DISCRETE SUB AORTIC MEMBRANE: THE ROLE OF TRANS ESOPHAGEAL ECHOCARDIOGRAPHY

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Discrete subaortic membrane is a rare cause of left ventricular outflow tract obstruction. The M-mode and two-dimensional transthoracic echocardiographic features of discrete subaortic membrane have been described previously. In this study transesophageal echocardiography (TEE) have been performed in 8 patients, previously diagnosed by transthoracic echocardiography to have discrete subaortic membrane. The study showed that TEE is far superior to transthoracic echocardiography in clearly showing the discrete membrane in full length with clear points of insertion. Moreover, the distance of the membrane from the aortic valve as well as the thickness of the membrane can be measured more accurately. Aortic regurgitation, a common complication of discrete subaortic membrane, was present in 7 patients. The severity of aortic regurgitation correlated inversely with the distance of subaortic membrane from the aortic valve. Although it was generally accepted that discrete sub aortic membrane is a congenital anomaly, some reports raised the question of whether discrete subaortic membrane is a congenital or an acquired lesion. There are some suggestions that the subaortic membrane may be derived from endocardial proliferation with fibrosis into the left ventricular outflow tract stimulated by turbulent blood flow through ventricular septal defects. This hypothesis may be supported by our findings in one patient who has a small ventricular septal defect and a very short membrane extending only a few mm from the interventricular septum. Further follow-up by TEE may show the progressive nature of this membrane.

DISCRETE SUBAORTIC membrane is a rare cause of left ventricular outflow tract obstruction (LVOT). It is congenital and more frequently found in males with a male/female ratio of approximately 2.1:1. It is characterized by a thin (1 to 2 mm) crescent-shaped fibrous membrane, 2 cm or less below the aortic valve. The membrane arises from the ventricular septum, extends across the LVOT and inserts onto the anterior mitral valve leaflet producing varying degrees of obstruction. The M-mode and two-dimensional transthoracic echocardiographic features of discrete subaortic membrane have been described previously. In this report, transesophageal echocardiographic findings in 8 patients with discrete sub aortic membrane are presented.

Method

In 8 patients previously diagnosed to have discrete subaortic stenosis by transthoracic echocardiography, transesophageal echocardiography was performed. In 7 patients a 5 MHz multiplane transducer was used (HewlettPackard Sono 1000 System), while in 1 patient as MHz biplane transducer was used (ATL Ultramark 7 System). Standard transesophageal views in the long axis, four chambers, short axis of the left ventricle and aortic valve, and in the short axis and long axis of the ascending aorta were obtained for imaging and Doppler color-flow mapping.
Results

The 8 patients included 6 males and 2 females aged 23 to 43 years (mean, 30.25) (Table 1). In all patients, the membrane was seen clearly as a thin fibrous structure just below the aortic valve (Figure 1). The distance from the membrane to the aortic valve leaflets varied from 0.2 to 1.7 cm. In 7 patients, the membrane extended across the L VOT and both the anterior insertion to the interventricular septum and posterior insertion to the anterior mitral valve leaflet were clearly demonstrated. In one case, the membrane was very short and extended a few millimeters from the anterior interventricular septum (Figure 2). Aortic regurgitation was present in 7 patients and ranged from mild to moderate. Mild mitral regurgitation was detected in one case (Patient 3 in Table 1). In this patient, the membrane was very close to the aortic valve which was markedly thickened. The anterior leaflet of the mitral valve was noted to be thickened as well.

Associated Congenital Anomalies

Mitral valve prolapse was detected in one case, ventricular septal defect alone was detected in one patient.

Table 1. Characteristics of patients with discrete subaortic membrane.

