Brief communication - Valves

Minimally invasive aortic valve papillary fibroelastoma resection

Vivian M. Hsu*, Pavan Atluri†, Martin G. Keane‡, Y. Joseph Woo*∥

∥Division of Cardiothoracic Surgery, Department of Surgery, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania, USA

*Division of Cardiovascular Medicine, Department of Medicine, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania, USA

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Abstract

The standard approach to the resection of aortic valve papillary fibroelastoma has involved traditional full median sternotomy. In this case series, we demonstrate a minimally invasive approach to the resection of these cardiac tumors to decrease operative trauma, reduce postoperative bleeding, decrease pulmonary complications, and expedite recovery from surgery. All patients recovered without incident.

Keywords: Minimally invasive; Papillary fibroelastoma; Aortic valve

1. Introduction

Papillary fibroelastoma are the most common cardiac valve tumors. These lesions are being increasingly incidentally discovered due to the widespread use of echocardiography [1–3]. Fibroelastoma have been found on atrioventricular and semilunar valves with equivalent frequency [4]. Given the risk of embolic complications, surgical resection is strongly advocated. The traditional operative approach for aortic valve lesions has entailed a full median sternotomy.

Several reports have advocated minimally invasive surgical approaches to cardiac surgical procedures due to decreased tissue trauma, reduced postoperative bleeding, minimal blood product transfusions, decreased neurologic and pulmonary complications, and faster recovery [5,6]. We report a series of patients in which we successfully utilized a minimally invasive approach, partial sternotomy, to resect these lesions.

2. Case reports

2.1. Patient 1

A 57-year-old woman with a recent embolic stroke was diagnosed with a 1 cm × 1 cm aortic valve fibroelastoma on the noncoronary leaflet of her aortic valve by transesophageal echocardiography (TEE). The patient was referred for surgical resection and a minimally invasive approach was chosen.

A partial sternotomy into the right 4th interspace was performed through a 7-cm skin incision, and cardiopulmonary bypass was initiated via aortic and right atrial cannulation. The ascending aorta was cross-clamped and partially opened transversely to allow for inspection of the leaflets and valvular mass. The mass on the leading edge of the noncoronary leaflet was excised at the base of the pedicle, preserving the leading edge of the leaflet. The aorta was then closed, and the patient was weaned from cardiopulmonary bypass. Total cardiopulmonary bypass time was 59 min (aortic cross-clamp time = 30 min). The patient recovered without complications. Final pathology confirmed papillary fibroelastoma.

2.2. Patient 2

A 46-year-old woman with a history of an embolic CVA was diagnosed with a 0.4 cm × 0.3 cm pedunculated fibroelastoma on the noncoronary leaflet of the aortic valve. The patient was referred for surgical resection and a minimally invasive approach was chosen.

The patient underwent a partial sternotomy into the right 4th intercostal space via an 8-cm anterior midline thoracic incision. Cardiopulmonary bypass was initiated via right atrial and aortic cannulation. The ascending aorta was cross-clamped and partially opened. The mass was excised at the base of the pedicle, leaving the aortic valve intact. Total bypass time was 58 min (aortic cross-clamp time = 33 min). The patient was discharged without complications. Final pathology confirmed papillary fibroelastoma.

2.3. Patient 3

A 52-year-old woman presented with a history of dyspnea on exertion and lightheadedness. On TEE, she was diagnosed with a wide-based, 1.2 cm × 1 cm irregular mobile mass on the noncoronary leaflet of the aortic valve. The patient was referred for surgical resection to prevent
Table 1

<table>
<thead>
<tr>
<th>Patient</th>
<th>Tumor size</th>
<th>Access</th>
<th>Incision length</th>
<th>Total CPB time</th>
<th>Aortic cross-clamp time</th>
<th>Postoperative discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient 1</td>
<td>1 cm × 1 cm</td>
<td>Partial sternotomy</td>
<td>7 cm</td>
<td>59 min</td>
<td>30 min</td>
<td>Day 5</td>
</tr>
<tr>
<td>Patient 2</td>
<td>0.4 cm × 0.3 cm</td>
<td>Partial sternotomy</td>
<td>8 cm</td>
<td>58 min</td>
<td>33 min</td>
<td>Day 3</td>
</tr>
<tr>
<td>Patient 3</td>
<td>1.2 cm × 1 cm</td>
<td>Partial sternotomy</td>
<td>5 cm</td>
<td>67 min</td>
<td>38 min</td>
<td>Day 4</td>
</tr>
<tr>
<td>Patient 4</td>
<td>0.6 cm × 0.3 cm</td>
<td>Partial sternotomy</td>
<td>4.5 cm</td>
<td>80 min</td>
<td>37 min</td>
<td>Day 4</td>
</tr>
</tbody>
</table>

