ACC Latin America Conference 2018

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Interpreting Images of the Heart: case based approach

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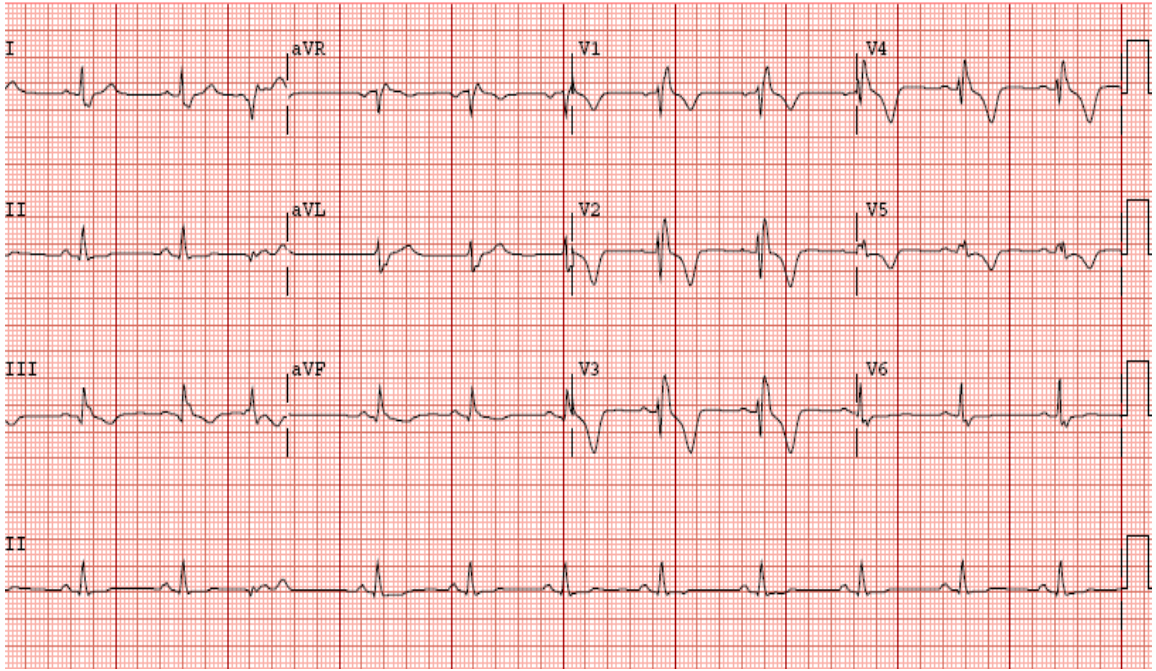
Case Presentation 1

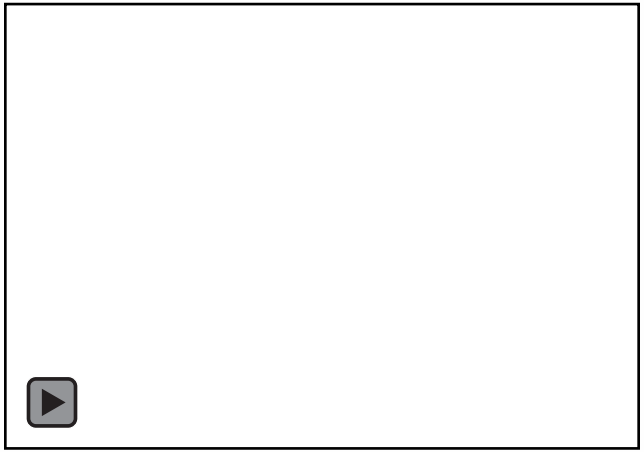
55 yow presented to outside hospital with SOB and near-syncope. Unwitnessed event with exertion, and without prodrome. Denied prior dizziness, palpitations or syncope.

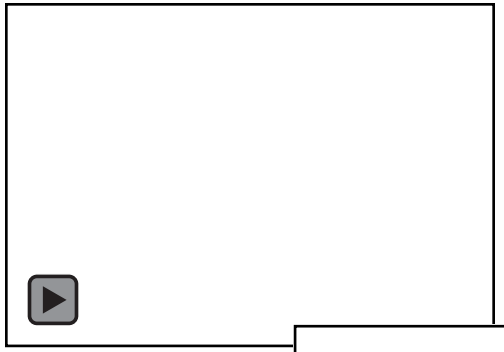
- Chest CT for PE revealed RV mass.
- PMHx: “childhood murmur”, vertigo
- Meds, SHx, FHx: unremarkable.
- PE: 106/60, 72 no orthostatic changes, no murmur at rest or with maneuvers.

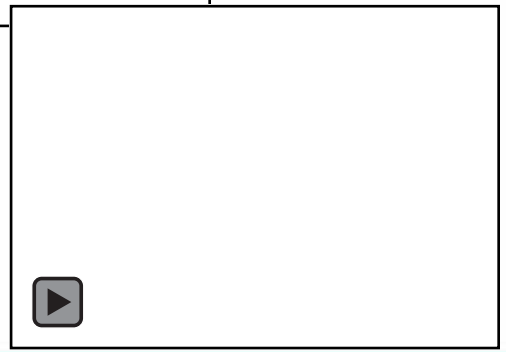
ECG: RAD, RVH, RBBB



ECHOCARDIOGRAM







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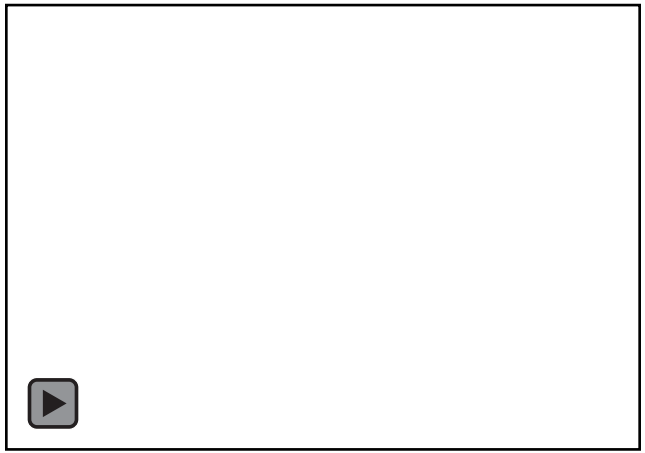

