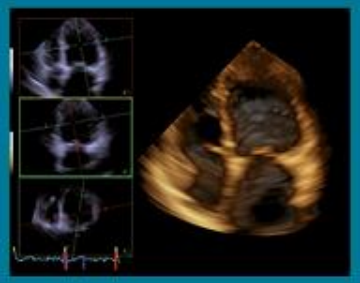


EuroValve

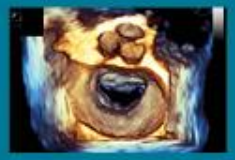
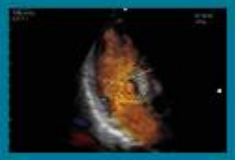
October 24-25, 2014

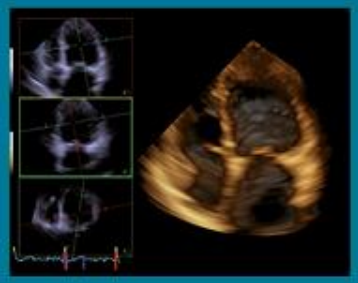
Challenging clinical situation
A patient with VHD and desire for pregnancy

Bernard Iung

Bichat Hospital, Paris, France





EuroValve

October 24-25, 2014

Faculty disclosure

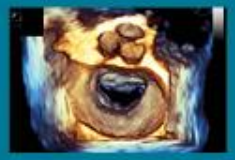
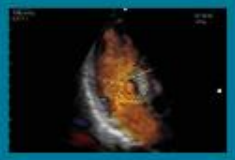
Bernard Iung

I disclose the following financial relationships:

Consultant for Abbott, Boehringer Ingelheim, Valtech

Paid speaker for Edwards Lifesciences



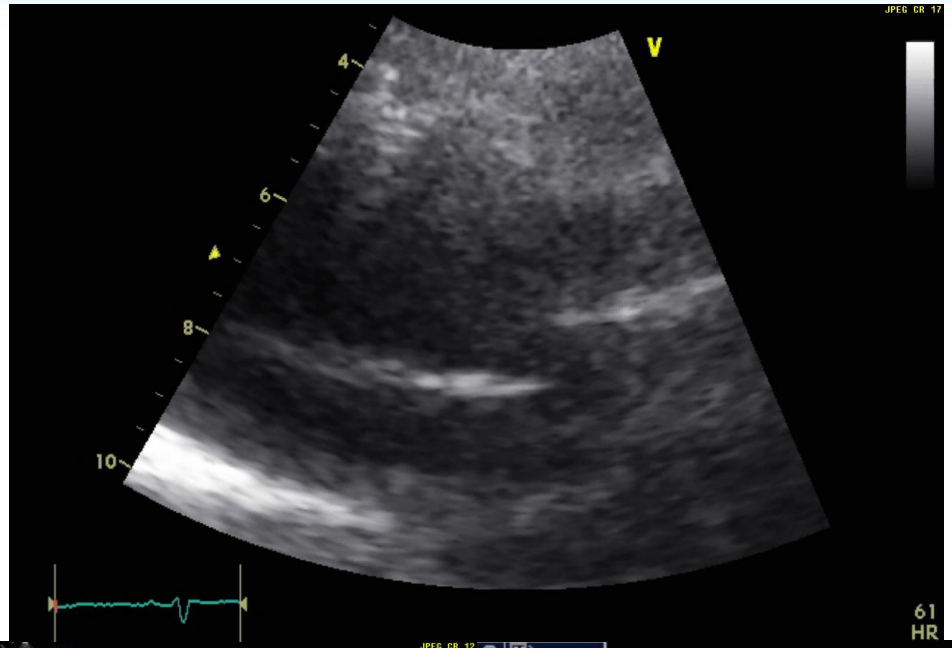



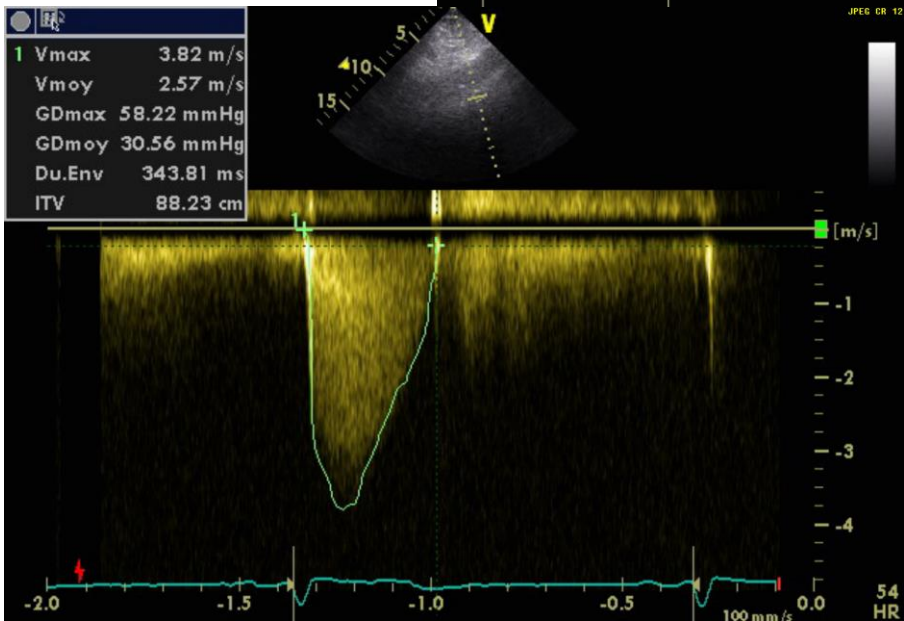
www.eurovalvecongress.com

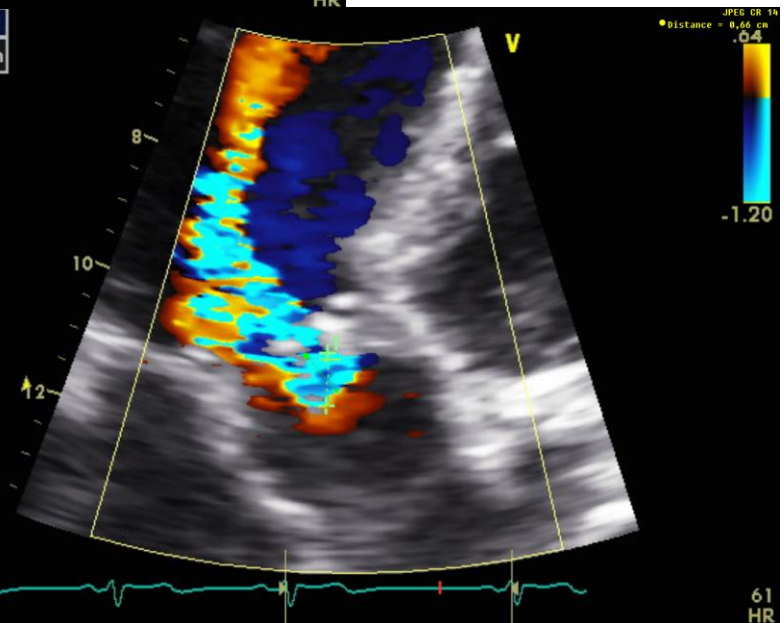
Case History

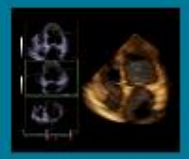
- 28-year old woman
  - Known aortic regurgitation
  - No symptoms
- Referred because of desire of pregnancy
  - Systolic murmur 3/6 and diastolic murmur 2/6, normal S2+
  - No sign of CHF, BP 116/66 mmHg
  - 53 Kg – 1.73 m (BSA: 1.6 m^2)
  - Sinus rhythm

