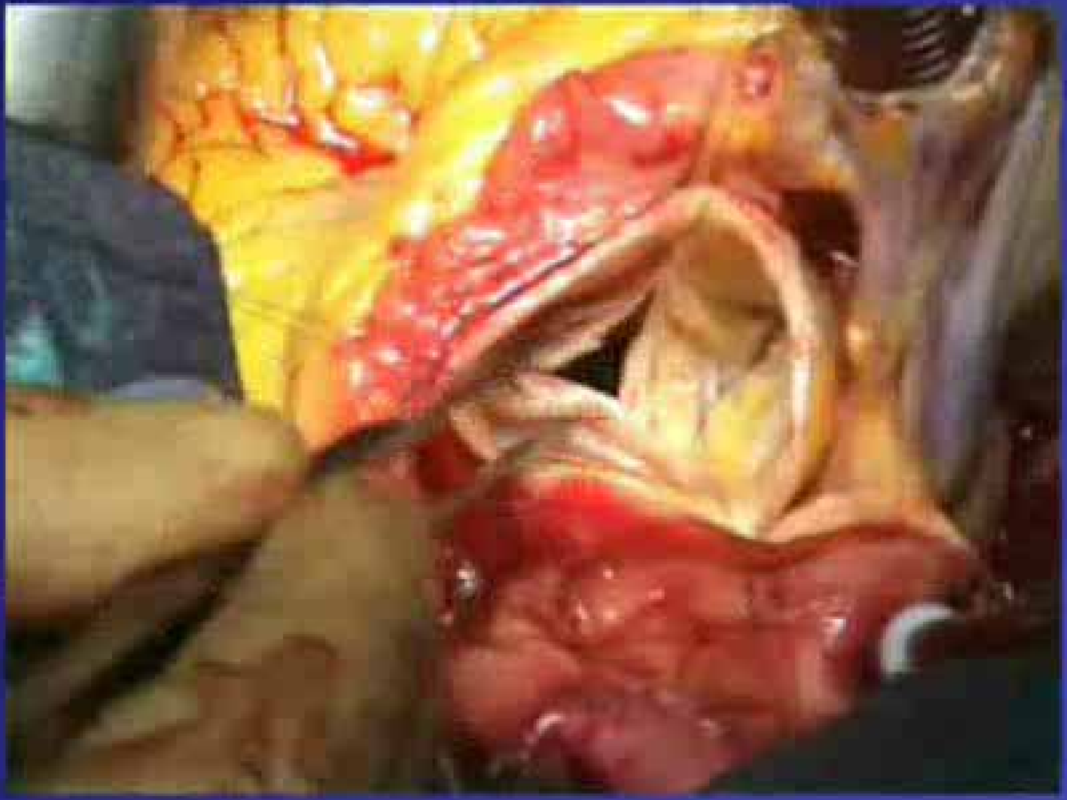
- Pseudo-bicuspide valve with one big leaflet and two other small leaflets with a commisure between them;

- a three commissures valve with three leaflets and three sinuses or a bicuspide valve with two sinuses, two leaflets and a cleft;

Incompetence mechanism:

Usually a fibrotic degeneration of the two small leaflets free edges creating a central defect in the coaptation with a central jet

AORTIC VALVE REPAIR



No perfect coaptation


Anteprima congresso

CORSO AVANZATO DI ECOCARDIOGRAFIA NELL'ECOCARDIOCHIRURGIA

Come utilizzare l'ecocardiografia transtoracica, transesofagea e 3D nella valutazione del cardiopatico prima, durante e dopo l'intervento cardiochirurgico

MILANO 9 MARZO 2010

PRESIDENTE ONORARIO
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Giuseppe Tarelli

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CONCLUSIONS

•"Numbers" alone can not lead to a correct surgical indication

•Nowadays NO surgeon will accept only a report but want to explore and understand images on his own.

