

Heart Disease in Pregnancy

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- No disclosures
- *(BUT: A lot to fit into a 20 minute lecture)*



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Overview

- Normal cardiac physiology in pregnancy
- Cardiac Disorders Pregnancy
 - Heart Failure
 - Artificial Heart Valves
 - Arrhythmias
 - Acute Coronary Syndromes
 - Congenital Heart Disease cases
- CHD cases in pregnancy
- Review of the literature
- Cardiac Contraindications to pregnancy

Phoenix: Healthcare



Phoenix: Healthcare



PRESENTED BY
PHOENIX CHILDREN'S Hospital

the **10th Annual Phoenix Fetal Cardiology Symposium**

www.fetalcardio.com

BEST CHILDREN'S HOSPITALS

U.S. News & WORLD REPORT

CARDIOLOGY & HEART SURGERY

2018-19

NPC-QIC Research Publications



The Society of Thoracic Surgeons

PEDIATRIC CARDIAC CRITICAL CARE CONSORTIUM

PC⁴ Improving outcomes quality through collaboration



PAC3

Pediatric Acute Care Cardiology Collaborative



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PCH Women's and Children's Pavilion 2021



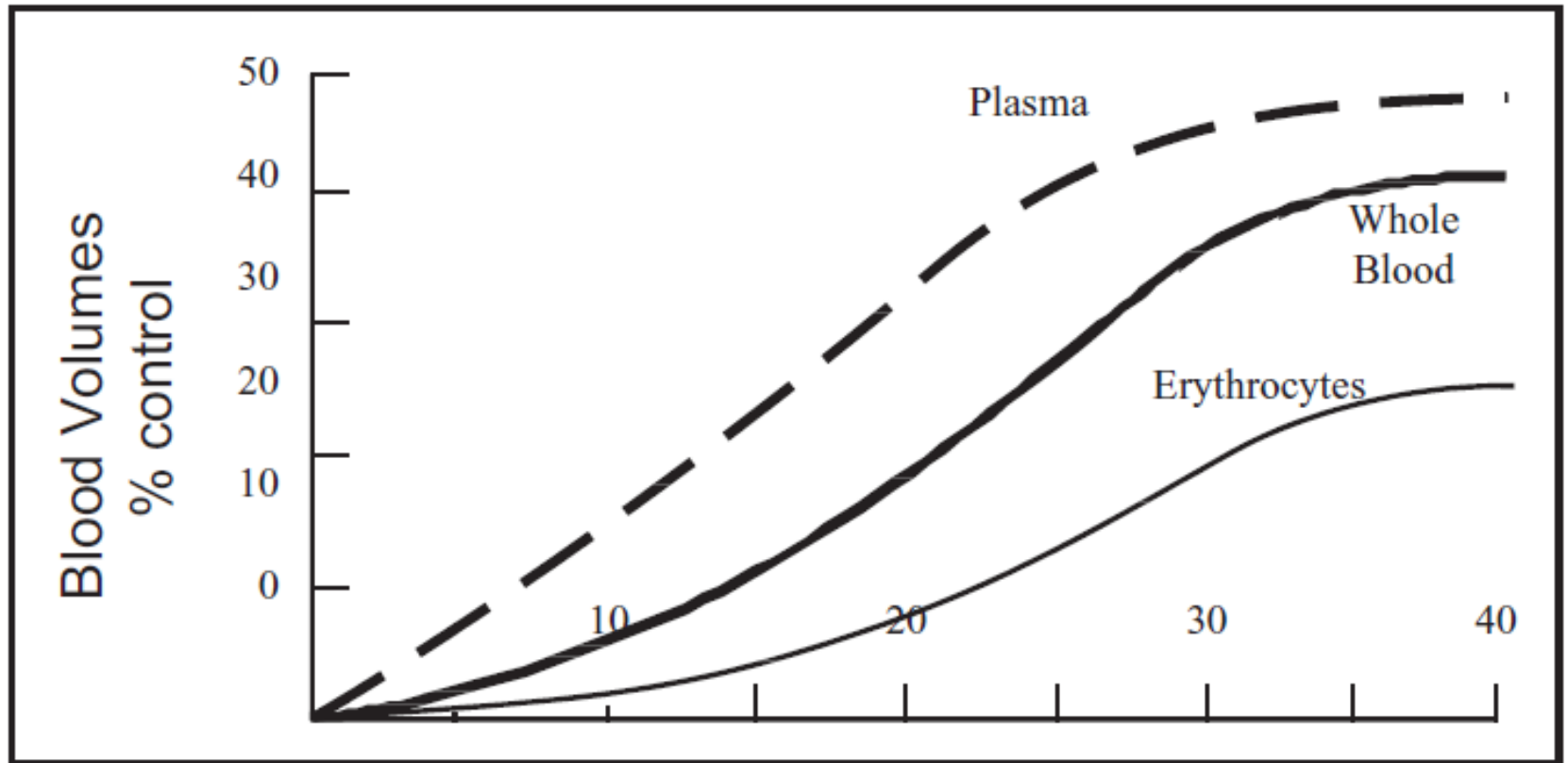
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CONGENITAL HEART DISEASE: *NOT JUST CHILDREN!*

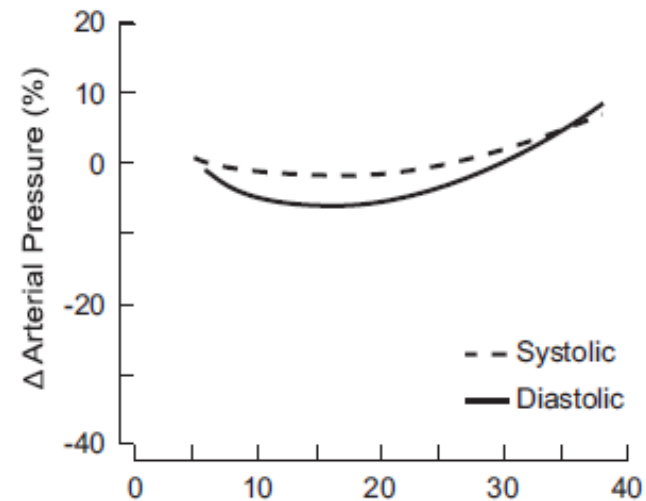
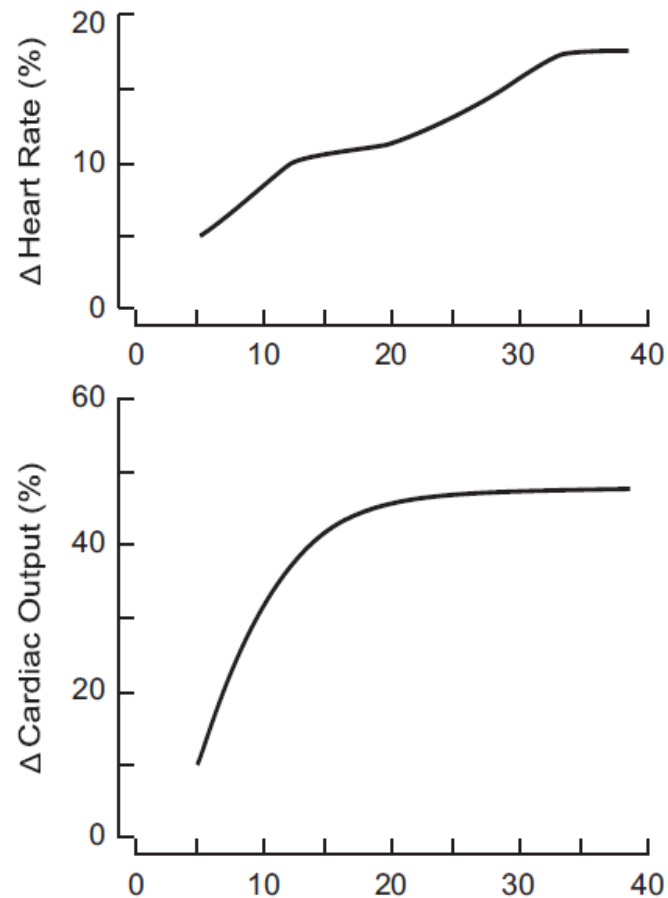


Antepartum Physiologic Changes

Blood Volume during Pregnancy



HR and C.O. during Pregnancy



Early Puerperium

- ↑ in left atrial dimensions 1-3 days postpartum
 - Mobilization of excessive body fluids
 - ↑ venous return
 - Normalizes within 10 days
- Heart rate normalizes within 10 days
- Diuresis between postpartum days 2-5

Late Puerperium

- Left ventricular dimensions decrease gradually for 4-6 months
- SV, CO, SVR return to pre-pregnancy values by 12 weeks postpartum

On to the cardiology...



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What is important in assessing the pregnant cardiac patient?



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Congenital Heart Disease Subtype

Pulm HTN

Mitral Stenosis - Severe?

Aortic Stenosis – Severe? Sx?

Coarctation – Native?

Marfan or Bicuspid AoV – Aorta Dilation?