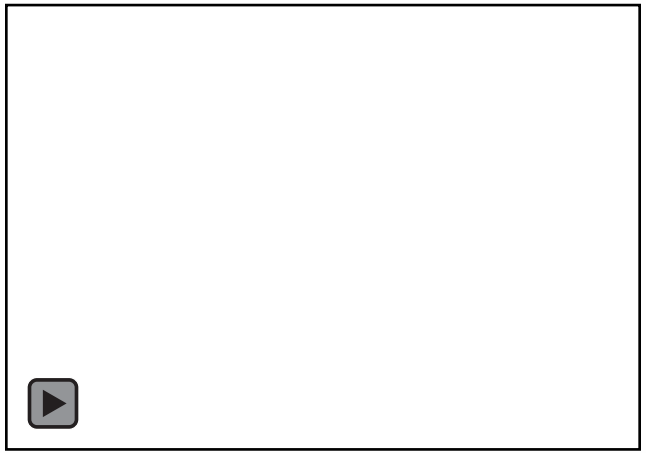

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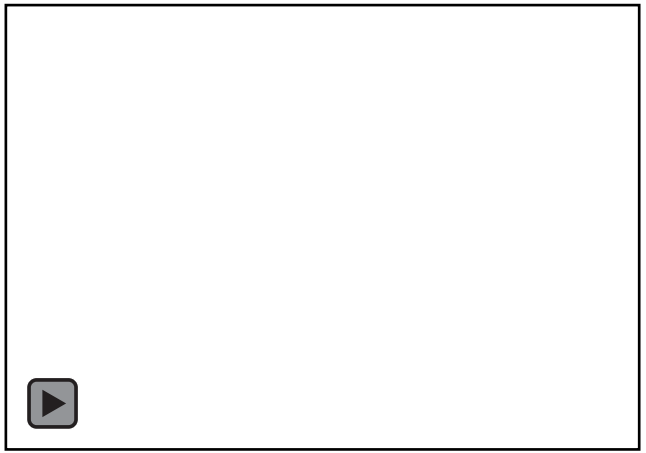
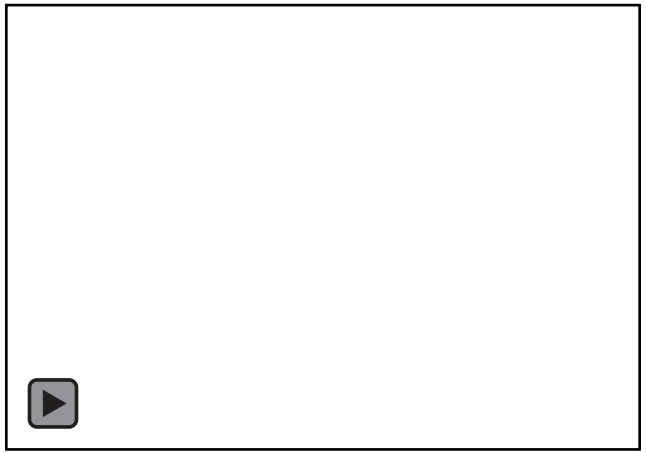




Invading RV apical myocardium and pericardium?

What would you do next?

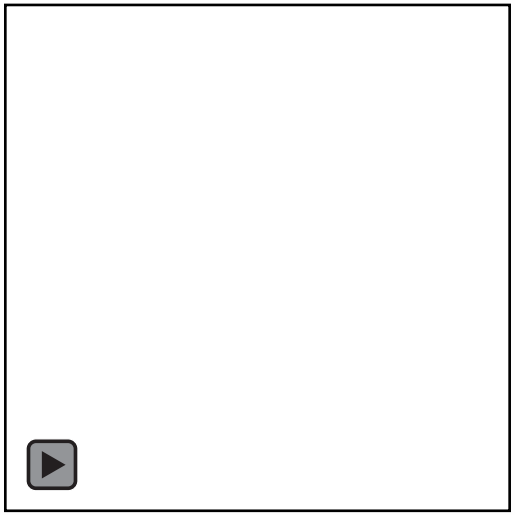
1. More imaging:
   - Cardiac CT
   - TEE
   - MRI
   - PET
   - Coronary angiogram
2. Endomyocardial Biopsy?
3. Call a surgeon

Differential Diagnosis Matters

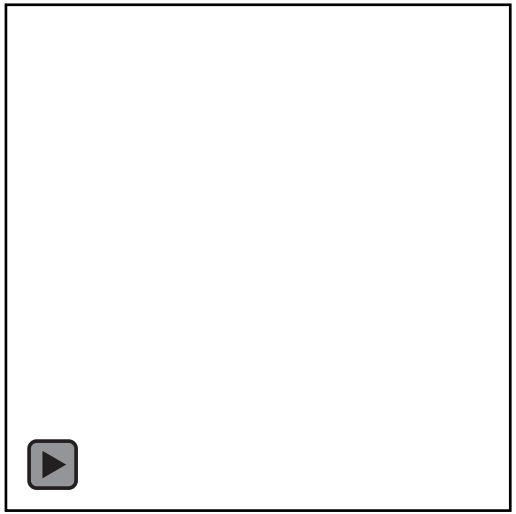
Cardiac Masses

- Primary Tumors:
  - Benign:
    - Myxoma, fibroelastoma (intracardiac)
    - Lipoma, fibroma, rhabdomyomas (children TS)
  - Malignant:
    - Sarcoma (angiosarcoma), lymphoma
- Metastatic cardiac involvement
- Thrombus
- Infection
- HCM variant?
  - Is this the cause of her childhood heart murmur?