•The Aortic Valve is a complex Functional Unit and surgical indications have to be matched and correlated between all its elements

AORTIC VALVE REPAIR

FoRCardio.Lab

Anteprima congresso

CORSO AVANZATO DI ECOCARDIOGRAFIA NELL'ECOCARDIOCHIRURGIA

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AORTIC VALVE REPAIR

Timing dell'intervento chirurgico.

Tutte le informazioni necessarie al chirurgo per la scelta della migliore soluzione possibile: riparazione percutanea, riparazione chirurgica o sostituzione valvolare?

Andrea Mangini
Research Director
FoRCardio.Lab
Università degli Studi di Milano – Politecnico di Milano

Cardiovascular Surgery Division
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Novel Measurement of Relative Aortic Size Predicts Rupture of Thoracic Aortic Aneurysms

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1326pts with 5918 pts/years of follow up in Yale University Database

Body surface area (BSA) was calculated using the Dubois and Dubois formula [9]:

$$BSA = 0.20247\left(wgt^{0.425} * \left(\frac{hgt}{100}\right)^{0.725}\right)$$

Aortic Size Index (ASI) = Aortic Diameter(cm) / BSA(m²)

(Ann Thorac Surg 2006;81:169–77)
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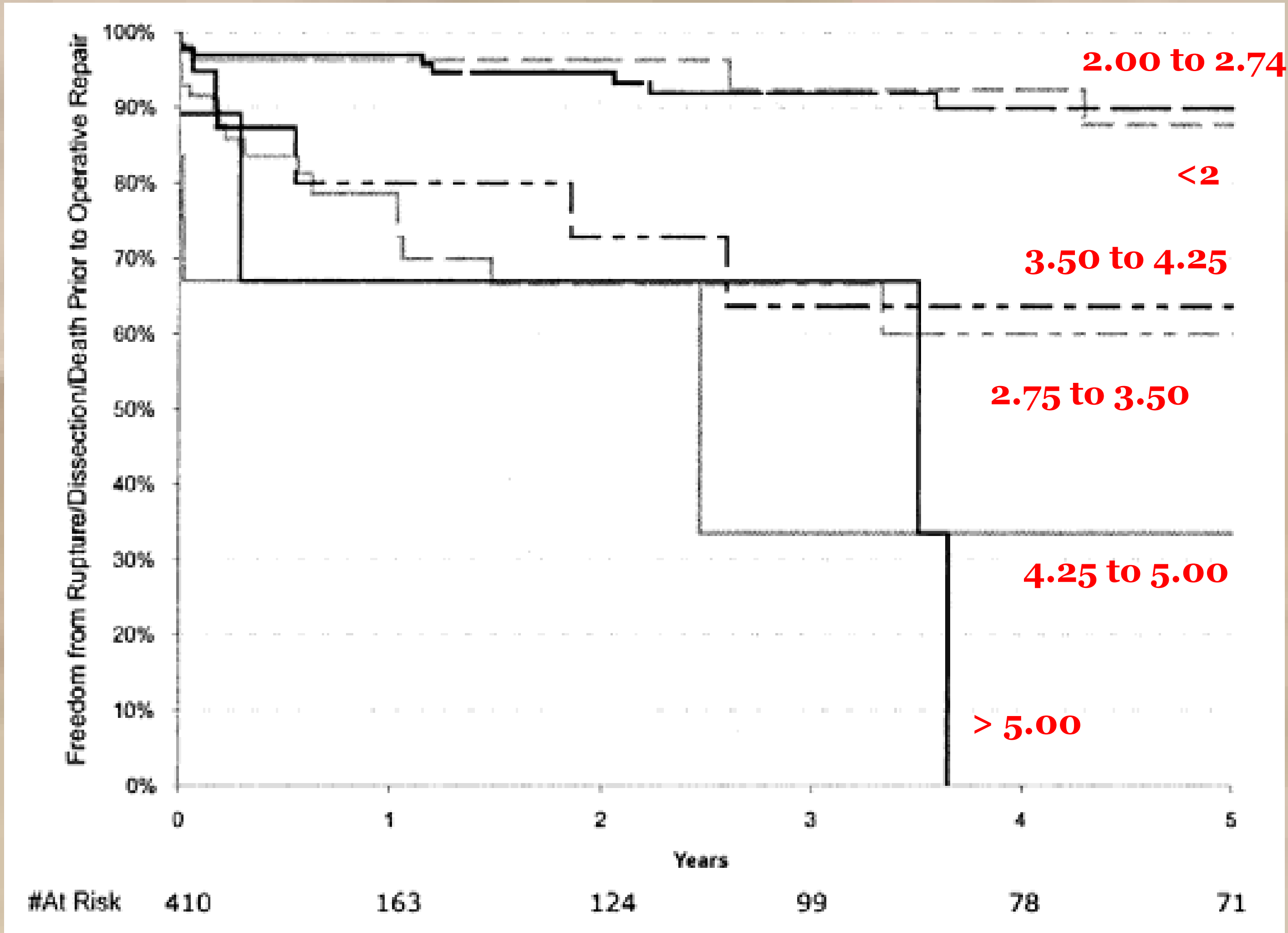
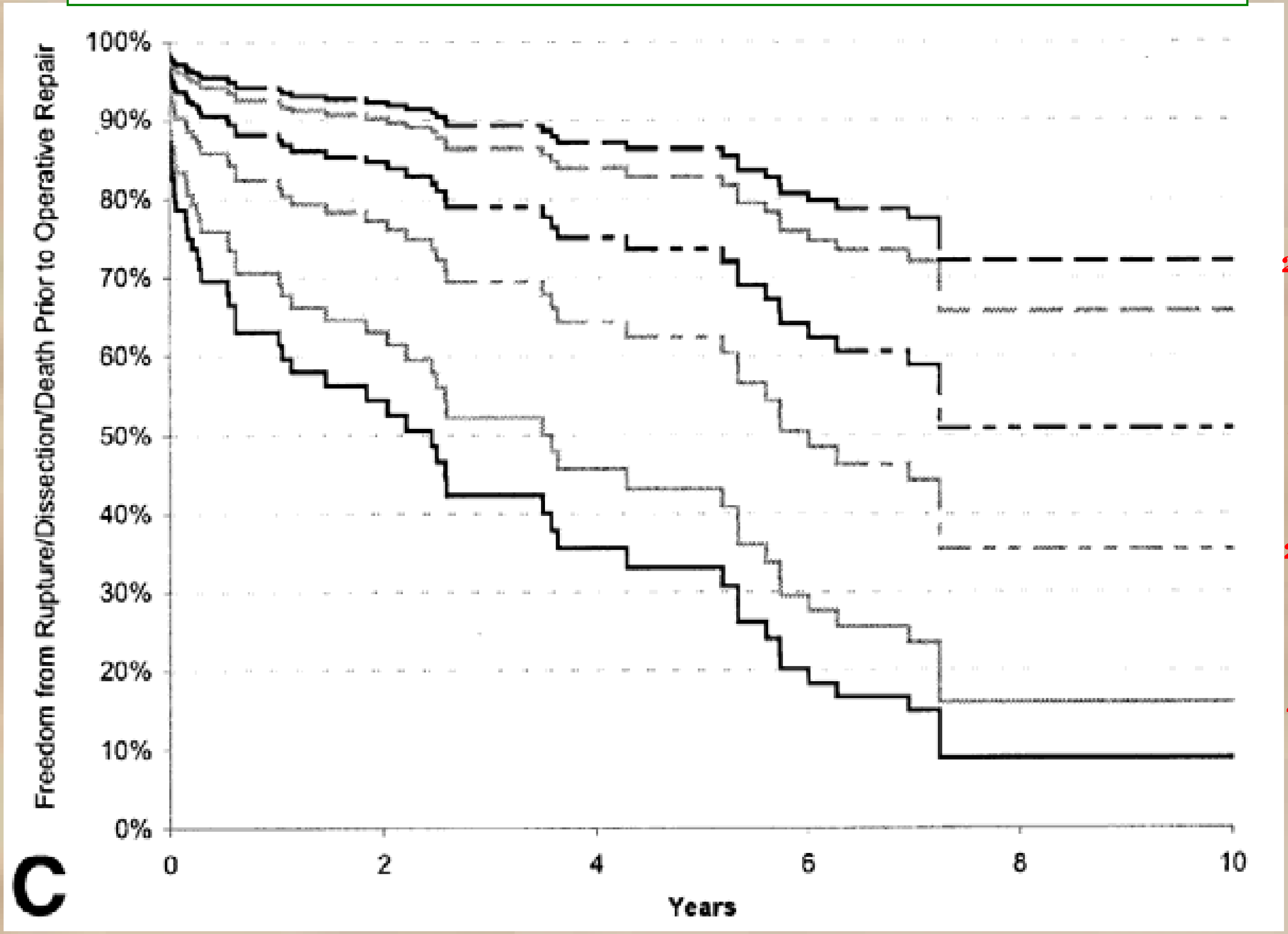
Freedom from Rupture/Dissection/Death prior to operative repair