Cyanotic CHD

Clinical Factors

NYHA Class

Cyanosis

Echo Factors

EF

MV Area

AoV Area

LVOT Obstrxn

AV Valve Regurg

Pregnancy
In CHD

Medical Hx

CHF/DVT

Arrhythmia

Smoking

Mech Valve

Testing

NT-proBNP

Exercise Test



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AHA SCIENTIFIC STATEMENT

Management of Pregnancy in Patients With Complex Congenital Heart Disease

Cannobio M, Warnes CA et al. *Circ* 2017



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)

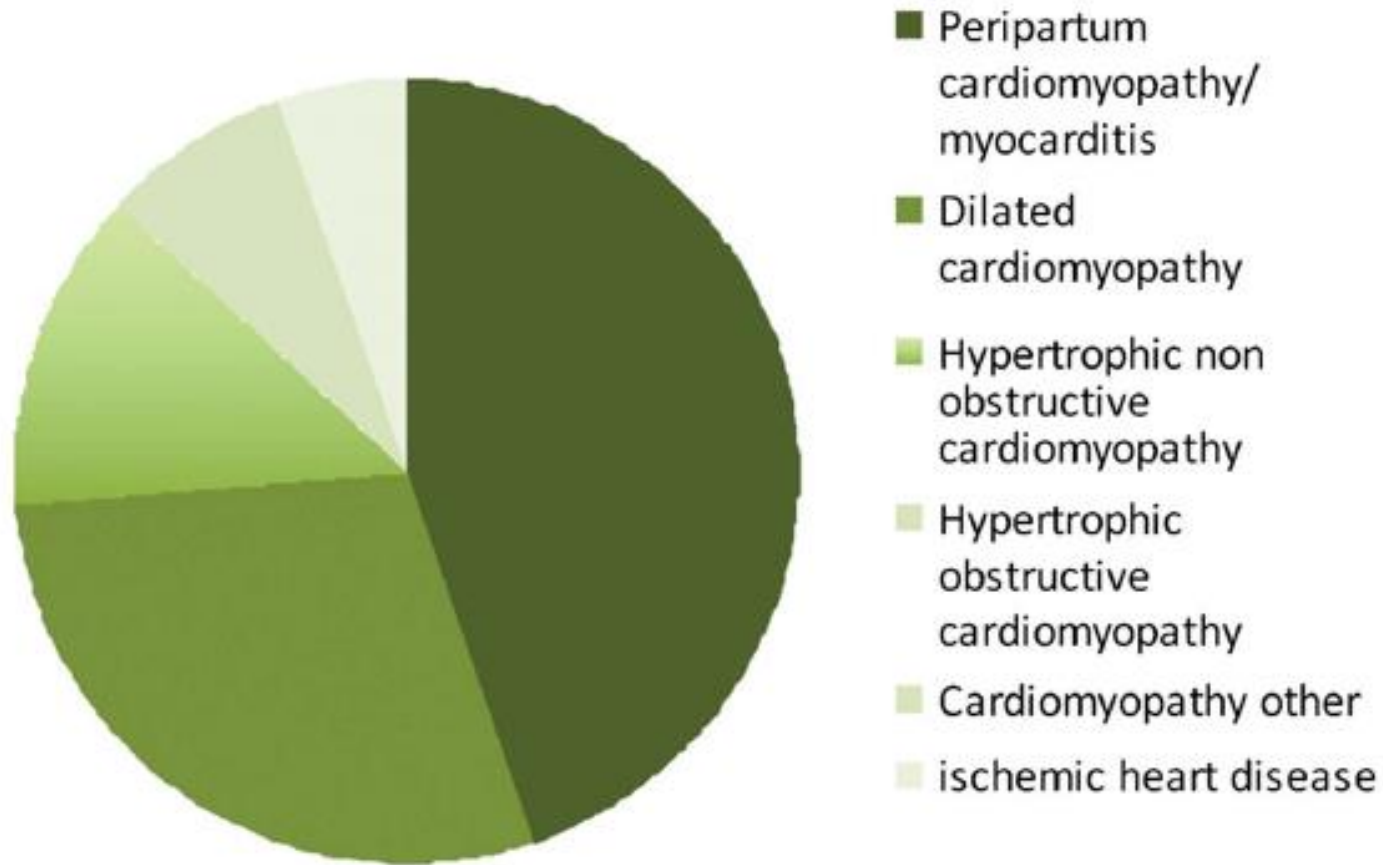
ESC Group. *Eur Heart J* 2011

General Rule

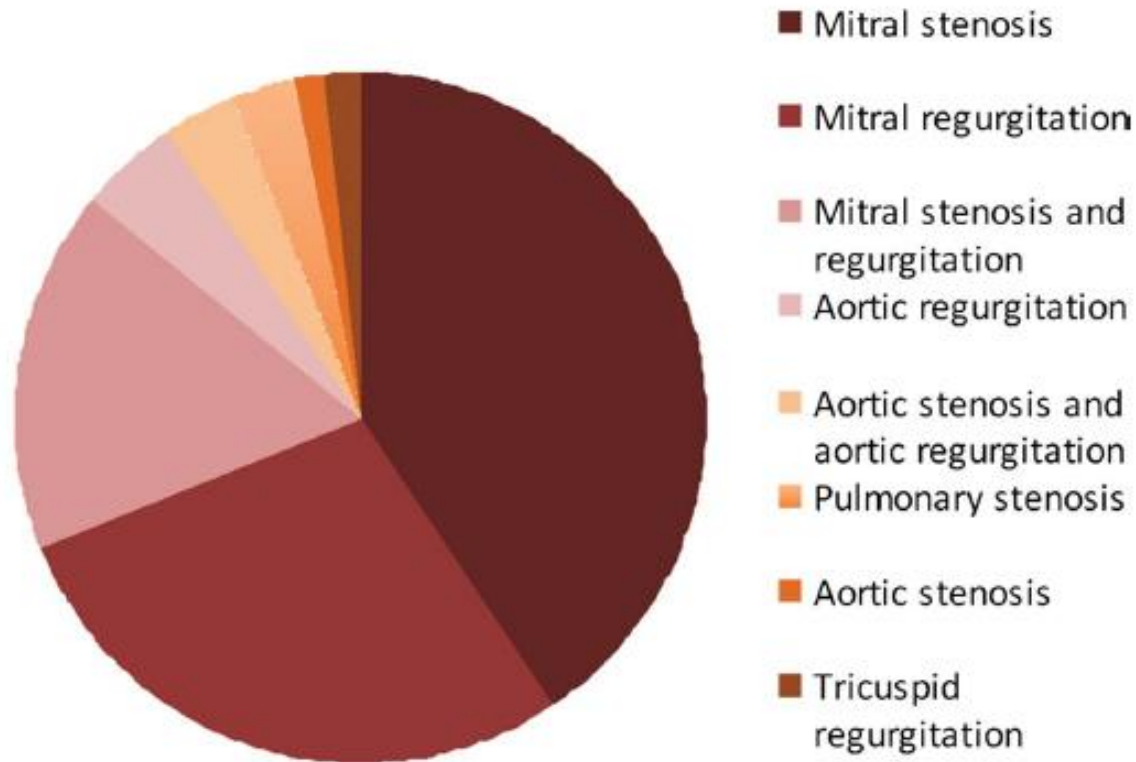
For Valvular Disease in Pregnancy

- Regurgitant Lesions: OK 
- Obstructive or Stenotic Lesions: Bad 

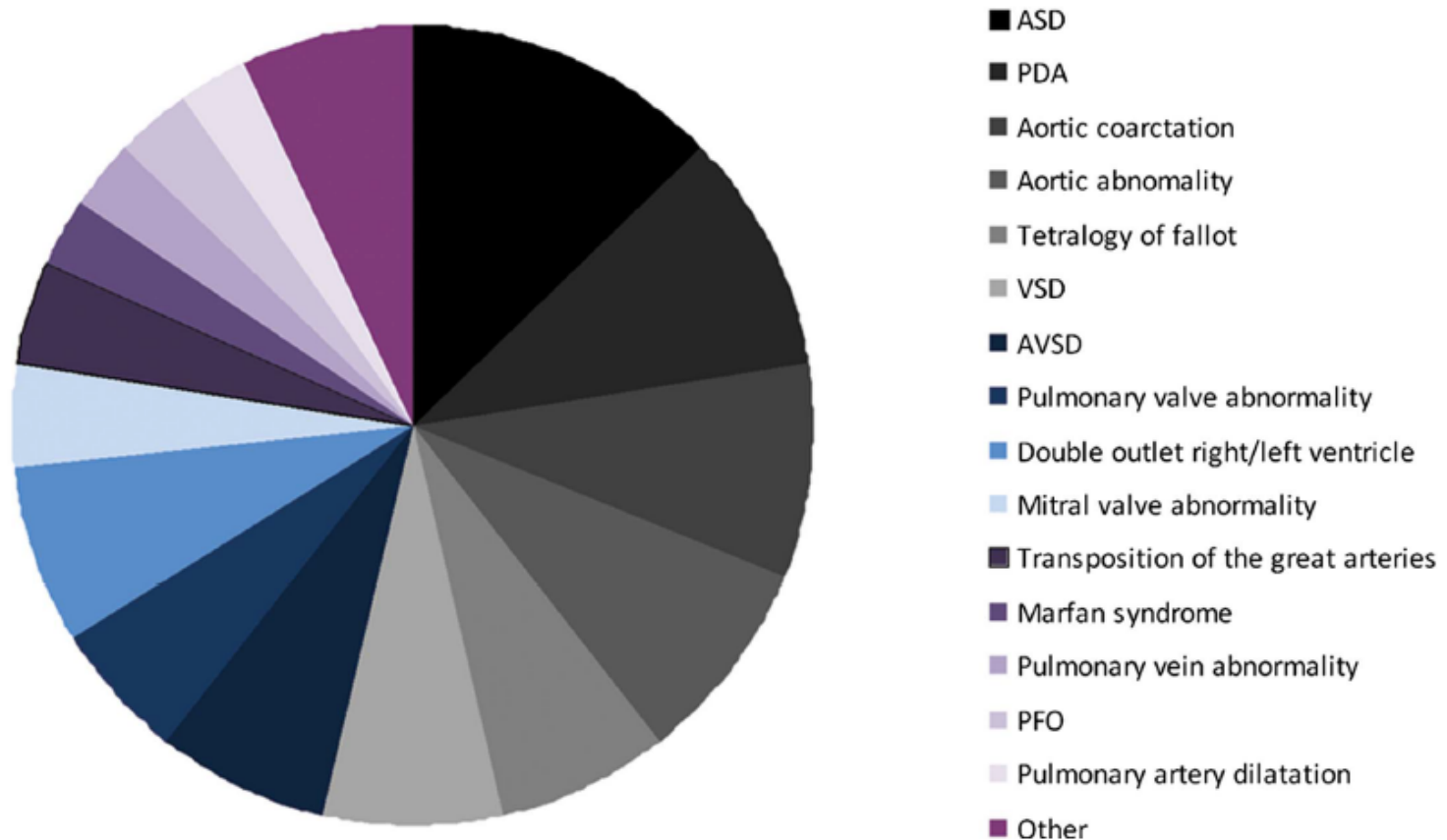
HF in Pregnancy - Cardiomyopathy



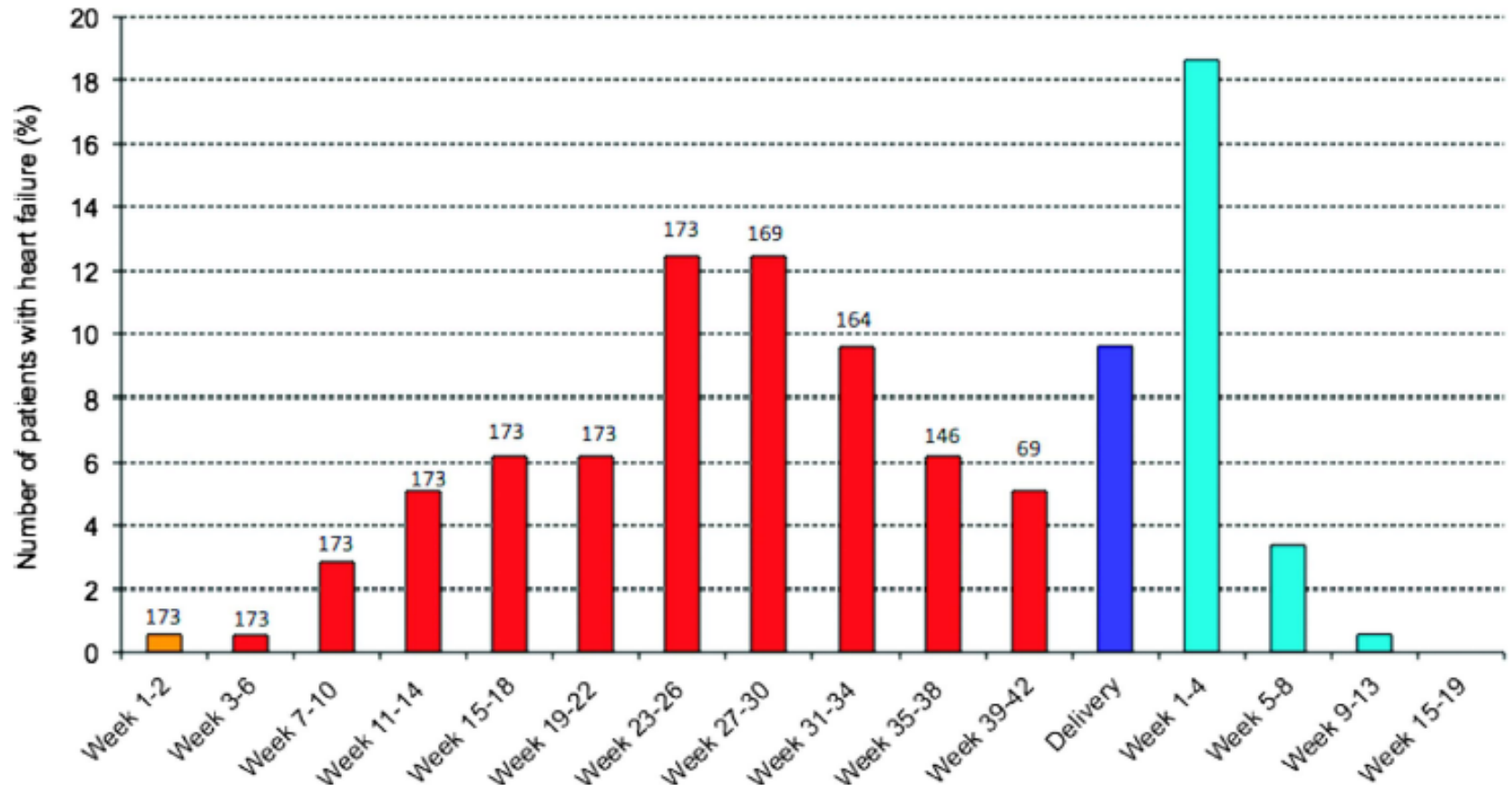
HF in Pregnancy – Valvular Causes



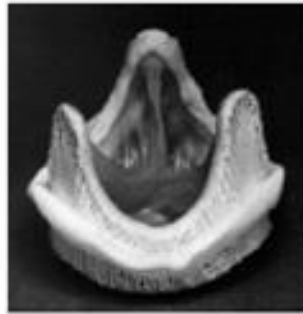
HF in Pregnancy – Congenital Heart