Cardiac MRI



Pre-gadolinium injection



Post-gadolinium injection

Avid enhancement (vascular), but uniform and no necrosis, isointense to muscle

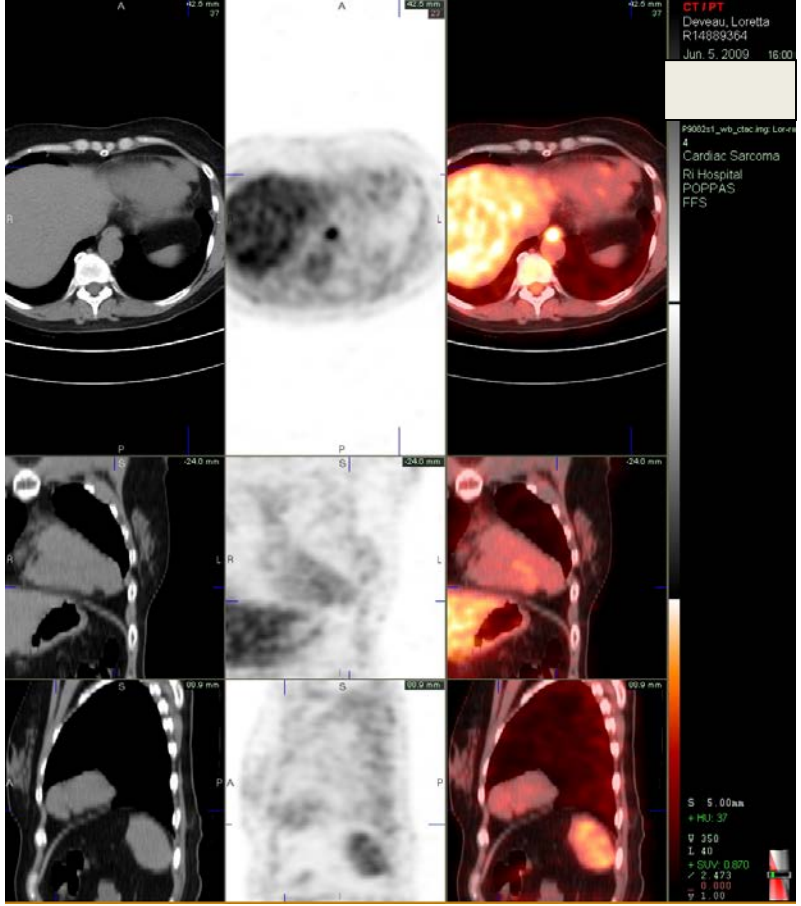
Endomyocardial biopsy

- Three samples from RV septum

  Normal endocardium

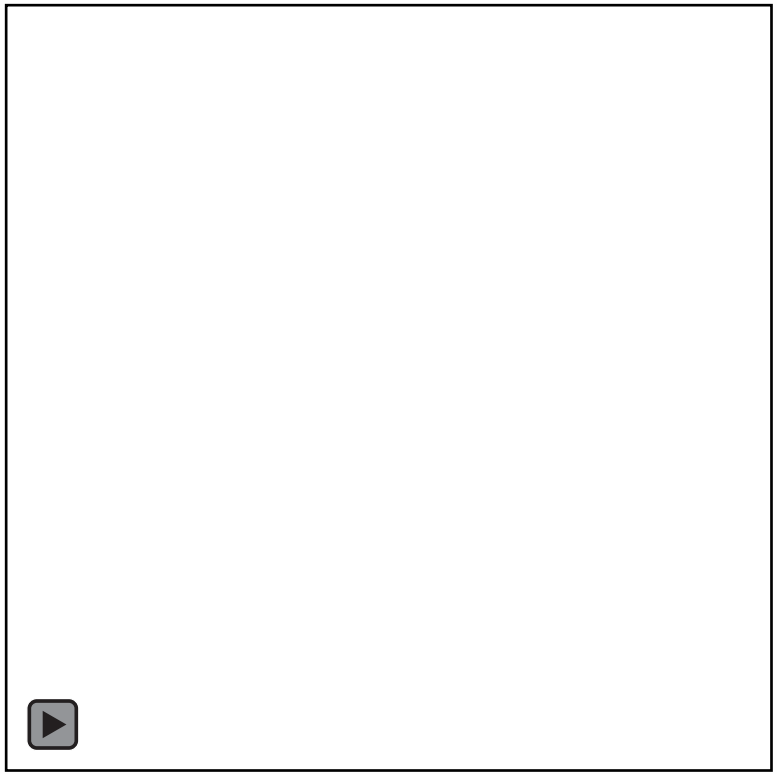
PET without FDG uptake: not malignant

No evidence of metastatic

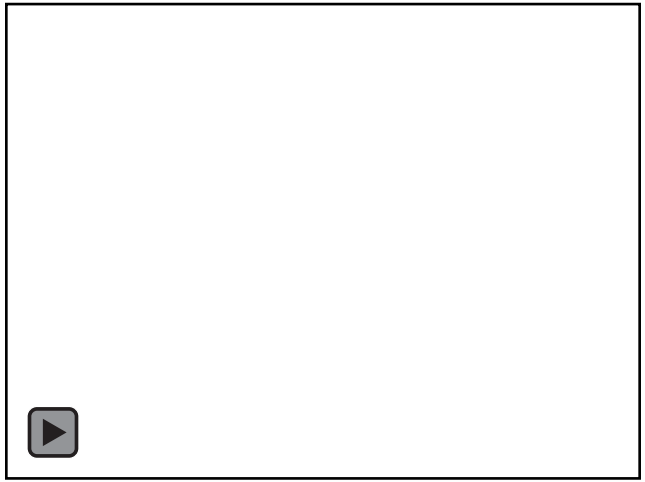


Preoperative Angiogram

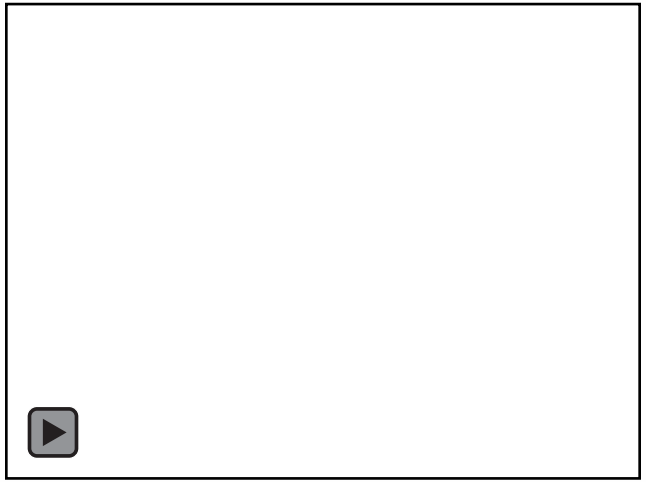
Tumor blush from LAD septal perforators



Intraoperative TEE

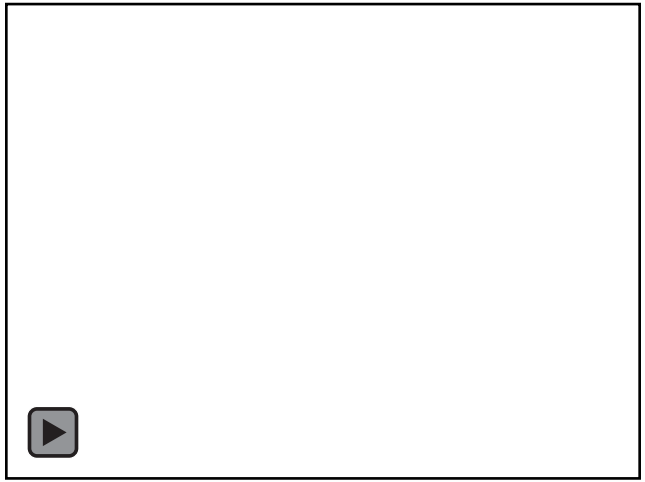


Transgastric 90 RV

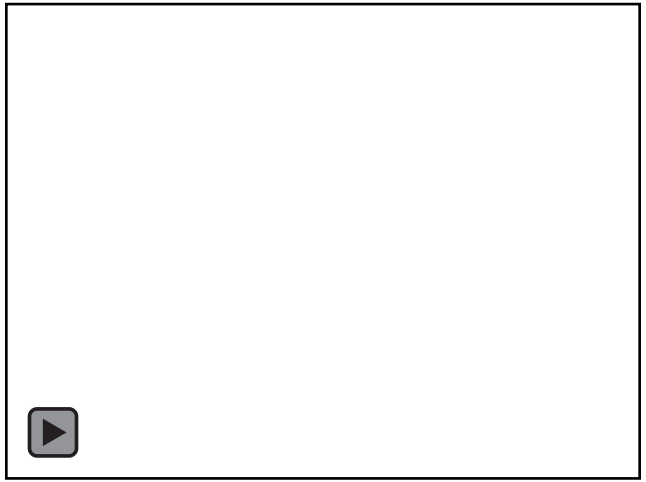


transgastric 120 RV, 3 papillary muscles

Intraoperative TEE

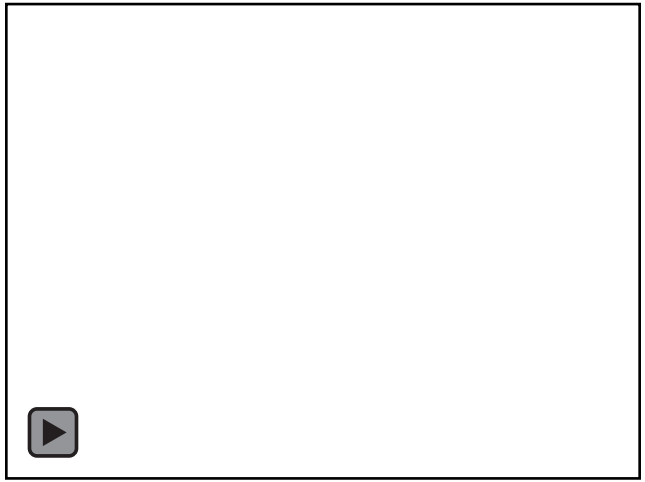


Deep Transgastric RV, nml TV

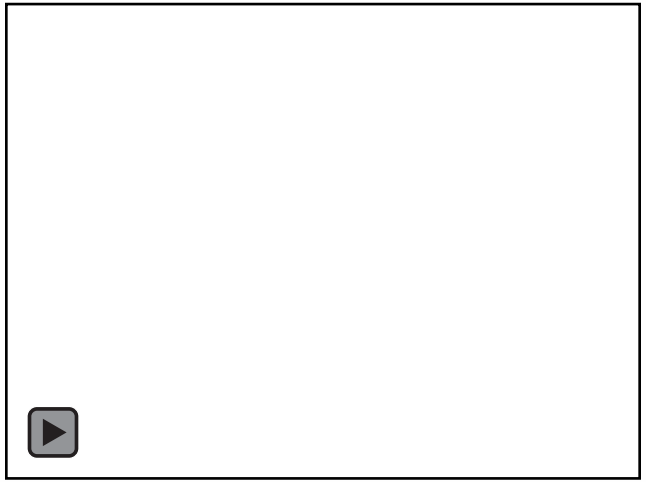


Transgastric SAX RV

Postop Echoes