Kaplan-Meier



10-year event-free estimated survival function stratified by ASI

COX Proportional Hazards regression



2.00 to 2.74

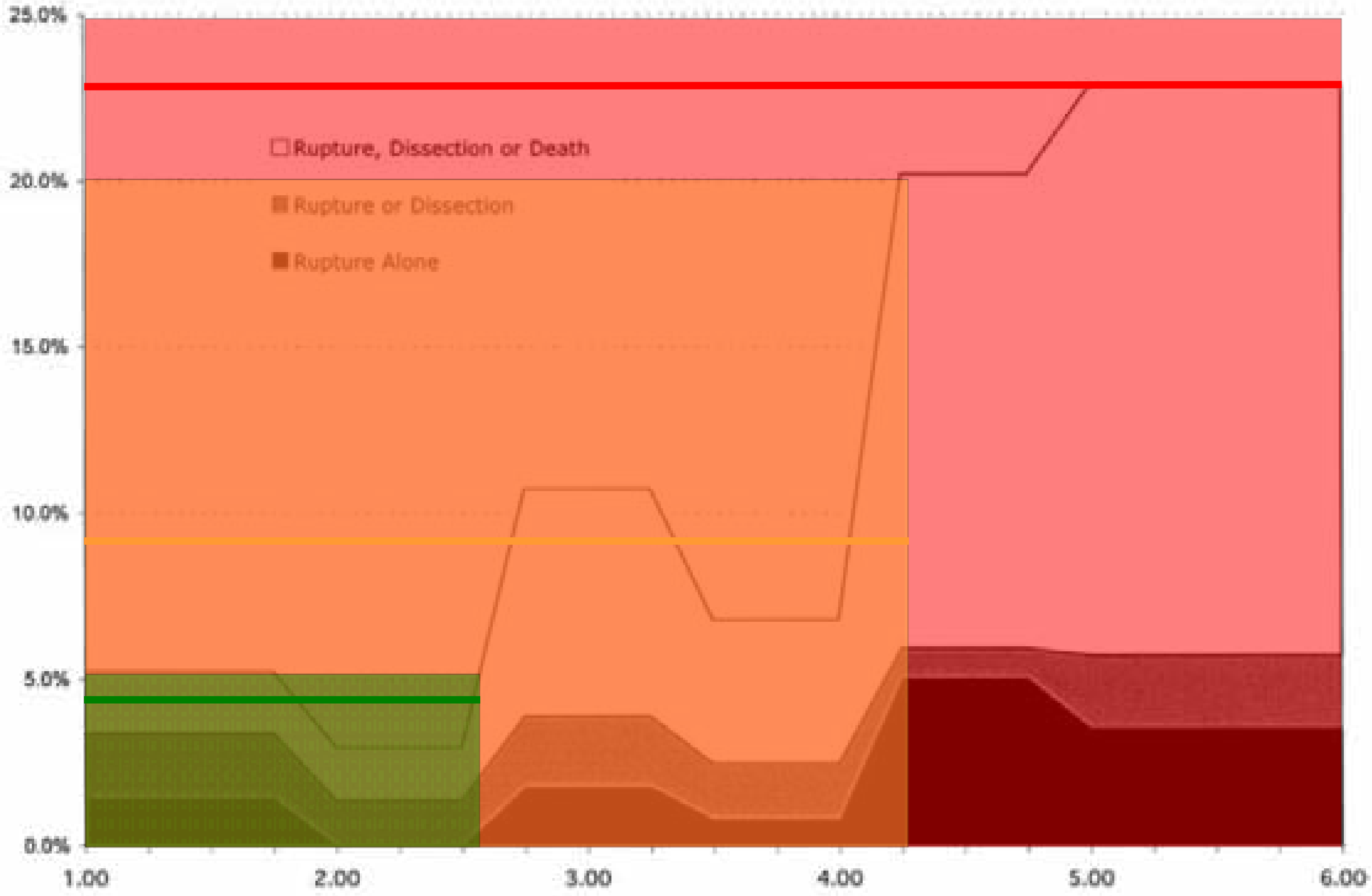
<2

3.50 to 4.25

2.75 to 3.50

4.25 to 5.00

> 5.00



Using ASI is possible to stratify pts into 3 risk categories

1. ASI < 2.75 yearly incidence 1% **(low risk)**
2. 2.75<ASI<4.25 yearly incidence 8% **(medium risk)**
3. ASI>4.25 yearly incidence 20-25% **(High risk)**

Table 5. *Risk of Complications by Aortic Diameter and Body Surface Area With Aortic Size Index Given Within Chart*

	Aortic Size (cm)									
	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0
BSA										
1.30	2.69	3.08	3.46	3.85	4.23	4.62	5.00	5.38	5.77	6.15
1.40	2.50	2.86	3.21	3.57	3.93	4.29	4.64	5.00	5.36	5.71
1.50	2.33	2.67	3.00	3.33	3.67	4.00	4.33	4.67	5.00	5.33
1.60	2.19	2.50	2.80	3.13	3.44	3.75	4.06	4.38	4.69	5.00
1.70	2.05	2.35	2.65	2.94	3.24	3.53	3.82	4.12	4.41	4.71
1.80	1.94	2.22	2.50	2.78	3.06	3.33	3.61	3.89	4.17	4.44
1.90	1.84	2.11	2.37	2.63	2.89	3.16	3.42	3.68	3.95	4.22
2.00	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00
