Cardiac Masses

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Cardiac Masses: Considerations

• **Definition of the mass**
  – Nature
  – Location
  – Benign or malignant

• **Presentation**
  – Incidental finding
  – Obstruction
  – Direct myocardial involvement
  – Embolization
  – Constitutional or systemic symptoms

• **Echocardiography remains 1º imaging modality**
  – Multimodality imaging may be required for characterization
Cardiac Masses: Differential Diagnosis

- Anatomical variants
- Implanted devices
- Thrombus
- Vegetations
- Tumors
  - Primary
  - Metastatic
- Artifacts
Anatomical Structures

- Pectinate muscle
- Q-tip
- False tendons
- Hypertrophy
- Papillary muscle
- Trabeculation
- Chiari network
- Crista terminalis
- Eustachian valve
- Moderator band
- Trabeculation
- ASA
- LHIAS
- Aorta
- Effusions
- Hiatus hernia
- Pericardial cyst
Anatomical Variants

LAA

RA
Implanted Devices

- Pacemaker leads
- Cardioverter-defibrillator leads
- Right heart catheters
- Occluder devices
- Prosthetic valves/clips
- Foreign bodies
Implanted Devices
Implanted Devices
**Thrombus**

- Most commonly encountered intra-cardiac mass
- Often associated cardiac pathology
  - LV thrombus
    - Apex most common
      - Acute MI
        » Estimated 4-15% patients with anterior MI
      - Dilated cardiomyopathy
        » DDx: false tendons, trabeculations, artifacts, apical hypertrophy, tumors, non-compaction, HES
  - LA thrombus
    - Appendage
    - Body
  - Right heart thrombus
    - Catheter-related
    - Pulmonary embolism
    - Appendage
    - RV apical area
LV Thrombus
LAA Thrombus
LA Thrombus
Right Heart Thrombus

Pulmonary Embolism

Catheter-related
Vegetations

• **Locations:**
  – Valve surfaces, areas of endocardium opposite intra-cardiac shunts, or prosthetic materials
    • Atrial surface mitral valve
    • Ventricular surface of aortic valve

• **Characteristics:**
  – Mobile, oscillating
  – Tissue density differing from surrounding tissue
  – May calcify if chronic/healed

• **Valve dysfunction may occur**
  – Valvular regurgitation
  – Valvular stenosis (if large enough)

• **Infective or non-infective**
Cardiac Tumors

• Primary
  – Rare
    • 0.017% to 0.033% of autopsies
  – Benign vs. malignant

• Secondary (Metastatic)
Primary Cardiac Tumors

• Benign (80%)
  – Myxoma
  – Fibroelastoma
  – Rhabdomyoma
  – Fibroma
  – Lipoma
  – Hemangioma
  – Teratoma
  – Paraganglioma

• Malignant (20%)
  – Sarcoma
  – Lymphoma
  – Mesothelioma
Cardiac Myxoma

• Most common primary cardiac tumor
• Majority are sporadic
  – 10% familial
    • Can recur and may be multi-centric
• Most frequently discovered 3\(^{rd}\) to 6\(^{th}\) decades
• Female preponderance (60-70%)
• Can arise anywhere within the heart
  – About 75% occur in the left atrium near fossa ovalis
  – Stalk
• Clinical presentation
  – Constitutional, embolic or obstructive symptoms
    • Many detected asymptptomatically
LA Myxoma

LA
LV
RA
RV

IAS

LA
IA
RA
RV
RA Myxoma
Valvular Myxoma
Papillary Fibroelastoma

- Second most prevalent adult 1º cardiac tumor
  - Commonly involves cardiac valves
    - Aortic valve most common location
      - Both surfaces show equal prevalence
    - Other cardiac structures/chambers (15-25%)
- Majority found in left heart
- Pathology:
  - Avascular, papillary fronds, pedunculated
  - Mid-portion of the valve
    - Usually do not cause valvular dysfunction
- Significant embolic potential recognized


Multiple tumors

Right-sided
Lambli’s Excresences

• Common
  – Found in 70-80% adults

• Pathology:
  – Linear, filiform fronds
    • Multiple
    • Located at closure lines
    • Ventricular surface of semilunar valves
    • Atrial surface of mitral valve

