Is non-enhanced CT useful in the detection of cardiac myxomas?

Poster No.: C-1870  
Congress: ECR 2012  
Type: Scientific Paper  
Authors: W. Shin, Y. H. Choe, S. M. Kim; Seoul/KR  
Keywords: Cardiac, Thorax, CT  
DOI: 10.1594/ecr2012/C-1870

Any information contained in this pdf file is automatically generated from digital material submitted to EPOS by third parties in the form of scientific presentations. References to any names, marks, products, or services of third parties or hypertext links to third-party sites or information are provided solely as a convenience to you and do not in any way constitute or imply ECR's endorsement, sponsorship or recommendation of the third party, information, product or service. ECR is not responsible for the content of these pages and does not make any representations regarding the content or accuracy of material in this file. 

As per copyright regulations, any unauthorised use of the material or parts thereof as well as commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method is strictly prohibited. You agree to defend, indemnify, and hold ECR harmless from and against any and all claims, damages, costs, and expenses, including attorneys' fees, arising from or related to your use of these pages. 

Please note: Links to movies, ppt slideshows and any other multimedia files are not available in the pdf version of presentations.

www.myESR.org
Purpose

1. Embolism of cardiac and aortic origin accounts for 20-25% of ischemic strokes. Cardiac tumor is one of embolic origin. Its diagnosis is important because many cardiogenic sources of systemic emboli are potentially identifiable and preventable prior to stroke.

2. Cardiac myxoma is the most common cardiac tumor. It has prevalence of 24.2% of primary tumors and cysts of heart and pericardium. The accumulative prevalence of cardiac tumors is 0.002-0.3% as determined from an autopsy.

3. Imaging study plays key role in the diagnosis of patients with cardiac myxoma because of its diversity and nonspecificity. For evaluating intracardiac lesions such as myxoma, contrast-enhanced CT and MR are widely used in suspicious patients.

4. Nonenhanced thoracic CT is widely used for detecting intrathoracic lesions. Nonenhanced chest CT is performed for checking primary lung lesion in diverse medical situation. Currently, low-dose chest CT is one of widely used tool for detecting lung cancer in physical checkup. Nonenhanced coronary CT is also widely performed for checking coronary calcium scoring which is related to occurrence of coronary artery disease.

5. Although heart is covered in nonenhanced CT, many clinicians, even radiologists, sometimes do not focus on cardiac lesion. However, in our experience, intracardiac tumors including myxoma are easily detected on nonenhanced CT. On nonenhanced CT, cardiac myxoma has lower attenuation than that of nonenhanced blood and its shape is well-defined spherical or ovoid.

6. In this study, we investigate detecting rate of cardiac myxoma on nonenhanced CT. And we aimed to evaluate the diagnostic capability of nonenhanced CT in the detection of cardiac myxoma.
Methods and Materials

Materials:

The institutional review board approved this HIPAA-compliant study, and the requirement for informed consent was waived because it was a retrospective study. From July 1998 to October 2011, we included 49 nonenhanced CT scans (30 cardiac CT, 17 chest CT and 1 tracheal CT) of 32 subsequent patients (17 males/15 females, age range of 31-73 years) who underwent nonenhanced CT, before surgery for pathologic-confirmed cardiac myxoma. Of these 49 CT, Twelve CT (4 cardiac CT and 8 chest CT) were performed in other hospitals.

Radiological methods:

Two radiologists (One cardiovascular fellow radiologist, S.M.K and one third year resident, W.S) who were blinded to patient's history and pathologic results reviewed nonenhanced CT scans for the detection of intracardiac lesions and determined the presence of the lesions in consensus.

In another session, they read CT images again after reviewing the medical records including the findings of contrast-enhance CT or MR. They recorded presence/absence of low attenuation areas and calcifications, measured attenuation in the low attenuation areas in the cardiac chambers and sizes of lesions on axial images.

- CT attenuation - The attenuation values in Hounsfield units was measured by placing ROI in each lesion.
- Size - The two-dimensional maximum diameter of cardiac myxomas was measured in centimeters using an electronic caliper tool.
- Calcification - Calcification of the lesions were noted, if present.

The size of cardiac myxoma on CT scans was compared to real size of surgical specimen, according to operation note.
Results

Two outside chest CT images were unavailable for review and excluded from the study. Thirty-two cardiac myxomas were detected by the readers (69.4%). After medical record review, additional four myxomas were detected (73.5%). Among 36 cardiac myxomas seen on noncontrast CT, 11 lesions showed calcifications (30.6%) (Table. 1).

