Calcification of the Tricuspid Annulus
Case Report and Review of the Relevant Literature

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SUMMARY
We present a case of tricuspid annulus calcification, documented by fluoroscopy, chest X-ray and cross sectional echocardiography. This case is interesting for two reasons:
1) Tricuspid annulus calcification is extremely rare and very few cases have been reported.
2) It is the third case described where two-dimensional echocardiography established the diagnosis of this very rare condition. Previously reported cases of tricuspid annulus calcification are reviewed.

Additional Indexing Words:
Cardiac calcifications

Calcification of the right heart valves and rings is only infrequently found. Tricuspid annular calcification is extremely rare and very few cases have been reported.1–8 We present such a case in a female patient with previous aortic and mitral valve replacement and severe tricuspid regurgitation. The calcification of the tricuspid annulus was observed by fluoroscopy, chest X-ray and two-dimensional echocardiography.

Case Report
A 65-year-old cachectic woman, who had undergone aortic and mitral valve replacement 10 years ago for severe rheumatic valvular disease, was admitted with severe dyspnea. On physical examination she looked emaciated; she had neck vein distension, massive ascites and gross pedal edema. The metallic opening and closing sounds of the prosthetic valves were easily heard. A grade III/VI pansystolic murmur best heard at the left of the lower sternum and xiphoid area was present and tended to increase during inspiration. Palpation revealed evidence of right ventricular enlargement.

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The liver was enlarged and pulsatile and hepatojugular reflux was prominent. The jugular venous pulse was composed entirely of a regurgitant C-V wave complex. Atrial fibrillation and biventricular hypertrophy were seen on ECG. The chest X-ray in posteroanterior view revealed severe cardiomegaly with some pleural effusion on the right. On fluoroscopy we did not note any abnormality of the prosthetic valves and we observed a moving mass of calcium at the site of the tricuspid annulus. The extensive calcification of the tricuspid annulus was obvious on the right lateral oblique view (Fig. 1). Two-dimensional echocardiography revealed a dense mass of echoes at the base of the tricuspid valve and a dilated right ventricle and right atrium (Fig. 2). The prosthetic valves seemed to function properly but the left ventricle was dilated and contracted poorly. The patient was felt to have very severe tricuspid regurgitation, but in view of her poorly functioning myocardium and her general ill health, she was considered to be unable to tolerate additional cardiac surgery, and therefore, was treated medically.
DISCUSSION

The cardiac and intracardiac calcifications most commonly seen on X-ray are those of the mitral and aortic valves, mural thrombi, mitral annulus and coronary arteries.\textsuperscript{9)\textperiodcentered} Calcification of the tricuspid annulus is very rare and some clinical details of the cases which have been reported previously are summarized in Table I. These calcifications may be quite obvious on plain chest films if they are extensive; if not, they are best evaluated on T.V. fluoroscopy, in localized spot films or by tomography.\textsuperscript{9)\textperiodcentered} In the postero-anterior projection of the chest the calcification of the valves and annuli are not easily demonstrated since they are superimposed on the spine and lie in the midline. For this reason, they are better assessed in the lateral or slightly
Fig. 3. M-mode echocardiogram obtained from Fig. 2B. The dense echoes from the calcified annulus are immediately behind the tricuspid valve (white arrows).

Table I. Reported Cases of Calcified Tricuspid Annulus

<table>
<thead>
<tr>
<th>Author</th>
<th>Age</th>
<th>Sex</th>
<th>Underlying heart disease</th>
<th>TR</th>
<th>RVP mmHg</th>
<th>Other calcifications</th>
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<tbody>
<tr>
<td>Rogers (1969)</td>
<td>51</td>
<td>F</td>
<td>PS ASD</td>
<td>—</td>
<td>69/9</td>
<td>PV</td>
</tr>
<tr>
<td>Rogers (1969)</td>
<td>42</td>
<td>M</td>
<td>ASD</td>
<td>—</td>
<td>70/10</td>
<td>—</td>
</tr>
<tr>
<td>Rogers (1969)</td>
<td>51</td>
<td>M</td>
<td>PS</td>
<td>—</td>
<td>165/10</td>
<td>—</td>
</tr>
<tr>
<td>Rogers (1969)</td>
<td>51</td>
<td>F</td>
<td>PS ASD</td>
<td>—</td>
<td>?</td>
<td>—</td>
</tr>
<tr>
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<td>46</td>
<td>M</td>
<td>PS</td>
<td>—</td>
<td>122/11</td>
<td>—</td>
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<tr>
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<td>47</td>
<td>F</td>
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<td>—</td>
<td>160/10</td>
<td>—</td>
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<tr>
<td>Malkawi (1981)</td>
<td>50</td>
<td>F</td>
<td>PS</td>
<td>—</td>
<td>116/16</td>
<td>—</td>
</tr>
<tr>
<td>our case</td>
<td>65</td>
<td>F</td>
<td>RVD</td>
<td>+</td>
<td>?</td>
<td>—</td>
</tr>
</tbody>
</table>

Cases of tricuspid annulus calcification which have been reported.

Abbreviations: ASD=atrial septal defect; PS=pulmonic stenosis; PV=pulmonic valve; RVP=right ventricular pressure; RVD=rheumatic valve disease; TR=tricuspid regurgitation; ?=data not available or not reported.

Oblique projections.6,7) Echocardiography has emerged as an invaluable tool for the detection of cardiac calcifications. Only 2 cases, however, of calcification of the tricuspid annulus have been reported in which the diagnosis was made by two-dimensional echocardiography.7,8)

One possible explanation for the rarity of calcific deposits on the tricuspid annulus, in contrast to the much higher frequency of those observed on the
mitral annulus, is the following. The two annuli or valve rings form the fibrous cardiac skeleton which affords a firm anchorage for the attachments of the atrial and ventricular musculature as well as the valvular tissue. In the infant the annuli are composed of fibrillar parallel collagen bundles which degenerate through aging. Lipid deposits are precipitated and foci of calcification are observed in these areas. Histologic studies of cases of massive mitral annulus calcification suggest that these lesions represent an exaggeration of the "ageing process".

Since the composition and function of mitral and tricuspid annuli are similar, we come to the conclusion that the more frequent calcification of the mitral annulus may be related to the higher pressure in the left ventricle, which may cause microtraumas, thus enhancing the degenerative process and the deposition of calcium. In patients with high standing pressures or volume overload, the mechanism for the degeneration of the tricuspid annulus is accelerated and calcification may occur.

A distinction should be made between a calcified tricuspid annulus and calcification of the tricuspid valve. The latter is almost never encountered. It may be caused by bacterial endocarditis or by a rheumatic inflammatory process. The infantile form is another uncommon type of calcification of the tricuspid valve in which the annulus remains intact.

Tricuspid annuloplasty can at times resemble calcification of the annulus on two-dimensional echocardiography. However, the surgeon, who had performed the operation, stated definitely in his files and from his memory that annuloplasty was not performed. Moreover, our patient did not have renal failure or diabetes mellitus, conditions which can predispose calcification.

Our case, as far as we know, is the 13th one of tricuspid annulus calcification to have been reported, and the third case where two-dimensional echocardiography was used in the diagnosis of this condition. It probably has the same pathophysiologic etiology as the previously described cases, which have been found in patients with right ventricular volume or pressure overload.

References

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