Cardiac Masses

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Cardiac Masses: Considerations

- Definition of the mass
  - Nature
  - Location
  - Benign or malignant

- Presentation
  - Obstruction
  - Direct myocardial involvement
  - Embolization
  - Constitutional or systemic symptoms

- Echocardiography is primary modality

- Multimodality imaging
Cardiac Masses: Differential Diagnosis

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

- **Left atrium**
  - Pectinate muscles
  - Q-tip (“warfarin ridge”)
- **Right atrium**
  - Crista terminalis
  - Eustachian valve
  - Chiari network
- **Ventricles**
  - False bands
  - Moderator band
  - Hypertrophy
  - Papillary muscles
  - Non-compaction
- **Pericardium**
  - Pericardial cysts
  - Pericardial fat
- **Valves**
  - Excresences
  - Mitral annular calcification
- **Lipomatous hypertrophy of interatrial septum**
- **Atrial septal aneurysm**
- **Hiatus hernias**
Anatomical Variants
Implanted Devices

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

LA
RA
CT
Implanted Devices
Thrombus

- Most common intra-cardiac mass
- Location often associated with cardiac pathology
  - LV thrombus
    - Acute MI
      - Estimated 4-15% patients with anterior MI (LV apex)
    - Dilated cardiomyopathy
      - DDx: false tendons, trabeculations, artifacts, apical hypertrophy, tumors, non-compaction, Loeffler’s
  - LA thrombus
    - Appendage
    - Body
  - RA thrombus
    - Catheter-related
    - Pulmonary embolism
    - Appendage
Thrombus

LV

RV

RA

LAA
Pulmonary Embolism

Catheter-related
Thrombus
Vegetations

- **Locations:**
  - Valve surfaces, areas of endocardium opposite intracardiac shunts, or prosthetic materials
    - Atrial surface mitral valve
    - Ventricular surface of aortic valve
  - Mobile, oscillating
  - Tissue density differing from surrounding tissue
  - Valvular regurgitation
    - Valvular stenosis (if large enough)
  - Infective or non-infective
  - May calcify if chronic/healed
Cardiac Tumors

- Primary Cardiac Tumors
  - Rare
    - 0.017% to 0.033% of autopsies
  - Benign
    - 75-85% of primary cardiac tumors
  - Malignant
# Primary Cardiac Tumors

## Benign tumors

<table>
<thead>
<tr>
<th>Tumor Type</th>
<th>No.</th>
<th>% of benign tumors</th>
<th>% of all tumors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myxoma</td>
<td>701</td>
<td>72.9</td>
<td>60.4</td>
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<tr>
<td>Papillary fibroelastoma</td>
<td>62</td>
<td>6.4</td>
<td>5.3</td>
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<tr>
<td>Rhabdomyoma</td>
<td>52</td>
<td>5.4</td>
<td>4.5</td>
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<tr>
<td>Fibroma</td>
<td>44</td>
<td>4.6</td>
<td>3.8</td>
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<tr>
<td>Lipoma</td>
<td>29</td>
<td>3.0</td>
<td>2.5</td>
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<tr>
<td>Teratoma</td>
<td>16</td>
<td>1.7</td>
<td>1.4</td>
</tr>
<tr>
<td>Hemangioma</td>
<td>16</td>
<td>1.7</td>
<td>1.4</td>
</tr>
<tr>
<td>Mesothelioma</td>
<td>14</td>
<td>1.5</td>
<td>1.2</td>
</tr>
<tr>
<td>Angioma</td>
<td>11</td>
<td>1.1</td>
<td>0.9</td>
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<tr>
<td>Hamartoma</td>
<td>9</td>
<td>0.9</td>
<td>0.8</td>
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<tr>
<td>Neurofibroma</td>
<td>3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Granular cell tumor</td>
<td>3</td>
<td>0.3</td>
<td>0.3</td>
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<tr>
<td>Thyroid</td>
<td>2</td>
<td>0.2</td>
<td>0.2</td>
</tr>
</tbody>
</table>

**Total benign tumors**: 962 (82.9%)

## Malignant tumors

<table>
<thead>
<tr>
<th>Tumor Type</th>
<th>No.</th>
<th>% of malignant tumors</th>
<th>% of all tumors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sarcomas</td>
<td>167</td>
<td>84.3</td>
<td>14.4</td>
</tr>
<tr>
<td>Angiosarcoma</td>
<td>38</td>
<td>28.3</td>
<td>4.8</td>
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<tr>
<td>Rhabdomyosarcoma</td>
<td>26</td>
<td>19.2</td>
<td>3.3</td>
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<tr>
<td>Fibrosarcoma</td>
<td>9</td>
<td>4.5</td>
<td>0.8</td>
</tr>
<tr>
<td>Leiomyosarcoma</td>
<td>7</td>
<td>3.5</td>
<td>0.6</td>
</tr>
<tr>
<td>Myosarcoma</td>
<td>6</td>
<td>3.0</td>
<td>0.5</td>
</tr>
<tr>
<td>Liposarcoma</td>
<td>6</td>
<td>3.0</td>
<td>0.5</td>
</tr>
<tr>
<td>Osteosarcoma</td>
<td>4</td>
<td>2.0</td>
<td>0.3</td>
</tr>
<tr>
<td>Neurogenic sarcoma</td>
<td>4</td>
<td>2.0</td>
<td>0.3</td>
</tr>
<tr>
<td>Other sarcomas</td>
<td>19</td>
<td>9.6</td>
<td>1.6</td>
</tr>
<tr>
<td>Mesothelioma</td>
<td>19</td>
<td>9.6</td>
<td>1.6</td>
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<tr>
<td>Lymphoma</td>
<td>8</td>
<td>4.0</td>
<td>0.7</td>
</tr>
<tr>
<td>Malignant teratoma</td>
<td>4</td>
<td>2.0</td>
<td>0.3</td>
</tr>
</tbody>
</table>

**Total malignant tumors**: 198 (17.1%)
Cardiac Myxoma

- Most common primary cardiac tumor
- Most are sporadic
  - 10% familial
    - Can recur and may be multicentric
- Female preponderance (60-70%)
- Most frequently discovered 3rd to 6th decades
- 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 Myxoma - Atypical Locations

LA
LV
RV
RA Myxoma
Valvular Myxoma
Papillary Fibroelastoma

- Second most common primary cardiac tumor
  - Most common tumor involving cardiac valves
    - Aortic valve most common location
      - Both surfaces show equal prevalence
    - May involve other cardiac structures/chambers (15-25%)
- Large majority found in left heart
- Avascular, papillary fronds, pedunculated
- Mid-portion of the valve
  - Usually do not cause valvular dysfunction
- Significant embolic potential recognized


Multiple tumors

Right-sided
Lambl’s Excresences

- Common
  - 70-80% adults
- Linear, filiform fronds
  - Ventricular surface of semilunar valves
  - Atrial surface of mitral valve
- Multiple
- Located at closure lines
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 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*)
    - Undifferentiated sarcoma
    - Rhabdomyosarcoma
    - Fibrosarcoma
    - Leiomyosarcoma
    - Osteosarcoma (calcification)

- **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 encountered most commonly
- Malignant melanoma 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
Extra-cardiac Masses
Thank you for your attention