• Do not interfere with valve function
Other Benign Primary Tumors

- **Rhabdomyoma**
  - Most common tumor in pediatric age group
  - Muscular
    - May protrude into cavity
  - Association with tuberous sclerosis
  - Spontaneous regression

- **Fibroma**

- **Lipoma**

- **Teratoma**

- **Angioma**

- **Paraganglioma**

- **Blood-filled cyst**
Other Benign Primary Tumors

Rhabdomyomas

Fibroma
Malignant Primary Cardiac Tumors

• **Sarcomas (80%)**
  - Angiosarcoma
    • *Usually found in right atrium*
    • Highly invasive
    • Lung metastases common
  - Other types (*left atrium more common*)
    • Undifferentiated sarcoma
    • Rhabdomyosarcoma
    • Fibrosarcoma
    • Leiomyosarcoma
    • Osteosarcoma (calification)

• **Mesotheliomas (10%)**
  - Arise from pericardium
  - Rarely may involve conduction system

• **Lymphomas (3-5%)**

• **Paragangliomas**
Angiosarcoma
Primary Cardiac Lymphoma
Secondary (Metastatic) Cardiac Tumors

- At least 20-to-40 times more common than primary cardiac tumors
  - 5-12% cancer patients
  - Consider with known malignancy and occurrence of new CV symptoms

- Breast and lung cancer and heme malignancy encountered most commonly

- Malignant melanoma has highest propensity for metastasis to the heart
Secondary (Metastatic) Cardiac Tumors

- Pericardial involvement
  - Most common
    - Pericardium > Myocardium > Endocardium
- Hematogenous/Lymphatic spread
  - Melanoma, lymphoma, breast
- Direct extension
  - Lung, breast, esophageal
- Invasion via venous structures
  - Vena cava
    - Renal, Hepatocellular, Uterine
  - Pulmonary veins
    - Lung, breast, thyroid
<table>
<thead>
<tr>
<th>Site, imaging characteristics</th>
<th>Most likely</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left atrium, cavitary (pedunculated or broad based attachment)</td>
<td>Myxoma</td>
<td>Sarcoma, metastasis (extension of lung primary), haemangioma, paraganglioma</td>
</tr>
<tr>
<td>Left atrium, involving wall/pericardium</td>
<td>Sarcoma (fibrous or myogenous differentiation)</td>
<td>Lymphoma, metastasis, haemangioma, paraganglioma</td>
</tr>
<tr>
<td>Right atrium (cavitary mass)</td>
<td>Myxoma</td>
<td>Idiopathic thrombus, lipomatous hypertrophy, metastasis (especially renal cell, hepatocellular carcinoma), haemangioma</td>
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<tr>
<td>Right atrium, involving wall/septum pericardium</td>
<td>Angiosarcoma</td>
<td>Lipomatous hypertrophy, lymphoma, haemangioma, paraganglioma</td>
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<tr>
<td>Valve</td>
<td>Papillary fibroelastoma</td>
<td>Myxoma, hamartoma</td>
</tr>
<tr>
<td>Ventricles (cavitary mass)</td>
<td>(Rare)</td>
<td>Sarcoma, lipoma, haemangioma, myxoma, idiopathic thrombus, metastasis (right ventricle), inflammatory myofibroblastic tumour</td>
</tr>
<tr>
<td>Ventricles, involving wall</td>
<td>(Rare)</td>
<td>Haemangioma</td>
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<tr>
<td>Pericardium</td>
<td>Metastasis</td>
<td>Lipoma</td>
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<td></td>
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<td>Lymphoma sarcoma, including rhabdomyosarcoma</td>
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<tr>
<td></td>
<td></td>
<td>Mesothelioma, lymphoma, sarcoma, (especially angiosarcoma, synovial sarcoma), haemangioma, lymphoma, solitary fibrous tumour, lipoma</td>
</tr>
</tbody>
</table>

Burke A et al. Heart 2008;94:117-123.
Extra-cardiac Masses
Thank you for your attention