The average attenuation and two dimensional sizes of cardiac myxomas on axial nonenhanced CT scans were 24 HU (range, -20 HU to 56 HU) and 3.5 x 2.3 cm (0.9 x 0.6 to 9.7 x 5.9 cm), respectively.

The sizes of cardiac myxomas on CT scans was smaller than those of pathologic specimen (p=0.02) (Table. 2). But each of them show similar increasing tendency on graph (Fig. 1). These problem did not affect the detection rate of cardiac myxoma.

<table>
<thead>
<tr>
<th></th>
<th>Number of detected cases</th>
<th>Detecting rate (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st reading</td>
<td>32</td>
<td>69.4</td>
<td>0.02</td>
</tr>
<tr>
<td>2nd reading with medical record review</td>
<td>36 (32+4: 11 calcified lesions)</td>
<td>73.5</td>
<td></td>
</tr>
</tbody>
</table>

Table. 1: Detecting rate of cardiac myxoma on nonenhanced CT scans

<table>
<thead>
<tr>
<th></th>
<th>Mean (cm)</th>
<th>Range (cm)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>on CT</td>
<td>3.5</td>
<td>0.9 ~ 9.7</td>
<td>0.02</td>
</tr>
<tr>
<td>Pathologic specimen</td>
<td>4.5</td>
<td>0.9 ~ 15.0</td>
<td></td>
</tr>
</tbody>
</table>

Table. 2: Size of cardiac myxoma (longest diameter on axial images)

Greater than 0.9cm in the image started to be noted on nonenhanced CT. However, some undetectable cardiac myxomas on CT were bigger than 1.5cm. Usually they have short height and broad base abutting to cardiac chamber. And undetectable cardiac myxomas have similar attenuation to surrounding cardiac chamber on each nonenhanced CT.

Limitations:
We tried to make optimal protocol for nonenhanced CT, but it was difficult. Because many elements can affect CT quality and detection rate of cardiac myxoma, including size of cardiac myxoma, patient's heart rate, dose equivalent, acquisition time, CT window level, etc.

In this study, relatively small number of cases are included. However, enrolled CT scans were performed in several CT scanners with various protocols. And intraobserver and interobserver variations were not considered. Readers reviewed axial images only, except coronal & sagittal images, even included on CT images. We did not enroll control group, such as normal thorax CT or abnormal thorax CT including other cardiac tumors or thrombi.
Fig. 1: Comparement: longest diameter of each same cardiac myxomas (pathologic specimen vs. CT scan, cm), $r = 0.6715$, $p < 0.0001$, 95% confidence interval for $r = 0.44$ to 0.8193

© Radiology, Samsung medical center - Seoul/KR
**Fig. 2:** F/50, LA myxoma

© Radiology, Samsung medical center - Seoul/KR
**Fig. 3:** M/49, LA myxoma. It was detectable on nonenhanced CT scan, especially after adjusting width and level. This lesion was measured as 5.2cm on nonenhanced CT and contrast-enhanced CT scans, 4.3cm on MRI. The surgical specimen was 4.2cm in size.

© Radiology, Samsung medical center - Seoul/KR

**Fig. 4:** M/49, LA myxoma (same case in Fig. 3). It was detectable on nonenhanced CT scan, especially after adjusting width and level. This lesion was measured as 5.2cm on nonenhanced CT and contrast-enhanced CT scans, 4.3cm on MRI. The surgical specimen was 4.2cm in size.

© Radiology, Samsung medical center - Seoul/KR
Fig. 5: M/73, LA myxoma. It was invisible on nonenhanced CT scan. However, this cardiac myxoma was detected on contrast-enhanced CT scan and MRI. This lesion was measured as 1.7cm on contrast-enhanced CT and 1.0cm on MRI. The pathologic report reveals cardiac myxoma and the size of pathologic specimen was 1.5cm.

© Radiology, Samsung medical center - Seoul/KR
Conclusion

Nonenhanced thorax CT is useful in detecting cardiac myxoma, especially if radiologists are keen to the findings of cardiac myxomas on nonenhanced CT.
References


Personal Information

Wonseon Shin, M.D.

Department of Radiology, Samsung medical center, Seoul, Korea.

E-mail: snthesun@gmail.com