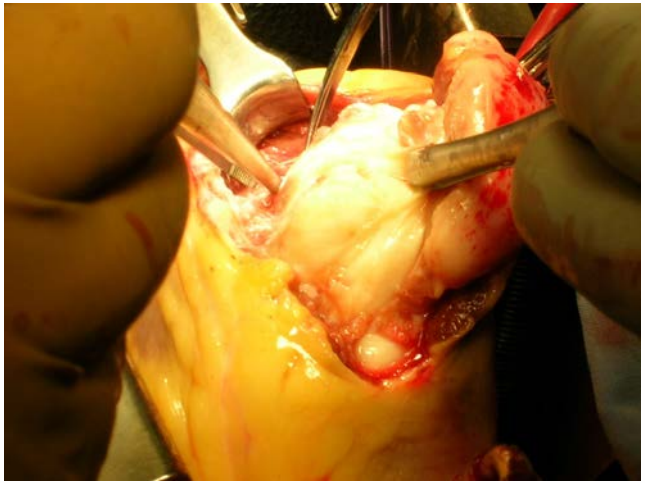


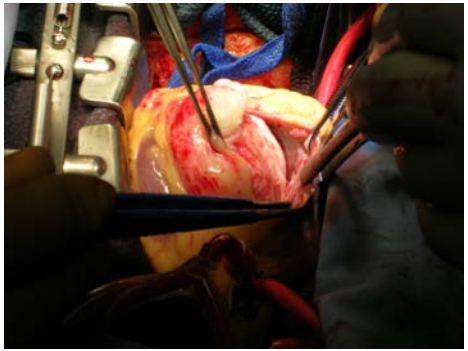
Intraoperative, post CPB TEE



Postoperative day 7 TTE

Intraoperative Pathology





Diagnosis: spindle cell tumor

Benign Fibroma

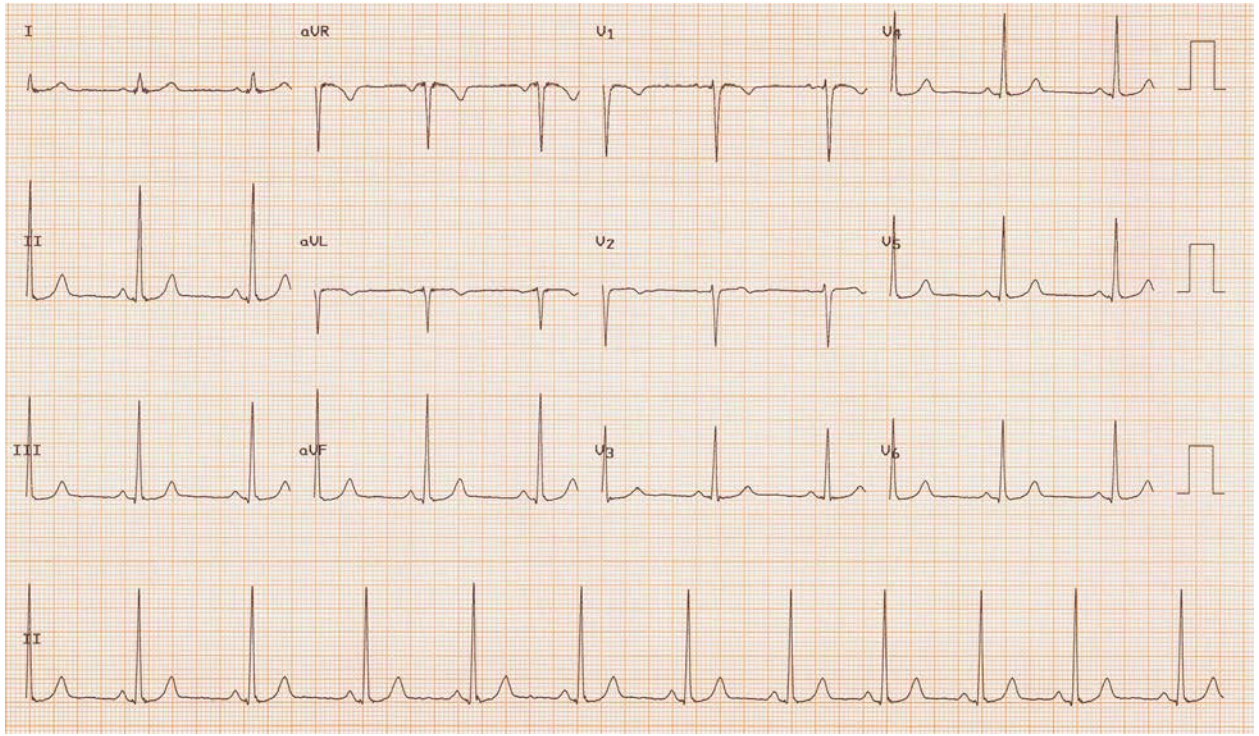
Take home messages

1. More imaging: To define extent and etiology
   - Cardiac CT
   - TEE
   - MRI
   - PET
   - Coronary angiogram
2. Endomyocardial Biopsy
3. Surgery: careful planning by the heart team

Case presentation II

- 18yow with exertional chest pain and syncope presents at 38 weeks gestation.
  - Age 17 ED visit for same
  - echo report “possible anomalous coronary”
- PE: BMI 35, 110/60 and equal, HR 90
  - CV: 1/6 SEM, normal S2, no S3
  - Lungs are clear
  - Abdomen gravid
  - Extremities pulses equal 2+ no edema
- ECG:

ECG

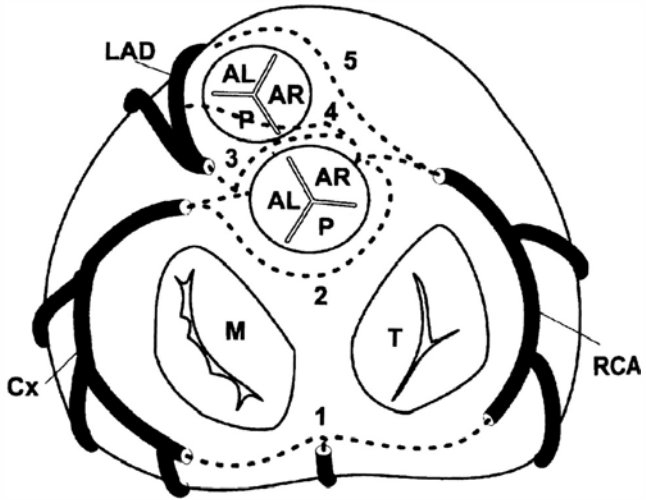


Question I:

What would you do next?

