Detection of ruptured aneurysm of sinus of Valsalva by contrast two-dimensional echocardiography

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SUMMARY The M-mode and two dimensional echocardiographic features are described of a patient with rupture of a sinus of Valsalva aneurysm into the right atrium. A clear echo-free zone arising from the tip of the aneurysm is visualised in the right atrium in diastole by peripheral injection of echocardiographic contrast material. At surgery a fistula was seen between the non-coronary cusp and the right atrium.

Recent reports show that two-dimensional contrast echocardiography should improve the possibility of detecting right-to-left shunts at atrial level, tricuspid regurgitation, and persistent left superior vena cava.

This report describes the use of two-dimensional contrast echocardiography to detect a rupture of a non-coronary sinus of Valsalva aneurysm into the right atrium by recording the negative jet during diastole in this chamber.

Case report

A 21-year old man was admitted to The Heart Institute of Japan. He had been well until eight weeks before admission, when fever and a heart murmur were first noted. During the next three weeks, fever subsided spontaneously without specific treatment. Physical examination on admission disclosed a blood pressure of 140/80 mmHg, and a pulse rate of 76 beats per minute. A grade 1/6 harsh systolic murmur was heard at the base of the heart and a grade 1/6 soft diastolic murmur was audible along the right sternal border. Physical examination was otherwise normal.

The electrocardiogram showed a sinus rhythm with normal ST-T wave and the chest x-ray was also normal.

The initial M-mode echocardiogram disclosed a mass of dense echoes in the right atrium just behind the orifice of the tricuspid valve in diastole which appeared to be continuous with the posterior aortic valve (Fig. 1A). The mitral valve, the tricuspid valve, and the pulmonary valve appeared to move normally.

On two-dimensional echocardiography the short axis view of the aortic root disclosed a dilated non-coronary sinus of Valsalva with a nipple-like aneurysm, protruding into the right atrium in diastole. An interruption in the echo (indicated by a white arrow) was visualised at the tip of the aneurysm (Fig. 1B). After peripheral injection of contrast material, both the right atrium and ventricle were homogeneously filled with contrast echoes in systole, and a clear echo-free zone, arising from the tip of the aneurysm, was recorded in the right atrium during diastole (Fig. 1C). It was felt that this patient probably had a ruptured sinus of Valsalva aneurysm into the right atrium secondary to infective endocarditis.

In order to confirm these findings, cardiac catheterisation and cineangiography were performed and the findings are summarised in the Table. Oximetry confirmed a left-to-right shunt at right atrial level.

The aortogram disclosed a nipple-like aneurysm

Table Cardiac catheterisation data

<table>
<thead>
<tr>
<th>Site</th>
<th>Blood pressure (mmHg)</th>
<th>Per cent oxygen saturation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aorta</td>
<td>118/54</td>
<td>97</td>
</tr>
<tr>
<td>Left ventricle</td>
<td>118/10</td>
<td>96</td>
</tr>
<tr>
<td>Pulmonary artery</td>
<td>33/10</td>
<td>90</td>
</tr>
<tr>
<td>Right ventricle</td>
<td>33/2</td>
<td>91</td>
</tr>
<tr>
<td>Right atrium</td>
<td>5 (mean)</td>
<td>90</td>
</tr>
<tr>
<td>Superior vena cava</td>
<td>7 (mean)</td>
<td>72</td>
</tr>
<tr>
<td>Inferior vena cava</td>
<td>7 (mean)</td>
<td>70</td>
</tr>
</tbody>
</table>

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Fig. 1  (A) M-mode scan from the aorta (AO) to the tricuspid valve (TV). A dense mass of echoes (arrow) can be seen in the right atrium (RA) during diastole just behind the orifice of the tricuspid valve which is continuous with the posterior aortic leaflet. (B) Two-dimensional echocardiograms (short axis view). In diastole the aneurysm of the non-coronary sinus of Valsalva presents as a nipple-like extension with a perforation at its tip (arrow). S, systole. D, diastole. (C) Two-dimensional contrast echocardiograms. After contrast injection the right atrium (RA), as well as the right ventricle (RV), are homogeneously filled with contrast echoes in systole. In diastole there is a clear, echo-free zone which corresponds to the path of the regurgitant jet from the tip of the aneurysm into the right atrium (white arrow). LA, left atrium; RA, right atrium; AO, aorta; RV, right ventricle; RVO, right ventricular outflow.
at the tip of the non-coronary sinus of Valsalva and simultaneous filling of the right atrium (Fig. 2).

At operation these findings were confirmed.
The ruptured aneurysm was excised and the defect was sutured. The postoperative course was uneventful.

Discussion

Sinus of Valsalva aneurysms are usually diagnosed after they have ruptured, when they may be fatal. The diagnosis may be suspected from the history of an abrupt onset of symptoms, including dyspnoea, chest pain, or palpitation, and the presence of a continuous murmur.4 All patients, however, do not present in this manner, and investigation is necessary to distinguish this from other causes of a continuous cardiac murmur.

Echocardiographic findings in patients with aneurysm of the sinus of Valsalva (ruptured or unruptured) have been previously reported.5-7 The echocardiograms vary according to the chamber that receives the aneurysm and whether or not it has ruptured. Weyman et al.8 reported a patient with rupture of an aneurysm of the right sinus into the right atrium which resulted in premature opening of the pulmonary valve, and dense echoes in the right atrium which moved through the tricuspid orifice in diastole.

In our case the M-mode echocardiogram disclosed only an abnormal echo mass beneath the orifice of the tricuspid valve in the right atrium which was continuous with the non-coronary cusp as reported by Weyman et al.8 The short axis view of the aorta by two-dimensional echocardiography, however, was more useful in detecting the enlarged non-coronary cusp, the aneurysm presenting as a nipple-like extension of the cusp with a perforation at its tip, and in early to mid-diastole, a negative jet arising from the tip of the aneurysm visualised in the right atrium by peripheral injection of contrast material. The negative contrast effect was best seen at slow heart rates and only when the right atrium was completely opacified with contrast.

In summary, contrast two-dimensional echocardiography is useful in detecting abnormalities of the aortic root and provides important information when planning cardiac catheterisation and operation.

References


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