Heart Failure in Pregnancy: By EGA



Artificial Heart Valves



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Mechanical Heart Valves

- Pregnant women with prosthetic valves: high risk of thrombo-embolism
 - Caution: older MVR or prior thrombus
- Decision about anticoagulant management should include risk assessment
 - Valve type
 - Position
 - History of thrombo-embolism
- Patient preference

Anticoagulation Options in Pregnancy

1. LMWH BID throughout pregnancy

*Check anti-Xa LMWH 4 hrs after sub-Q injection

2. UFH throughout pregnancy SQ Q12 h

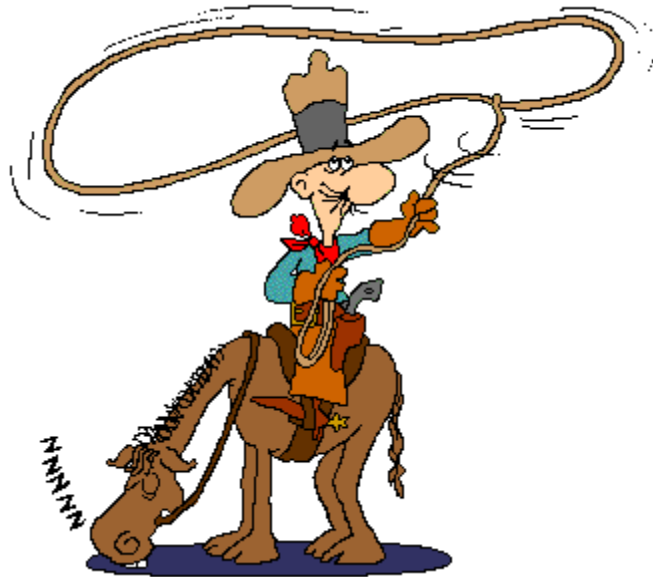
*PTT 50-70 or anti-Xa heparin 0.35-0.70 U/ml

3. UFH or LMWH (as above) until week 13, then warfarin until week 35, then UFH or LMWH until delivery

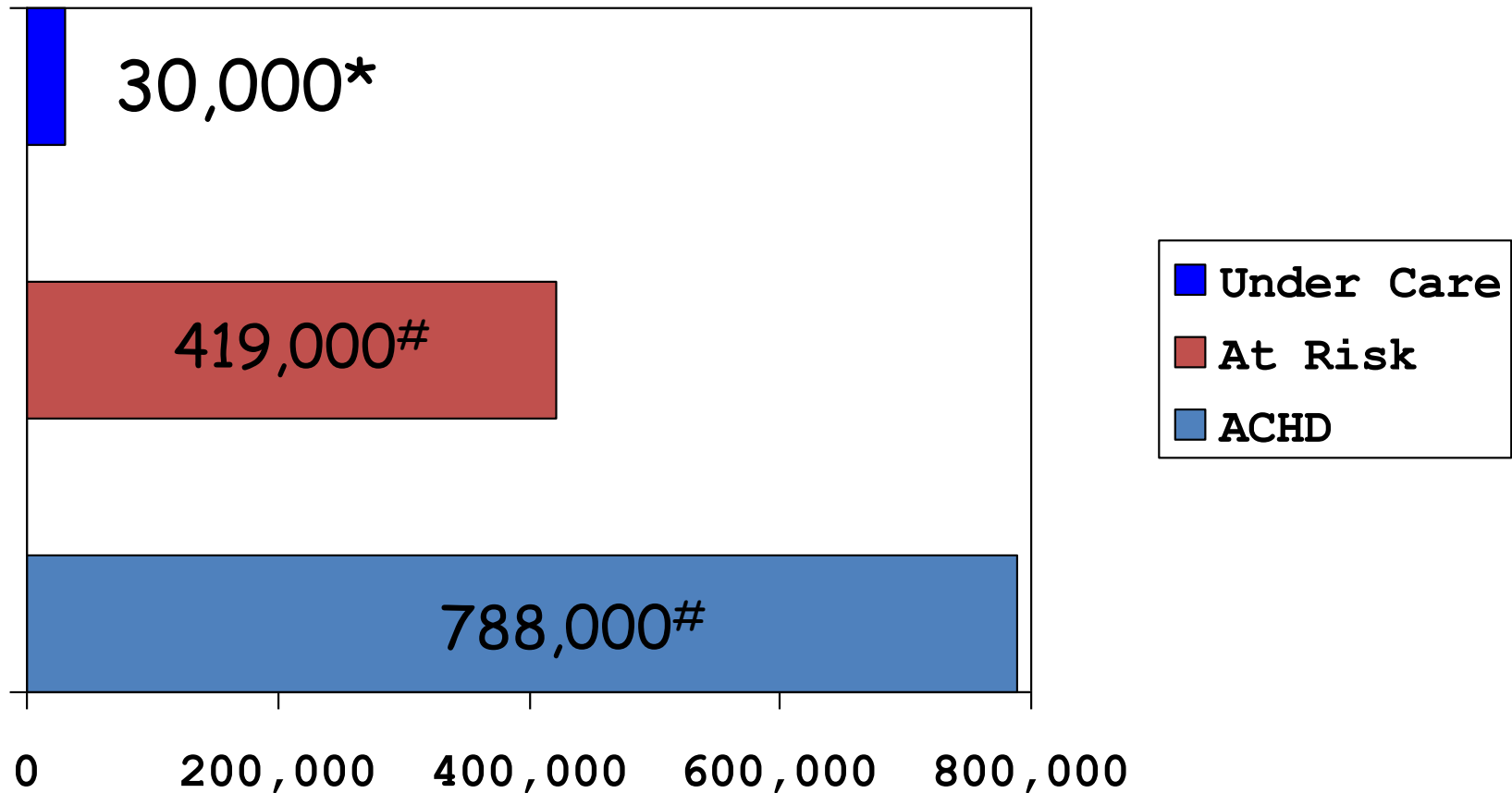
*Addition of low-dose aspirin (75-100 mg/d)

4. If warfarin < 5mg, then *OK TO CONTINUE IN PREGNANCY!*

On to Congenital Heart Disease!!!