1. Repeat the echo
2. CT angio
3. Cardiac catheterization
4. MRI
5. Deliver the baby

Anomalous Aortic Origin of Coronary Artery: AAOCA



Angelini Circ. 2007;115:1296-1305

- LM/LAD from right sinus
- RCA from left sinus
  - Course between AO and PA may result in compression with ischemia/SCD
  - Incidence 0.1-0.3% births
- Registry of SCD athletes
  - 2nd most common,13% of 286
- SCD in military recruits
  - Most common etiology
    - JACC 2003;41:974
    - Ann Int Med 2004;141:829.
- Low SCD if asymptomatic
  - JACC 2007;50:2083

Estimated fetal and maternal effective doses of diagnostic and interventional radiology procedures

Procedure	Fetal exposure		Maternal exposure	
Chest radiograph (PA and lateral)	<0.01 mGy	<0.01 mSv	0.1 mGy	0.1 mSv
CT chest	0.3 mGy	0.3 mSv	7 mGy	7 mSv
Coronary angiography[a]	1.5 mGy	1.5 mSv	7 mGy	7 mSv
PCI or radiofrequency catheter ablation[a]	3 mGy	3 mSv	15 mGy	15 mSv

EHJ 2011:32:3147

ESC Guidelines Helpful

Echocardiography should be performed in any pregnant patient with unexplained or new cardiovascular signs or symptoms.	I	C
MRI (without gadolinium) should be considered if echocardiography is insufficient for diagnosis.	IIa	C
A chest radiograph, with shielding of the fetus, may be considered if other methods are not successful in clarifying the cause of dyspnoea.	IIb	C
Cardiac catheterization may be considered with very strict indications, timing, and shielding of the fetus.	IIb	C
CT and electrophysiological studies, with shielding of the fetus, may be considered in selected patients for vital indications.	IIb	C
Coronary bypass surgery or valvular surgery may be considered when conservative and medical therapy has failed, in situations that threaten the mother's life and that are not amenable to percutaneous treatment.	IIb	C

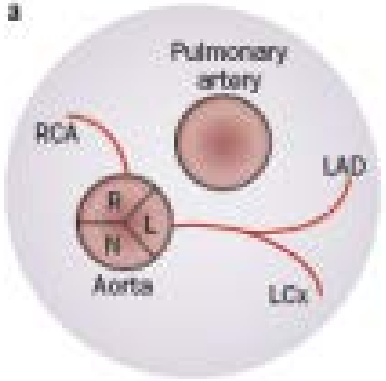
Balance risk to mother of NOT doing the test

Treatment Plan

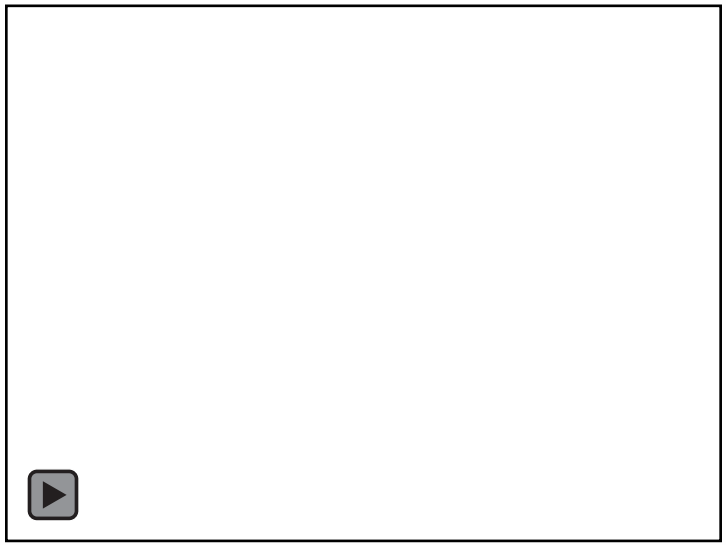
- Initiate betablocker
- Admit to hospital
- Proceed with induction of labor
- Pain management with epidural
- Early referral to congenital heart surgeon

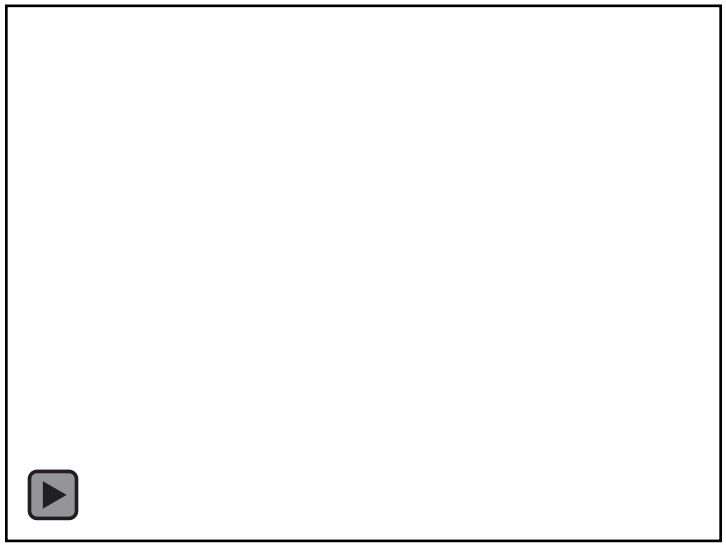
Take Home Points

- Anomalous Coronaries:
  - Course and symptoms
  - Echo and CT both
- CT scan is safe in pregnancy
  - care for two
- Team approach with expertise
  - L&D hemodynamically labile