EuroValve

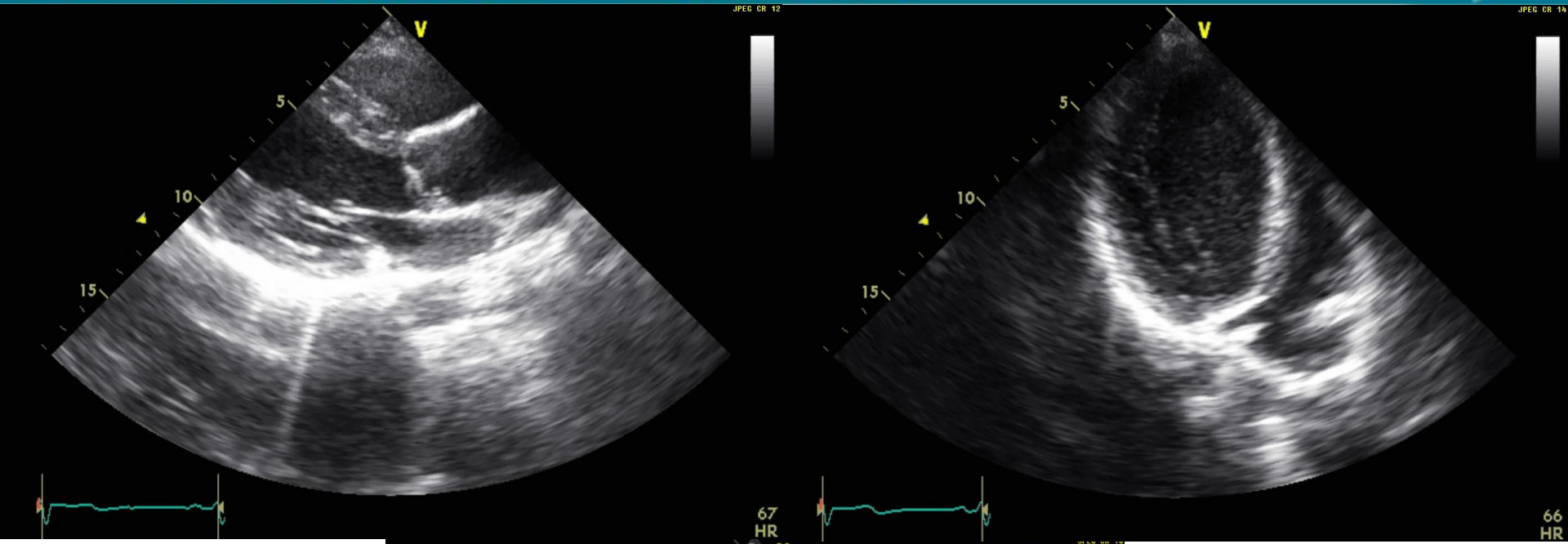

JPEG CR 17
V
4
6
8
10
61
HR


1 Vmax 3.82 m/s
Vmoy 2.57 m/s
GDmax 58.22 mmHg
GDmoy 30.56 mmHg
Du.Env 343.81 ms
ITV 88.23 cm
JPEG CR 12
V
5
10
15
[m/s]
-1
-2
-3
-4
-2.0
-1.5
-1.0
-0.5
0.0
100 mm/s
1 L 0.77 cm
54
HR


