

EuroValve

March 10-11, 2016

Hotel Bloom!, **Brussels**, BELGIUM
www.eurovalvecongress.com

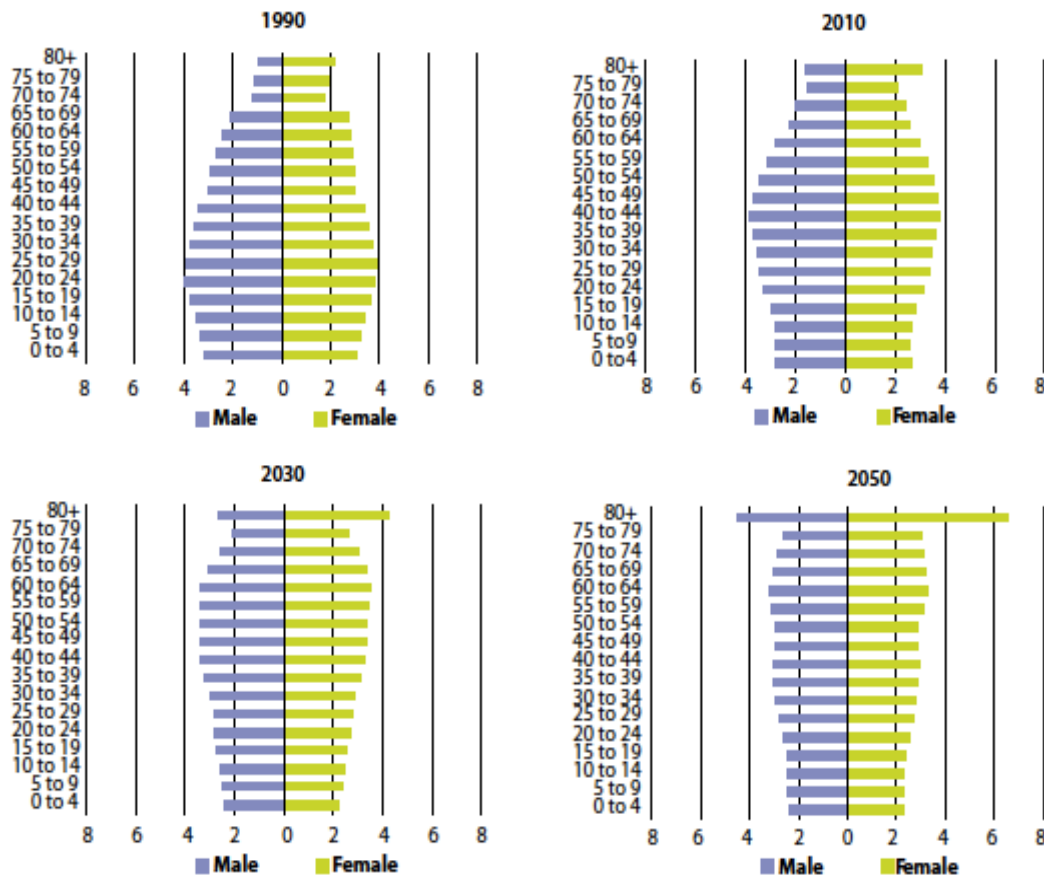


NEW CHALLENGES: **Comorbidities and Multiple Valves**

Dr BD Prendergast DM FRCP FESC

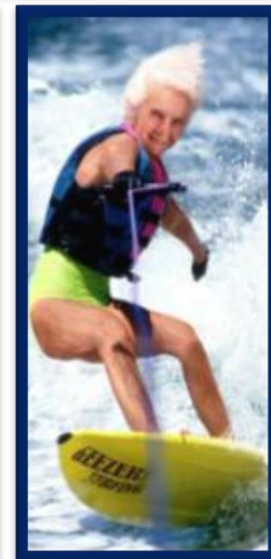
St Thomas' & London Bridge Hospitals, London, UK

We are all getting older...



Percent of total population

Eurostat 2010



The Burden of Valve Disease



US Population study: pooled from CARDIA, ARIC, CHS

11,911 adults with routine echocardiography

US Community study: Rochester, Minnesota (Mayo Clinic)

16,501 adults with clinically indicated echocardiograms (18.6% of population)



Methods

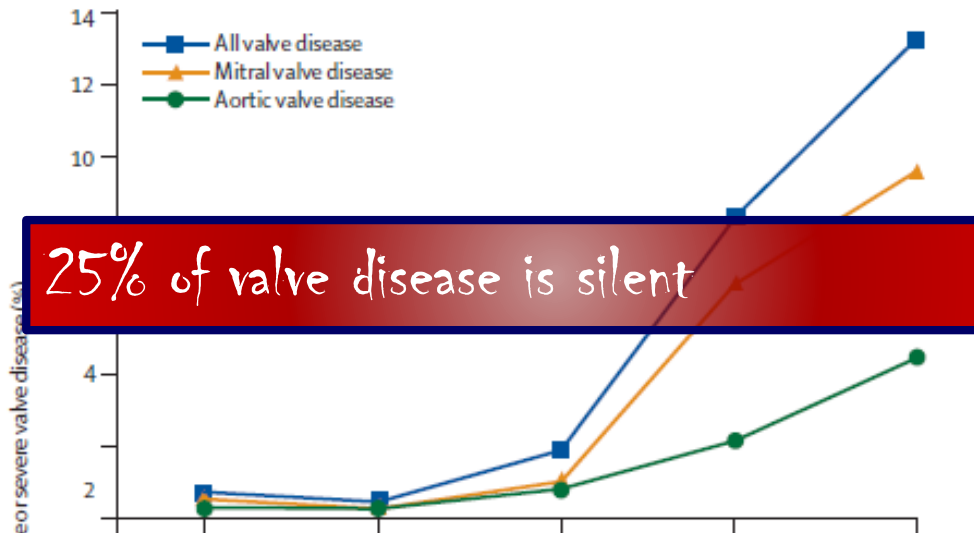
Moderate/severe disease only

ACC/ASE definitions

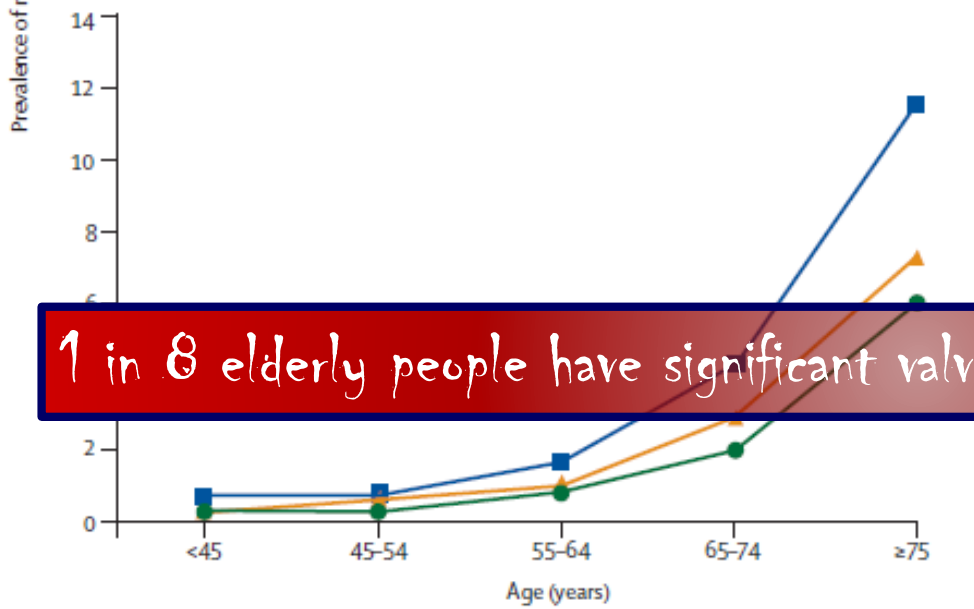
Age/gender specific analyses

Survival vs. matched controls

Nkomo VT et al. *Lancet* August 18th 2006: 1005-1011.



25% of valve disease is silent



1 in 8 elderly people have significant valve disease

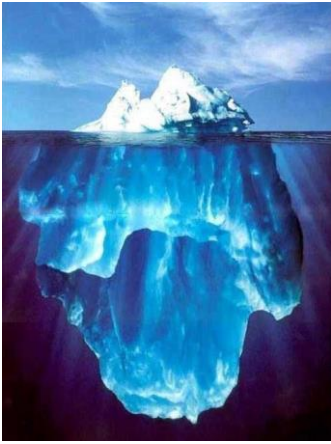
Population prevalence
(2000 census
"Case burden"

2.5%

Community prevalence
"Clinical burden"