ACHD Patient Numbers in USA



ACHD professional athletes...



MacKinzie Kline

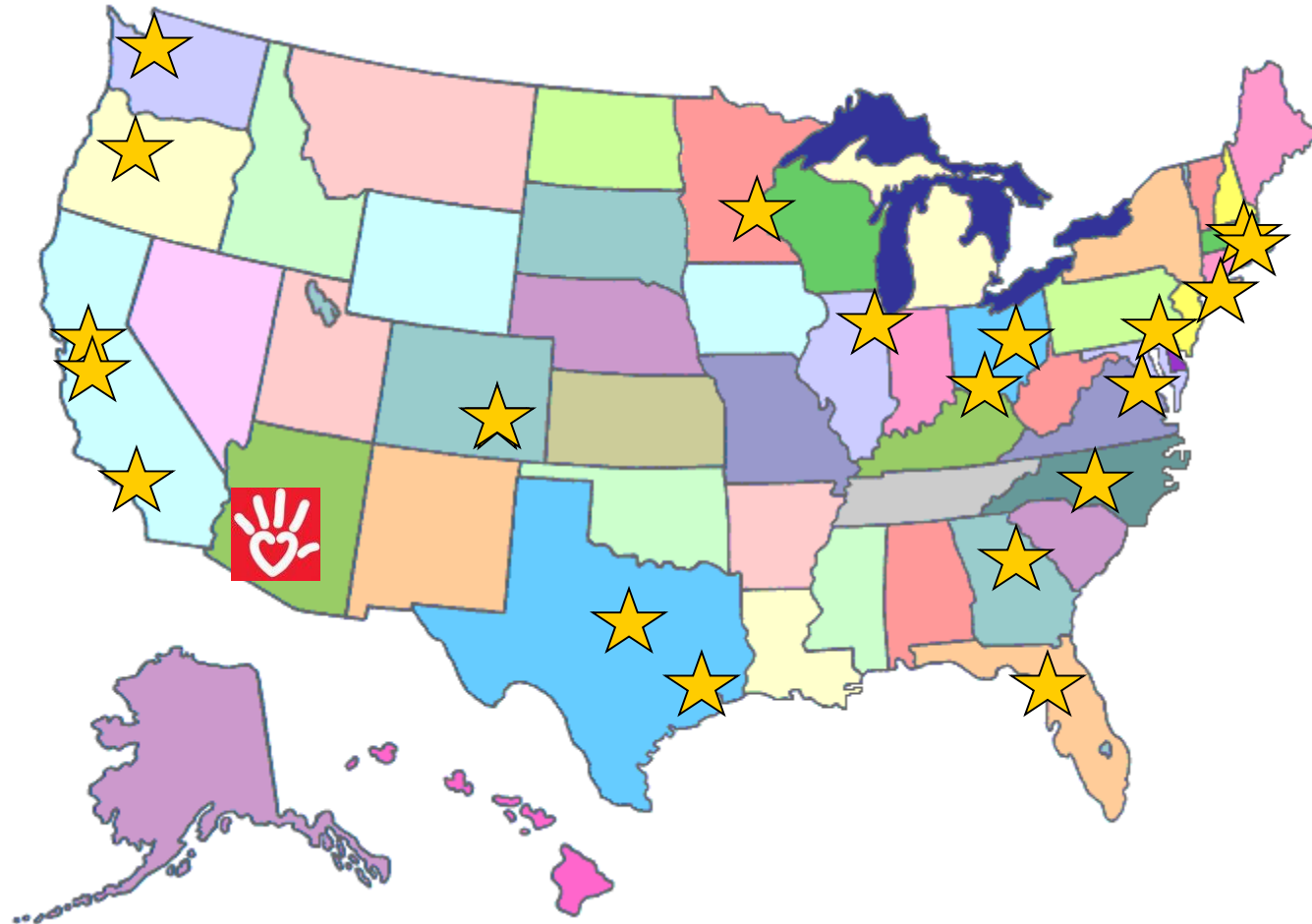


Ronny Turiaf



Erik Compton

Adult Congenital Heart Centers in the U.S. 2019



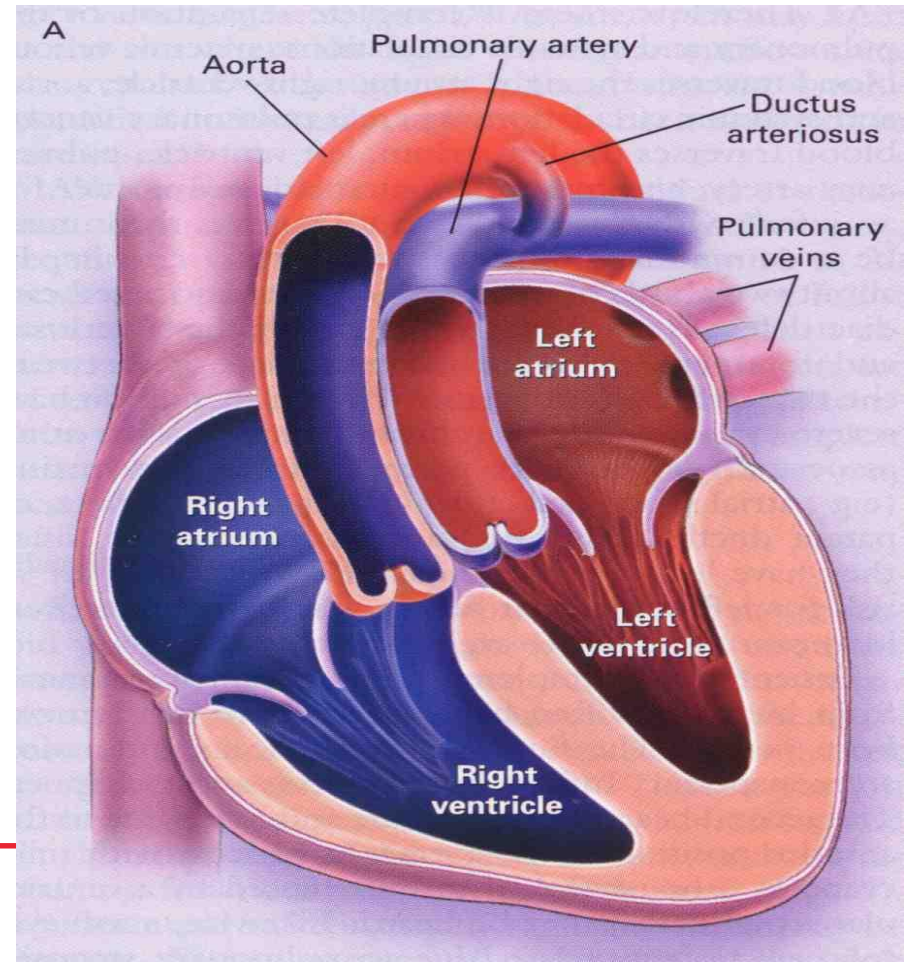
ACHD: Tough cases...



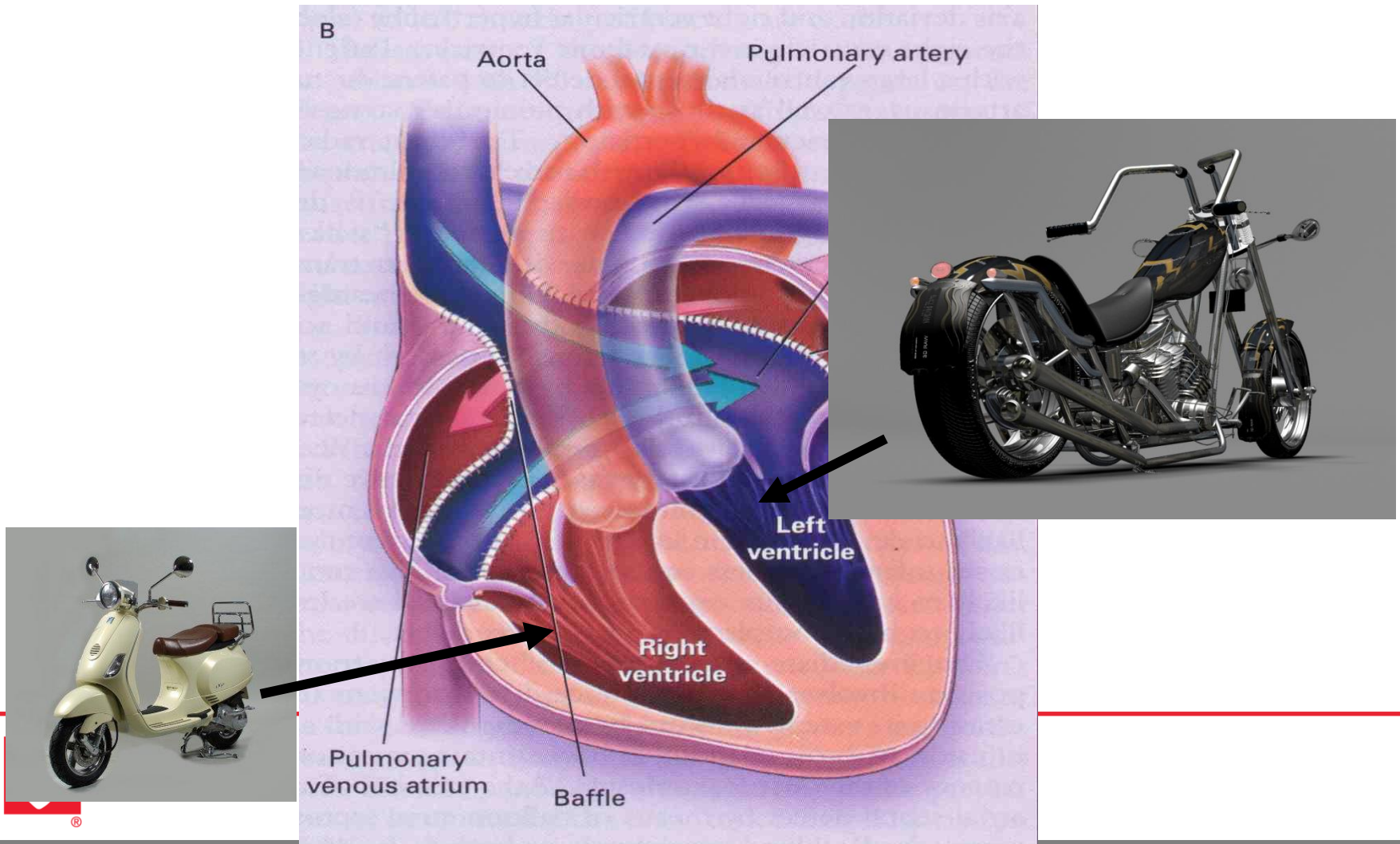
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Case: D-Transposition

- 30 y/o woman
 - Normal at birth
 - Day of life #5, turned blue
 - Dx'd with D-transposition of great arteries
 - Had surgery
- Now wants to get pregnant



The Mustard Operation: Cyanosis is gone, but... RV gets overworked and gets tired!