JPEG CR 14
Distance = 0.66 cm
.64
-1.20
V
8
10
12
61
HR



EuroValve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JPEG CR 14
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66
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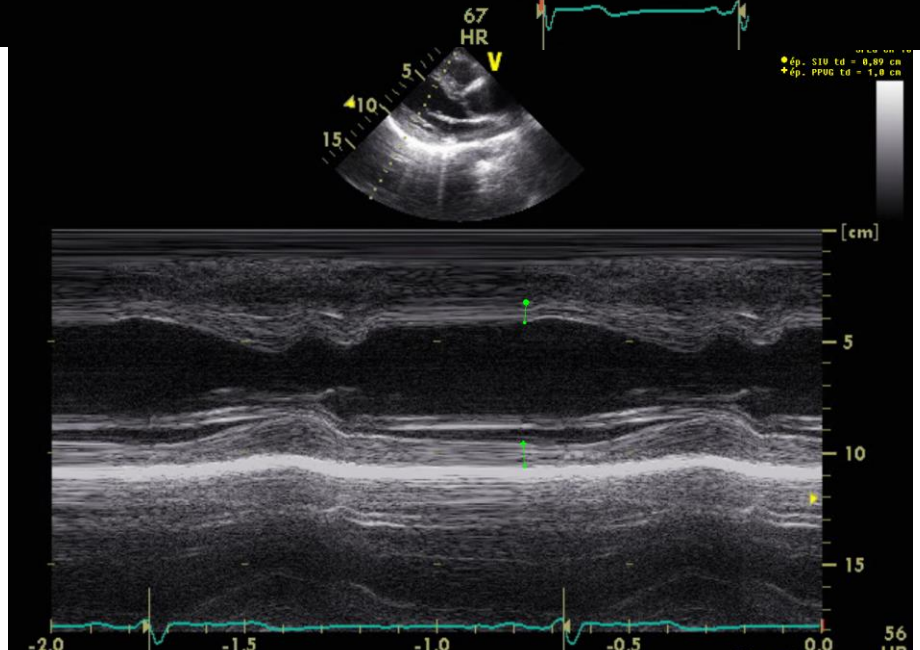
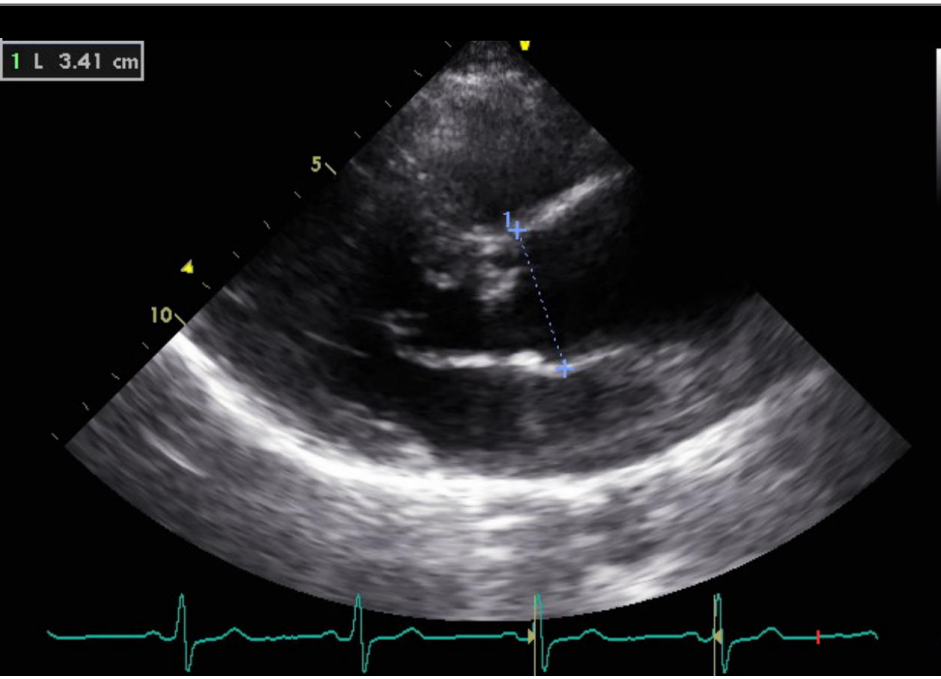
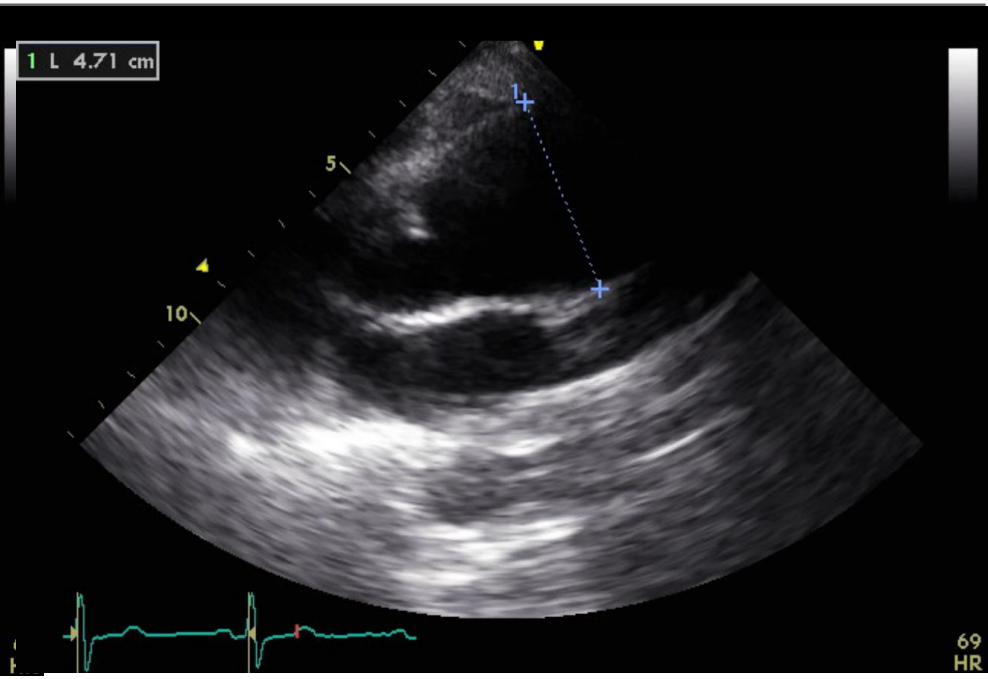

67
HR
V
5
10
15
6p. SIW td = 0,89 cm
6p. PPWG td = 1,0 cm
[cm]
5
10
15
-2.0
-1.5
-1.0
-0.5
0.0
56


1 L 3.41 cm
5
10
1


1 L 4.71 cm
5
10
1
69
HR

- Bicuspid aortic valve type 1 (fusion right/NC cusps)
- Aortic regurgitation
  - ERO 0.37 mm^2, regurgitant volume 88 ml
- Aortic stenosis
  - Mean gradient 30 mmHg, v.max. 3.8 m/sec.
  - Valve area 1.5 cm^2
- sPAP 30 mmHg
- Ascending aorta
  - Valsalva 34 mm, tubular aorta 47 mm
- Left ventricle
  - 58/39 mm, EF 65%

Do you consider other investigations?

1. CT scan
2. MRI
3. Exercise echocardiography
4. Coronary and aortic angiography
5. Nt-pro BNP

2014 ESC guidelines on the diagnosis and treatment of aortic diseases

Document covering acute & chronic aortic diseases of the thoracic & abdominal aorta of the adult

Chairpersons: Raimund Erbel (Germany), Victor Aboyans (France)

Authors/Task Force members: Catherine Boileau (France), Eduardo Bossone (Italy), Roberto Di Bartolomeo (Italy), Holger Eggebrecht (Germany), Arturo Evangelista (Spain), Volkmar Falk (Switzerland),Herbert Frank (Austria), Oliver Gaemperli (Switzerland), Martin Grabenwöger (Austria),Axel Haverich (Germany), Bernard Iung (France), Athanasios John Manolis (Greece), Folkert Meijboom (Netherlands), Christoph A. Nienaber (Germany), Marco Roffi (Switzerland),Herve Rousseau (France), Udo Sechtem (Germany), Per Anton Sirnes (Norway), Regula S von Allmen (Switzerland), and Christiaan JM Vrints (Belgium).