1.8%

MR 1.7%, MS 0.1%
AR 0.5%, AS 0.4%



OxVALVE

VALVULAR HEART DISEASE
Population Cohort Study

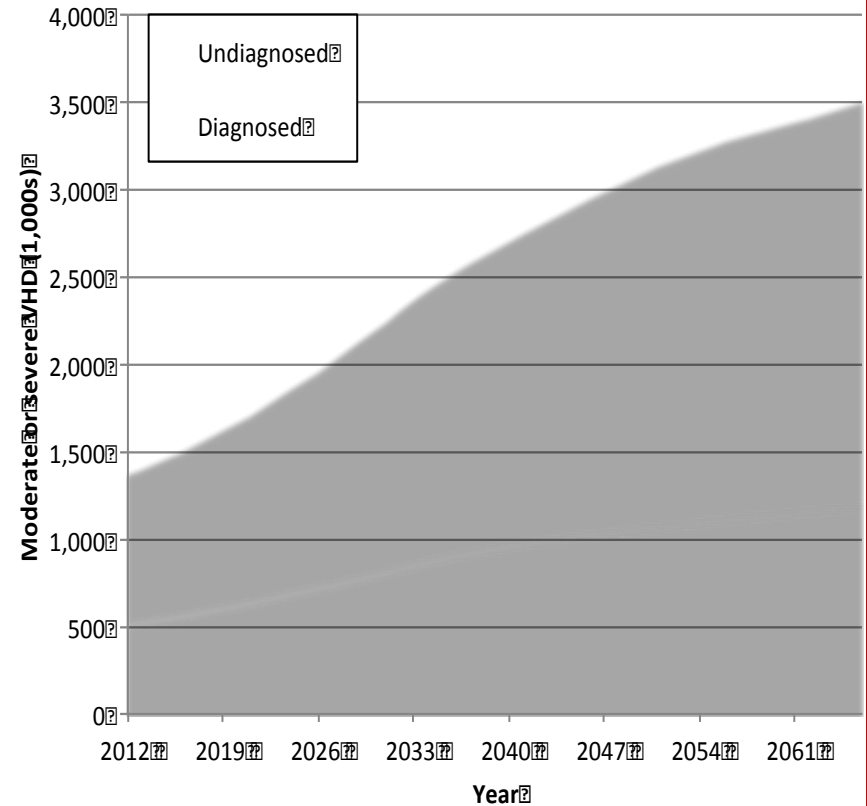
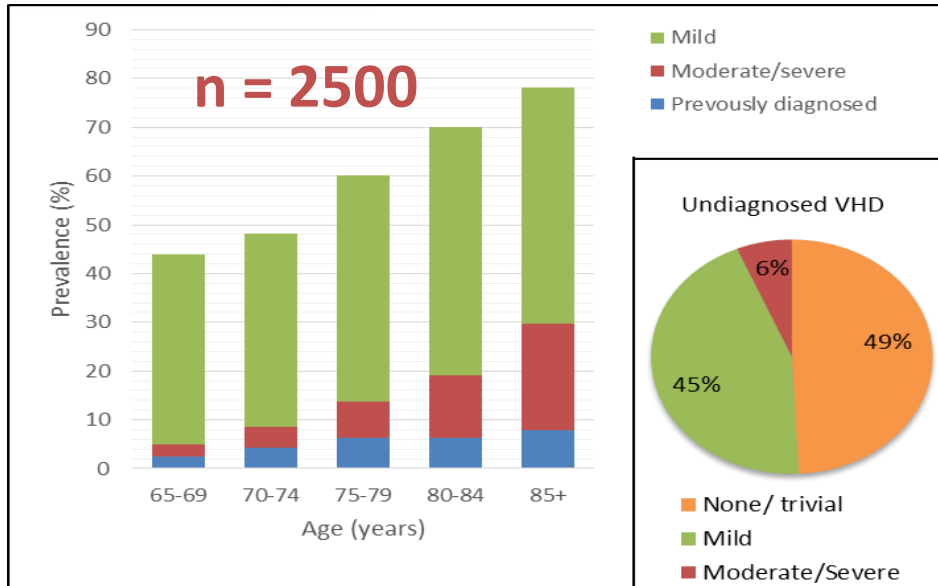


*National Institute for
Health Research*

School for Primary Care Research

Oxford Radcliffe Hospitals 

Results



Aortic Stenosis in the 21st century

Clinical characteristics of a 52,000 French population

- French hospital episode statistics 2007
- ICD 10 coding for AS
- 51,720 patients with AS in 1200 hospitals
- Characteristics
 - Mean age 78+/-11 yrs
 - >70 yrs 82%
 - Male 52% (female dominance >80 yrs)
 - Diabetes 22%, hypertension 65%, PVD 8%
 - Neurological dysfunction 13%, COPD 14%
 - Renal dysfunction 12%
 - AF 36%





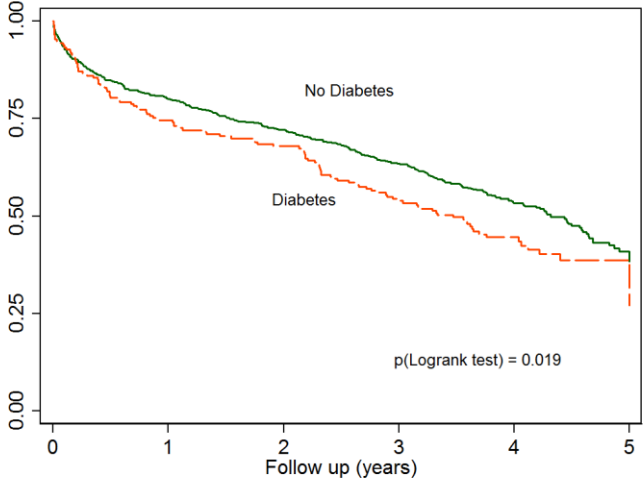
Three- and Five-Year Outcomes After Transcatheter Aortic Valve Implantation in High-Risk Patients With Severe Aortic Stenosis

The U.K. TAVI (United Kingdom Transcatheter Aortic Valve Implantation) Registry

Alison Duncan¹, Peter Ludman², Winston Banya¹, David Cunningham³, Damien Marlee³, Simon Davies¹, Jan Kovac⁴, Thomas Spyt⁴, Neil Moat¹

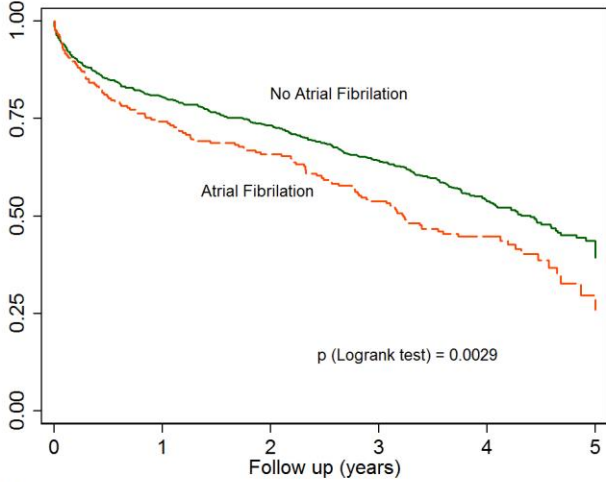
1: Royal Brompton Hospital, London, 2: Queen Elizabeth Hospital, Birmingham
3: University College Hospital, London, 4: University Hospital Leicester,

Independent Predictors of Long-Term Survival



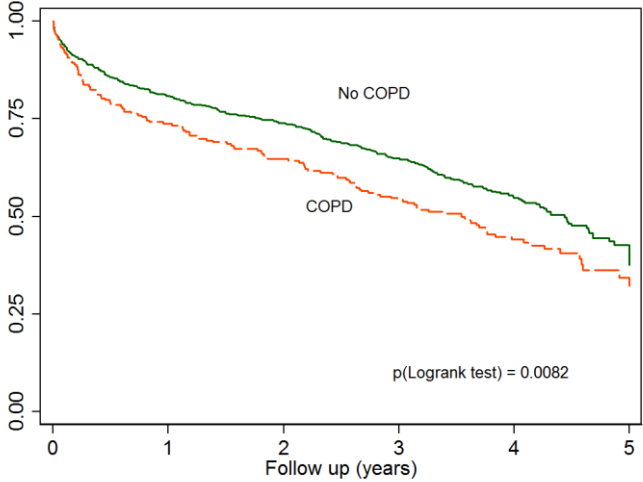
Number at risk

No Diabetes	656	520	465	401	215	47
Diabetes	195	144	131	105	46	10



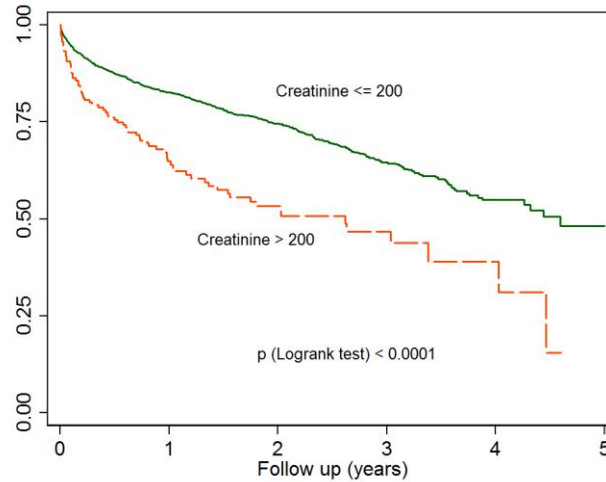
Number at risk

No Atrial Fibrillation	650	518	470	406	217	50
Atrial Fibrillation	204	150	132	106	46	8