<table>
<thead>
<tr>
<th>No.</th>
<th>Age (y)</th>
<th>Sex</th>
<th>Distance of membrane from posterior aortic morphology</th>
<th>Aortic regurgitation</th>
<th>Gradient across aortic valve (obtained by TIE)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>valve leaflet</td>
<td></td>
<td>Peak</td>
</tr>
<tr>
<td>1</td>
<td>32</td>
<td>F</td>
<td>0.3 cm Thickened</td>
<td>Moderate</td>
<td>52</td>
</tr>
<tr>
<td>2</td>
<td>32</td>
<td>M</td>
<td>0.4 cm Thickened</td>
<td>Moderate</td>
<td>90</td>
</tr>
<tr>
<td>3</td>
<td>23</td>
<td>M</td>
<td>0.2 cm Markedly thickened</td>
<td>Moderate</td>
<td>117</td>
</tr>
<tr>
<td>4</td>
<td>27</td>
<td>F</td>
<td>1.7 cm Normal</td>
<td>Mild</td>
<td>38</td>
</tr>
<tr>
<td>5</td>
<td>23</td>
<td>M</td>
<td>0.5 cm Mildly thickened</td>
<td>Mild</td>
<td>47</td>
</tr>
<tr>
<td>6</td>
<td>24</td>
<td>M</td>
<td>1.0 cm Mildly thickened</td>
<td>Mild</td>
<td>45</td>
</tr>
<tr>
<td>7</td>
<td>42</td>
<td>M</td>
<td>1.6 cm Normal</td>
<td>Mild</td>
<td>23</td>
</tr>
<tr>
<td>8</td>
<td>39</td>
<td>M</td>
<td>0.5 cm, very short membrane</td>
<td>None</td>
<td>No gradient</td>
</tr>
</tbody>
</table>

TIE = transthoracic echocardiography; VSD = ventricular septal defect; MVP = mitral valve prolapse; PDA = patent ductus arteriosus.

Figure 1. Multiplane transesophageal echocardiography, left ventricular outflow tract, longitudinal view, demonstrating a discrete subaortic membrane just below the aortic valve.

Figure 2. The same view as above demonstrating a very short subaortic membrane in another patient (arrow).
case, while ventricular septal defect and patent ductus arteriosus were detected in another case.

Discussion

The role of transthoracic echocardiography in the diagnosis and evaluation of cases with discrete subaortic membrane is well established. In the majority of cases, the membrane can be easily visualized from the long-axis parasternal view. In some cases, the membrane is better visualized from the apical 5-chamber view. However, the discrete membrane cannot be visualized by transthoracic echocardiography in a small number of cases.

Transthoracic echocardiography has other limitations in that the membrane is usually not seen in full length. In particular, the insertion to the anterior mitral valve leaflet is usually not seen. This study shows that transesophageal echo cardiography can be very useful in clearly showing the discrete membrane and in identifying its anatomic sub-types. Moreover, the membrane is seen in full length with clear points of insertion. The distance of the membrane from the aortic valve as well as the thickness of the membrane can be measured more accurately. This may be of importance in pre-surgical evaluation as well as in the selection of cases for percutaneous transluminal balloon dilatation of discrete subaortic membrane.

Aortic regurgitation is the most frequent complication of discrete subaortic membrane observed in about 50% of the cases. In our study, aortic regurgitation was present in 7 patients (87.5%). It was mild in 4 cases and moderate in 3 cases. The severity of aortic regurgitation correlated inversely with the distance of the subaortic membrane from the aortic valve. This was in contrast to the conclusion reached previously by Motro et al. Their study suggested that patients in whom the membrane is remote from the aortic valve are more likely to develop aortic regurgitation than those with a shorter distance between the membrane and valve.

Discrete subaortic membrane is often associated with other congenital cardiac defects such as ventricular septal defect, patent ductus arteriosus, coarctation of aorta, idiopathic hypertrophic cardiomyopathy, and mitral valve abnormalities. In our study, some of these associations were detected (Table 1).

Although it was generally accepted that discrete subaortic membrane is a congenital anomaly, some reports raised the question of whether discrete subaortic membrane is a congenital or an acquired lesion. Chung et al reported 8 patients with ventricular septal defect who initially showed no evidence of LVOT obstruction by cardiac catheterization, angiography, and transthoracic echocardiography; these patients subsequently developed discrete subaortic membrane following spontaneous closure or reduction in size of the ventricular septal defect. Chung et al suggested that the subaortic membrane is closely related to the membranous ventricular septum and that the sub aortic membrane may be derived from endocardial proliferation with fibrosis into the LVOT stimulated by turbulent blood flow through the defect. This hypothesis may be supported by our findings in Patient 8 who had a small ventricular septal defect, patent ductus arteriosus, and a very short membrane extending only a few millimeters from the membranous ventricular septum and not causing any significant LVOT obstruction. One may assume that this short membrane developed recently and that further follow-up may show its progressive nature.

References


