

The background of the slide is a photograph of a harbor scene. In the foreground, the masts and rigging of many sailboats are visible, creating a dense pattern of vertical lines. Behind the boats, a city skyline is visible under a blue sky with scattered white clouds. The city includes several historic buildings with domes and spires, and a prominent modern building with a curved, glass facade. The overall scene is bright and clear.

EuroValve

January 26-27, 2017

Ascending aorta dilation and aortic valve disease.

Risk in special circumstances: pregnancy, sport activities.

Bernard Iung

Bichat Hospital and Paris Diderot University

Paris, France

www.eurovalvecongress.com



EuroValve

January 26-27, 2017

Faculty disclosure

Bernard Iung, MD

I disclose the following financial relationships:

Speaker's fee from Edwards Lifesciences

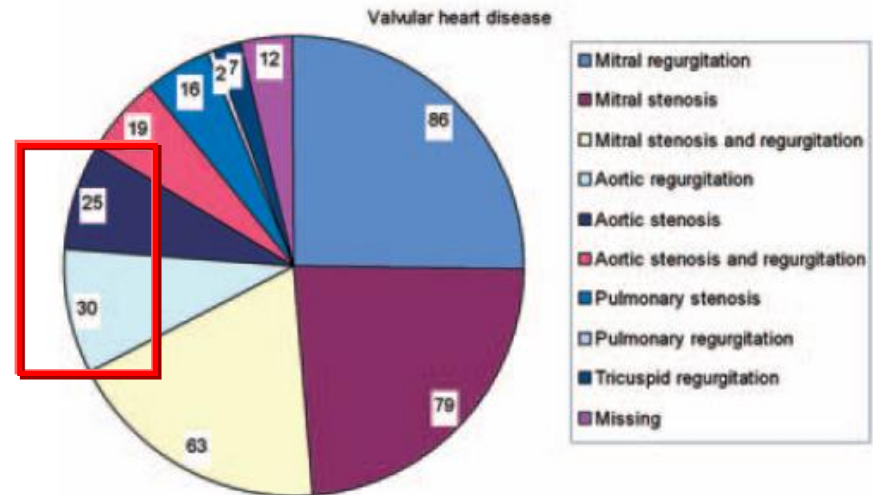
www.eurovalvecongress.com



EuroValve

January 26-27, 2017
Crowne Plaza Barcelona Fira Center, SPAIN

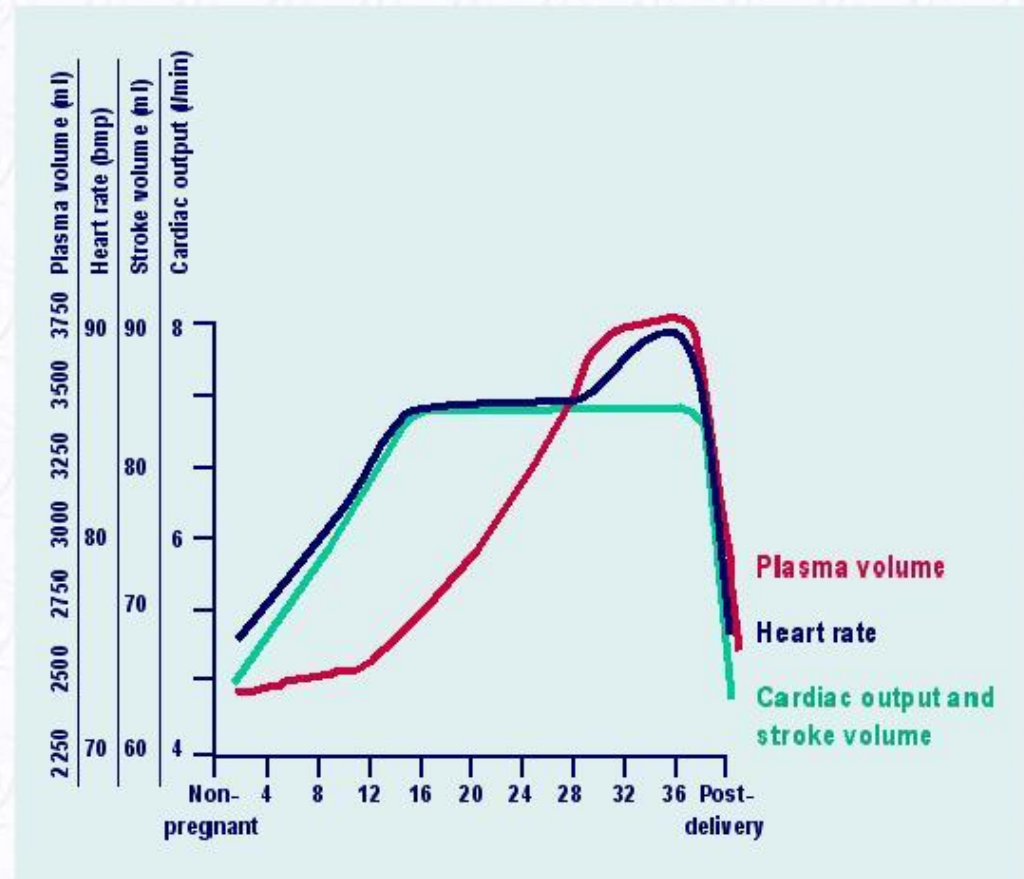
- Women with aortic aneurysms are exposed to the risk of aortic dissection during pregnancy.
- Aortic valve disease are frequently associated.
- Aortic valve disease account for 17% of valvular disease during pregnancy.
- Sport activities also lead to increased haemodynamic stress.



