Review article

Diagnosis and management of entrapped embolus through a patent foramen ovale

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Abstract

The diagnosis of impending paradoxical embolus by echocardiography is exceptional and its management remains unclear. Through a personal case, we performed an exhaustive review of the medical literature of this rare finding. Since the first report, only 43 cases have ever been reported. The superiority of transesophageal echocardiography is underlined. The clinical features are complex. The classical simultaneous pulmonary and paradoxical embolism is often absent. Therapeutic options are cardiac surgery, thrombolysis or anticoagulation. The early mortality rate is high (21%). In addition, recurrent embolisms are reported when a medical treatment is chosen. The cumulative results of each possibility are described. © 1998 Elsevier Science B.V. All rights reserved

Keywords: Echocardiography; Embolism; Foramen ovale

1. Introduction

Since the last decade, the improvement of echocardiography made the diagnosis of entrapped embolus through a patent foramen ovale (PFO) more common. As this finding remains extremely rare, the clinical features and therapeutic management of the condition are still unknown. As we recently detected one case, we studied all reported cases through an exhaustive review of the medical literature indexed by MedLine database. For each case, we studied the clinical presentations, the diagnostic and therapeutic methods and the management of this unusual form of thrombo-embolic disease. After a brief report of our personal case, we present the cumulative results of each strategy and the clinical outcome of these cases.

2. Our case

A 66-year-old-man, admitted to a primary care hospital for fever and cough 10 days earlier, suddenly presented an acute dyspnea and then collapsed. A transthoracic echocardiogram (TTE) suspected a thrombus in the right atrium. The patient, transferred to our institution, had a TEE that confirmed the presence of a long serpentine like thrombus in the right atrium, protruding in the left atrium through a PFO (Fig. 1). The patient underwent cardiopulmonary bypass for embolectomy. The intracardiac thrombus (Fig. 2) was adherent to the foramen ovale and the left atrium. After thrombus removal the PFO had been sutured and an embolectomy of both main pulmonary arteries was performed. Unfortunately, the patient died at the end of the cardiopulmonary bypass, from a severe right ventricle failure.

3. Discussion

Since the first report by Nellessen et al. [1] in 1985, 43 cases of entrapped thrombus through a PFO have been published [2–40]. Table 1 summarises the clinical presentations at the time of diagnosis. Among 40 cases with clinical data, the mean age is 61.2 ± 14.2 years old (range 20–84 years).

3.1. Clinical presentation

Clinical features can be misleading (Table 1). In 53% of
available data (21 cases of total 40), pulmonary embolism is not associated with any paradoxical embolism. As illustrated in our case, the clinical presentation is not predictive of this complication and without routine echocardiography, the thrombus would be misdiagnosed. Conversely, isolated systemic embolus is rare. Only three cases are known [14,27,29], even though echocardiography is generally performed after any stroke or distal acute ischaemia. The reason could be that a high right atrial pressure is necessary to protrude a thrombus through the inter-atrial shunt [35]. Finally only 16 of 40 cases (40%) presented a typical pulmonary and paradoxical embolism, as expected.

Fig. 1. Transesophageal echocardiography (four chambers view): LA, left atrium; RA, right atrium; T, thrombus.

Fig. 2. Intracardiac thrombus (cut in two during removal).
3.2. Echocardiographic findings

In most cases (35 cases/44, 80%), TTE correctly made the diagnosis or was doubtful, making TEE necessary for more information. In 20 of these cases, TTE was combined with TEE. There is no report of false positive diagnosis by TTE being corrected by TEE or macroscopic verification. In four cases ([16,32,39] and our case) only the right part of the thrombus was detected, and in one case [38] only the left side segment of the thrombus was revealed by TTE. In our case, the quality of TTE images was unsatisfactory and TEE was necessary before referring the patient to surgery. In nine cases, only TEE is presented as making the diagnosis possible.

3.3. Management and prognosis

The overall early mortality of the reported cases is high: eight patients out of 39 with known outcomes died (21%; see [3,8,18,19,24,31] and our case). The best management remains unclear. Three therapeutic options can be discussed. The impending thrombus can be removed surgically or be dissolved by thrombolytics and/or anticoagulation.

Theorically, thrombolysis or even anticoagulation seem to be hazardous in great and mobile intracardiac thrombi with an important risk of either fragmentation or complete embolization. Moreover the deep vein thrombosis can also be a source of recurrent embolism. For Gulba et al. [41], the high risk of recurrent embolism during thrombolysis for pulmonary embolism suggest the indication of temporary caval filters. However, the presence of intra atrial thrombi contra-indicate the insertion of this device via jugular punc-tion. A phlebography could therefore be mandatory to affirm the inferior vena cava patency before a contralateral femoral puncture, which appears to be time-consuming.