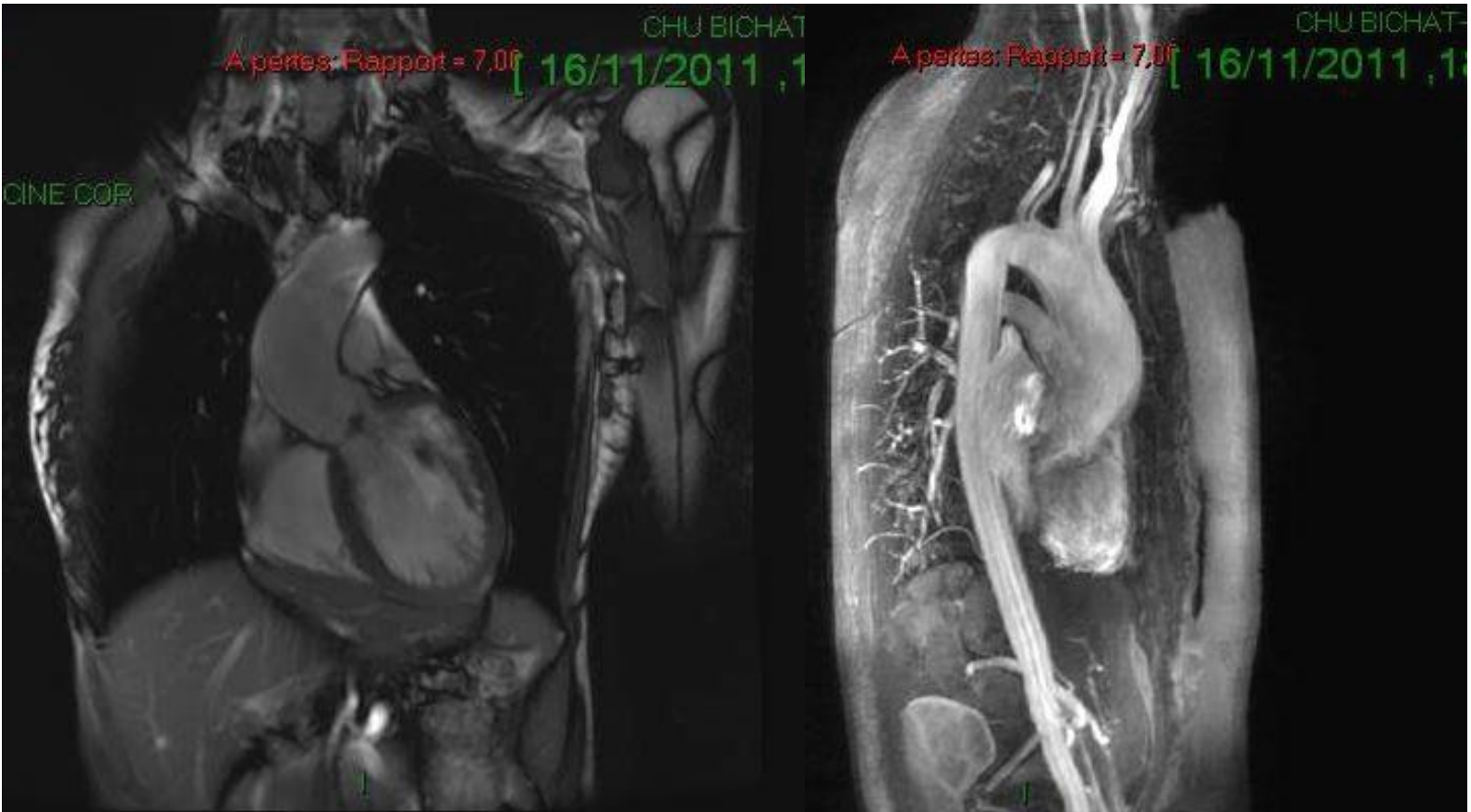
Recommendations in patients with aortic aneurysm	Class[a]	Level[b]
When an aortic aneurysm is identified at any location, assessment of the entire aorta and aortic valve is recommended at baseline and during follow-up.	I	C
In case of aneurysm of the abdominal aorta, duplex ultrasound for screening of peripheral artery disease and peripheral aneurysms should be considered.	IIa	C
Patients with aortic aneurysm are at increased risk of cardiovascular disease: general principles of cardiovascular prevention should be considered.	IIa	C

Recommendations for imaging the aorta	Class[a]	Level[b]
It is recommended to measure diameters at pre-specified anatomical landmarks, perpendicular to the longitudinal axis.	I	C
In case of repetitive imaging of the aorta over time to assess change in diameter, it is recommended to use the imaging modality with the lowest iatrogenic risk.	I	C
In case of repetitive imaging of the aorta over time to assess change in diameter, it is recommended to use the same imaging modality with a similar method of measurement.	I	C
It is recommended to report all relevant aortic diameters and abnormalities according to the aortic segmentation.	I	C
It is recommended to assess renal function, pregnancy, and history of allergy to contrast media in order to select the optimal imaging modality of the aorta with minimal radiation exposure, except for emergency cases.	I	C
The risk of radiation exposure should be assessed, especially in younger adults and in those undergoing repetitive imaging.	IIa	B
Aortic diameters may be indexed to the body surface area, especially for the outliers in body size.	IIb	B

MRI of aorta

Diameters

- Valsalva 37 mm
- sinotubular junction 35 mm
- tubular aorta 46 mm
- arch 28 mm
- descending aorta 19 mm



Recommendations for the management of valvular heart disease

Aortic stenosis

Recommendations	Class	Level
Patients with severe AS should undergo intervention pre-pregnancy if:		
• the are symptomatic,	I	B
• or LV dysfunction (LVEF < 50%) is present.	I	C
Asymptomatic patients with severe AS should undergo intervention pre-pregnancy when they develop symptoms during exercice testing.	I	C
Asymptomatic patients with severe AS should be considered for intervention pre-pregnancy when a fall in blood pressure below baseline during exercice testing occurs.	IIa	C

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218
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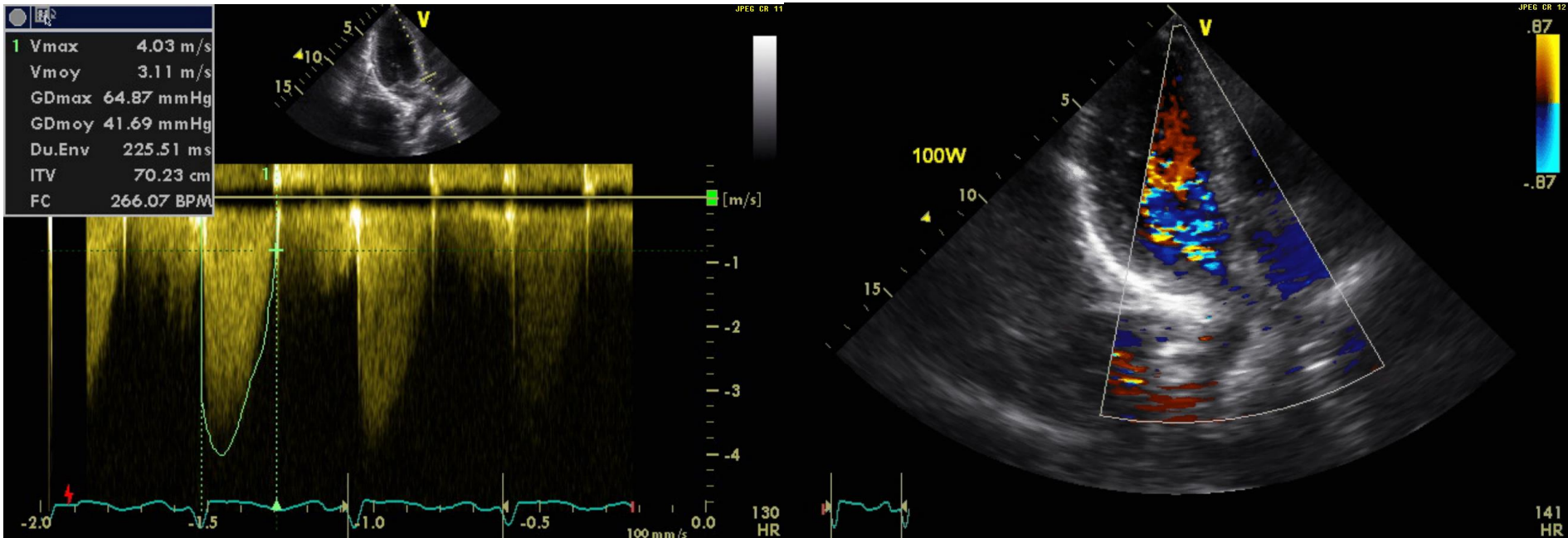
Exercise echocardiography

- 10 minutes, 100 watts, 92% of predicted max. HR
- Good functional tolerance, normal BP response
- LVEF 70% at peak exercise
- Mean aortic gradient 32 → 42 mmHg
- sPAP 30 → 45 mmHg



Is there an indication for surgery, even without taking into account the planned pregnancy ?