(Roos-Hesselink et al.
Eur Heart J 2013;34:657-65)

Haemodynamic Changes During Pregnancy

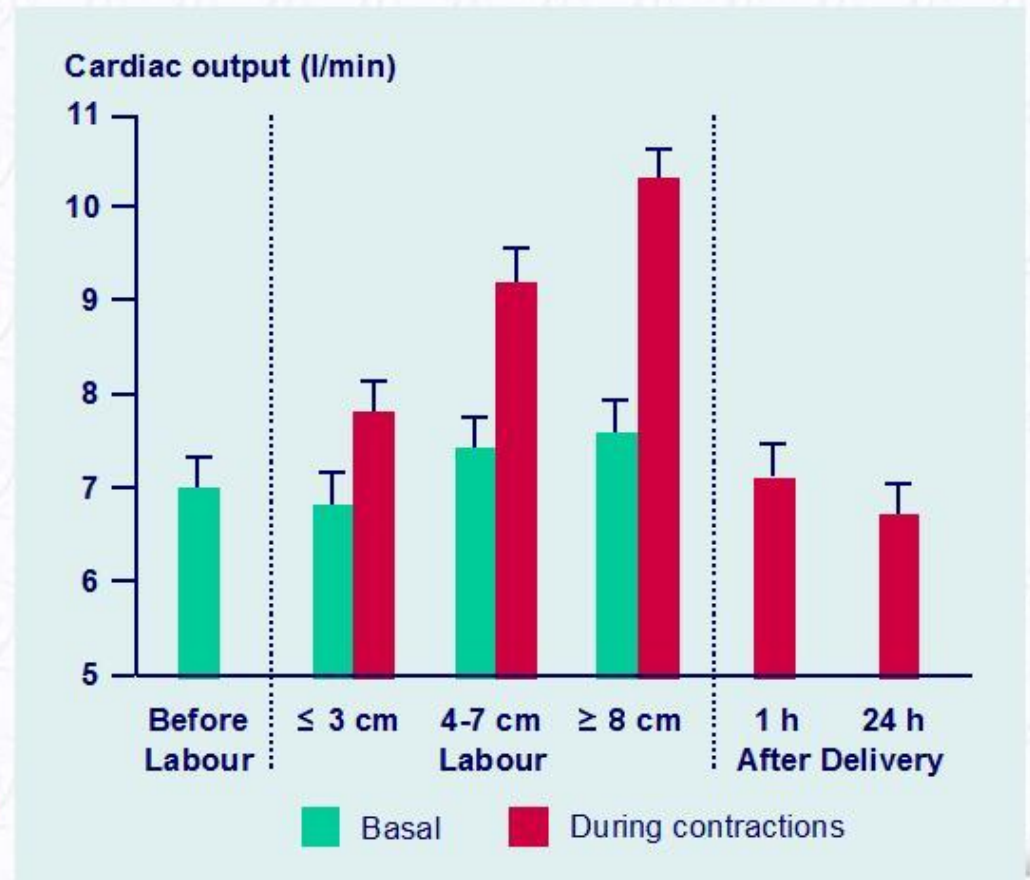
- $\uparrow$ blood volume $\approx$ 50%.
- $\uparrow$ cardiac output 30-50% maximum between, 5th and 8th months.
- $\downarrow$ systolic and diastolic blood pressure.
- $\downarrow$ systemic arterial resistance (hormones, placenta).