Number at risk

COPD	589	473	429	369	191	41
No COPD	236	171	150	125	61	16



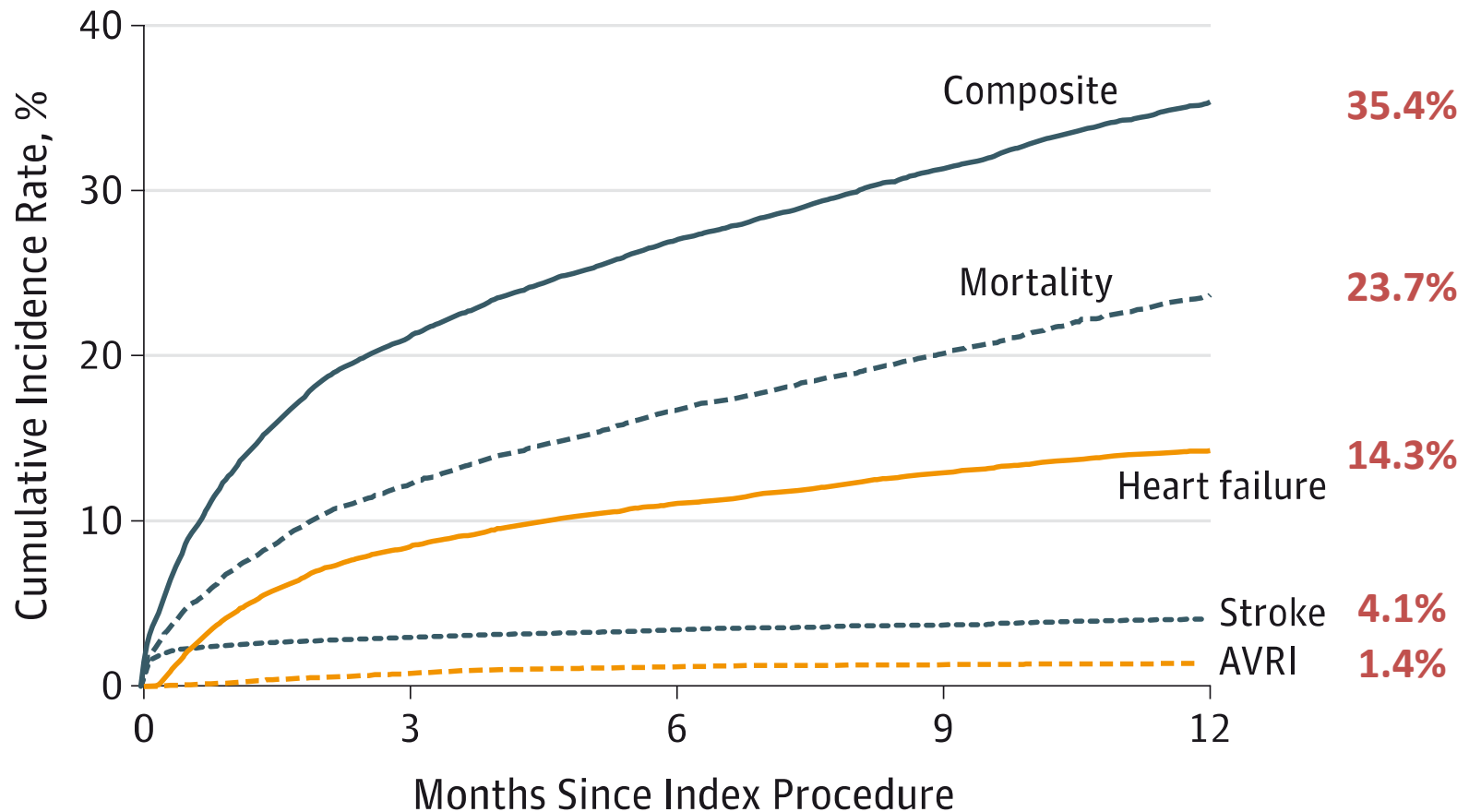
Number at risk

Creatinine <= 200	2336	1499	809	321	76	11
Creatinine > 200	162	80	42	16	6	0

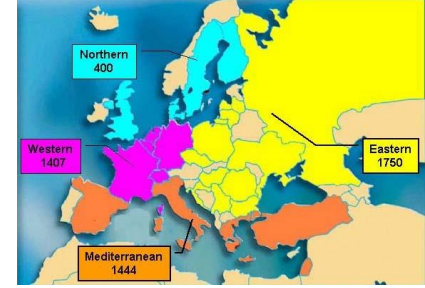
Clinical Outcomes at 1 Year Following Transcatheter Aortic Valve Replacement



“Big data” study: STS/ACC TAVI Registry & Medicare/Medicaid claims 2011-2013
12,182 TAVI procedures at 299 US centres (median age 84 yrs, median STS PROM 7.1%)



Prevalence of VHD in Europe



92 centers
25 countries

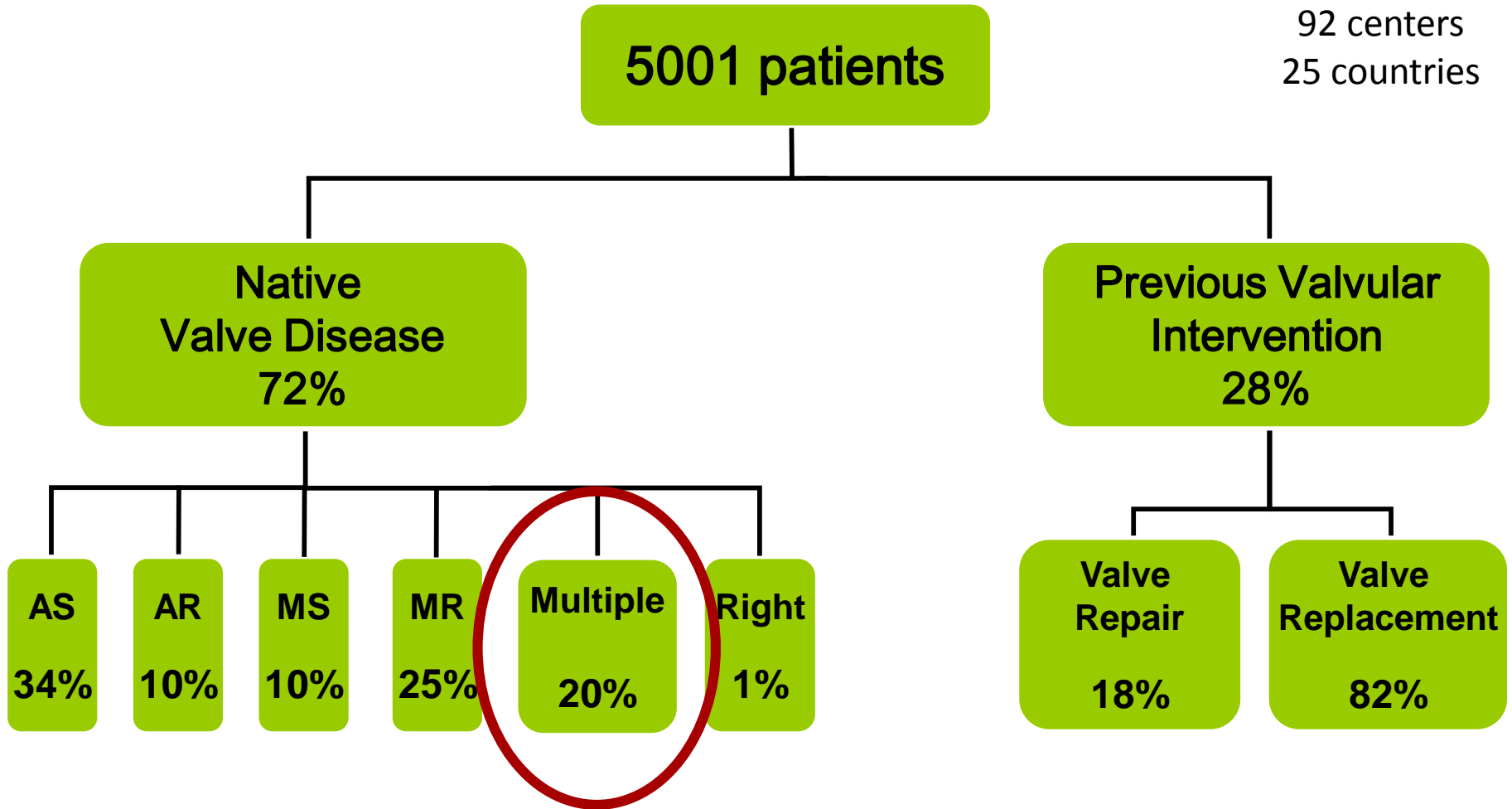
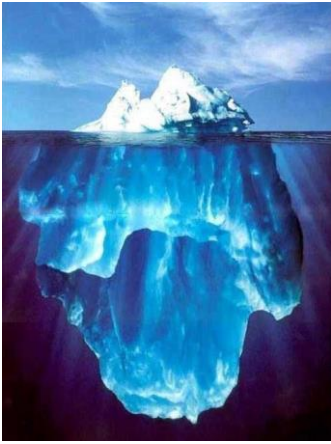


Table 2 Causes of multivalve heart disease

Acquired		
Cardiac diseases	Rheumatic heart disease	→ 51%
	Infective endocarditis	→ 3 %
	Degenerative calcific	→ 41%
Adverse effects of treatment	Cardiac remodelling/dilatation (functional)	
	Thoracic/mediastinal radiation therapy	
	Adverse drug effects (ergot-derived agonists, anorectic agents)	
Non-cardiac systemic diseases	End-stage renal disease on haemodialysis	
	Carcinoid heart disease	
Congenital		→ 1%
Connective tissue disorders	Marfan syndrome	
	Ehlers–Danlos syndrome	
Other (rare)	Trisomy 18, 13 and 15	
	Ochronosis (alkaptonuria)	
	Shone’s anomaly	
	Congenital polyvalvular cardiac disease, without trisomy	