Conversely, the delay between clinical presentation and echographic diagnosis could be extremely variable, from 1 h to few weeks, as shown in Table 2. In the cases with long delays (as in our case), the efficacy of thrombolitics or anticoagulants might be more hypothetical on an old thrombus.

In this review, 11 patients (mean age 67.9 ± 12.2 years) benefited from anticoagulation alone (heparin relayed by oral anticoagulants). Seven patients survived (64%) but two had a recurrent embolism during treatment administration: in one case [4] a transient ischemic attack, and in another one [21], a pulmonary embolism was noted. In another report [24], anticoagulation was performed before surgery scheduled for the following day, but the patient died before surgery.

Thrombolysis was attempted only in six cases (mean age 58.8 ± 7.6 years); this small number was insufficient to be evaluated. One patient died before discharge [8] and thrombolysis had to be repeated for complete resolution in two cases [21,32].

In our case, we preferred surgery even though we were aware of the risks of cardiac surgery, as the patient suffered cardiac failure. This therapeutic choice seemed to be more rapid and complete than the others, as the PFO would be closed at the same time.

In our case, 24 patients underwent cardiopulmonary bypass for embolectomy and suture of the inter-atrial shunt (mean age 56.2 ± 16.1 years). The outcome was known in 22 cases (Table 2). Nineteen (86%) survived. No embolization after thrombus removal is reported. Moreover, a clip was often inserted on the inferior vena cava during surgery avoiding post-operative recurrent embolism.

4. Conclusion

The echocardiographic diagnosis of entrapped thrombus through a patent foramen ovale is extremely rare. Surprisingly, more than one half of the reported cases presented atypical clinical presentation, without paradoxical or pulmonary embolism. This could be an additional reason to perform routine TTE after any pulmonary or arterial embolism. Each time this complication is suspected by clinical presentation or TTE data, TEE on emergency is mandatory.

Table 1
Clinical patterns of the reported cases

<table>
<thead>
<tr>
<th>Clinical patterns</th>
<th>Number of cases (%)</th>
<th>Localisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulmonary embolism alone</td>
<td>21 (53%)</td>
<td>Cerebral</td>
</tr>
<tr>
<td>Pulmonary and paradoxical embolism</td>
<td>16 (40%)</td>
<td>Limb</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Limb + visceral</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coronary</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Visceral</td>
</tr>
<tr>
<td>Paradoxical embolism alone</td>
<td>3 (7%)</td>
<td>Cerebral</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Limb</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cerebral + limb</td>
</tr>
</tbody>
</table>

Table 2
Therapeutical strategies and their outcome

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Number of cases</th>
<th>Age (range, years)</th>
<th>Treatment delay (days)</th>
<th>Known outcome (alive/dead)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticoagulation only</td>
<td>11</td>
<td>49–84</td>
<td>0–28</td>
<td>7/4</td>
</tr>
<tr>
<td>Surgery</td>
<td>24</td>
<td>20–80</td>
<td>0–28</td>
<td>19/3*</td>
</tr>
<tr>
<td>Thrombolysis</td>
<td>6</td>
<td>54–70</td>
<td>0–7</td>
<td>5/1</td>
</tr>
</tbody>
</table>

*In two cases treated by surgery, the outcomes are not available [11].
for more precise information. Whether a systematic TEE should be performed on any patient with a suspected pulmonary embolism is debatable [42,43]. As the entrapped embolus through a PFO is a very rare finding, it cannot be a sufficient argument for a systematic use of TEE in every case of pulmonary embolism. A duplex scanning of abdominal and deep veins of legs could also have been recommended, especially to examine the possibility of placing an inferior caval filter or clip.

The cumulative results of these sparse reports do not allow us to make surgery a definite medical option. As the series is a compilation of individual and heterogeneous case reports, we did not make any statistical comparison between different groups. Nevertheless, surgery seems to have the best results. In addition, anticoagulation or thrombolysis can pose secondary complications, especially recurrent embolisms. There is no report of such complications when surgery has been performed.

Each alternative is to be considered separately. When surgical removal seems too hazardous, i.e. in the older patients, anticoagulation with echocardiographic controls can be proposed. The use of thrombolytics requires the absence of classical contra-indications to prevent life-threatening haemorrhage. The efficacy and safety of thrombolysis remain to be evaluated as only six cases are reported.

References