1. Yes, because of aortic valve disease
2. Yes, because of ascending aorta
3. No

Indications for surgery in severe aortic regurgitation

	Class	Level
Surgery is indicated in symptomatic patients.	I	B
Surgery is indicated in asymptomatic patients with resting LVEF ≤ 50%.	I	B
Surgery is indicated in patients undergoing CABG or surgery of ascending aorta, or on another valve.	I	C
Surgery should be considered in asymptomatic patients with resting EF > 50% with severe LV dilatation: LVEDD > 70 mm, or LVESD > 50 mm or LVESD > 25 mm/m^2 BSA.	IIa	C

European Heart Journal 2012 - doi:10.1093/eurheartj/ehs109 &
European Journal of Cardio-Thoracic Surgery 2012 -
doi:10.1093/ejcts/ezs455).

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Recommendations for management of aortic root dilatation in patients with bicuspid aortic valve (BAV)		
In case of BAV, surgery of the ascending aorta:		
is indicated in case of aortic root or ascending aortic diameter >55 mm.	I	C
is indicated in case of aortic root or ascending aortic diameter >50 mm in the presence of other risk factors.[c]	I	C
is indicated in case of aortic root or ascending aortic diameter >45 mm when surgical aortic valve replacement is scheduled.	I	C
ß-blockers may be considered in patients with BAV and dilated aortic root >40 mm.	IIb	C
Because of familial occurrence, screening of first-degree relatives should be considered.	IIa	C
In patients with any elastopathy or BAV with dilated aortic root (>40 mm), isometric exercise with a high static load (e.g. weightlifting) is not indicated and should be discouraged.	III	C

European Heart Journal (2014):doi:10.1093/eurheartj/ehu281

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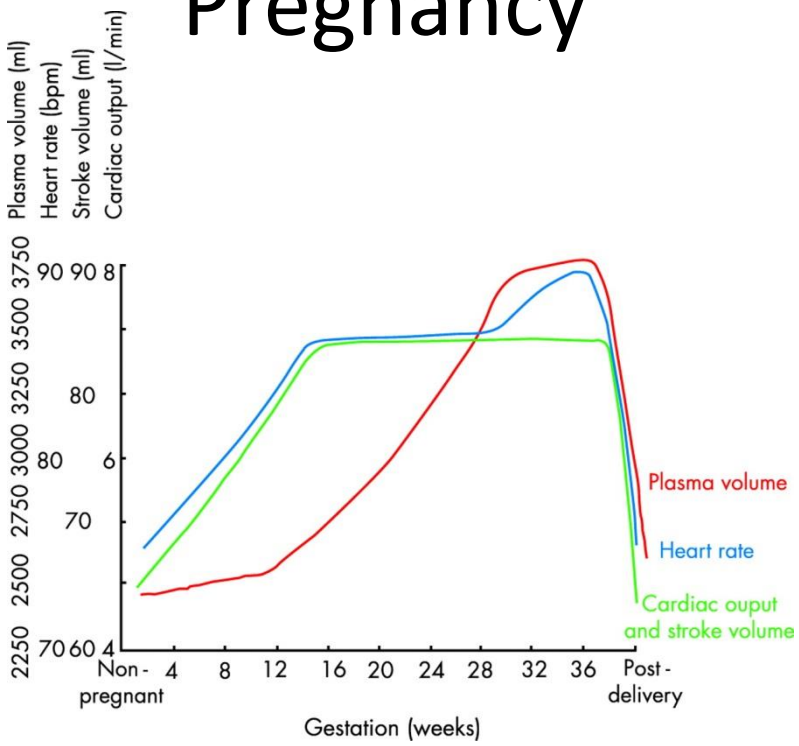
Is there an indication for surgery given the desire of pregnancy?

1. Yes, because of aortic valve disease
2. Yes, because of ascending aorta
3. No

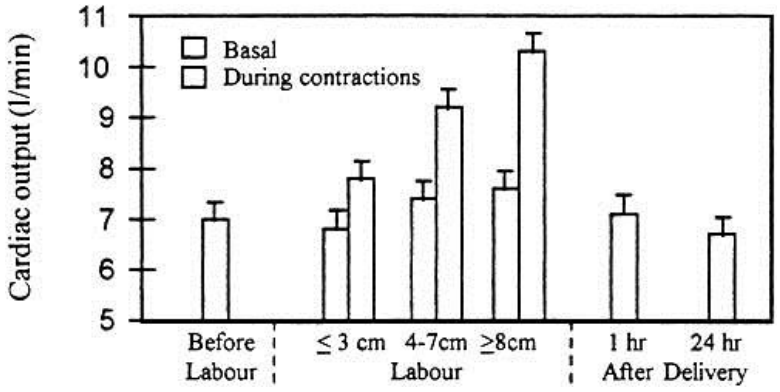
Haemodynamic Changes During Pregnanacy

Pregnancy



(Thorne Heart 2004;90:450)

Delivery



(Hunter et al. Br Med J 1992;68:540-3)

- Aortic regurgitation
  - Increase in regurgitant volume
  - But favourable effect of tachycardia and decrease in systemic vascular resistances
- Ascending aortic aneurysm
  - Impact of increased cardiac output on the risk of dissection

European Heart Journal
doi:10.1093/eurheartj/ehr218

ESC Guidelines on the management of cardiovascular diseases during pregnancy

The Task Force on the Management of Cardiovascular Diseases during Pregnancy of the European Society of Cardiology (ESC)

Endorsed by the European Society of Gynecology (ESG), the Association for European Paediatric Cardiology (AEPC), and the German Society for Gender Medicine (DGesGM).

Authors/Task Force Members Vera Regitz-Zagrosek (Chairperson) (Germany)*, Carina Blomstrom Lundqvist (Sweden), Claudio Borghi (Italy), Renata Cifkova (Czech Republic), Rafael Ferreira (Portugal), Jean-Michel Foidart† (Belgium), J. Simon R. Gibbs (UK), Christa Gohlke-Baerwolf (Germany), Bulent Gorenek (Turkey), Bernard Iung (France), Mike Kirby (UK), Angela H. E. M. Maas (The Netherlands), Joao Morais (Portugal), Petros Nihoyannopoulos (UK), Petronella G. Pieper (The Netherlands), Patrizia Presbitero (Italy), Jolien W. Roos-Hesselink (The Netherlands), Maria Schaufelberger (Sweden), Ute Seeland (Germany), Lucia Torracca (Italy).

