Target Audience

General pathologists, surgical pathologists, autopsy pathologists, cardiovascular pathologists, forensic pathologists, molecular pathologists, pathology residents, and pathology fellows.

Overview

Cardiovascular specimens are commonly encountered in clinical practice, but formal training on how to handle them is lacking. Both the Society for Cardiovascular Pathologists (SCVP) and the Association for European Cardiovascular Pathology (AECVP) have recognized the need for a uniform approach to the handling and reporting of cardiovascular specimens. Pathologists and clinicians alike must also be aware of the value and limitations of newer ancillary diagnostic techniques such as genomics and proteomics. This module aims to familiarize participants with the fundamentals of handling, surgery, and biopsy-obtained pericardial specimens. Specifically, the course will address information that is relevant and actionable for clinicians. It also seeks to inform participants about the emerging technologies available to help inform diagnoses and clinical practice.

Learning Objectives

The participant will:

- Describe the fundamental approaches to handling pericardial specimens (both surgery- and biopsy-obtained).
- Explain the impact of emerging ancillary tools such as microbiologic studies (including molecular microbiology methods) and immunohistochemistry.
- Synthesize clinically actionable information that is essential to convey to care providers and, ultimately, the patient and/or the patient’s family.
References


Pericardial Disease

Lecture Outline

- Surgical procedures
- Constrictive pericarditis
- Recurrent pericarditis
- Pericardial effusions
- Pericardial neoplasms
- Tips for handling tissue

MAYO CLINIC

Pericardial Disease

Maintenance of Certification Self-Assessment Module

2016

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Pericardial Disease
Lecture Outline

- Surgical procedures
- Constrictive pericarditis
- Recurrent pericarditis
- Pericardial effusions
- Pericardial neoplasms
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Surgical Procedures
Underlying Pericardial Conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>%</th>
<th>M:F</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constriction</td>
<td>45</td>
<td>3:1</td>
<td>Any</td>
</tr>
<tr>
<td>Pericarditis</td>
<td>15</td>
<td>2:1</td>
<td>Any</td>
</tr>
<tr>
<td>Effusion</td>
<td>10</td>
<td>2:1</td>
<td>Any</td>
</tr>
<tr>
<td>Neoplasm</td>
<td>30</td>
<td>1:1</td>
<td>Any</td>
</tr>
</tbody>
</table>

Age is at time of surgical procedure

Surgical Procedures
Pericardectomy and Others

- Pericardectomy
  - Radical: ant, L lat, inf, post
  - Subtotal: anterior only
  - Partial: other ("completion")

- Other procedures
  - Window: drainage of fluid
  - Resection: for neoplasms
  - Biopsy: for diagnosis
Surgical Procedures
Pericardial Anatomy

Simulated Subtotal (Anterior) Pericardectomy

Surgical Procedures
Pericardial Anatomy

Simulated Subtotal (Anterior) Pericardectomy

Surgical Procedures
Radical Pericardectomy

Animated Sequence (Anterior View)
Surgical Procedures
Radical Pericardiectomy

Multiple Large Specimens

Pericardial Disease
Lecture Outline
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Constrictive Pericarditis
Common Causes
- North America & Europe
  - Idiopathic (undetermined) 40
  - Previous cardiac surgery 25
  - Old mediastinal irradiation 15
  - Previous pericarditis 10
- Worldwide
  - Tuberculosis (most common cause)
  - TB rare in North America & Europe
### Constrictive Pericarditis

#### Common Causes

- **North America & Europe**  
  - Idiopathic (undetermined) 40%  
  - Previous cardiac surgery 25%  
  - Old mediastinal irradiation 15%  
  - Previous pericarditis 10%

- **Worldwide**  
  - Tuberculosis (most common cause)  
  - TB rare in North America & Europe

#### Rare Causes (10%)  

- **Autoimmune connective tissue diseases**  
  - SLE, rheumatoid arthritis, scleroderma  

- **Malignancies involving pericardium**  
  - Breast, lung, lymphoma, mesothelioma  

- **Other rare causes of constriction**  
  - Uremia, drugs, sarcoidosis, Wegener's granulomatosis, mediastinal fibrosis, asbestososis, amyloidosis, trauma, TB
Constrictive Pericarditis
Mechanism of Development

Initial Fibrinous “Bread-and-Butter” Pericarditis

Progressive Hemorrhagic Pericarditis

Constrictive Pericarditis
Gross Features

- Surgical procedure %
  - Radical pericardiectomy 50
  - Subtotal or partial 50

- Gross pathology %
  - Thick (2-17 mm, #4) 95
  - Firm and fibrotic 95
  - Palpable calcium 30
  - None of the above <5
Constrictive Pericarditis
Microscopic Features