Thorne Heart 2004;90:450-6

Haemodynamic Changes During Delivery

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



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



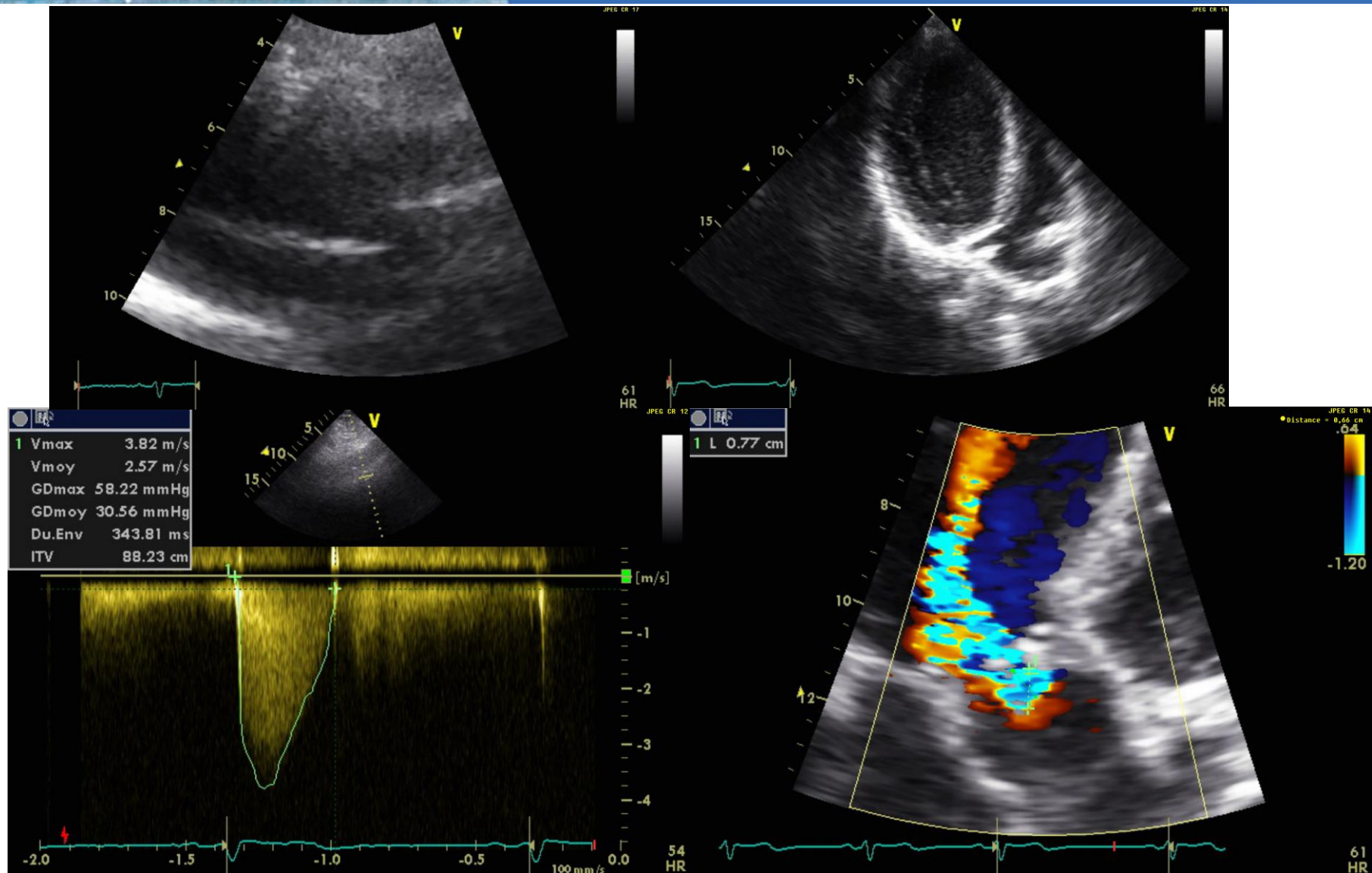
Case History

- 28-year old asymptomatic woman
- Referred because of desire of pregnancy
- Clinical examination
 - Systolic murmur 3/6 and diastolic murmur 2/6, normal S2+
 - No sign of heart failure, BP 116/66 mmHg
 - 53 Kg – 1.73 m (BSA: 1.6 m²)
- Sinus rhythm



EuroValve

January 26-27, 2017
Crowne Plaza Barcelona Fira Center, SPAIN





EuroValve

January 26-27, 2017
Crowne Plaza Barcelona Fira Center, SPAIN

- Bicuspid aortic valve type 1 (fusion right/NC cusps)
- Aortic regurgitation
 - ERO 0.37 mm², regurgitant volume 88 ml
- Aortic stenosis
 - Mean gradient 30 mmHg, v.max. 3.8 m/sec.
 - Valve area 1.5 cm²
- Systolic PAP 30 mmHg
- Left ventricle
 - 58/39 mm, EF 65%

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

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 exercise testing.	I	C
Asymptomatic patients with severe AS should be considered for intervention pre-pregnancy when a fall in blood pressure below baseline during exercise testing occurs.	Ila	C