ESC Committee for Practice Guidelines (CPG): Jeroen Bax (CPG Chairperson) (The Netherlands), Angelo Auricchio (Switzerland), Helmut Baumgartner (Germany), Claudio Ceconi (Italy), Veronica Dean (France), Christi Deaton (UK), Robert Fagard (Belgium), Christian Funck-Brentano (France), David Hasdai (Israel), Arno Hoes (The Netherlands), Juhani Knuuti (Finland), Philippe Kolh (Belgium), Theresa McDonagh (UK), Cyril Moulin (France), Don Poldermans (The Netherlands), Bogdan A. Popescu (Romania), Zeljko Reiner (Croatia), Udo Sechtem (Germany), Per Anton Sirnes (Norway), Adam Torbicki (Poland), Alec Vahanian (France), Stephan Windecker (Switzerland).

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Recommendations for the management of valvular heart disease

Regurgitant lesions

Recommendations	Class	Level
Patients with severe aortic or mitral regurgitation and symptoms or impaired ventricular function or ventricular dilatation should be treated surgically pre-pregnancy.	I	C
Medical therapy is recommended in pregnant women with regurgitant lesions when symptoms occur.	I	C

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

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Stratification

High risk states - contraindications for pregnancy

Conditions in which pregnancy risk is WHO IV (pregnancy contraindicated)
• Pulmonary arterial hypertension of any cause.
• Severe systemic ventricular dysfunction (LVEF < 30%, NYHA III-IV).
• Previous peripartum cardiomyopathy with any residual impairment of left ventricular function.
• Severe mitral stenosis, severe symptomatic aortic stenosis.
• Marfan syndrome with aorta dilated > 45 mm. • Aortic dilatation > 50 mm in aortic disease associated with bicuspid aortic valve.
• Native severe coarctation.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

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Diseases of the Aorta

Increased risk of dissection during pregnancy
May lead to consider prophylactic surgery

	Risk of dissection
• Marfan syndrome	aortic Ø > 45 mm
• Bicuspid aortic valve	lower risk than Marfan
• Ehlers Danlos type IV	even if non-dilated aorta
• Turner syndrome	consider body size aortic Ø > 27 mm/m² BSA

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218
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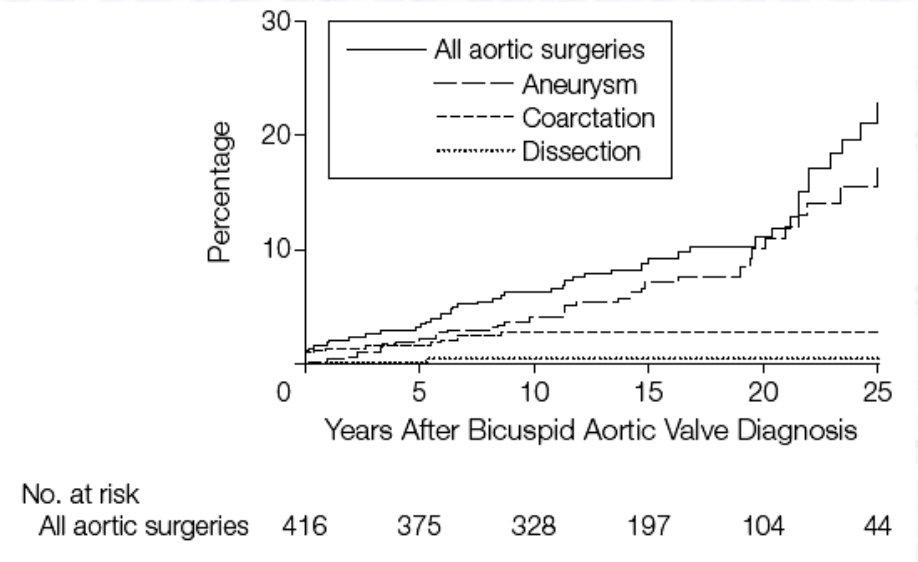
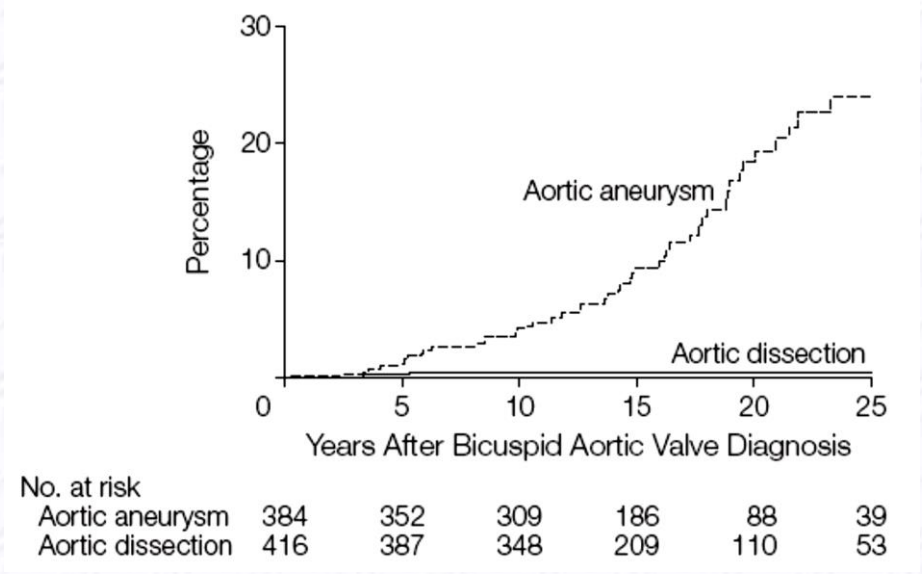
BAV and aortic complications

416 patients with BAV (mean age 35 yrs), mean FU 16 yrs

Mean initial aortic root diameter 34 ± 9 mm





(Michelena et al. JAMA 2011;306:1104–12)

European Heart Journal (2014):doi:10.1093/eurheartj/ehu281

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Alternative of surgical treatment before pregnancy

- **Aortic valve replacement**
  - Mechanical prosthesis: increased thrombo-embolic risk
  - Bioprosthesis: rapid expected deterioration at 28 years
  - Valve repair: limited experience on long-term durability, specific expertise
- **Replacement of ascending aorta**
  - Only supra-coronary replacement needed

Choice of the aortic/mitral prosthesis : in favour of a bioprosthesis

	Class	Level
A bioprosthesis is recommended according to the desire of the informed patient.	I	C
A bioprosthesis is recommended when good quality anticoagulation is unlikely (compliance problems, not readily available) or contraindicated because of high bleeding risk (prior major bleed, comorbidities, unwillingness, compliance problems, lifestyle, occupation).	I	C
A bioprosthesis is recommended for reoperation for mechanical valve thrombosis despite good long-term anticoagulant control.	I	C
A bioprosthesis should be considered in patients for whom future redo valve surgery would be at low risk.	IIa	C
A bioprosthesis should be considered in young women contemplating pregnancy.	IIa	C
A bioprosthesis should be considered in patients aged > 65 years for prosthesis in aortic position or > 70 years in mitral position, or those with life expectancy lower than the presumed durability of the bioprosthesis.	IIa	C

European Heart Journal 2012 - doi:10.1093/eurheartj/ehs109 & European Journal of Cardio-Thoracic Surgery 2012 - doi:10.1093/ejcts/ezs455).

