CMR/CT Evaluation of Pericardial Disease

Bernard P. Paelinck, MD, PhD
Antwerp University Hospital
no disclosures
1. The normal pericardium

< 0.4 cm thickness
< 15 – 35 ml
The normal pericardium

CT

CMR

Rajiah JCCT 2010
# Imaging of pericardial diseases

<table>
<thead>
<tr>
<th></th>
<th>echo</th>
<th>CT</th>
<th>CMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>availability</td>
<td>++++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>soft-tissue contrast</td>
<td>+</td>
<td>++</td>
<td>++++</td>
</tr>
<tr>
<td>temporal resolution</td>
<td>++++</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>physiology</td>
<td>++++</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>extracardiac</td>
<td>+</td>
<td>++++</td>
<td>+++</td>
</tr>
</tbody>
</table>

**Limitations:**
- echogenicity
- radiation/iodinated contrast
- contraindications
2. Pericardial disease

a. Pericardial effusion
b. Constrictive pericarditis
c. Congenital abnormalities
d. Pericardial tumor
a. Pericardial effusion

1. localization
2. (limited) characterization

<table>
<thead>
<tr>
<th></th>
<th>HU</th>
</tr>
</thead>
<tbody>
<tr>
<td>serous</td>
<td>&lt;20</td>
</tr>
<tr>
<td>exsudate</td>
<td>20-60</td>
</tr>
<tr>
<td>hemorrhage</td>
<td>variable</td>
</tr>
</tbody>
</table>

CT

Lopez Costa, Sem Roentgen 2008
Pericardial effusion

CMR

1. localization
2. characterization

<table>
<thead>
<tr>
<th></th>
<th>T1 signal</th>
<th>SSFP</th>
</tr>
</thead>
<tbody>
<tr>
<td>transudate</td>
<td>↓</td>
<td>↑</td>
</tr>
<tr>
<td>exudate</td>
<td>↓↑</td>
<td>↓↑</td>
</tr>
<tr>
<td>hemorrhage</td>
<td>↓↑</td>
<td>↓↑</td>
</tr>
</tbody>
</table>
Pericardial effusion

CT

Lopez Costa, Sem Roentgen 2008

CMR

Paelinck, NEJM2003

tamponade
### Keypoints pericardial effusion

<table>
<thead>
<tr>
<th>CT</th>
<th>CMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>cause/clues to etiology</td>
<td>cause/clues to etiology</td>
</tr>
<tr>
<td>(IVS motion/collapse)</td>
<td>IVS motion/collapse</td>
</tr>
</tbody>
</table>

CAVE: not appropriate for clinically unstable patients
b. Constrictive pericarditis

CMR

SSFP

thickness >4 mm

accuracy 93%

(Masui, Radiology 1992)

real-time SSFP

septal bounce

sens. 81%, spec. 100%

(Giorgi, Radiology 2003)

LGE

LGE thickness ≥ 3 mm

sens. 86%, spec. 80% to predict reversibility

(Feng, Circ 2011)
Constrictive pericarditis

CT

Rajiah, JCCT 2010

thickness >4 mm
(Isner, Ann Intern Med 1982)
calcification
# Keypoints constrictive pericarditis

<table>
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<th>CMR</th>
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<tbody>
<tr>
<td>thickness + localization</td>
<td>thickness + localization</td>
</tr>
<tr>
<td>calcification</td>
<td>inflammation (LGE)</td>
</tr>
<tr>
<td></td>
<td>functional (cine)</td>
</tr>
</tbody>
</table>

CAVE: constrictive pericarditis may be present without pericardial thickening  
(Taljera, Circ 2003)
c. Partial/global absence of pericardium

CT

CMR

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0.002-0.004%

>left side (Yamano, Circ J 2004)
Pericardial cyst

CT

CMR

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>> incidental

>> right anterior cardiophrenic angle (70%)
d. Pericardial tumors

CMR

metastatic disease (thymoma)
Pericardial tumors

CMR

T1

T2

T2 FS

cavernous haemangioma

courtesy P. Van Herck
Pericardial tumors

CMR

SSFP

T1

T2

hematoma
Keypoints pericardial tumors

Echo = initial investigation (cfr. pericardial effusion)

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<tr>
<td>extracardiac lesions</td>
<td>local extent</td>
</tr>
<tr>
<td>-</td>
<td>characterization (?) (T1/T2)</td>
</tr>
<tr>
<td>-</td>
<td>DD hematoma, effusion (first pass)</td>
</tr>
</tbody>
</table>

Differentiation:
Benign: encapsulated, well defined
Malign: invasion/tethering of soft tissue/great vessel
Conclusions and keypoints

CT and CMR are complementary to echocardiography

**CT**
1. clear delineation of pericardium
2. calcification
3. extracardiac lesions

**CMR**
1. superior tissue characterization, except for calcification
2. haemodynamic assessment with high temporal resolution
3. preferred technique for constrictive pericarditis