CPB: cardiopulmonary bypass.

embolic sequelae and a minimally invasive approach was chosen.

The patient underwent a 5-cm anterior mediastinal skin incision, partial 3rd interspace sternotomy, and cardiopulmonary bypass via aortic and right atrial cannulation. The ascending aorta was cross-clamped and partially opened transversely to visualize the mass that adhered to the ventricular surface of the noncoronary leaflet. The entire tumor was resected while preserving the valve. Total cardiopulmonary bypass time was 67 min (aortic cross-clamp time = 38 min). The patient recovered without incident. Final pathology confirmed papillary fibroelastoma.

### 2.4. Patient 4

A 61-year-old woman was diagnosed with a 0.6 cm × 0.3 cm pedunculated multilobular fibroelastoma on the right coronary cusp of the aortic valve following two separate cerebral transient ischemic attacks over a four-week period. The patient was referred for surgical resection and a minimally invasive approach was chosen.

A partial sternotomy into the 3rd interspace was performed through a 4.5-cm skin incision, and cardiopulmonary bypass was initiated via aortic and right atrial cannulation. The ascending aorta was cross-clamped and partially opened transversely. The entire lesion was excised at the base with leaflet preservation. The total cardiopulmonary bypass time was 80 min (aortic cross-clamp time = 37 min). The patient had an uneventful recovery. Final pathology confirmed papillary fibroelastoma (Table 1).

### 3. Discussion

In this case series, we illustrate the successful application of minimally invasive cardiac surgical techniques, in particular the partial sternotomy, to resect aortic valve papillary fibroelastoma. This approach presented to the patients the greatest opportunity for rapid recovery, improved cosmesis, and excellent overall patient satisfaction. While our cases support the benefits of the partial sternotomy, a large randomized prospective trial would be necessary to better assess its advantages over traditional sternotomy for the resection of these tumors. Although one study of this type has not shown differences in outcomes between the two approaches for valve replacement, the authors acknowledge that their analysis may have been limited [7]. A recent study involving twice as many patients has demonstrated that the partial sternotomy has significant postoperative benefits over traditional sternotomy, including reduced blood loss and pain, improved cosmesis, and shorter lengths of hospital stay [8]. In our experience, the partial sternotomy afforded our patients these advantages without compromise to the procedure.

Papillary fibroelastoma are typically <1 cm in diameter, can arise anywhere on the valve leaflets, and are often characterized as having multiple fronds of tissue. The fronds consist of a fibrous core surrounded by elastic fibers, loose connective tissue, and an endothelial lining contiguous with the rest of the valve or endocardium [1].

Fibroelastoma are typically diagnosed incidentally during TEE. Tumor or thrombus embolizations arising from these aortic valve lesions often lead to end-organ malperfusion.

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Fig. 1. Representative preoperative TEE images of an aortic valve papillary fibroelastoma in (a) short axis, (b) long axis, and (c) color flow Doppler imaging indicating mild aortic valvular insufficiency. Corresponding representative postoperative TEE images in (d) short axis, (e) long axis, and (f) color flow Doppler in the same patient. These images demonstrate both successful resection of the mass and no postoperative aortic insufficiency.
and dysfunction, including stroke and myocardial infarction (Fig. 1).

In these patients, the preoperative diagnosis of fibroelastoma in addition to histories of cardiovascular and cerebrovascular injury required surgical resection to reduce the risk of future embolizations. The surgically beneficial option of a minimally invasive approach prompted resection via a partial sternotomy. As confirmed by postoperative TEE, the integrity of the aortic valve was maintained. These cases demonstrate the feasible application of minimally invasive strategies as the standard approach to the surgical resection of aortic valve fibroelastoma.

References