Pregnancy in D-TGA s/p Atrial Switch

- International registry, 16 U.S. centers
- 70 pregnancies in 40 women
 - 1985-2002
 - 90% were Mustard, 10% Senning repair
 - 32% had pacemaker
 - 40% had arrhythmia
 - 26% had SVT
 - 2% had non-sustained VT
 - 45% had decreased systemic vent function (EF)

Pregnancy in D-TGA s/p Atrial Switch

Pregnancy outcomes and complications

Variable	Value
Outcomes	
Live birth	54 infants (2 twin pregnancies)
Spontaneous abortion	10
Therapeutic abortion	6
Obstetric complications	4/50 (17%)
Hypertensive disorders of pregnancy (preeclampsia, gestational hypertension)	4
Gestational diabetes	2
Placenta praevia	1
Placentalomegaly	1
Birth weight (g) (singletons only, n = 48)	2,714 ± 709 (range 964–4,309)
Birth weight <2,500 g	15/48 (31%)
GA (wks) (singletons only)	36.7 ± 3.6 (range 24–41)
Preterm delivery (<37 wks GA)	19 (39%)
Very preterm delivery (<34 wks GA)	9 (18%)

Case: Pulm HTN/Cyanosis

CARDIAC CATHETERIZATION REPORT

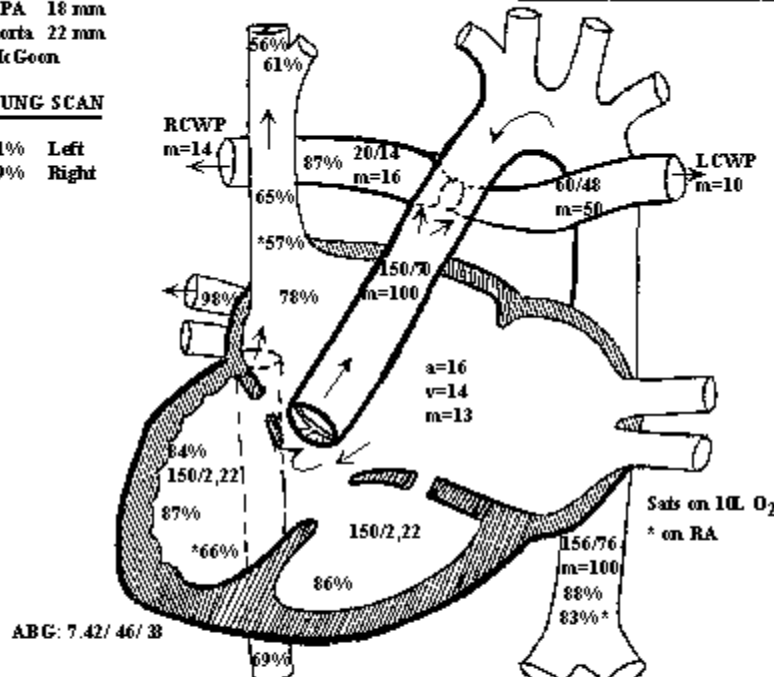
DOB 02-01-74 AGE 25 years
 PCD NO. 83307 HOSP. NO. 8362862
 STAFF DOCTOR Mullins
 FELLOW El-Said / Schutte

MEASUREMENTS

RPA 17 mm
 LPA 18 mm
 Aorta 22 mm
 McGoon

LUNG SCAN

81% Left
 19% Right



ABC: 7.42/ 46/ 38

Arrows indicate catheter course

Ht 154 cm Wt 60.6 kg BSA 1.58 m² Hgb 15.7 Hct 48.8 %

Qp:Qs 2:1 Qs 2.3 L/min/m² PAR (Rt) 3 / (Lt) 9.2 U_m² LSVC No

DIAGNOSIS:

1. Dextrocardia
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3. RV dominant complete AV canal (2+ regurgitation)
4. Large inlet ventricular septal defect
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6. Pulmonary atresia
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- 25 y/o
- Pulm atresia
- 10 weeks pregnant!

Pregnancy in Eisenmenger Syndrome or Pulm HTN

- NOT RECOMMENDED!!!
- *Avila WS Eur Heart J 2005*
 - 13 pregnancies in 12 women with ES
 - 3 Sab (23%), 1 PTL at 23 wks
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Case:

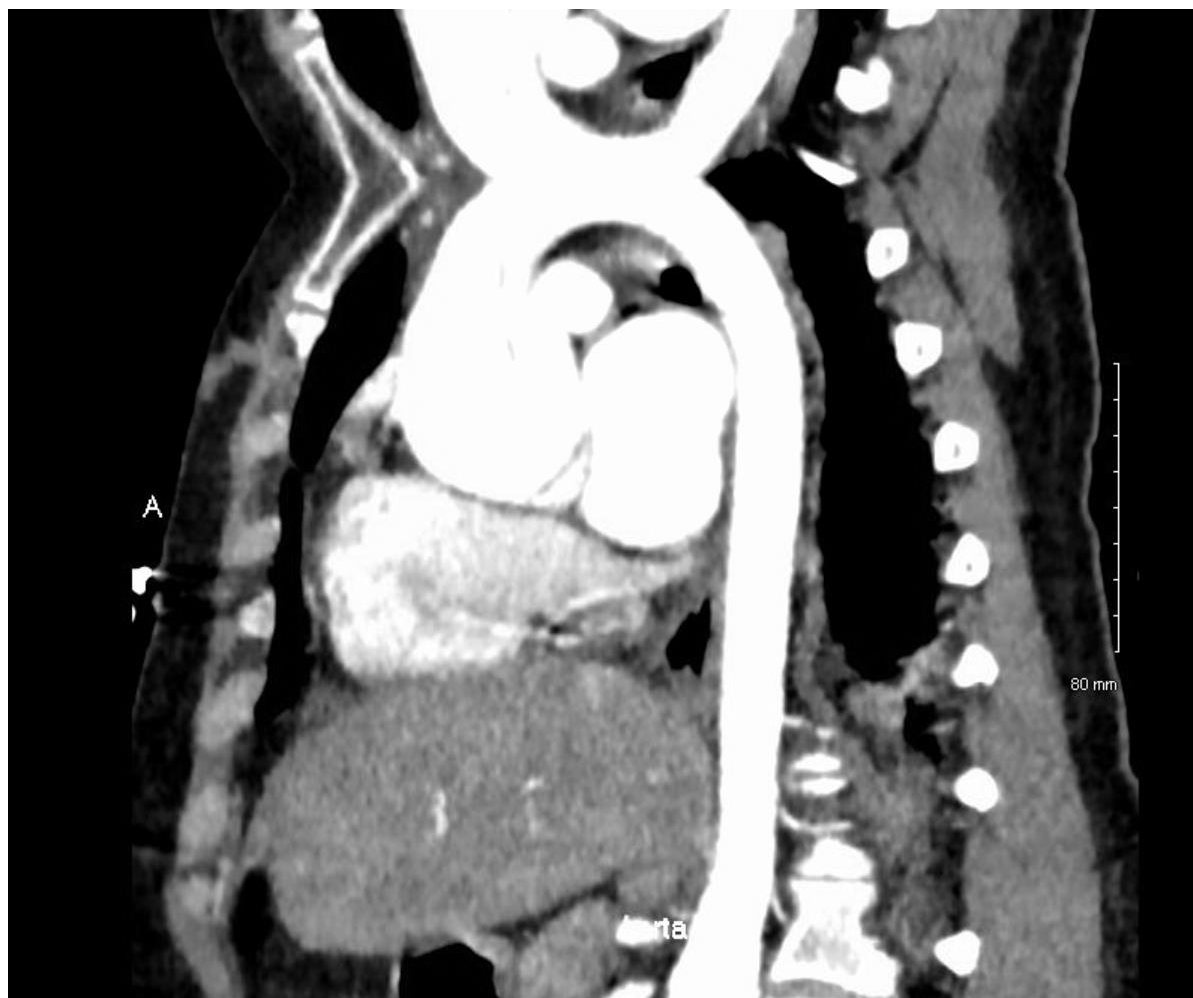
Marfan Syndrome in Pregnancy

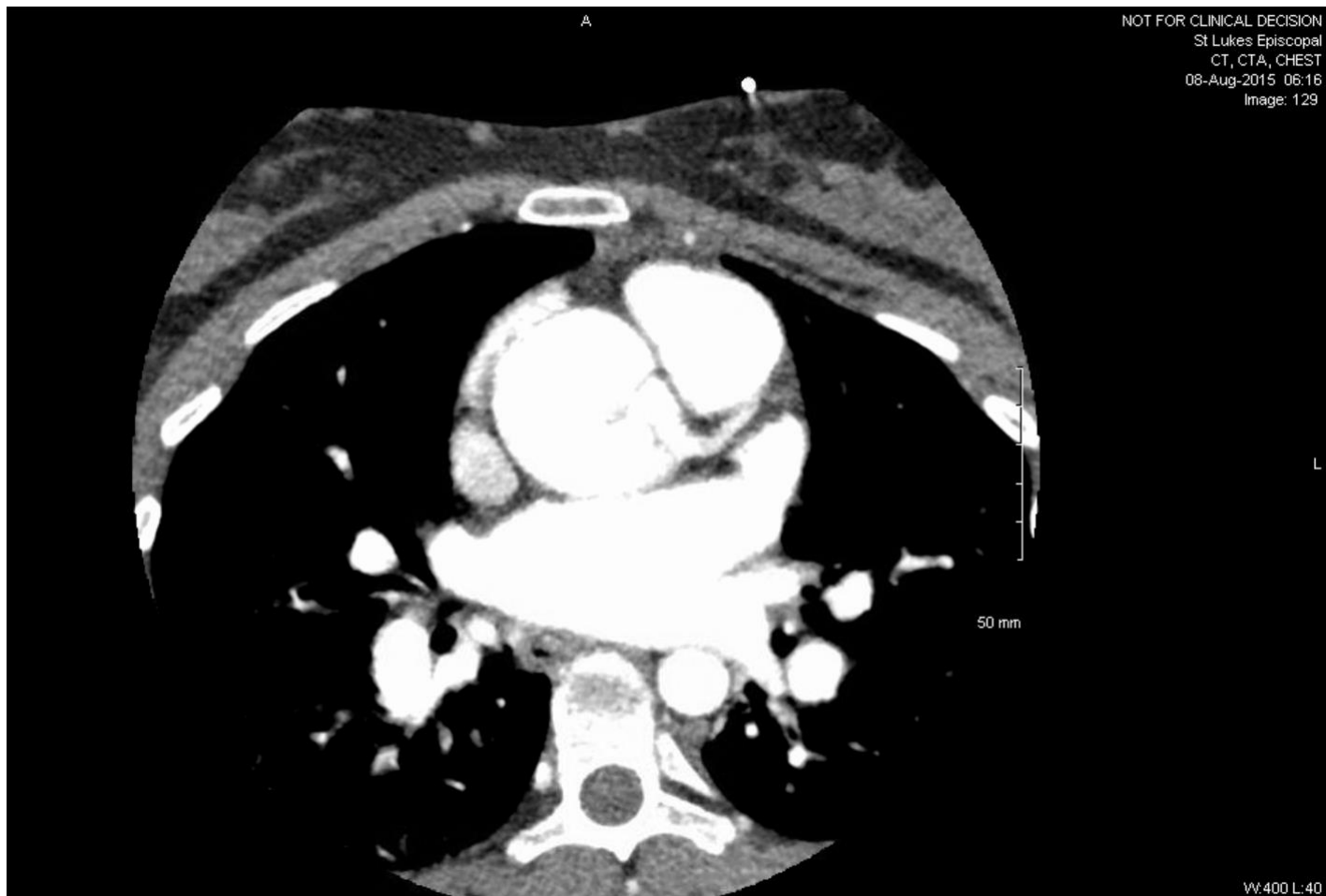
25 y/o G2P1 Marfan Syn w/ aortic aneurysm of 4.3 cm.

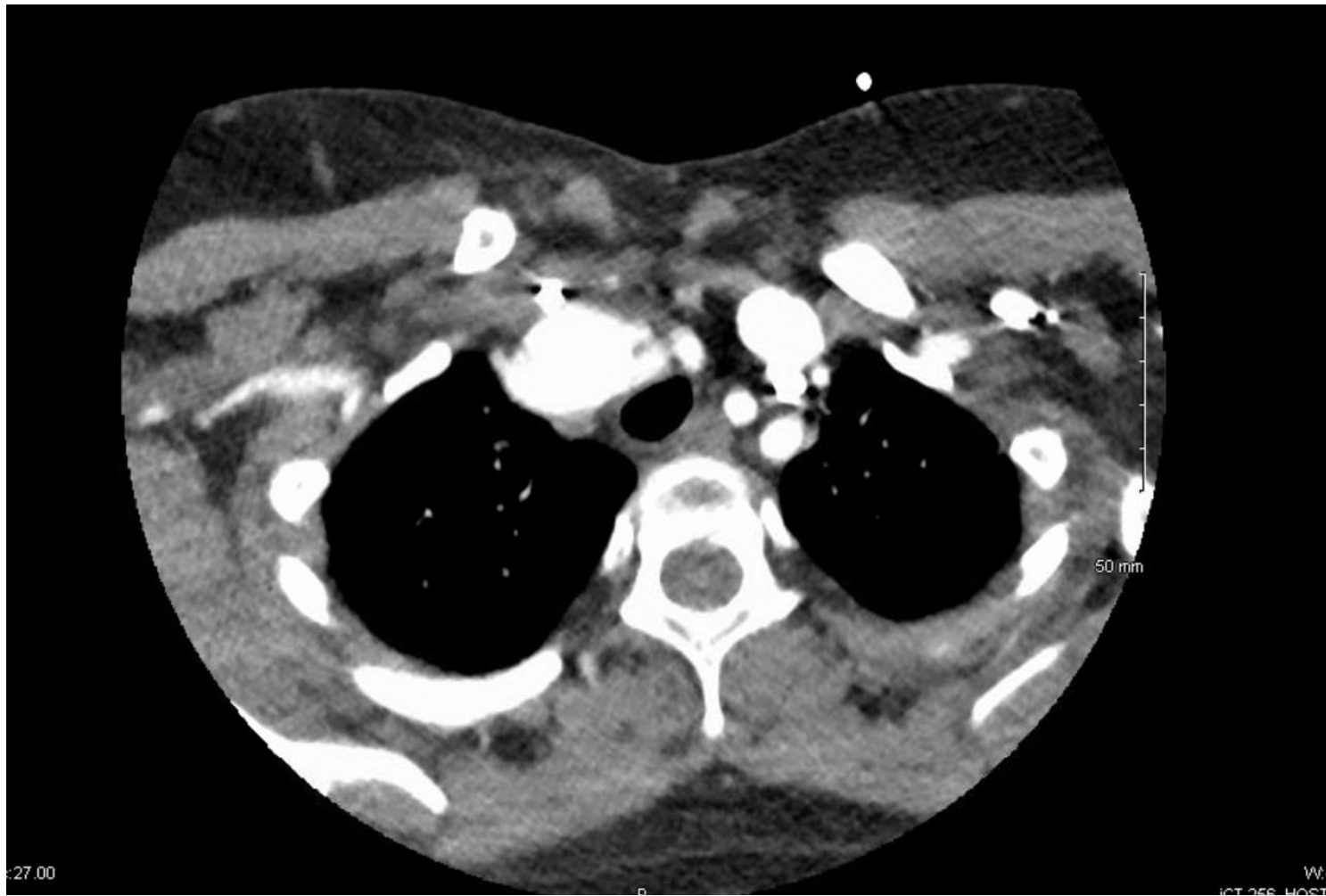
Plan: C-section on Thurs

Transfer to CCU after C-section

*Hospital Course: Chest Pain & ST Elevation
on post-op day #2 (Saturday)*







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Antegrade cerebral perfusion: 3+