OxVALVE

VALVULAR HEART DISEASE
Population Cohort Study

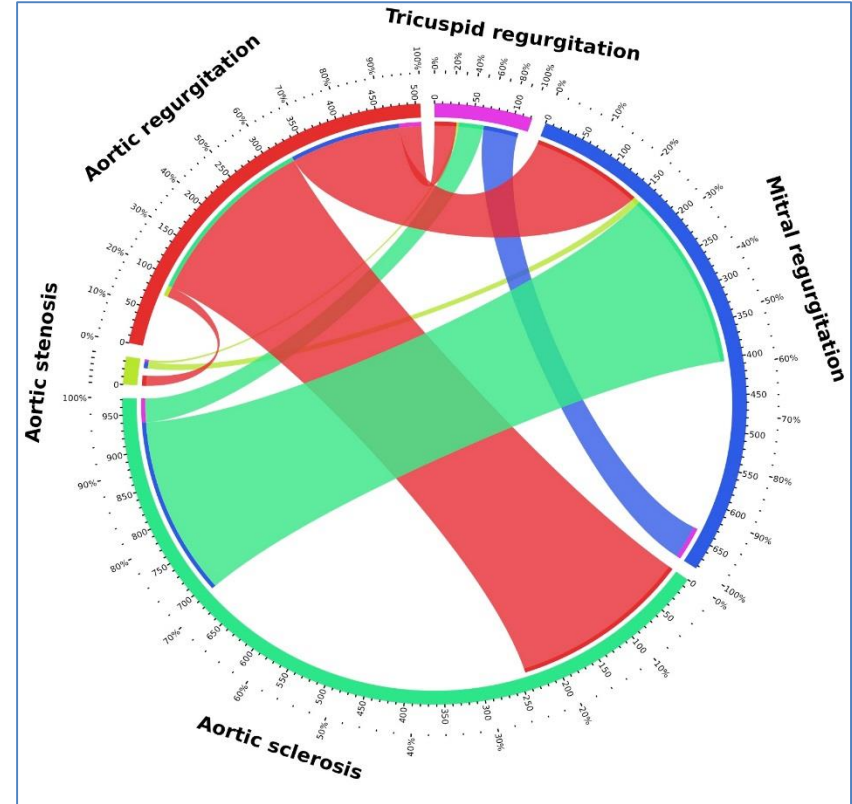
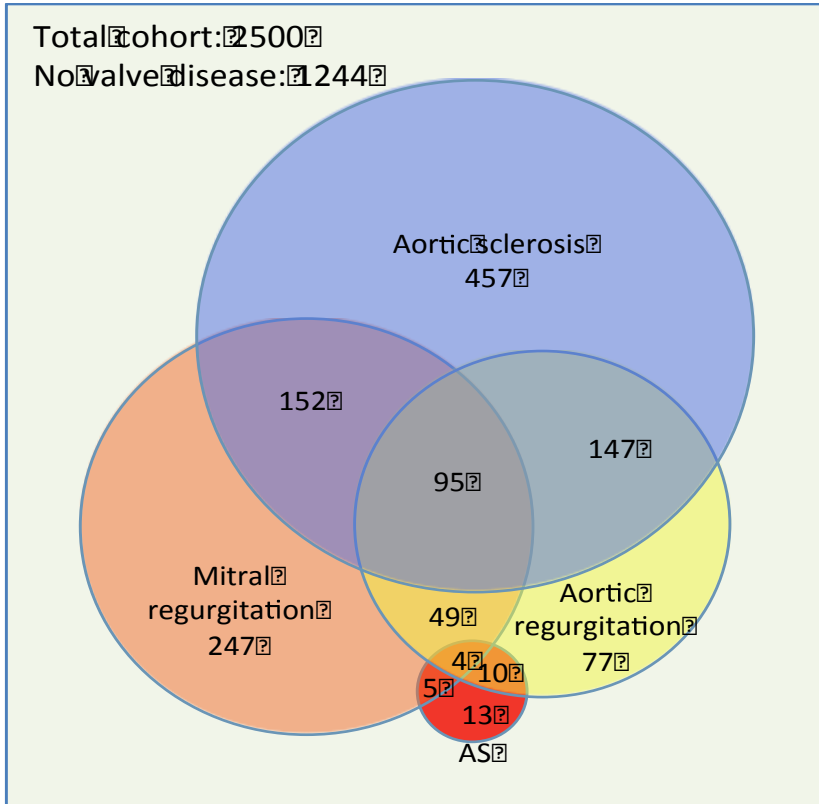


