DISCLOSURES

• None

HANDOUT:
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CASE ONE
CASE ONE

- 32 yr old male
- Atypical CP, equivocal stress echo
- Cath: “No vessel coming off R sinus”, concern for anomalous coronary artery
CASE ONE
QUESTION

• The most common complication of Quadricuspid Aortic Valve (QAV) is:
  • A. Valvular aortic stenosis
  • B. Aortic regurgitation
  • C. Atrial fibrillation
  • D. Left ventricular hypertrophy

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QUADRICUSPID AORTIC VALVE (QAV)

- Rare, 1/6000 aortic valve surgery patients
- M = F, avg. age at Dx ~ 50
- Classification by size of cusps
  - Most common: 3 same size + 1 smaller cusp (type B)
- Echo: “X”-shaped SAX view
- CT/MR: confirmatory; perform planimetry and/or flow measurement

# Classification of QAV

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
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<tbody>
<tr>
<td>A</td>
<td>4 equal sized cusps</td>
</tr>
<tr>
<td>B</td>
<td>3 equal + 1 smaller <em>(most common)</em></td>
</tr>
<tr>
<td>C</td>
<td>2 equal + 2 equal smaller</td>
</tr>
<tr>
<td>D</td>
<td>1 large + 2 intermediate + 1 smaller</td>
</tr>
<tr>
<td>E</td>
<td>3 equal + 1 larger</td>
</tr>
<tr>
<td>F</td>
<td>2 equal large + 2 smaller unequal sizes</td>
</tr>
<tr>
<td>G</td>
<td>4 unequal sized cusps</td>
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</tbody>
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QUADRICUSPID AORTIC VALVE (QAV)

- Usually isolated, but can be associated with:
  - Single or Anomalous Coronary Arteries
  - Displacement of coronary ostia (from addl cusp)
  - HCM / Subaortic Stenosis
  - PDA, VSD
  - Endocarditis

QUADRICUSPID AORTIC VALVE (QAV)

• Complications:
  • **Aortic Insufficiency (#1)**
    • Up to 75% at time of Dx
  • LVH
  • Conduction problems (BBB)
• TX: Reconstruction and/or Surgical valve replacement

CASE TWO
CASE TWO

- 68 yo Male, embolic lesions in kidneys on CT
- Technically difficult echo exam, ? AoV lesion
CASE TWO: DDX

• Vegetation
• Thrombus
• Tumor
• Degenerated valve tissue
CASE TWO:
PAPILLARY FIBROELASTOMA
QUESTION:

- Papillary Fibroelastoma is:
  - A. the most common cardiac tumor
  - B. potentially malignant
  - C. more common in females
  - D. responsible for 75% of valvular tumors
QUESTION: ANSWER

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PAPILLARY FIBROELASTOMA

- Avg age 60
- M=F
- #1 neoplasm of cardiac valves
  - (prevalence only ~ 0.02%)
- #2 or 3 cardiac neoplasm overall (myxoma, lipoma)
- Often Asx but can present w/ embolic disease (tumor or bland), TIA/stroke, dyspnea, sudden cardiac death
- Imaging Diagnosis!

PAPILLARY FIBROELASTOMA

- Path: gelatinous, avascular papilloma covered by single layer epithelium
- “sea anemone” surface: but can be obscured by surface thrombus
- Mobile, pedunculated lesions w/ connection to endothelium by stalk

PAPILLARY FIBROELASTOMA

- Aortic >> mitral > tricuspid > pulmonic
- Can also occur on endocardial surfaces of atria / ventricles
- Mobility is independent predictor of non-fatal and fatal events (surgical treatment)

PULMONIC VALVE FIBROELASTOMA
CASE THREE
CASE THREE

- 45 yr old female
- 330 lb, 5’2”
- Previous pacer (vent rate 75)
- Previous aortic valve replacement
CASE THREE

- New onset CHF
- Abnormal echo – possible lesion on prosthetic aortic valve
- CTA requested to assess valve....
- And ....CCTA requested for pre-op coronary clearance
TECHNICAL ISSUES

• How to scan with low enough noise to fully assess valve and coronaries
• Impact of paced HR
• Pacer wire artifacts?
VEGETATION ON ST. JUDE PROSTHETIC AORTIC VALVE (330 LB PATIENT)
QUESTION

• In order to improve image quality in larger patients, one should:
  
  A. Use filtered back projection reconstruction
  
  B. Utilize ECG pulsing
  
  C. Utilize weight-based contrast medium dosing
  
  D. Scan at 100 kV to save dose
QUESTION: **ANSWER**

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PROSTHETIC VALVE DYSFUNCTION

• SX:
  • Heart Murmur
  • Heart Failure
  • Fever
  • Stroke
  • DOE
  • Angina

PROSTHETIC VALVE DYSFUNCTION

- Echo primary imaging tool
- Fluoroscopy can visualize stuck leaflets
- CT useful if echo limited (obese, COPD)
  - Leaflet excursion
  - Perivalvular abscess
  - Mycotic aneurysms
PROSTHETIC VALVE DYSFUNCTION: CT IMAGING

- Retrospective ECG gating useful for motion
  - No ECG pulsing
- Ni / Ti alloys: GOOD (St. Jude: Nickel alloy)
- Cobalt Chrome: BAD (Bjork – Shiley)
- Most Bioprosthetic valves are well assessed

TECHNICAL TIPS FOR IMAGING LARGE PATIENTS - 1

• Consider 140 kV voltage (trade-offs)
  • Less blooming artifact from metal
  • Less image noise
  • More dose

• Scan at thicker initial collimation

• Slow gantry rotation time (~ 0.5 sec)
TECHNICAL TIPS FOR IMAGING LARGE PATIENTS -2

- Use iterative reconstruction techniques
- WEIGHT-BASED Contrast medium flow-rates and volume
- Radiation dose: HIGH but re-do valve surgery for dysfunction has mortality up to 15%!!
CONCLUSIONS

- Quadricuspid aortic valve is visualized as an “X” on echo and CT/MR, and is associated with AI
- Aortic valve fibroelastoma is the most common valvular tumor
- Vegetations and lesions of prosthetic valves can be well assessed on ECG-synchronized CTA
- Adaptations / tradeoffs necessary for imaging valves in larger patients
THANKS FOR YOUR ATTENTION!

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• Albert Hsiao, MD, PhD
• Dominik Fleischmann, MD

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