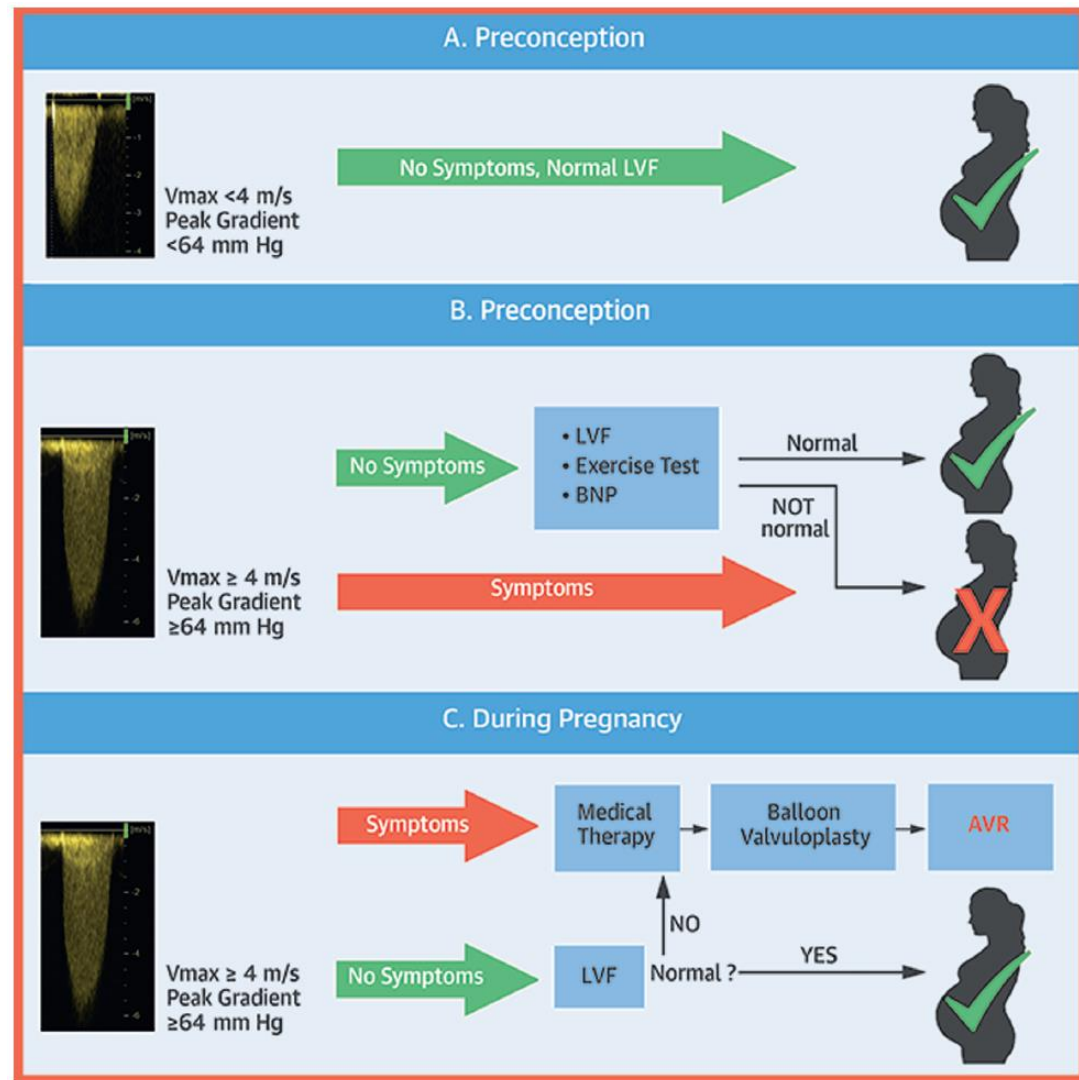


EuroValve

January 26-27, 2017

Crowne Plaza Barcelona Fira Center, SPAIN

- 96 women with AS (34 severe, 62 moderate)
- 21% hospitalized during pregnancy (35% if severe AS)
- Heart failure in 7% if asymptomatic and 26% if symptomatic
- One case of balloon aortic valvuloplasty
- No maternal mortality
- Predictors of complications
 - AS severity
 - Symptoms