*National Institute for
Health Research*

School for Primary Care Research

Oxford Radcliffe Hospitals 

Results



Management of Single Valve Lesions

Severe

Moderate

Mild



Symptoms
Cavity enlargement
LV dysfunction



Management of Multivalvular and Combined Lesions

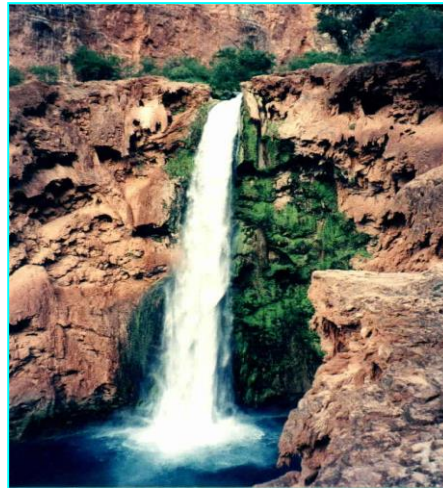
Moderate

Moderate

Severe



+



=



Symptoms
Cavity enlargement
LV dysfunction



PHILIPS

18/12/2009

15:06:45

TIS0.9

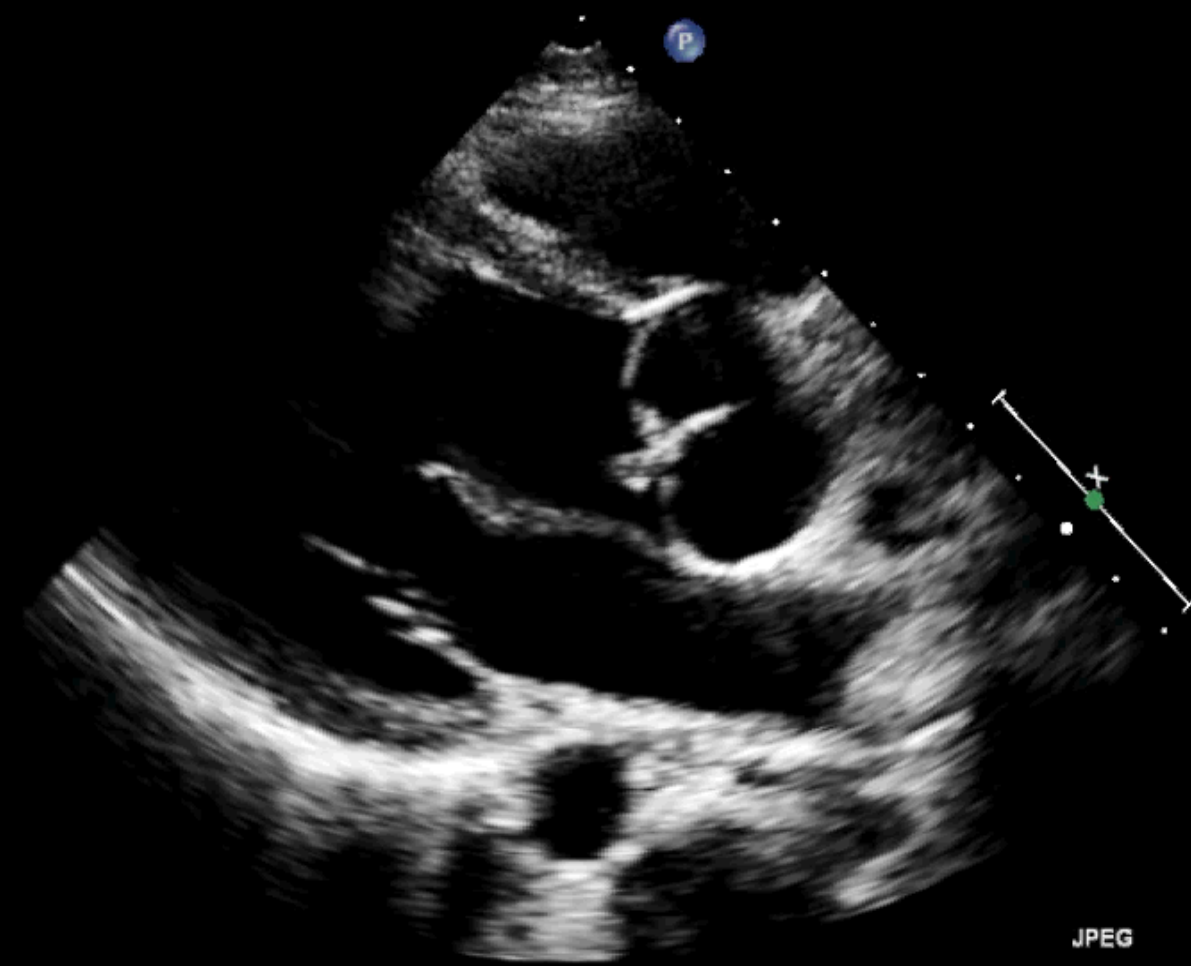
JPEG CR 23:1
MI 1.4

S5-1/OXFORD

FR 55Hz
13cm

M3

2D
44%
C 50
P Low
HGen

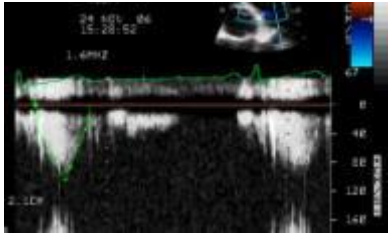


JPEG

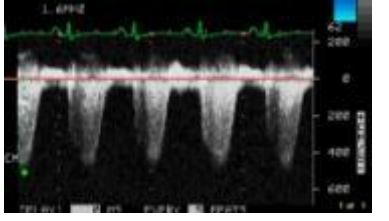
65 bpm

Haemodynamics

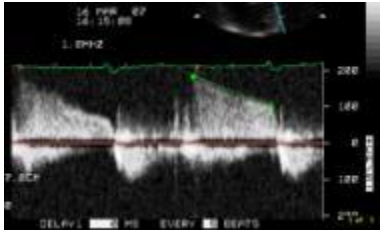
RVOT flow



TR – derive peak PA systolic pressure



PR – mean PA pressure



RA pressure



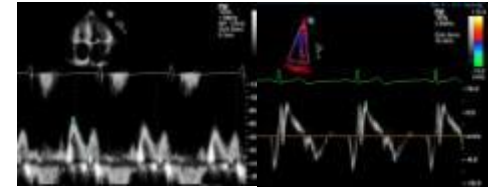
Systemic vascular resistance

Pulmonary vascular resistance

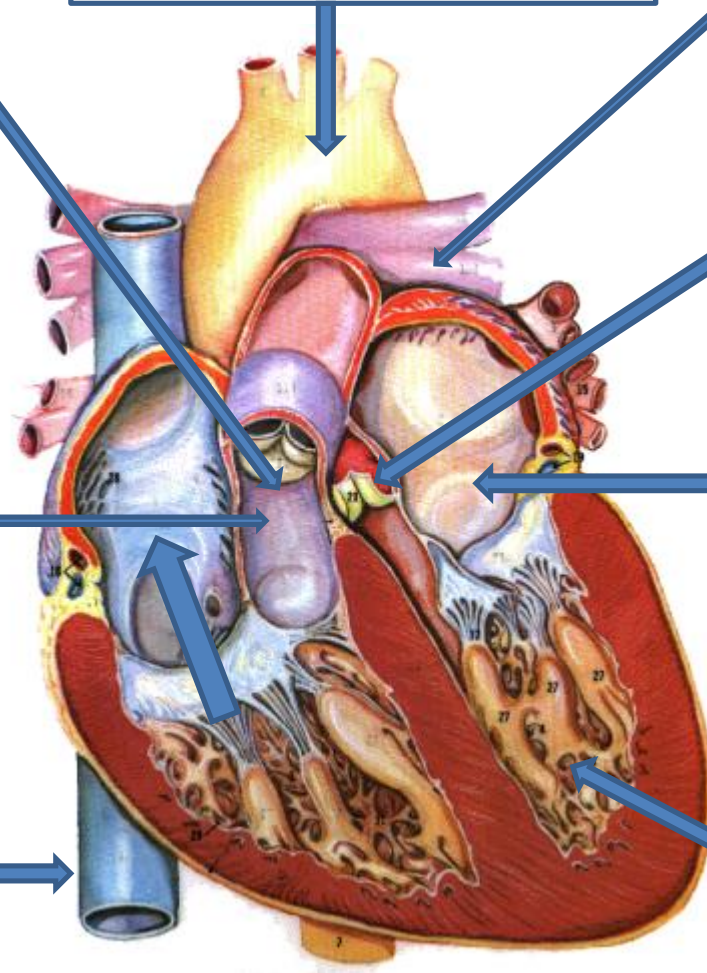
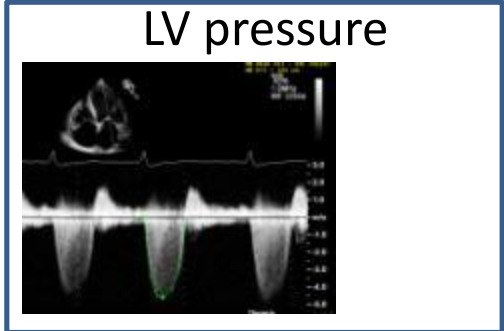
Cardiac output



LA pressure



LV pressure



Multiple and Mixed Valve Disease: Role of Echocardiography

As with any single valve-single lesion disease, imaging of patients with multiple and/or mixed valve disease should evaluate:

- Aetiology
- Mechanism(s) of dysfunction
- Severity
- Consequences
- Possibility of repair

Multiple and Mixed Valve Disease: Role of Echocardiography

...nevertheless, there are specific issues, including

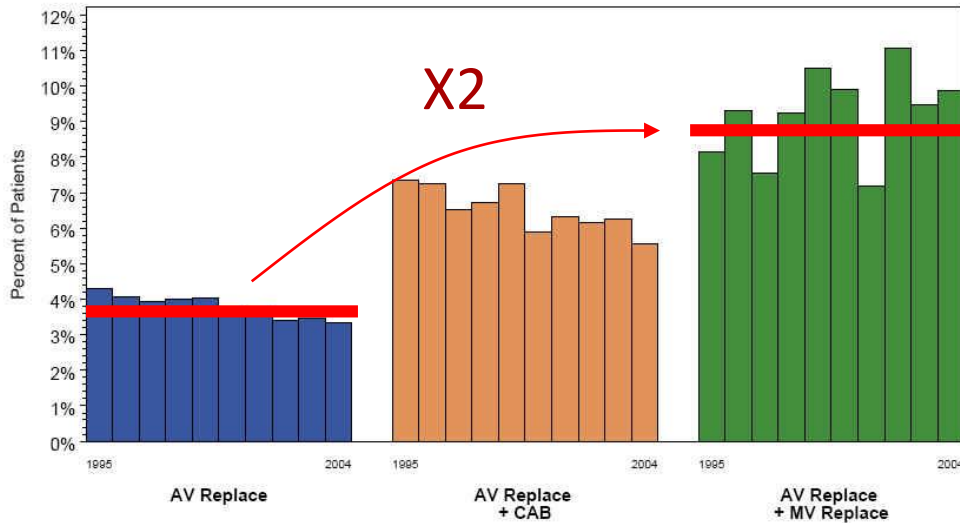
- scarcity of data in the literature
- indices of the severity of valvular regurgitation or stenosis validated only in patients with single valve-single lesions disease
- hemodynamic interaction
 - Measurements which are less dependent on loading conditions are preferred (eg. direct planimetry, ERO, vena contracta)

Interventions in Multiple Valve Disease

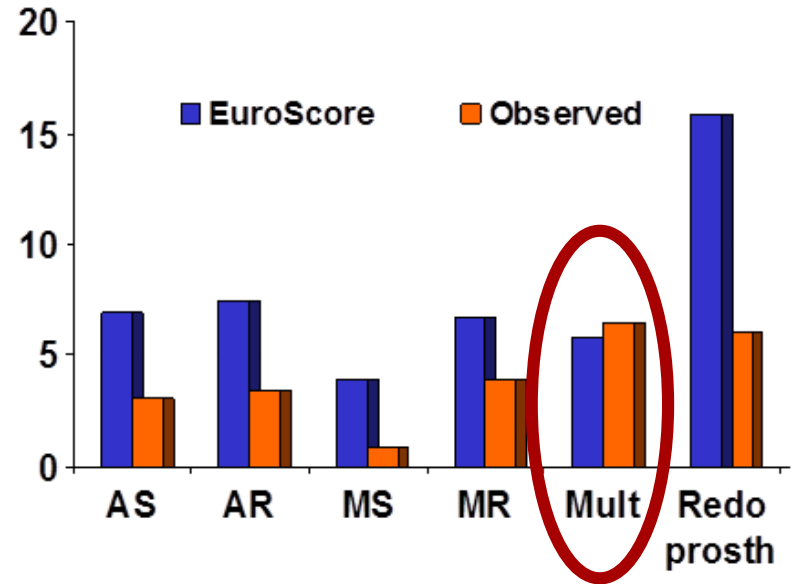
- Operative risk
 - Increased in double- vs. single-valve replacement
 - Type of procedure: valve replacement, valve repair, TAVI
 - Overall risk (risk scores poorly validated)
 - Local conditions
 - Calcification, additional procedures (aorta, tricuspid, CABG)
- Long-term consequences
 - Risk of re-operation
 - Late mortality/morbidity after double valve replacement