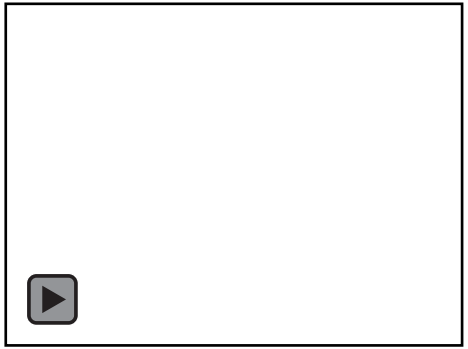


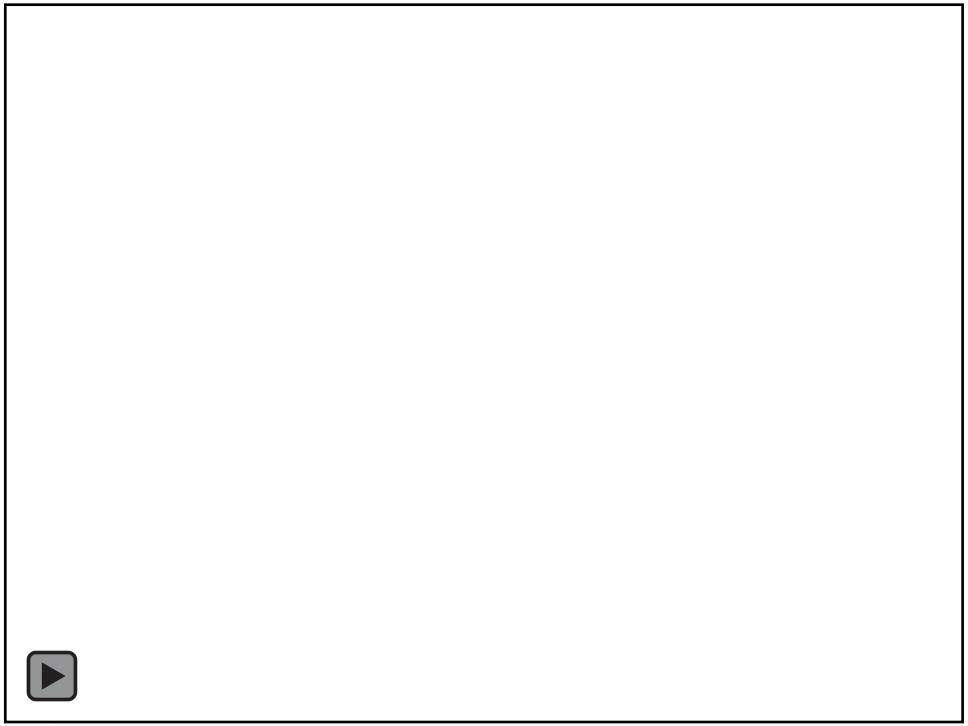
CASE III: What is the etiology of the AI?