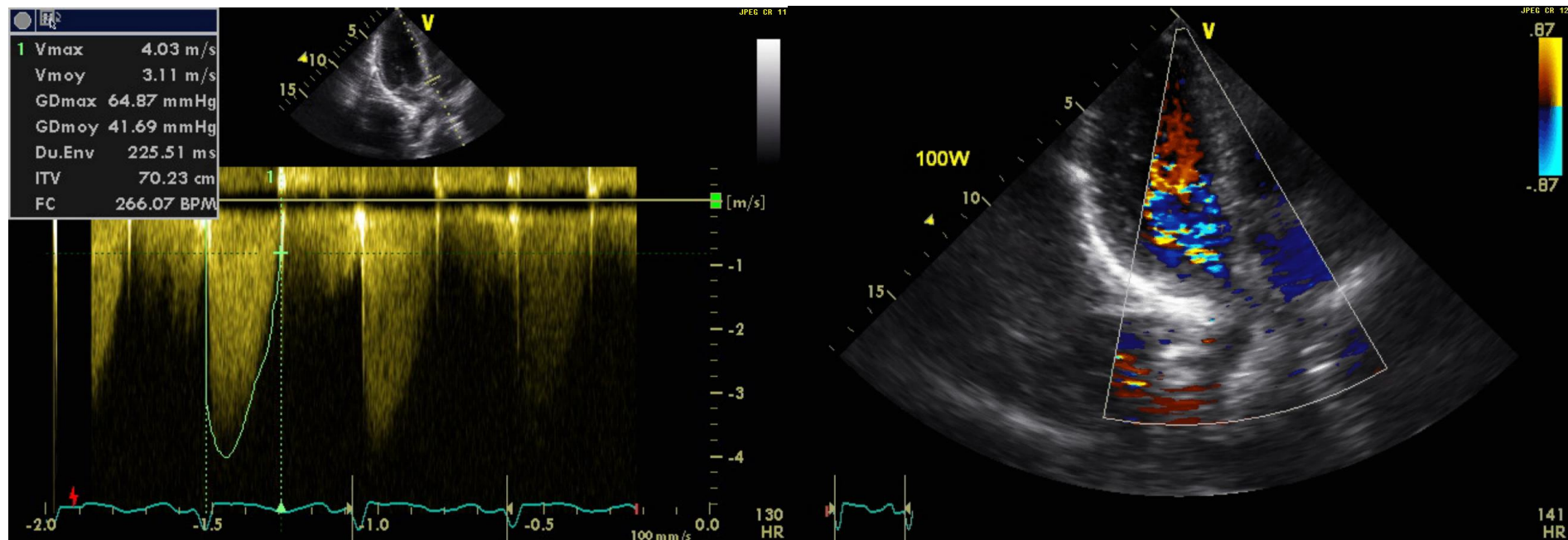


(Orwat et al.
J Am Coll Cardiol 2016;68:1727-37)