Operative Mortality

Unadjusted Aortic Valve Operative Mortality
Cumulative over last 10 years

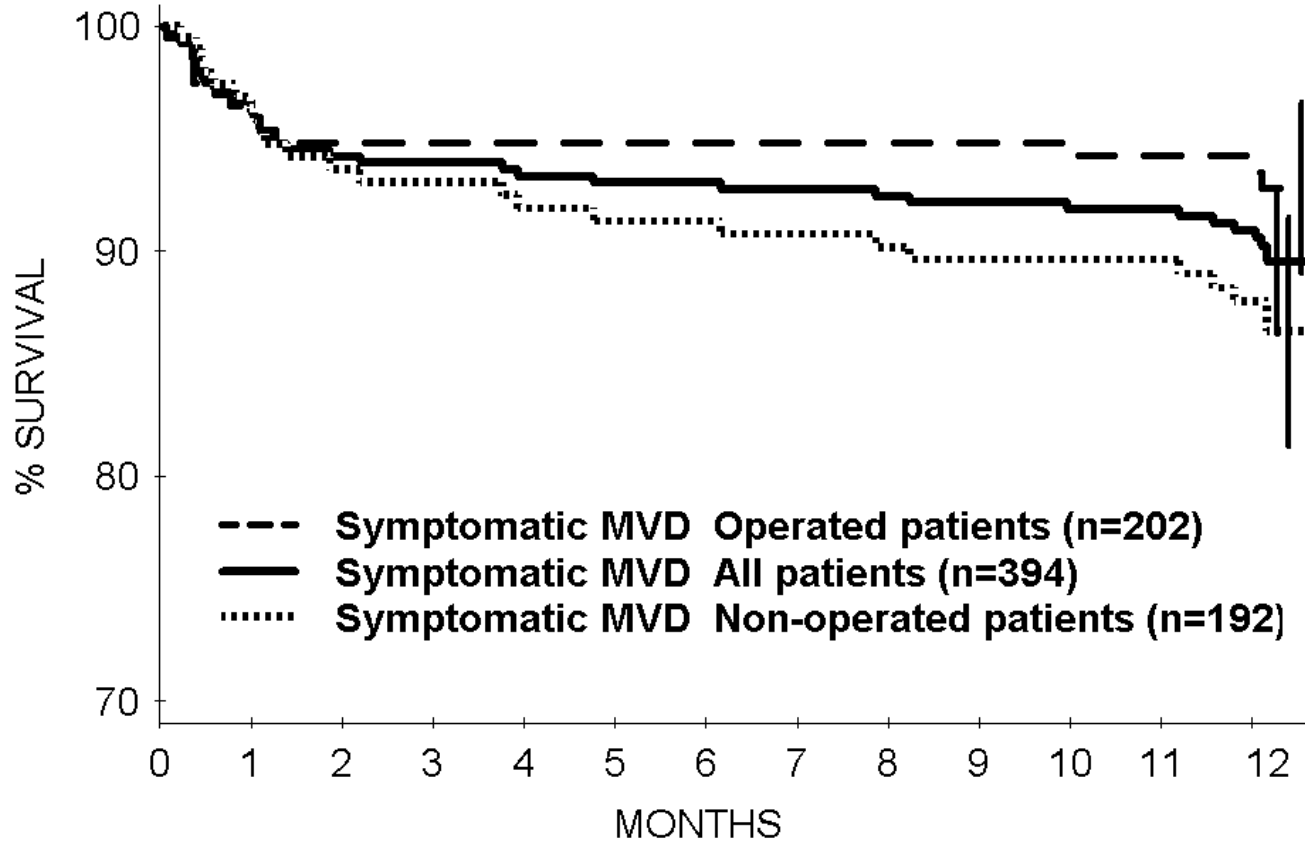


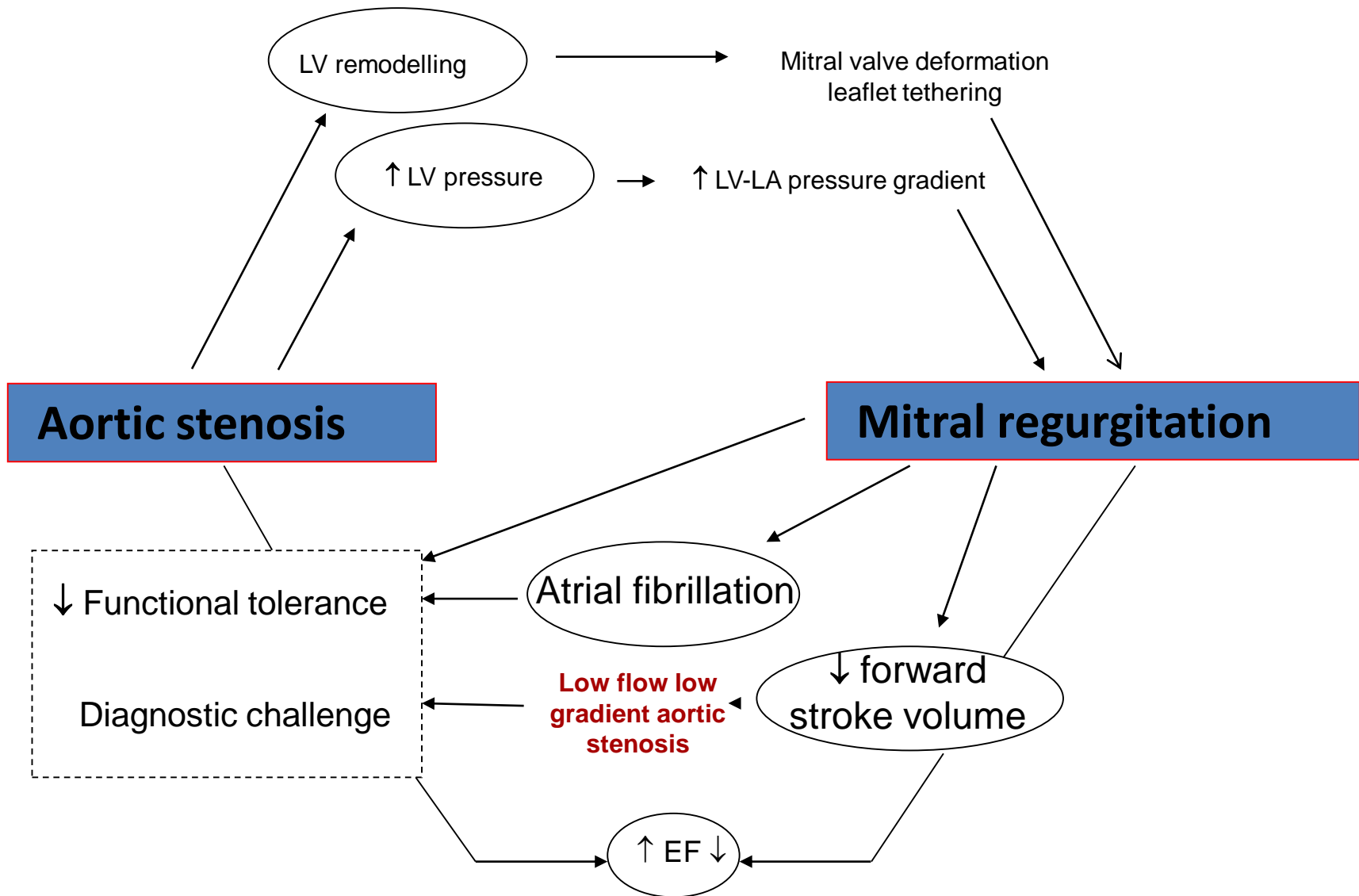
STS Database



Euro Heart Survey

One-Year Survival





Management of AS + MR

- Impact of isolated AVR on MR
 - 17 studies, ± 1300 patients
 - Regression observed in 65-75%
 - Regression may be observed even in patients with moderate/severe MR

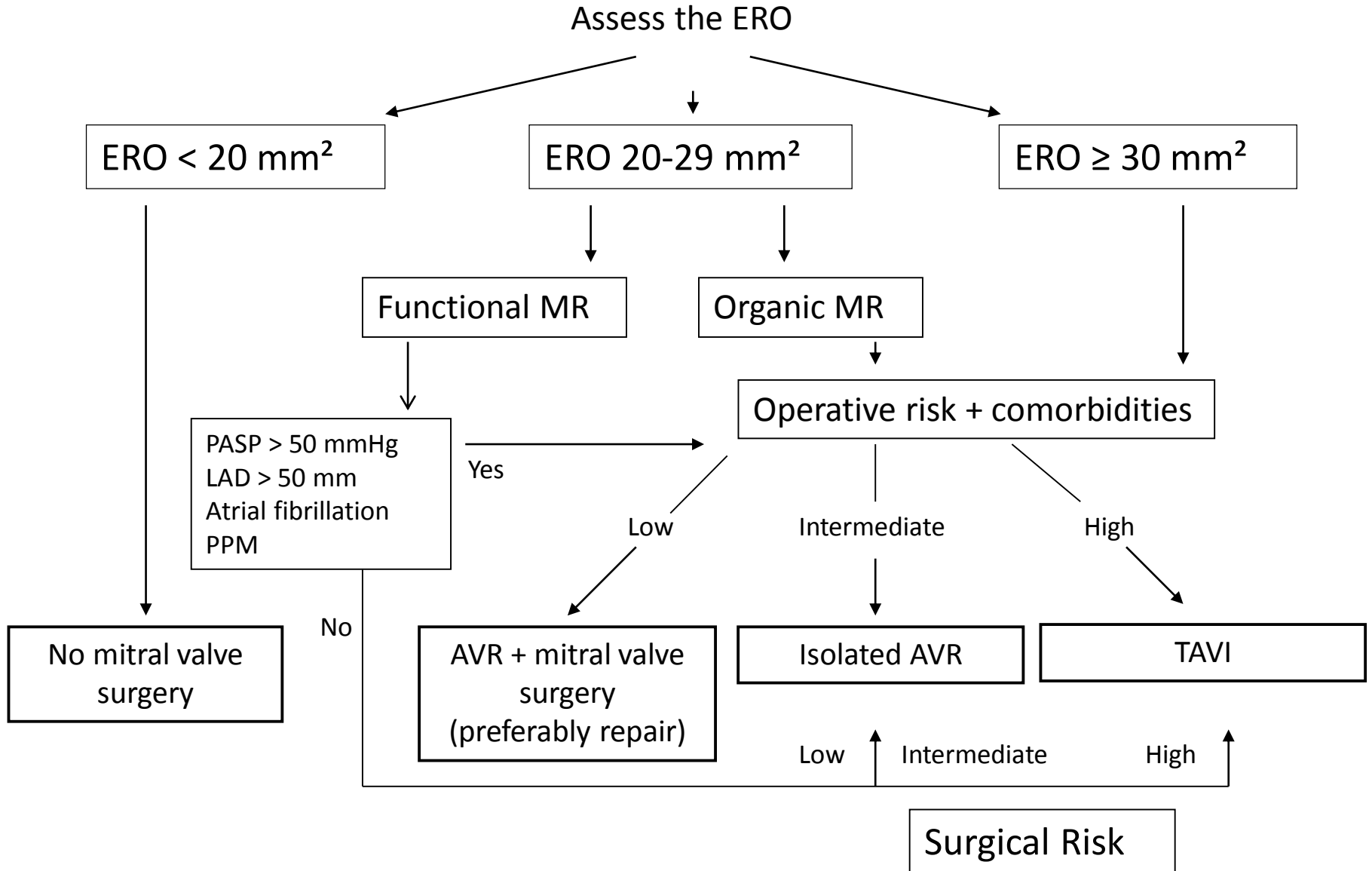
Improvement

- Functional etiology
- Low EF, CHF
- Lower grade of MR
under GA

Less/no improvement

- Organic etiology
- Enlarged atrium
- AF
- Pulmonary HT
- Patient prosthesis mismatch

Symptomatic Aortic Stenosis + Mitral Regurgitation



International Guidelines



Nishimura R et al. J Am Coll Cardiol 2014;63(22):e57-e186.
Vahanian A et al. Eur Heart J 2012. www.escardio.org

Management of Multiple Valve Disease

2012 ESC

*Guidelines on the Management of Valvular
Heart Disease*

« Data on multiple valve diseases
are lacking and do not allow for
evidence-based
recommendations..»