2.10	1.67	1.90	2.14	2.38	2.62	2.86	3.10	3.33	3.57	3.80
2.20	1.59	1.82	2.05	2.27	2.50	2.72	2.95	3.18	3.41	3.64
2.30	1.52	1.74	1.96	2.17	2.39	2.61	2.83	3.04	3.26	3.48
2.40	1.46	1.67	1.88	2.08	2.29	2.50	2.71	2.92	3.13	3.33
2.50	1.40	1.60	1.80	2.00	2.20	2.40	2.60	2.80	3.00	3.20

☐ = low risk (~1% per yr); ▒ = moderate risk (~8% per yr); ▓ = severe risk (~20% per yr).

White area indicates low risk, light gray area indicates moderate risk, and dark gray area indicates severe risk.

BSA = body surface area.

Women → changes in the activity of inflammatory mediators in the presence of higher estrogen levels

⇩

Ropture below what most would consider appropriate operative intervention criteria

Simulation
Female 40Kg 150cm 70y/o

BSA	1.30
Expected Ascending Aorta D *(D=3.9xBSA+26.3)*	31.38 mm
Expected Aortic Size Index *(=AAD/BSA)*	2.40cm/m²
ze with 8%/year complications rates ***Surgical Indication***	35.8mm

AORTIC VALVE REPAIR

Simulation
male 80Kg 175cm 70y/o

BSA	1.95
Expected Ascending Aorta D *(D=4.3xBSA+27.1)*	35.48 mm
Expected Aortic Size Index *(=AAD/BSA)*	1.81cm/m^2
ze with 8%/year complications rates ***Surgical Indication***	49.9mm