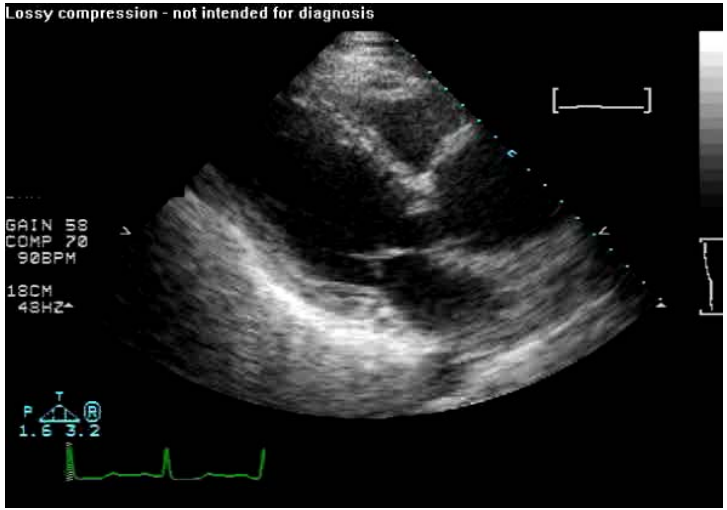


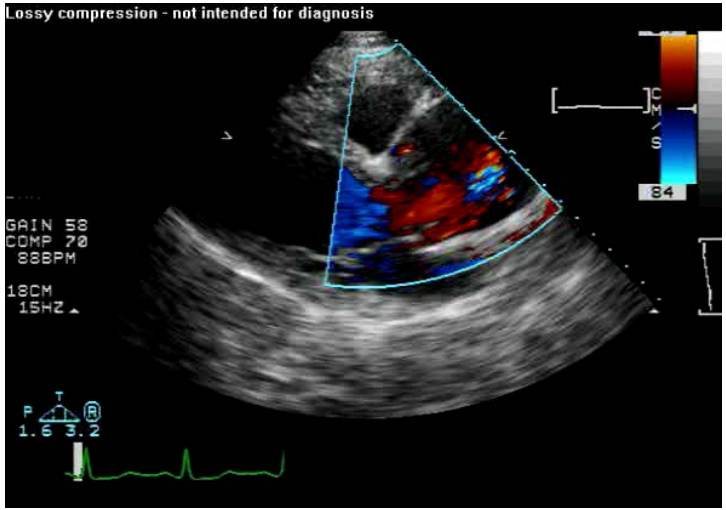
Trauma with avulsion of AV at annulus



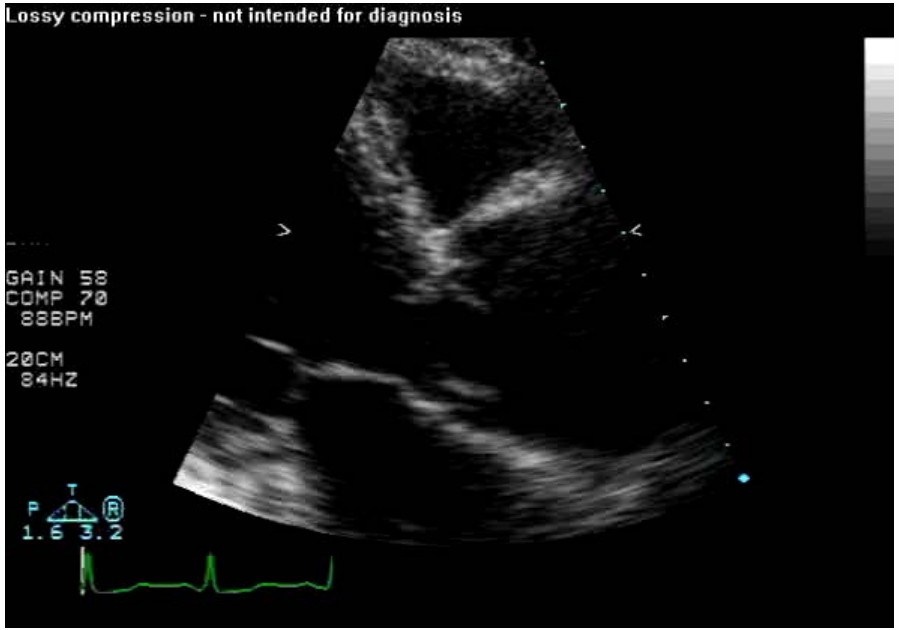


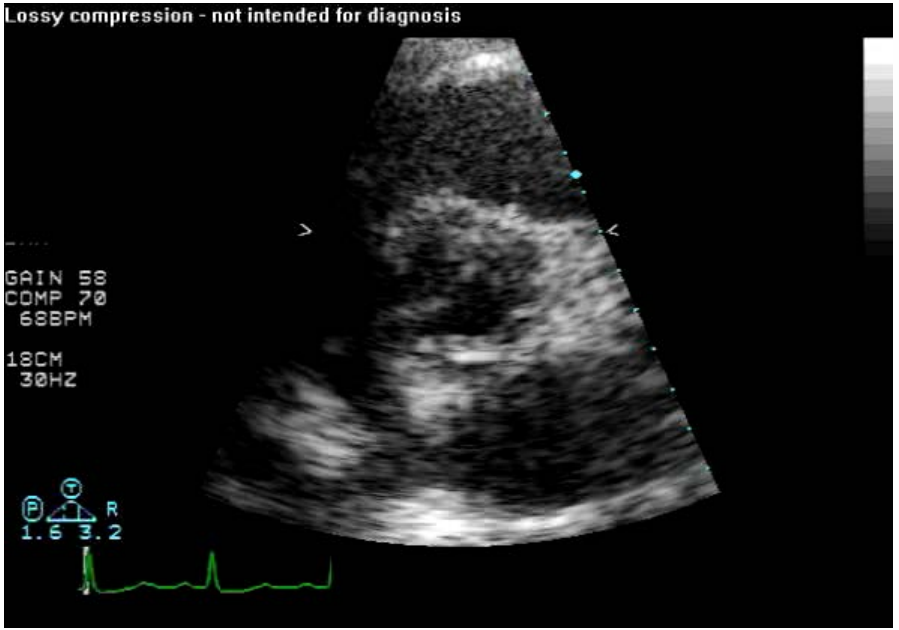
Aortic dissection and severe AV





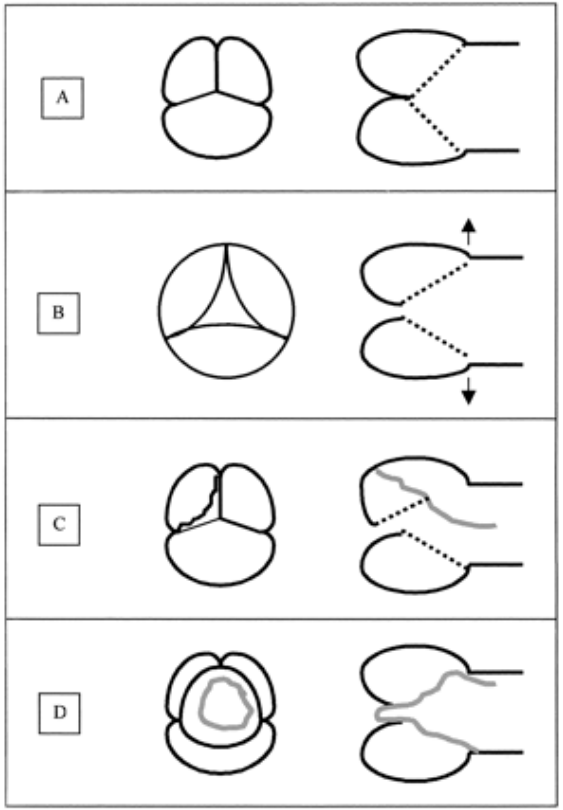
Dissection flap prolapsing across AV





TEE in Dissection: Repair or Replace

- A. Normal AV
  - Leaflet tips coapt
  - STJ = annulus
- B. Incomplete closure
  - Dilated STJ
- C. Leaflet prolapse
  - Leaflet attachment disrupted
- D. Dissection Flap prolapse
  - Nml AV leaflets



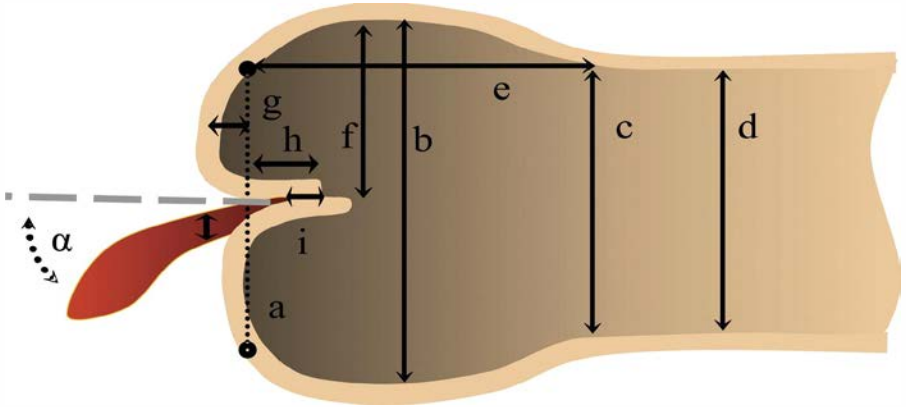
Movosowitz HD et al. JACC 2000;36:884

TEE to guide in the OR: Repair or Replace?

Table 4. Intraoperative TEE Predictors of ≥3+ Recurrent AR With the Cox Multivariate Analysis

Multivariate Analysis	HR	95% Confidence Interval	Cox p Value
Coaptation length	0.82	0.63–1.00	0.05
Tips below the level of the aortic annulus	7.9	6.52–9.28	<0.01
Diameter of aortic annulus	1.18	1.03–2.45	0.01
Residual AR	5.3	1.47–6.57	0.01

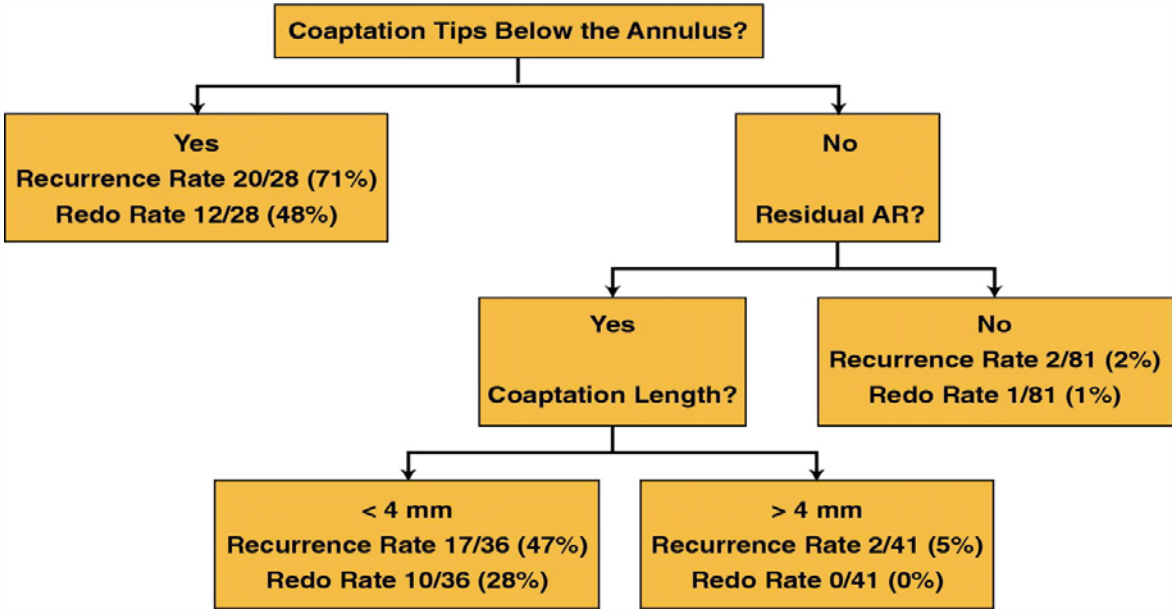
HR = hazard ratio; other abbreviations as in Tables 1 and 3.