2014 ACC/AHA

*Guidelines for the Management of Patients
With Valvular Heart Disease*

«Each case must be considered
individually...
...the committee has developed no
specific recommendations. »

Table 1 Indications for concomitant valve surgery in patients undergoing surgery on another valve

Valve lesion	ACC/AHA guidelines	ESC guidelines
AS	<p>Class I: AVR is indicated for patients with severe AS undergoing surgery on the aorta or other heart valves (<i>level of evidence: C</i>)</p> <p>Class IIa: AVR is reasonable for patients with moderate AS undergoing CABG or surgery on the aorta or other heart valves (<i>level of evidence: B</i>)</p> <p>Class IIb*: AVR may be considered in patients undergoing CABG who have mild AS when there is evidence, such as moderate to severe valve calcification, that progression may be rapid (<i>level of evidence: C</i>)</p>	<p>Class I: There is evidence and/or general agreement that patients with severe AS undergoing surgery on another valve should have AVR (<i>level of evidence: C</i>)</p> <p>Class IIa: The weight of evidence/opinion is in favour of AVR in patients with moderate AS undergoing surgery on another valve (<i>level of evidence: C</i>)</p>
AR	<p>Class I: AVR is indicated for patients with chronic severe AR while undergoing surgery on other heart valves (<i>level of evidence: C</i>)</p> <p>Class IIb*: AVR may be considered in patients with moderate AR while undergoing CABG (<i>level of evidence: C</i>)</p>	<p>Class I: There is evidence and/or general agreement that patients with severe AR undergoing surgery on another valve should have AVR (<i>level of evidence: C</i>)</p>
TR	<p>Class I: Tricuspid valve repair is beneficial for severe TR in patients with MV disease requiring MV surgery (<i>level of evidence: B</i>)</p> <p>Class IIb: Tricuspid annuloplasty may be considered for less than severe TR in patients undergoing MV surgery when there is pulmonary hypertension or tricuspid annular dilatation (<i>level of evidence: C</i>)</p>	<p>Class I: There is evidence and/or general agreement that patients with severe TR undergoing left-sided valve surgery should have tricuspid valve surgery (<i>level of evidence: C</i>)</p> <p>Class IIa: The weight of evidence/opinion is in favour of tricuspid surgery in patients with moderate organic TR undergoing left-sided valve surgery (<i>level of evidence: C</i>) and in patients with moderate secondary TR with dilated annulus (>40 mm by echo) in a patient undergoing left-sided valve surgery (<i>level of evidence: C</i>)</p> <p>If severe functional TR in patients with severe MS, PMC can be attempted.</p> <p>Class I: There is evidence and/or general agreement that patients with severe TS (+/-TR) undergoing left-sided valve intervention should have tricuspid valve surgery (or balloon valvotomy if TS is isolated) (<i>level of evidence: C</i>)</p>
TS	No clear position	<p>Class I: There is evidence and/or general agreement that patients with severe TS (+/-TR) undergoing left-sided valve intervention should have tricuspid valve surgery (or balloon valvotomy if TS is isolated) (<i>level of evidence: C</i>)</p>
MR	If severe AS and severe MR, AVR plus MV repair is the preferred strategy. If severe AS and less-than severe MR, intraoperative TOE and visual inspection of the MV to determine if additional MV surgery is warranted	In patients undergoing AVR for AS, functional MR without mitral annulus dilatation or marked abnormalities in LV geometry, surgical intervention on the MV is in general not necessary
MS	In combined MS and AR, consider balloon mitral valvotomy, and monitor for symptomatic improvement before eventual AVR if MS is predominant	<p>In patients with MS combined with severe aortic valve disease, surgery is usually preferable.</p> <p>If coexisting MS and moderate aortic valve disease, PMC can be performed to postpone surgical treatment of both valves</p>

Moderate AS defined by the ESC guidelines as valve area 1.0–1.5 cm² (0.6–0.9 cm²/m² BSA) or mean aortic gradient 30–50 mm Hg in the presence of normal flow conditions, and by the ACC/AHA as valve area 1.0–1.5 cm² (>0.6 cm²/m² BSA), maximal jet velocity 3.0–4.0 m/s, mean aortic gradient 25–40 mm Hg.

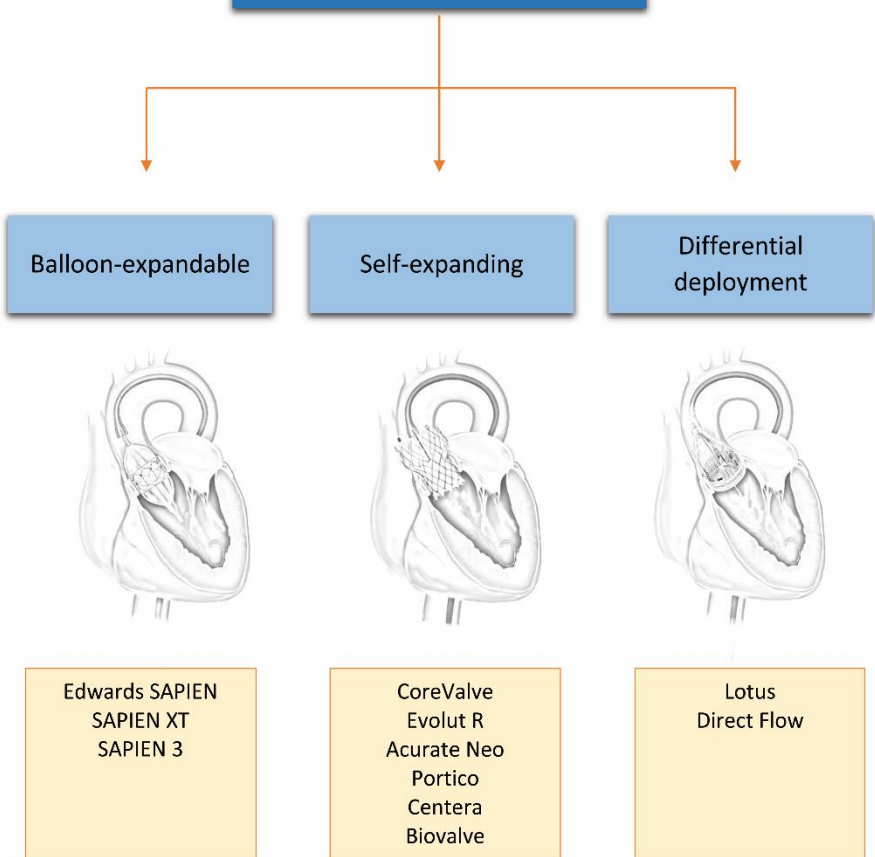
*In these situations, the guidelines refer to CABG as the main reason for surgery, and not to surgery on another heart valve.

ACC, American College of Cardiology; AHA, American Heart Association; AR, aortic regurgitation; AS, aortic stenosis; AVR, aortic valve replacement; BSA, body surface area; CABG, coronary artery bypass grafting; ESC, European Society of Cardiology; LV, left ventricular; MR, mitral regurgitation; MS, mitral stenosis; MV, mitral valve; PMC, percutaneous mitral commissurotomy; TOE, transoesophageal echocardiography; TR, tricuspid regurgitation; TS, tricuspid stenosis.

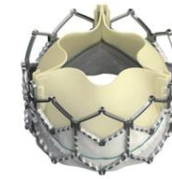
From Multiple Valves to Multiple Devices