Endovaginate
Direct common carotid

Complications: low / Drains: 2 / 100

Specimens: AV leaflets
Aortic wall - 1 L pleural

Harvesting
LLE

⑥ Repair of
the base of
the aorta

⑦ Excision
of R subcl
aneurysm

⑧ Aorta
R subcl
bypass

⑨ IABP
R CFA

PHHPSH

- Marfan
- post partum
- birth 8/6/2011
- C-section
- C-section 3 days

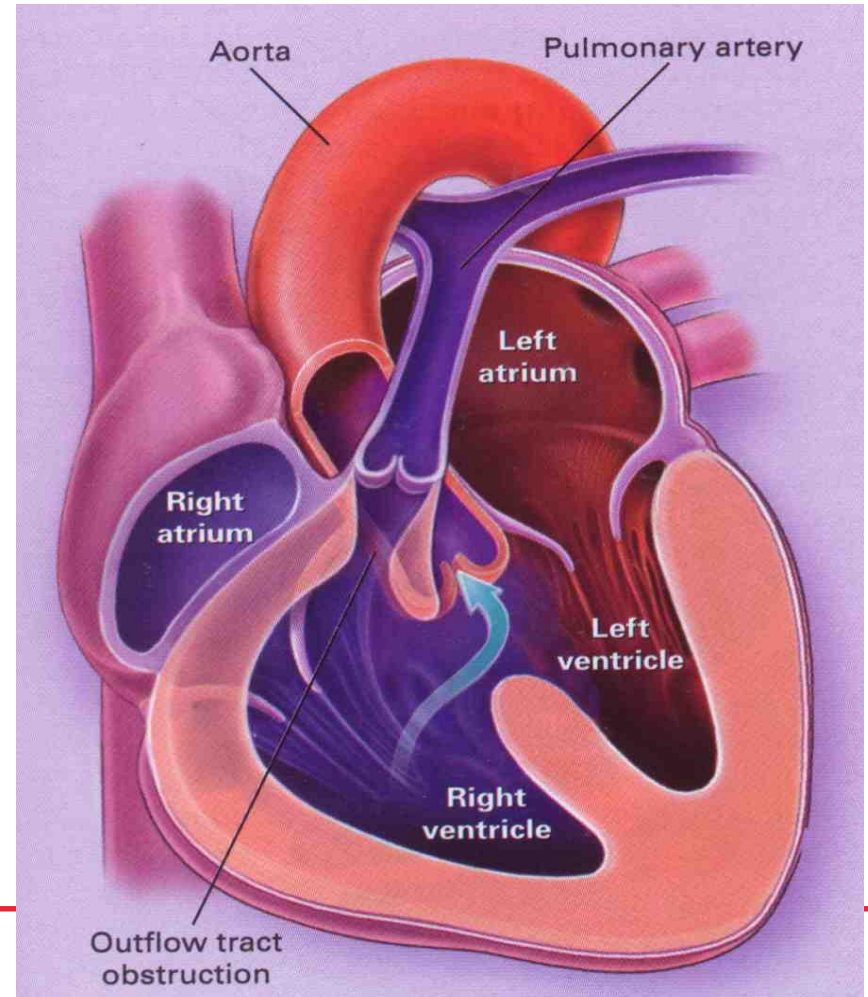
CR=0.6
EF=50%

PREOPERATIVE DIAGNOSIS AND OPERATIVE FINDINGS

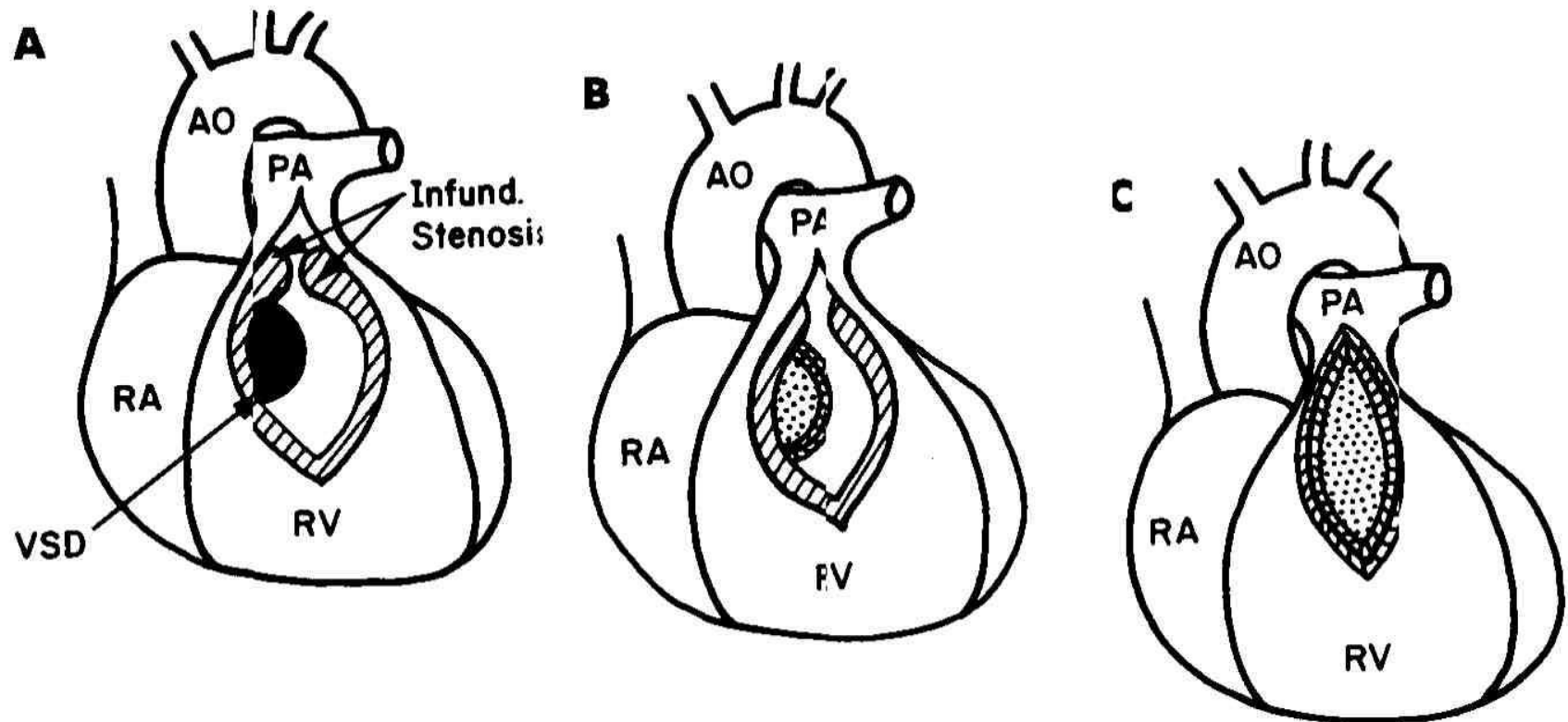
PROCEDURE DESCRIPTION

Case: Tetralogy of Fallot

- 25 y/o woman
- Cyanotic at birth with murmur
- Dx'd with tetralogy of Fallot



Tetralogy of Fallot: Total Correction, c. 1960-1980s



Pregnancy in ToF

- Denmark, single center registry
- ToF repair, 1972-1992
- 25 pts with 54 pregnancies
 - 38 pts without pregnancy
 - 8 spont abortions (1 pt had 5 Sab before delivering)
 - 6 elective abortions
- → 39 pregnancies

Pregnancy in ToF

Table 4. Obstetrical and neonatal outcomes among 25 women with tetralogy of Fallot, and characteristics of 41 live births.

Outcome	Value ^a	
Number of pregnancies	54	
Mean pregnancies per patient	2.2 (1–6)	
Mean live births per patient	1.6 (1–4)	
Age at first pregnancy in years	26 (21–34)	
New York Heart Association class 1 before 1 st pregnancy	23 (92)	6 had cardiac sx: ankle edema, palpitations, dyspnea
Spontaneous abortions	8 (15)	
Live births	41	
Duration of pregnancy, in weeks	39 (36–42)	
Premature deliveries, prior to 37 weeks	6 (15)	
Deliveries by Caesarean section	5 (12)	
Weight at birth	3.2 (2.5–4.7)	3 had ToF/Pulm Atresia,
Small for gestational age	1 (2)	
Congenital cardiac disease	4 (10)	2 sibs had DiGeorge Syn, as did mother

^aContinuous variables are presented as median and range; nominal variables as total number and percentage of sample.

Case: Coarctation

- 22 y/o F, h/o coarctation repair as a child
- Comes to clinic to ask to see “if she can get pregnant”
- *Reality: She is pregnant, 8 weeks WBD*
- Plan: Cardiac MRI



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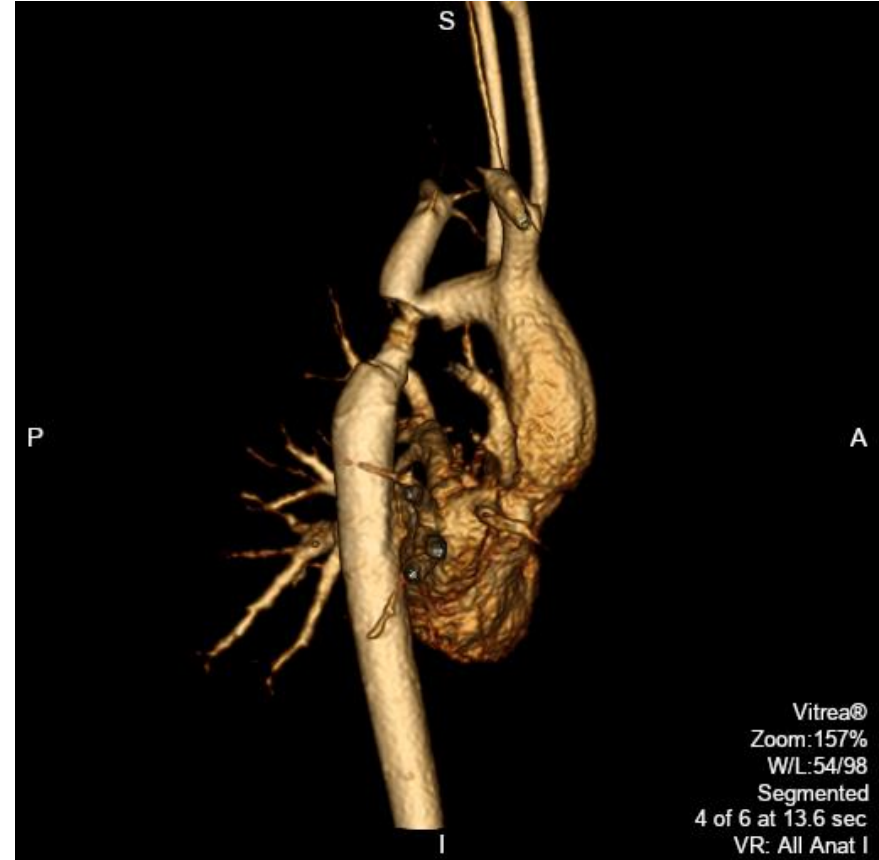
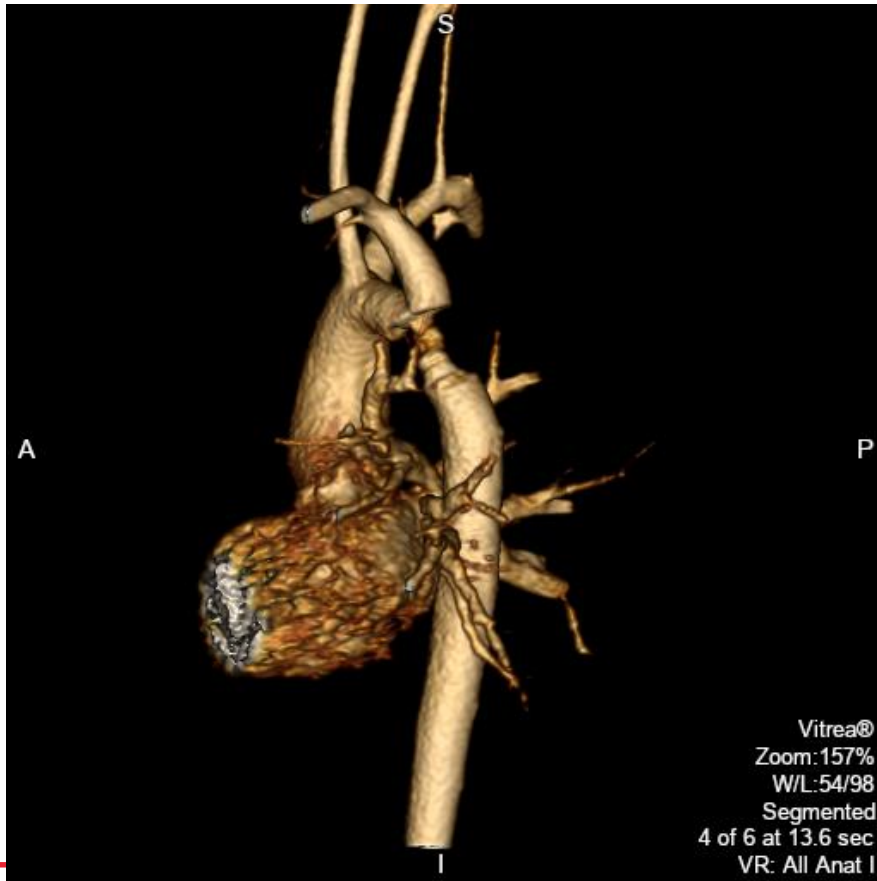
Case: Coarctation in Pregnancy