Schematic Representation of the TEE Measurements

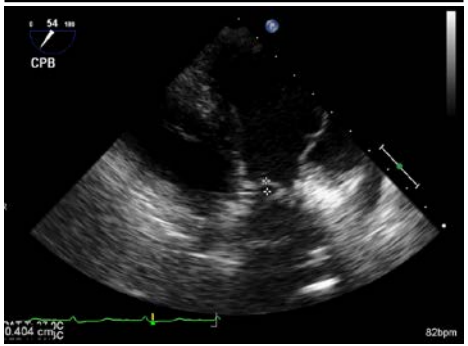
le Polain de Waroux, J.-B. et al. J Am Coll Cardiol Img 2009;2:931-939

Risk of AV Repair Failure According to immediate postop TEE



le Polain de Waroux, J.-B. et al. J Am Coll Cardiol Img 2009;2:931-939

Assess after root replacement/valve repair



RCC prolapse and 2+ AI after first CPB

No prolapse or AI after rerepair

Surgical Classification of AI

- Similar to Carpentier for MV disease
  - Functional classification to guide repair techniques..
    - » VanDyck M. Anesth Analg 2010;111:59
- TEE coorelated w/ OR inspec
  1. Enlarged Aorta & normal cusps
  2. Cusp prolapse (or fenestration): *eccentric jets*
  3. Cusp retraction (poor quality/quantity)
     - » El Khoury Circ 2007;116:I264.
- 781 chronic AI elective surgeries/5 yrs
  1. Central: dilation only
  2. Eccentric: dilation and valve
     - » Lansac E. EJCS 2008;33(5):872-878.

Classification scheme: predicted short and long term repair success

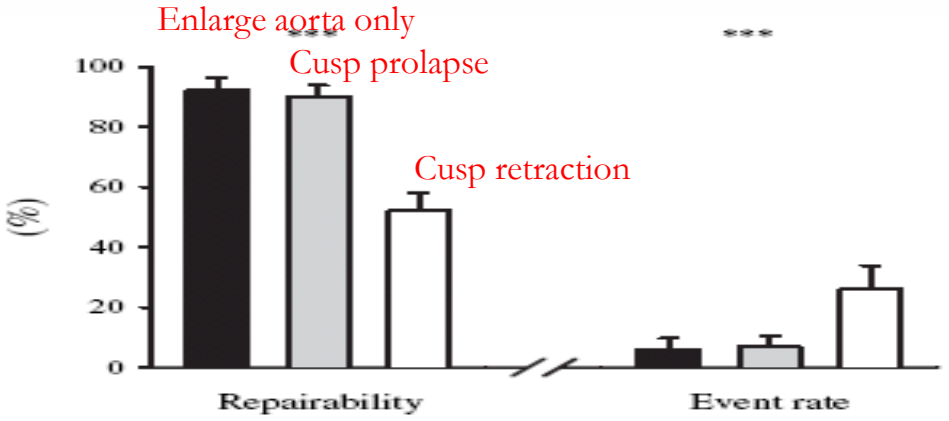
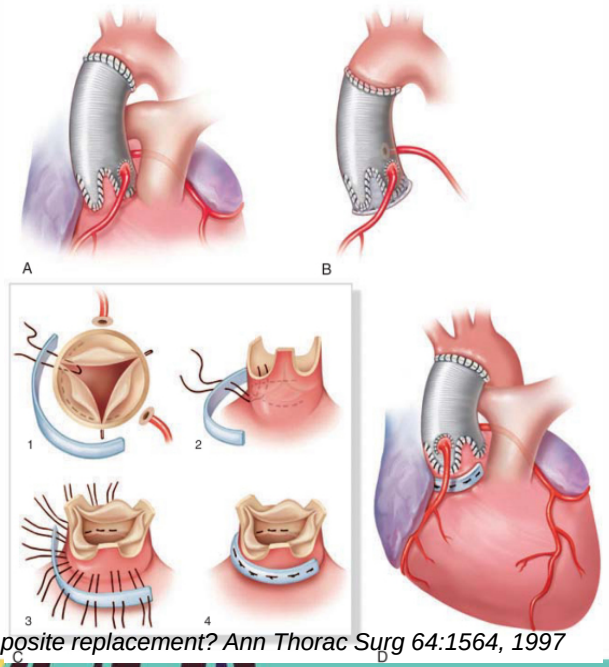


Figure 2. Incidence of valve sparing or repair surgery in the whole population (left) and event rate in patients undergoing sparing or repair surgery (right), according to anatomic classification by TEE. Closed bars, type 1; Half-tone bars, type 2; Open bars, type 3. ***χ^2<0.001 type 3 vs type 1 and 2.

El Khoury Circ 2007;116;I264

Surgical Treatment:
valve sparing aortic root replacement

A. Remodeling of root:
Replacement of sinuses



B. Reimplantation of valve:
for annuloaortic ectasia

Aortic annuloplasty:
For annuloaortic ectasia

David TE: Aortic root aneurysms: Remodeling or composite replacement? Ann Thorac Surg 64:1564, 1997

Take home message

- Imaging in crucial:
  - preop to define etiology and valve structure suitability
  - intraop for successful repair
- Understand surgical approaches
  - communicate structure and function

Classification scheme: surgical techniques

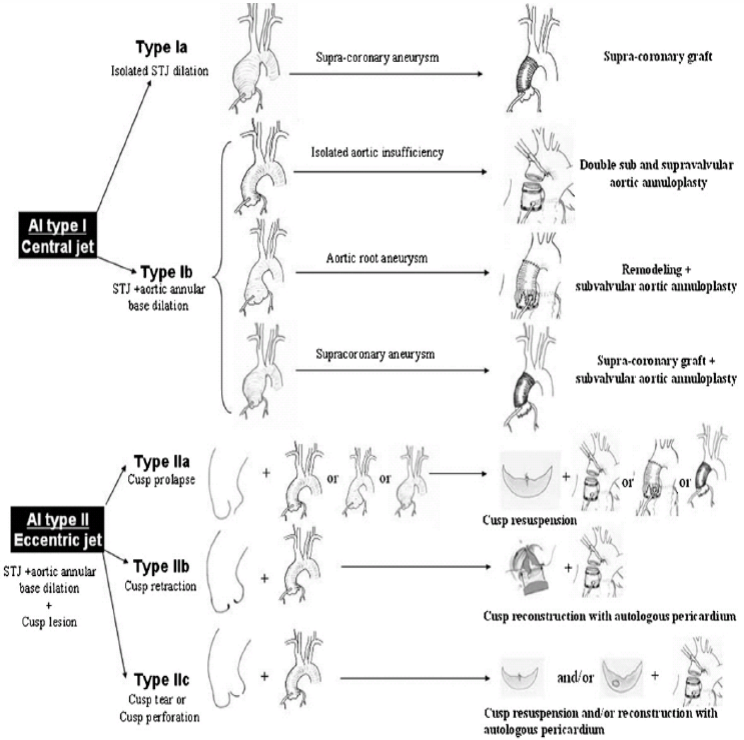


Fig. 2. Lesional classification of aortic insufficiencies (AI) and adapted surgical strategies. STJ: sino-tubular junction.

Lansac EJCS 2008;33:872-878.