TAVI: Menu du Jour

Transfemoral TAVI devices



Balloon-expandable valves



SAPIEN XT



SAPIEN 3

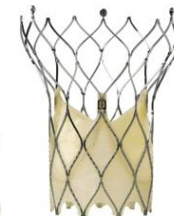
Self-expanding valves



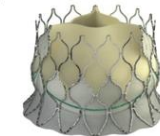
EVOLUT R



ACURATE NEO



PORTICO



CENTERA



BIOVALVE

Differential deployment technologies

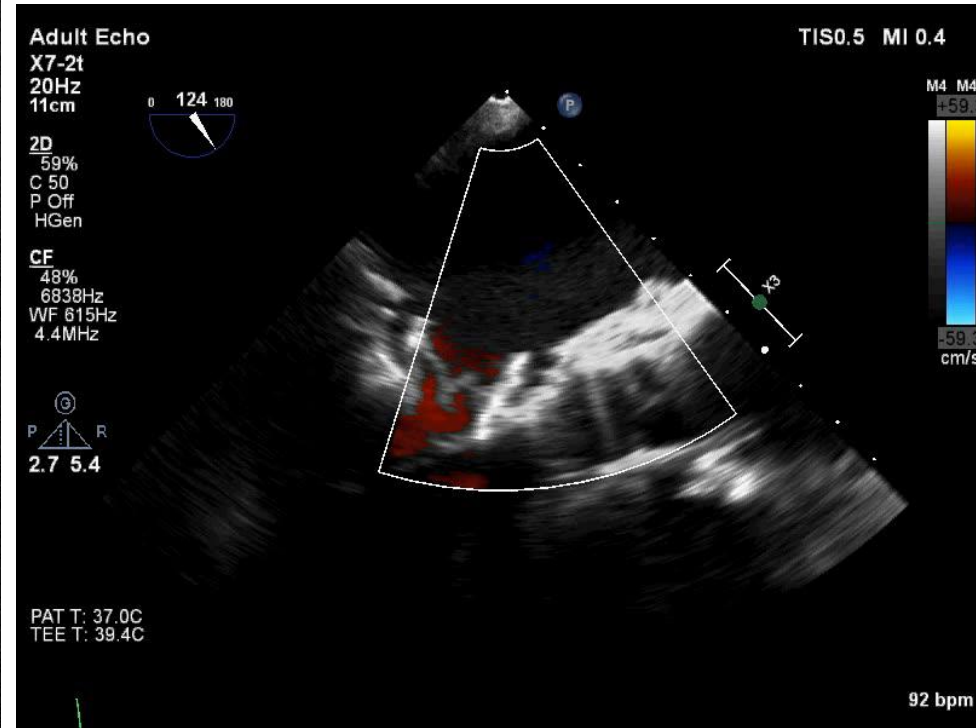
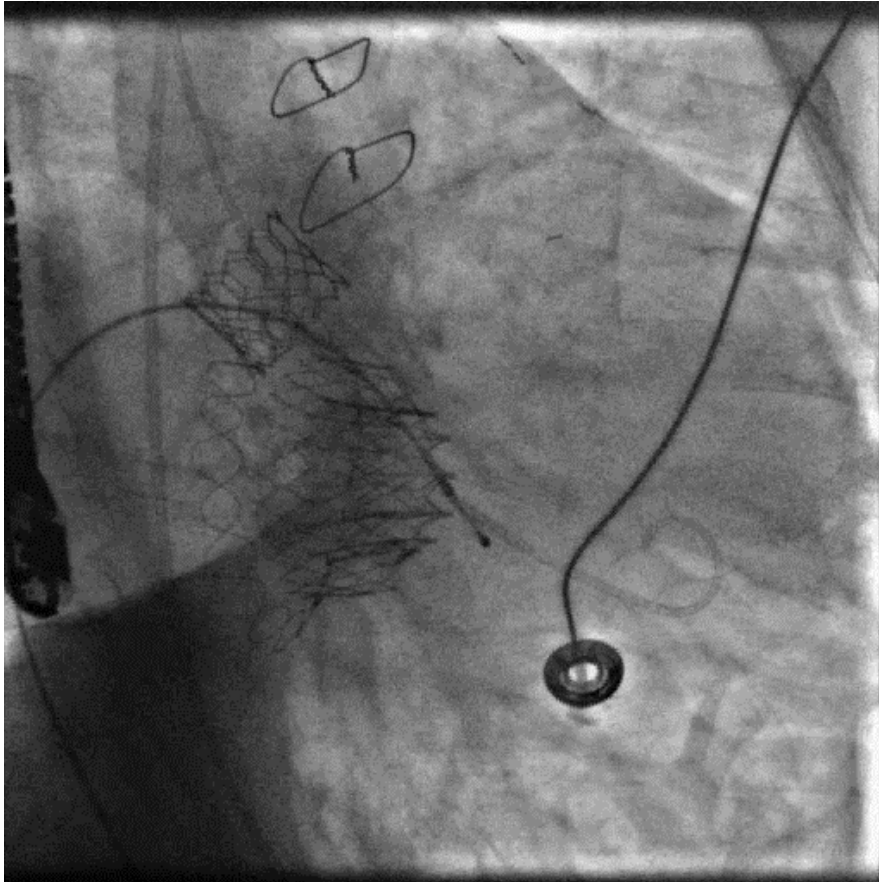


DIRECT FLOW



LOTUS

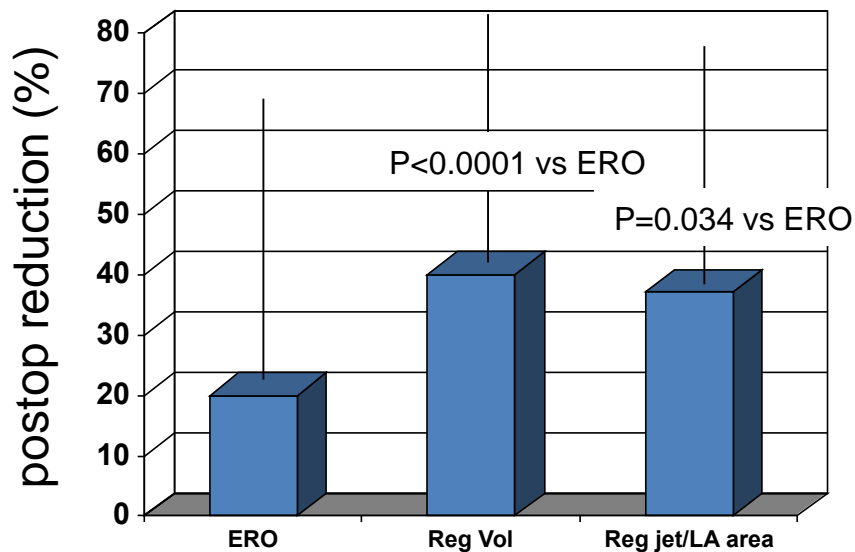
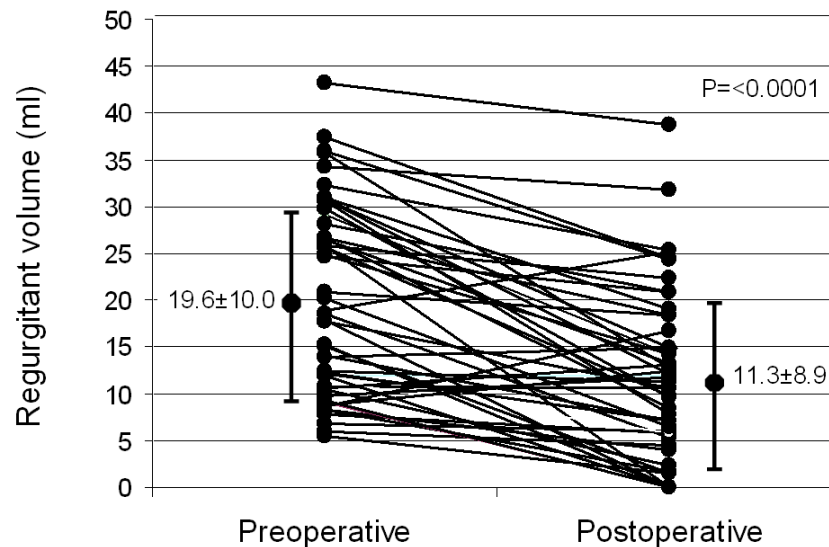
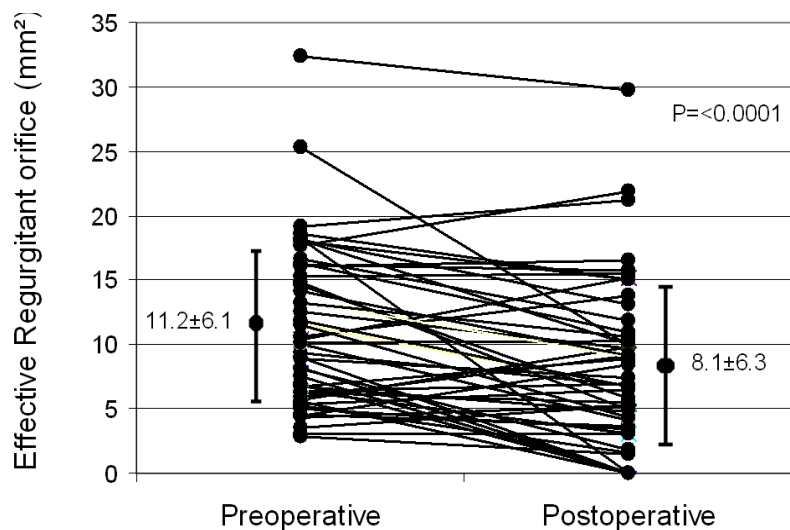
Combined Percutaneous Aortic and Mitral Valve Implantation in a Single Patient (in a Single Week)



Take Home Messages

- Comorbidities are common in valvular heart disease (predominantly as a function of ageing) and have a major impact on outcome
- Multiple valve disease poses particular challenges:
 - Diagnosis
 - Echocardiographic assessment
 - Choice of intervention
 - Very limited evidence
- The advent of TAVI and novel mitral technologies opens a whole new range of treatment permutations
- Valvular heart disease is never boring!

Quantitative changes in MR after AV replacement



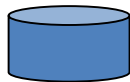
Threshold of MR severity?

Ischaemic (functional) MR
ERO $\geq 20 \text{ mm}^2$ (1)

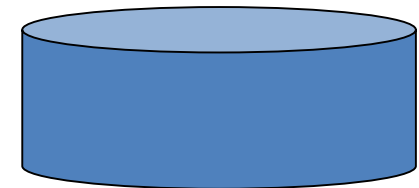
Organic MR
ERO $\geq 40 \text{ mm}^2$ (2)

Frequent downgrading
after AVR

Less frequent downgrading
Risk of future reoperation



$\geq 25-30 \text{ mm}^2$



Take home messages

- **Multiple and mixed valve disease are frequent**
 - almost 50% of degenerative origin
- **Diagnostic pitfalls**
 - Haemodynamic interactions between valve lesions
 - Indices validated in single-valve/single lesion disease
 - Measurements less dependent on loading conditions should be preferred
- **Management strategy: few data in the literature**
 - each case must be considered individually
 - increased operative risk of multiple valve surgery
 - risk of leaving a valve unoperated