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

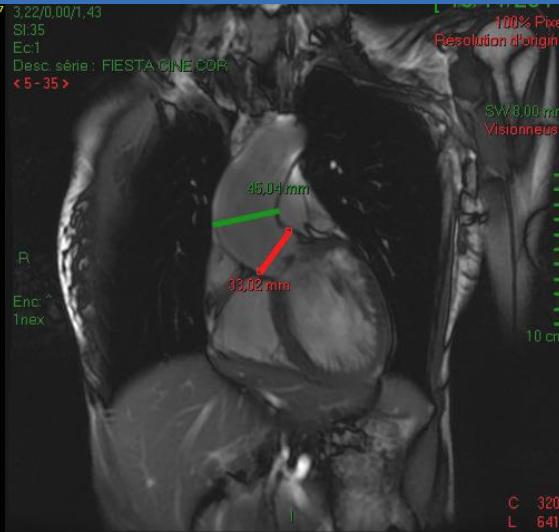
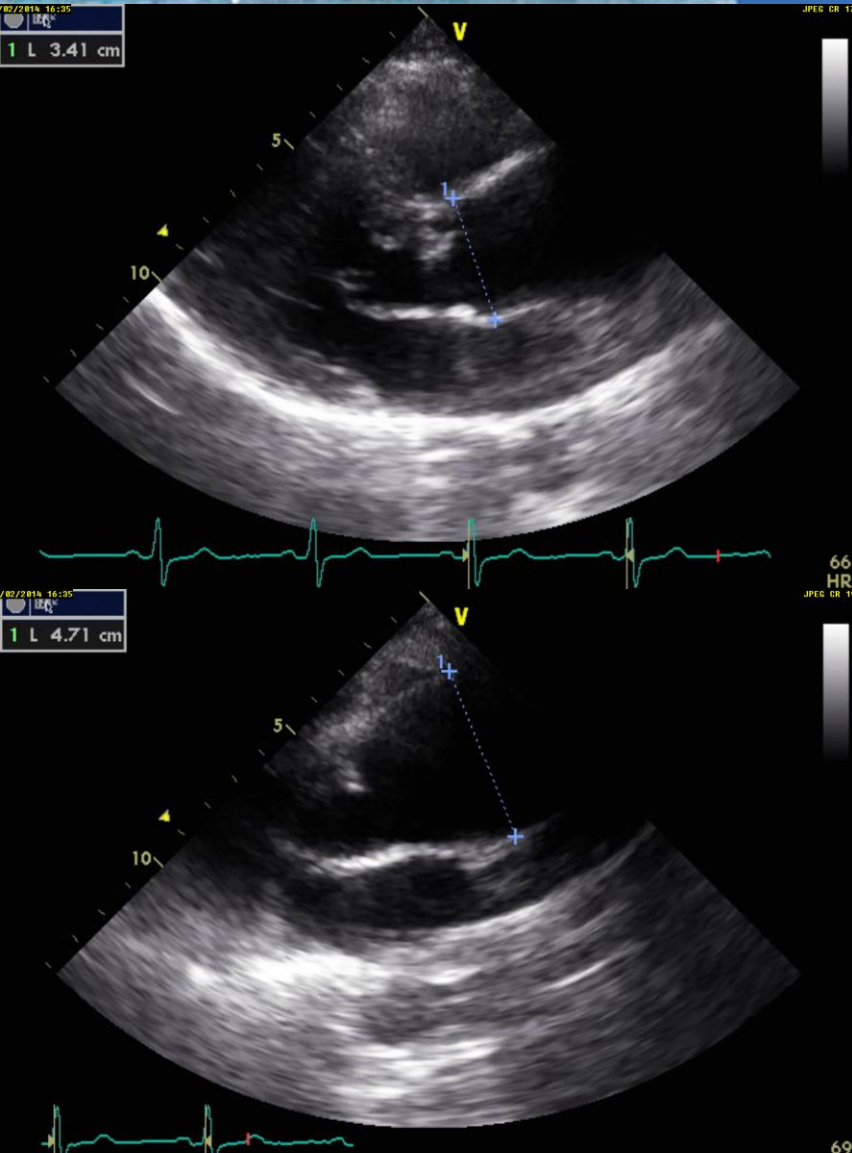