- **Thickening**
  - Dense fibrosis 95
  - Calcification 35
  - Granulation tissue 15

- **Inflammation**
  - Lymphoplasmacytic 75
  - Neutrophilic (acute) 10
  - Granulomatous 5

Constrictive Pericarditis
Microscopic Features

- **Hemorrhage**
  - Fibrin deposition 35
  - Hemosiderin 30
  - Mural thrombus <5

- **Other features**
  - Cautery artifact 50
  - Mesothelial inclusions <5
  - Thymic tissue <5

Constrictive Pericarditis
Microscopic Features

- Organizing Fibrin
- Old Fibrosis
- Pericardium

Fibrin, Fibrosis, and Lymphocytes (H&E)
Constrictive Pericarditis
Microscopic Features

Mesothelial Inclusions (H&E)

Constrictive Pericarditis
Microscopic Features

Tuberculous Caseating Granulomas (H&E, AFB)

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Recurrent Pericarditis
Causes of Inflammation

- **Common causes**
  - Idiopathic (unknown) 65
  - Iatrogenic (surg, radiation) 20
  - Viral infection (documented) 10

- **Uncommon causes**
  - Non-viral infections, autoimmune disease, uremia, drugs & tumors

- **Surgical indication**
  - Failed NSAID/steroid therapy & persistent intractable chest pain

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Recurrent Pericarditis
Gross & Microscopic Features

- **Gross findings**
  - Thick (2-13 mm, m 3) 80
  - Firm or rubbery 80
  - Palpable calcium <5

- **Microscopic findings**
  - Inflammation 95
  - Fibrotic thickening 80
  - Fibrin deposition 25
  - Granulation tissue 20

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Recurrent Pericarditis
Gross Features

[Image of congested fibrinous pericardium]
Pericardial Disease
Lecture Outline

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Pericardial Effusion
General Features

• Common causes 35%
  • Neoplasms 35%
  • Idiopathic 30%
  • Pericardiectomy 25%
• Uncommon causes 10%
  • Infection, mediastinal irradiation, connective tissue disease, uremia, sarcoidosis, trauma
• Persistent pericardial effusion
  • May exist either without or with constriction
  • Surgery: any of 6 types; depends on cause

Pericardial Effusion
Gross & Microscopic Features

• Gross findings %
  • Thick (1-9 mm, 4) 90
  • Firm and fibrous 85
  • Fibrin deposition 65
• Microscopic findings %
  • Inflammation & fibrosis 85
  • Fibrin deposition 65
  • Granulation tissue 45
  • Hemosiderin 40
Pericardial Disease
Lecture Outline

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Pericardial Neoplasms
General Features

• Malignant neoplasm %
  • Carcinoma of lung 25
  • Carcinoma of breast 15
  • Lymphoma (all types) 10
  • Mesothelioma 10
  • Other malignancy 20
• Benign tumor %
  • Pericardial cyst 20

Pathology is the same as similar tumors elsewhere in the body

Pericardial Neoplasms
Pathologic Features

Mesothelioma with Constriction (Short-Axis) (H&E)
Pericardial Neoplasms
Pathologic Features

Primary Cardiac Angiosarcoma (Short-Axis)

Pericardial Neoplasms
Pathologic Features

Primary Cardiac Angiosarcoma (Surgical Resection)

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**Parietal Pericardium**  
Tips for Handling Gross Tissue

- **Tissue processing**
  - Cut each section at least 1.5 cm in length
  - Submit at least six representative sections

- **Slide preparation**
  - Decalcify tissue, for any amount of calcium
  - Do not process plate-like or nodular calcium
  - Instruct Histology Lab to cut tissue on edge

- **Additional procedures**
  - Special stains for infections and neoplasms

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**Parietal Pericardium**  
Surgical CV Template

<table>
<thead>
<tr>
<th>Pericardium</th>
<th>Description</th>
<th>Processed gross tissue, measuring in aggregates, e.g., 5 mm, and resecting in the following manner:</th>
<th>Hematoxylin and staining with elastic, with elastase decalcification. Photographed. Not sectioned for microscopy in specific Al/B1.</th>
</tr>
</thead>
</table>

(Choose one of the following two diagnoses)

1. **Diagnosis**: Heart, followed by pericardial disease, pericardial fibrosis. Features consistent with clinical diagnosis of constrictive pericarditis, including non-specific/valvular fibrosis and acute/chronic cardiac non-specific/valvular fibrosis.

2. **Diagnosis**: Heart, followed by pericardial disease, pericardial fibrosis. Features consistent with clinical diagnosis of recurrent pericarditis/recurrent pericardial effusions, including ______________.

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