- Managed jointly with MFM
- Echoes every trimester
- Multi-disciplinary planning: MFM, OB Anesth, Cardiology
- Delivered term SVD with assisted second stage

Coarctation: Unrepaired in adult

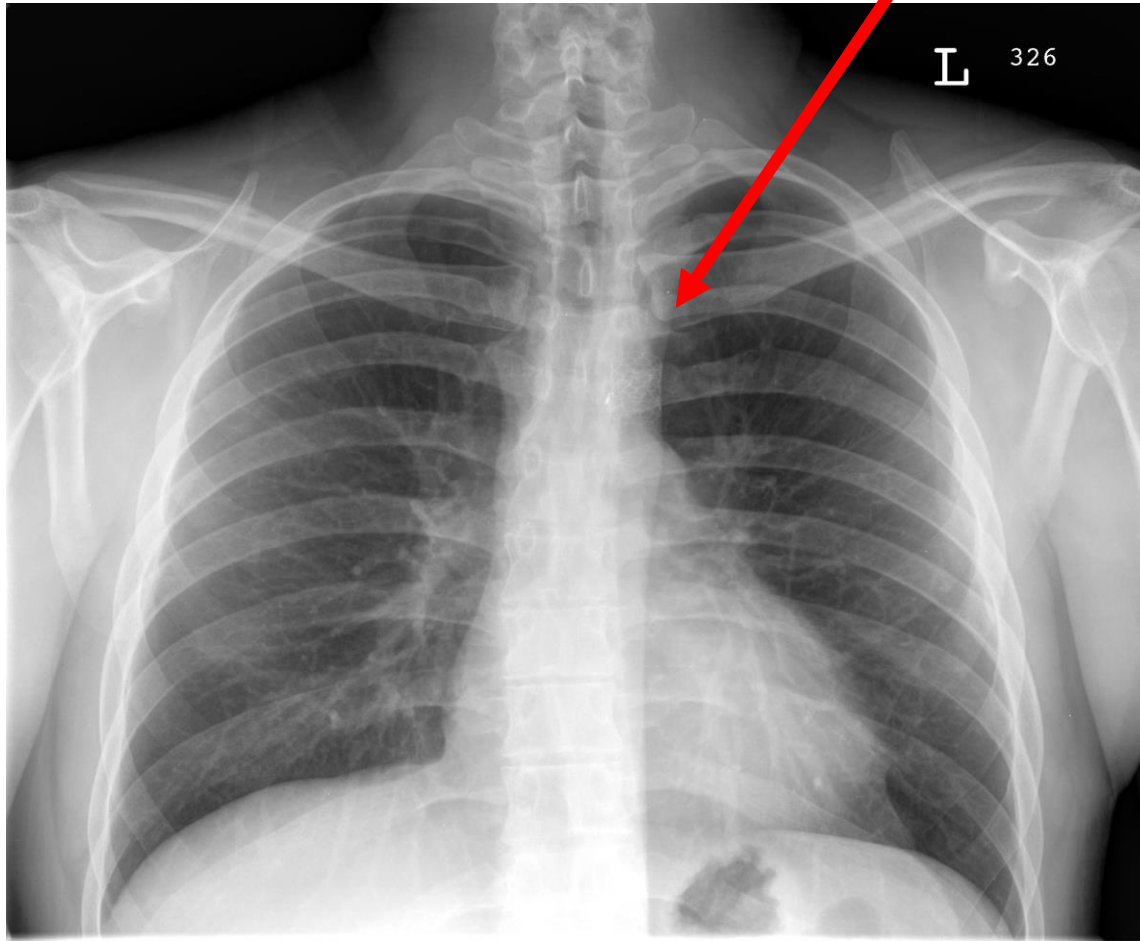


Beware of Artifact on MRI!



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Coarctation, s/p metallic stent



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Case: Pulm HTN/Cyanosis

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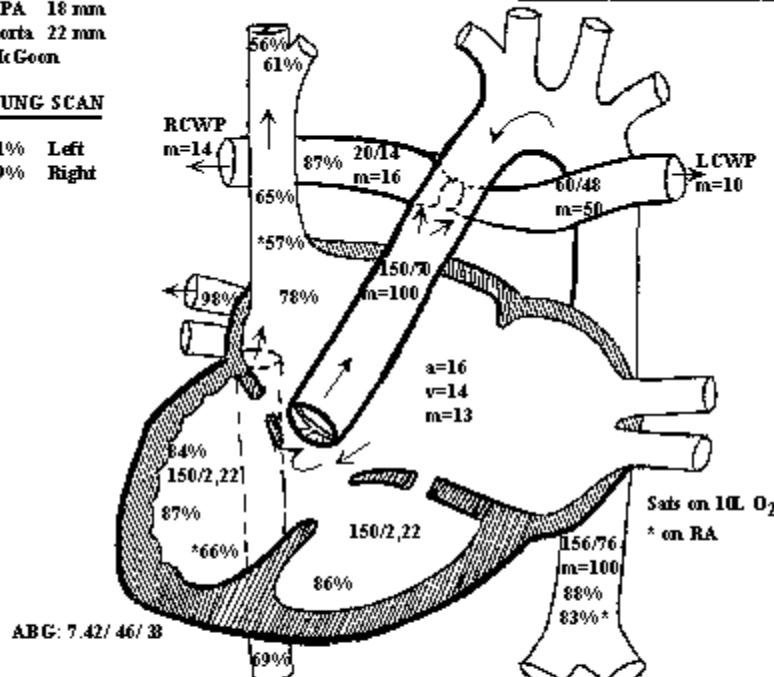
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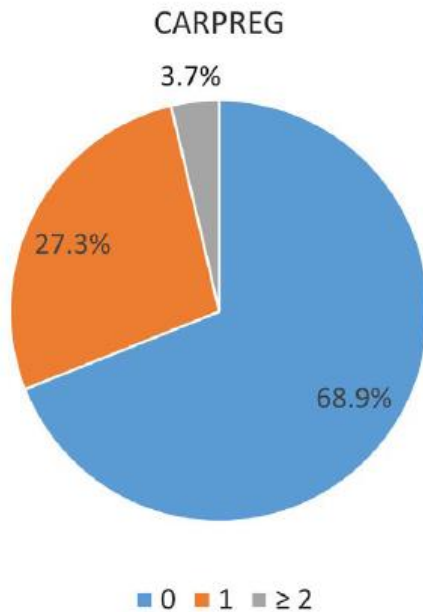
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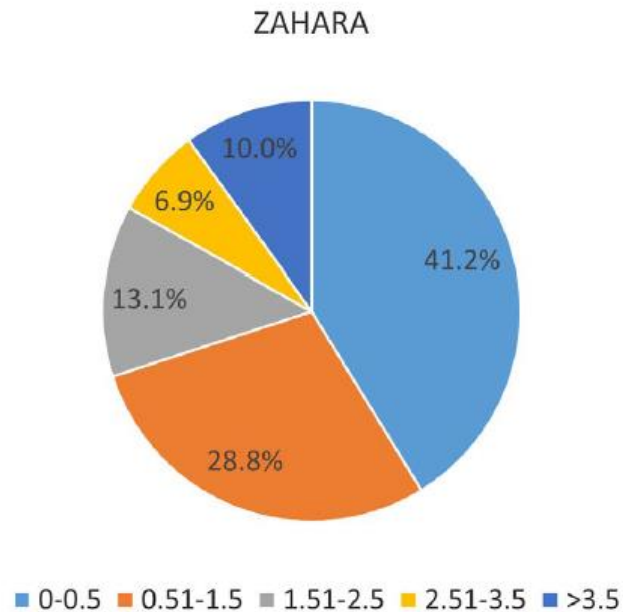
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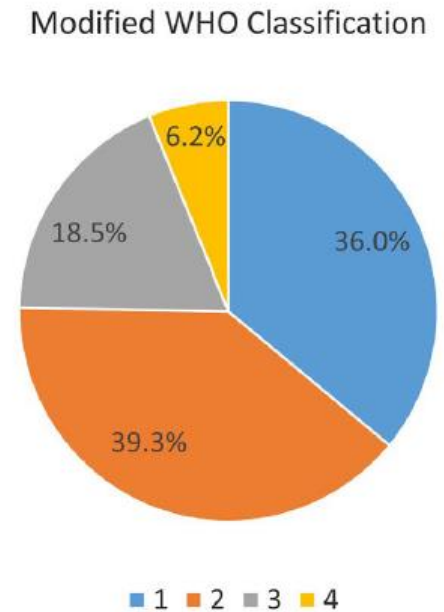
CV Risk Prediction in Pregnancy: *WHO is better*



Siu 2001



Drenthen 2010



Diller 2014

Cardiac Contraindications to Pregnancy

- Marfan Syndrome w/ Ao Root > 4 cm
- Bicuspid AoV w/ Ao Root > 5 cm
- LVOT Obstruction:
 - Aortic Stenosis or Mitral Stenosis (severe)
 - Coarctation of the Aorta
- LVEF < 30%
- Pulmonary HTN
- Cyanosis with O₂ Sat < 85%

SUMMARY

- Pregnancy should no longer be routinely discouraged for ALL patients with CHD
 - Remember the Cardiac Contraindications
- Patients can be risk-stratified according to their cardiac defect
- Successful maternal and fetal outcomes can be achieved with close MFM and Cardiology care

QUESTIONS?



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