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	Baseline	Weeks of pregnancy			
		12	20	28	34
Mean gradient (mmHg)	30	34	34	38	38
AR grade (/4)	3	3	3	3	3
LV dimensions (mm)	58/39	55/36	56/34	58/33	56/32
Max Ao.Ø (mm)	47	48	46	45	46
Systolic PAP (mmHg)	30	30	35	35	40
NYHA class	I	I	I	II	II

Delivery

Caesarean section was performed at 38.5 weeks

Caesarean delivery should be considered for obstetrical indications or for patients with dilatation of the ascending aorta >45 mm, severe aortic stenosis, pre-term labour while on oral anticoagulants, Eisenmenger syndrome, or severe heart failure.	IIa	C

- Healthy boy
- 3170 g, cm
- Apgar 10 /10
- No complication

Conclusion

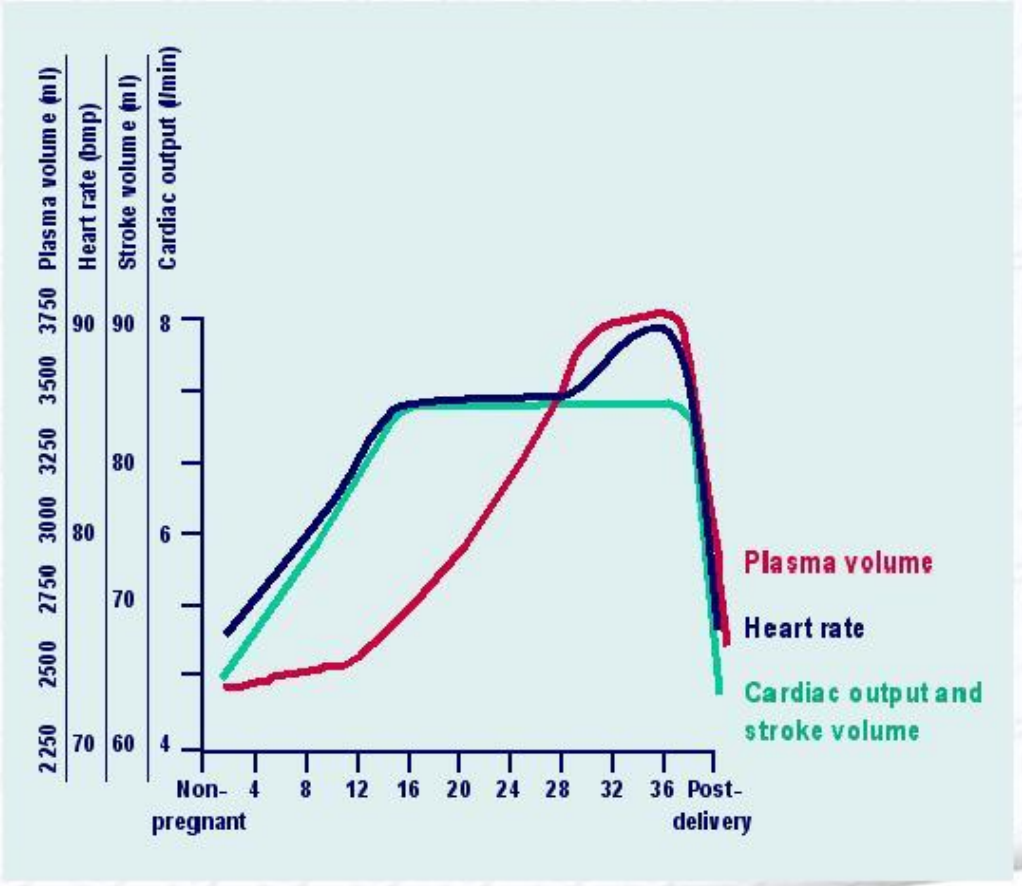
- Bicuspid aortic valve requires complete evaluation
- In asymptomatic patients with severe AR, indications for surgery rely on aortic size and LV function
- Pregnancy is well tolerated in regurgitant valve diseases, even severe
- The risk of aortic complications seems lower than initially expected
- In borderline cases, individual risk-benefit analysis is neeeded

How do you plan delivery ?

1. Vaginal delivery at normal term
2. Vaginal delivery at 38 weeks
3. Caesarean section at 38 weeks
4. Caesarean section at 38 weeks under haemodynamic monitoring

Haemodynamic Changes During Pregnancy

- ↑ blood volume ≈ 50%.
- ↑ cardiac output 30-50% maximum between, 5th and 8th months.
- ↓ systolic and diastolic blood pressure.
- ↓ systemic arterial resistance (hormones, placenta).



Thorne Heart 2004;90:450-6

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

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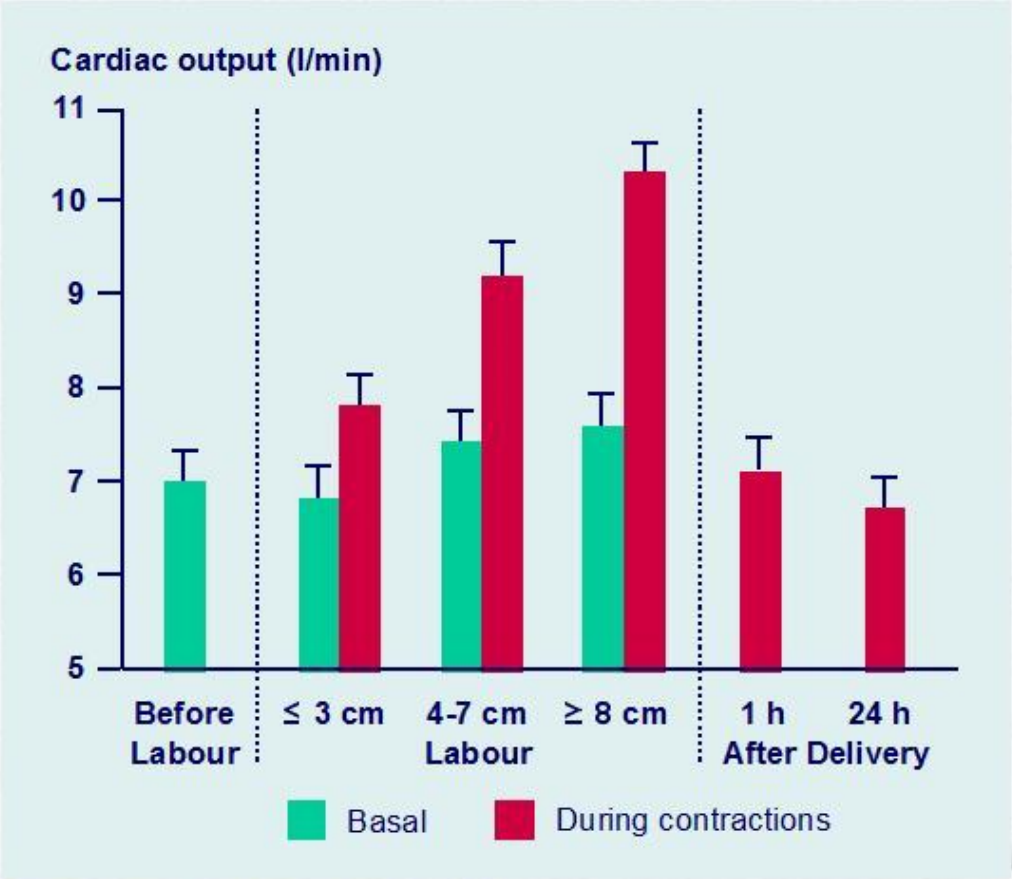
Haemodynamic Changes During Delivery

