Cardiac tamponade, echo-guided pericardiocentesis

Fausto J Pinto, MD, PhD, FACC, FESC
Lisbon University, Portugal

Belgrade, October 23, 2010
ESC Guidelines

Guidelines on the Diagnosis and Management of Pericardial Diseases
Executive Summary

The Task Force on the Diagnosis and Management of Pericardial Diseases of the European Society of Cardiology
Mechanisms of Disease

- Inflamed parietal pericardium rubs against pleura (Pericarditis)
- Accumulation of pericardial fluid exerts pressure on cardiac chambers (Tamponade Physiology)
- Thickened, +/- calcified pericardium restricts normal cardiac filling (Constrictive Pericarditis)
- Others (neoplasms, cysts, etc)
Acute Pericarditis

- **Infectious**
  - viral
  - tuberculosis
  - pyogenic bacterial
- **Non-infectious**
  - Post-myocardial infarction
  - Uremia
  - Neoplastic disease
  - Radiation induced
  - Connective tissue diseases
  - Drug induced
Pericardial Effusion Echo Evaluation

- Size
- Location
- Loculation
- Consolidation or associated mass
- Hemodynamics
- Clearance for tap
Horowitz classification of pericardial effusion

Difference in pericardial pressures
Rapid vs slow accumulation

Echocardiographic Diagnosis
Cardiac Tamponade

- RA and RV diastolic collapse
- Swinging Heart
- Reduced chamber size
- Distended inferior vena cava with no respiratory changes
- Exaggerated respiratory variation of the mitral and tricuspid valve flow velocities
RV Diastolic Collapse

RA Collapse
Swinging Heart

Map 3
150dB/C 6
Persist Low
2D Opt:HGen
Fr Rate: High

HDI 5000
MESTRE, JOAQUIM JOS
Serv.Cardiologia StaMaria
20054031
P4-2 A.Card/ANA
16 Sep 05
11:23:01
TII 1.0
MI 1.3
23.7 cm
## Echo signs of tamponade

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>RA collapse</td>
<td>55%</td>
<td>88%</td>
<td>10%</td>
<td>99%</td>
</tr>
<tr>
<td>RV collapse</td>
<td>48%</td>
<td>95%</td>
<td>38%</td>
<td>99%</td>
</tr>
<tr>
<td>IVC dilation</td>
<td>97%</td>
<td>66%</td>
<td>7%</td>
<td>99%</td>
</tr>
</tbody>
</table>
Respiratory variation of tricuspid inflow > 50%

Respiratory variation of mitral inflow > 30%

Respiratory variation of pulmonary outflow > 30%
Imaging Findings in Pericardial Tamponade

Yared, K. et al. J Am Coll Cardiol Img 2010;3:650-660
**Table 1. Imaging Findings in Pericardial Tamponade**

**TTE**
- Pericardial effusion
- RV collapse in diastole; right or left atrial collapse in systole
- Respiratory variation in mitral (>25%) and tricuspid (>40%) inflow
- Ventricular interdependence
- Plethora of IVC
- Prominence of diastolic reversals in hepatic veins by pulsed Doppler

**CCT/CMR**
- Presence of pericardial effusion, even if loculated or localized
- Cine CCT or CMR
  - Ventricular interdependence
  - Chamber collapse

*CCT = cardiac computed tomography; CMR = cardiac magnetic resonance; IVC = inferior vena cava; RV = right ventricle; TTE = transthoracic echocardiography.*
Constrictive pericarditis vs restrictive cardiomyopathy
Constrictive Physiology

Echocardiographic signs of constriction

- Thickened and adherent pericardium
- Respiratory “bounce” of septum
- Diastolic mitral regurgitation
- Dilated IVC without respiratory variation
- Respiratory variation > 25% in AV valves
- Normal E’ on tissue Doppler
Diastolic septal bounce with inspiration

- Venous return increases leading to increased RV volume
- Total cardiac volume constrained by pericardium
- Interventricular dependence leads to septal shift toward left side
Doppler mitral flow and superior vena caval velocity in a patient with pericardial constriction

Little, W. C. et al. Circulation 2006;113:1622-1632
Restriction vs Constriction
Restriction vs Constriction

Ha JW et al. Am J Cardiol 2004;94:316
Multimodality Imaging in Constrictive Pericarditis

Yared, K. et al. J Am Coll Cardiol Img 2010;3:650-660
Echo-guided Pericardiocentesis

SAFE and EFFECTIVE

- locating the optimal site of puncture
- determining the depth of the pericardial effusion and the distance from the puncture site to the effusion
- monitoring the results of the pericardiocentesis
Echo guided pericardiocentesis
Subxiphoid Pericardiocentesis Guided by Contrast Two-dimensional Echocardiography in Cardiac Tamponade: Experience of 110 Consecutive Patients*

F. Vayre†1, H. Lardoux3, M. Pezzano3, J.-P. Bourdarias2 and O. Dubourg2

1Department of Cardiology, Hôpital Cochin, René Descartes University, 27 rue de Faubourg St-Jacques, 75014 Paris; 2Department of Cardiology, Hôpital Ambroise Paré, Paris-Ouest University, 9 Avenue Charles de Gaulle, 92100 Boulogne; 3Department of Cardiology, Hôpital Gilles de Corbeil, 52 Avenue Henri Dunant, 91100 Corbeil-Essonnes, France

Table 1. Major complications of pericardiocentesis in the different series.

<table>
<thead>
<tr>
<th>Author</th>
<th>n</th>
<th>Contrast study</th>
<th>Death during puncture</th>
<th>RVP</th>
<th>Arrhythmia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Callahan[11]</td>
<td>117</td>
<td>No</td>
<td>0 (0%)</td>
<td>2 (1.7%)</td>
<td>Not mentioned</td>
</tr>
<tr>
<td>Guberman[24]</td>
<td>56</td>
<td>No</td>
<td>1 (1.8%)</td>
<td>6 (11.7%)</td>
<td>Not mentioned</td>
</tr>
<tr>
<td>Chandraratna[31]</td>
<td>16</td>
<td>Yes</td>
<td>0 (0%)</td>
<td>3 (18.7%)</td>
<td>Not mentioned</td>
</tr>
<tr>
<td>Susini[32]</td>
<td>29</td>
<td>Yes</td>
<td>0 (0%)</td>
<td>2 (6.9%)</td>
<td>2 (6.9%)</td>
</tr>
<tr>
<td>Krikorian[37]</td>
<td>123</td>
<td>No</td>
<td>5 (4.1%)</td>
<td>11 (8.9%)</td>
<td>1 (0.8%)</td>
</tr>
<tr>
<td>Present study</td>
<td>110</td>
<td>Yes</td>
<td>6 (5.4%)</td>
<td>11 (10%)</td>
<td>6 (5.4%)</td>
</tr>
</tbody>
</table>

n=number of patients.
RVP=right ventricular puncture.
Echo guided pericardiocentesis

- Safe and effective technique for tamponade relief
- Pericardial contrast may be used for needle tip location
- Prolonged pericardial drainage allows more complete fluid drainage
hvala mnogo