EuroValve

January 26-27, 2017

Crowne Plaza Barcelona Fira Center, SPAIN



Diameters of aorta

- Valsalva 33-34 mm
- sinotubular junction 35 mm
- tubular aorta 45-47 mm
- arch 28 mm
- descending aorta 19 mm



EuroValve

January 26-27, 2017

Crowne Plaza Barcelona Fira Center, SPAIN

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

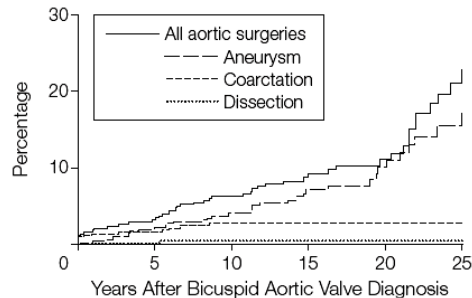
Recommendations for management of aortic root dilatation in patients with bicuspid aortic valve (BAV)

In case of BAV, surgery of the ascending aorta: is indicated in case of aortic root or ascending aortic diameter >55 mm. is indicated in case of aortic root or ascending aortic diameter >50 mm in the presence of other risk factors. ^c is indicated in case of aortic root or ascending aortic diameter >45 mm when surgical aortic valve replacement is scheduled.		
	I	C
	I	C
β-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

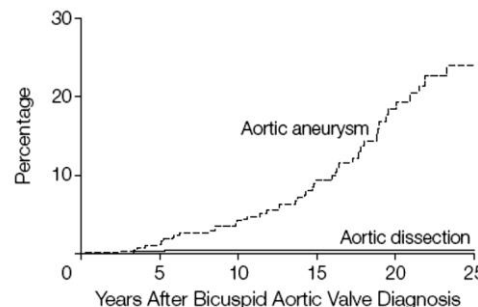


Aortic Diseases and Pregnancy: BAV

- Prevalence at birth 0.5-2%, 30-50% develop ascending aortic aneurysm
- Low risk of aortic dissection in the community



No. at risk						
All aortic surgeries	416	375	328	197	104	44



No. at risk						
Aortic aneurysm	384	352	309	186	88	39
Aortic dissection	416	387	348	209	110	53

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

- Low risk of aortic dissection during pregnancy
 - 216 pregnancies in 88 women with BAV
(maximum aortic diameter > 40 mm in 7 and > 50 mm in 1)
 - No aorta-related complication (McKellar et al Am J Cardiol 2011;107:97-9)



Aortic Diseases and Pregnancy: Marfan

- Most frequent syndromic disease (1/3000 – 1/5000)
- Autosomic dominant genetic disease
- Increased risk of aortic dissection during pregnancy (all aortic segments)
- Low risk of aortic complications if maximum aortic diameter ≤ 45 mm