- Labour:
  - ↑ O_2 consumption,
  - ↑ baseline cardiac output,
  - ↑ cardiac output and blood pressure during uterine contractions, depending on modalities of delivery (epidural analgesia, Cesarean section)
- Post-partum:
  - ↑ blood shift from placenta,
  - ↑ preload and cardiac output.



Hunter et al. *Br Med J* 1992;68:540-3

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

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Echocardiographic criteria for the definition of severe valve regurgitation: *an integrative approach*

	Aortic regurgitation	Mitral regurgitation		Tricuspid regurgitation
Semiquantitative				
Vena contracta width (mm)	> 6	≥ 7 (> 8 for biplane)		≥ 7
Upstream vein flow	–	Systolic pulmonary vein flow reversal		Systolic hepatic vein flow reversal
Inflow	–	E-wave dominant ≥ 1.5 m/s		E-wave dominant ≥ 1 m/s
Other	Pressure half-time < 200 ms	TVI mitral/TVI aortic > 1.4		PISA radius > 9 mm
Quantitative		***Primary***	***Secondary***	
EROA (mm^2)	≥ 30	≥ 40	≥ 20	≥ 40
R Vol (ml/beat)	≥ 60	≥ 60	≥ 30	≥ 45
+ enlargement of cardiac chambers/ vessels	LV	LV, LA		RV, RA, inferior vena cava

Adapted from Lancellotti, EAE recommendations. *Eur J Echocardiogr.* 2010;11:223-244 and 307-332

European Heart Journal 2012 - doi:10.1093/eurheartj/ehs109 &
European Journal of Cardio-Thoracic Surgery 2012 - doi:10.1093/ejcts/ezs455).

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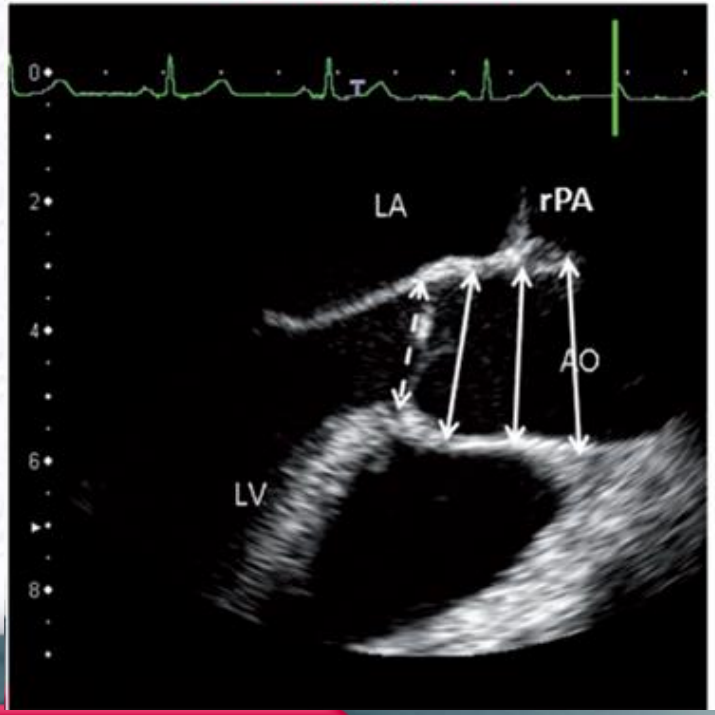
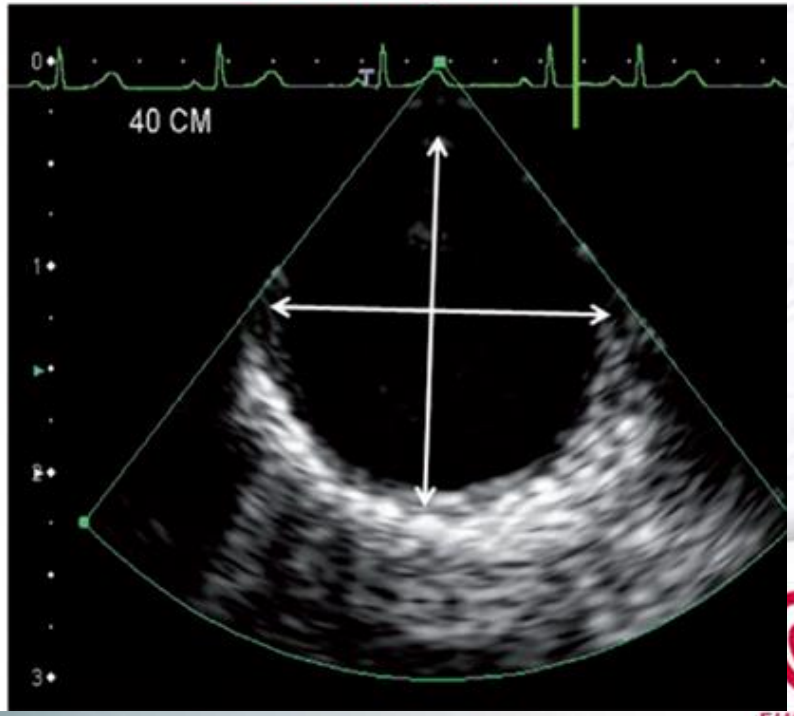
Transoesophageal echocardiographic long-axis and cross-sectional image of the ascending and descending aorta, indicating the points of diameter measurements: sinus of Valsalva, beginning of the ascending aorta, ascending aorta at the level of the right pulmonary artery. Also shown, the measurement of the aortic valvular ring.

Transoesophageal Echocardiogram

ascending aorta



descending aorta



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