Pericardiectomy for constrictive pericarditis with postoperative increase of tricuspid regurgitation

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Abstract
We report a case of tricuspid regurgitation (TR) that increased markedly after pericardiectomy for constrictive pericarditis. Preoperative mild-to-moderate TR increased to severe following surgery. The patient was asymptomatic, and gradual regression of TR was observed. Eighteen months postoperatively, a left atrial thrombus formed, and a second surgery consisting of thrombectomy and tricuspid annuloplasty was performed. The increase in TR after pericardiectomy was thought to be due to dilatation of the right chambers and the annulus of the tricuspid valve. Several studies that entail mitral regurgitation after pericardiectomy are discussed.

Keywords: Pericardiectomy, constrictive pericarditis, tricuspid regurgitation, mitral regurgitation

Introduction
Pericardiectomy for constrictive pericarditis is not a complicated procedure; it involves peeling off the hard shell of calcification. However, it is not always a safe procedure and has a 5-15% perioperative mortality [1]. Longstanding disease may induce myocardial atrophy or fibrosis; mediastinal inflammation and fibrosis may produce recurrent cardiac compression, and inadequate or incomplete resection may result in no improvement [1]. Tricuspid regurgitation (TR) is another factor, which may complicate pericardial constriction [2]. Recently, we encountered a surgical case of pericardial constriction in which TR increased postoperatively. Although the patient tolerated the early-phase procedure, tricuspid annuloplasty was subsequently performed. The relationship between pericardiectomy and regurgitation of the atrio-ventricular valves is discussed in this report.

Case presentation
A 68-year-old woman was referred to our hospital due to acute heart failure. She had been diagnosed with constrictive pericarditis with extensive calcification 15 months previously. After treating the acute heart failure with intravenous furosemide, her symptoms abated; however, she required a high dosage of oral furosemide (120 mg/day) and spironolactone (50 mg/day). She was scheduled for surgery in June 2009. Preoperative transthoracic echocardiography revealed diastolic dysfunction with a mild to moderate TR. The left ventricular diastolic dimension (LVDd) was 40 mm, the left ventricular systolic dimension (LVDs) was 27 mm, and the left ventricular ejection fraction (LVEF) was 60.0%. The deceleration time was 127 msec, indicating diastolic dysfunction. (Table 1) presents the results of echocardiograms in order from preoperative to recent dates.

Cardiac catheterization revealed a dip and plateau of right and left ventricular pressures. Computed tomography (CT) revealed severe calcification of the pericardium.

The first surgery was a pericardiectomy, via a median sternotomy, and cardiopulmonary bypass (CPB). The anterior pericardium was incised between the phrenic nerves and the inferior pericardium. The harmonic scalpel was effective in resecting the calcified pericardial shell. Since immediate preoperative echocardiography revealed only mild TR, tricuspid repair was not performed. Postoperative echocardiography revealed severe TR due to annular dilatation. The LVDd increased to 47 mm, the LVDs increased to 34 mm, and the LVEF decreased to 54.9%. Although she still required the same doses of oral diuretics, she had no cardiac failure symptoms, and received routine follow-up. (Figure 1) shows that TR increased after the first surgery. (Figure 2) shows the preoperative enhanced CT and the postoperative plain CT. The annular diameter of the tricuspid valve increased from 33.8 mm to 36.9 mm postoperatively. After pericardiectomy, the direction of the apex rotated dorsally, and the right heart chambers moved anteriorly.

A pericardial biopsy revealed no signs of active inflammation and no signs of granuloma formation. Therefore, the etiology of the pericarditis was unknown. Furthermore, cultures were negative for bacterial infection and negative for tuberculous and nontuberculous mycobacterial infection.

The preoperative serum creatine kinase (CK)-MB of the referral day when acute cardiac failure occurred was only 18 IU/l. In addition, the serum CK-MB on the first postoperative day was only 26 IU/l. These data indicated that with the first procedure there was no evidence of myocardial involvement pre- and post-surgery.

In December 2010, echocardiography revealed moderate TR...
Table 1. Echocardiography.

<table>
<thead>
<tr>
<th></th>
<th>Pre 1st op</th>
<th>Post 1st op</th>
<th>Pre 2nd op</th>
<th>Post 2nd op</th>
<th>Recent</th>
</tr>
</thead>
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<tr>
<td>LVDd (mm)</td>
<td>40</td>
<td>47</td>
<td>49</td>
<td>65</td>
<td>55</td>
</tr>
<tr>
<td>LVDs (mm)</td>
<td>27</td>
<td>34</td>
<td>31</td>
<td>52</td>
<td>37</td>
</tr>
<tr>
<td>LVEF (%)</td>
<td>60.0</td>
<td>54.9</td>
<td>66.8</td>
<td>40.7</td>
<td>59.7</td>
</tr>
<tr>
<td>TR</td>
<td>mild-moderate</td>
<td>severe</td>
<td>moderate</td>
<td>trivial</td>
<td>mild</td>
</tr>
<tr>
<td>MR</td>
<td>trivial</td>
<td>trivial</td>
<td>trivial</td>
<td>trivial</td>
<td>mild</td>
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</tbody>
</table>

LVDD: Left Ventricular Diastolic Dimension
LVD: Left Ventricular Systolic Dimension
LVEF: Left Ventricular Ejection Fraction
TR: Tricuspid Regurgitation
MR: Mitral Regurgitation

Discussion

There are two standard approaches for a pericardiectomy: antero-lateral thoracotomy or a median sternotomy [3]. We usually select a median sternotomy with routine use of CPB. We believe that it safer to use CPB because of the potential risks of hemodynamic deterioration with this disease. Under a median sternotomy, an anterior excision of the pericardium between the phrenic nerves, and the inferior pericardium to the right chambers and some of the left chambers, which may lead to annular dilatation and regurgitation of the tricuspid valve.

Gongora et al., [2] evaluated 261 cases of constrictive pericarditis. Among those with moderate/severe TR, operative mortality was similar whether or not repair was undertaken. They reported only 29% improvement in TR if repair was not performed. Their conclusion was to consider repair when moderate/severe TR exists to reduce symptoms. TR may worsen after pericardiectomy [2,4]. Our case exhibited only mild TR immediately before surgery, and mild cases were not discussed by Gongora et al.

Mantri et al., [5] studied 14 cases of pericardiectomy for
Conclusions

TR increased markedly after pericardiectomy for constrictive pericarditis. The etiology is thought to be the dilatation of the right chambers with annular dilatation of the tricuspid valve. In treating constrictive pericarditis, care must be taken to evaluate TR, even if it is mild. Even if TR deteriorates to a severe level, it may regress due to compensation.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

ST and AM contributed to the preoperative planning and the surgical procedures. OL was involved in data collection. All authors contributed to case follow-up. All authors read and approved the final manuscript.

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