(Meijboom et al. Eur Heart J 2005;26:914-20)

(Omnes et al. Int J Gynaecol Obstet 2013;122:219-23)

- Indication for beta-blockers throughout pregnancy
- Planned caesarean section if aortic diameter > 40 mm

Diseases of the Aorta

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

	Risk of dissection
• Marfan syndrome	aortic $\varnothing > 45$ mm
• Bicuspid aortic valve	lower risk than Marfan
• Ehlers Danlos type IV	even if non-dilated aorta
• Turner syndrome	consider body size aortic $\varnothing > 27$ mm/m ² BSA



EuroValve

January 26-27, 2017

Crowne Plaza Barcelona Fira Center, SPAIN

	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.

Ila

C

- Healthy boy
- 3170 g, 52 cm
- Apgar 10 /10
- No complication



Sport and Aortic Aneurysm

Physical activity and recreational sports

Recommendations based on individual cardiopulmonary capacity
as assessed by cardiopulmonary exercise testing (CEPT)

Max. Aortic diameter (mm)	Exercise intensity	% of max. heart rate during CEPT
<35	High	75-90
35-45	Moderate	60-75
45-50	Moderate	60-75
≥ 50	Low	<60

(Budts et al. Eur Heart J 2013;34:3669-74)



Sport and Aortic Stenosis

V.Max aortic velocity (m/sec.)	Exercise intensity	% of max. heart rate during CEPT
<2.6	High	75-90
2.6-3.0	Moderate	60-75
3.0-4.0	Moderate	60-75
>4.0	Low	<60

Low exercise intensity if coarctation of the aorta and arm-leg gradient ≥ 20 mmHg

(Budts et al. Eur Heart J 2013;34:3669-74)



Sport and Aortic Regurgitation

LVEF	Exercise intensity	% of max. heart rate during CEPT
➤55	High	75-90
45-55	Moderate	60-75
30-45	Moderate	60-75
< 30 *	Low	<60

* Or LVEDD > 63 mm or LVESD > 42 mm with LVEF <55%

(Budts et al. Eur Heart J 2013;34:3669-74)



EuroValve

January 26-27, 2017

Crowne Plaza Barcelona Fira Center, SPAIN

	A. Low dynamic	B. Moderate dynamic	C. High dynamic
I. Low static	Bowling Cricket Golf Riflery	Fencing Table tennis Tennis (doubles) Volleyball Baseball ^a /softball ^a	Badminton Race walking Running (marathon) Cross-country skiing (classic) Squash ^a
II. Moderate static	Auto racing ^{a,b} Diving ^b Equestrian ^{a,b} Motorcycling ^{a,b} Gymnastics ^a Karate/Judo ^a Sailing Archering	Field events (jumping) Figure skating ^a Lacrosse ^a Running (sprint)	Basketball ^a Biathlon Ice hockey ^a Field hockey ^a Rugby ^a Soccer ^a Cross-country skiing (skating) Running (mid/long) Swimming Tennis (single) Team handball ^a
III. High static	Bobsledding ^{a,b} Field events (throwing) Luge ^{a,b} Rock climbing ^{a,b} Waterskiing ^{a,b} Weight lifting ^a Windsurfing ^{a,b}	Body building ^a Downhill skiing ^{a,b} Wrestling ^a Snow boarding ^{a,b}	Boxing ^a Canoeing, Kayaking Cycling ^{a,b} Decathlon Rowing Speed skating Triathlon ^{a,b}

(Pelliccia et al. Eur Heart J 2005;26:1422-45)



Conclusion

- The risk of aortic complications during pregnancy depends on aortic diameter and the aetiology of aortic aneurysm.
- In young women, the most frequent aetiology is BAV followed by Marfan.
- In AS, heart failure is rare in women with moderate AS and in those who are asymptomatic.
- In AR, even severe, pregnancy is well tolerated.
- Importance of pre-pregnancy assessment using comprehensive imaging.
- Sport activity should also be adapted to aortic size and valvular function.