

Multiple Valve Replacement in Limited Access: A Case Report

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ABSTRACT

Nowadays minimally invasive surgery represents an accepted technique to treat heart valve disease. We report a case of surgical correction of multiple valve disease in a 61-year-old woman through a minimally invasive right anterolateral minithoracotomy. The intervention was performed under transesophageal echocardiography and videoscopic guidance. High thoracic epidural anesthesia allowed a rapid weaning from mechanical ventilation and a faster recovery.

INTRODUCTION

Recent progress in technology and instrumentation has allowed valve surgery through ministernotomy or minithoracotomy to become increasingly accepted, especially for mitral valve procedures. The following case reports of a patient who underwent multiple valve procedures through a short anterolateral thoracotomy.

CASE REPORT

A 61-year-old woman who had been complaining of effort dyspnea and cough during the past 3 years, recently experienced progressive dyspnea on exertion (New York Heart Association functional class III) and was admitted to our institution for further investigation. The medical history revealed a recent hospital admission for heart failure on atrial fibrillation. The transthoracic echocardiography revealed a mitral stenosis with a functional area of 1.1 cm² and a mean transvalvular gradient of 9 mmHg. It was associated to an aortic regurgitation of grade 3/4+ and to a tricuspid regurgitation of grade 3/4+. The systolic pulmonary artery pressure was 40 mmHg. The coronary angiography showed no lesions. The left ventricular ejection fraction was 0.59.

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There were no comorbidities or cardiovascular risk factors. The body surface area was 1.85 m².

Operative Technique

The day before the procedure a high thoracic epidural catheter (19 G) was inserted at Th2-Th3 level. In the operating theater, the patient was placed in a supine position with the right side of the chest slightly elevated and the right arm bent over the head. The airways were intubated with a double-lumen endotracheal tube. Epidural anesthesia was maintained by boluses of ropivacaine 1% 4 mL and general anesthesia with propofol 4 to 10 mg/kg per hour. Along with standard monitoring, the whole procedure was followed by transesophageal echocardiography.

The venous drainage was accomplished by a 14 F single lumen cannula in the right jugular vein and a 28 F venous cannula through the femoral vein. The arterial return was obtained by a 21 F arterial cannula in the femoral artery. A conventional cardiopulmonary bypass system was used. The thorax was opened through a right lateral minithoracotomy (7 cm) in the fourth intercostal space between the middle clavicular and the anterior axillary lines. A 15-mm port was inserted in the middle axillary line of the same intercostal space to allow the placement of a videoscope, through which CO₂ (3 L/min) was delivered. On cardiopulmonary bypass, the pericardium was opened and suspended by stay sutures transcutaneously fixed outside the chest. In moderate hypothermia (30°C) the aorta was cross clamped with a transthoracic inserted Chitwood clamp. The heart was arrested by a bolus of adenosin followed by the blood cardioplegia delivery in the aortic root. Intermittent retrograde cardioplegic solution was administered via a coronary sinus catheter every 20 minutes. The inspection of the aortic valve through an "S" incision showed thickened and retracted cusps causing central regurgitation. The valve was excised. After caval snaring the right atrium was opened to reveal a dilated tricuspidal annulus that was responsible for the valvular incompetence. The interatrial septum was then opened in the fossa ovalis and the incision extended to the roof of the left atrium [Guiraudon 1991]. The mitral leaflets were thickened and retracted with partial commissural fusion. The valve was replaced by a 29-mm mechanical valve prosthesis, anchored to the annulus with supra-annular single U stitch with teflon

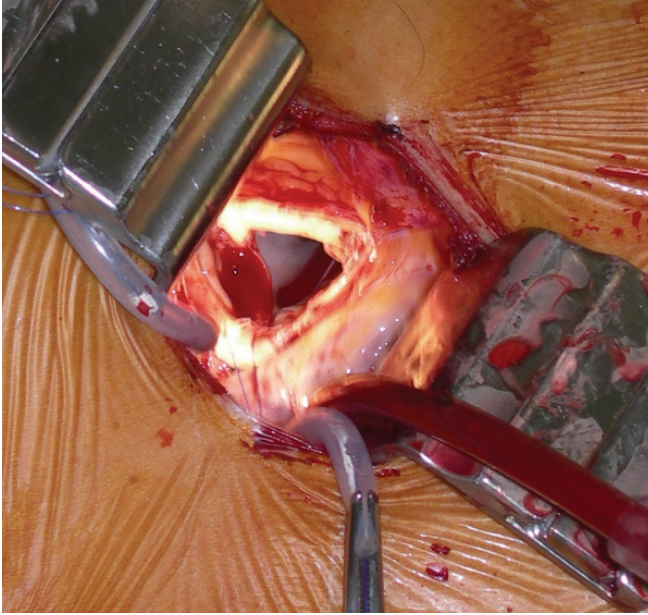


Figure 1. Intraoperative view: aortic valve.

felt. The aortic valve was replaced by a 19-mm mechanical prosthesis in epiannular position, anchored with double Ethibond 2/0 stitches reinforced with teflon felt on the ventricular side. All sutures were tied using a knot-pusher. After closure of the atriectomies and aortotomy, the heart was reperfused and deaired. On beating heart the tricuspid valve was repaired with a De Vega posterior annuloplasty. The weaning from the cardiopulmonary bypass was uneventful and the operation was completed in the usual manner.

The patient was weaned from mechanical ventilation while still in the operating theater (with acceptable respiratory and hemodynamic parameters). She was then transferred to the intensive care unit and on the 1st postoperative day to the ward. Epidural analgesia was maintained with continuous infusion of ropivacaine 0.2% with fentanyl 5 µg/mL at a rate 4 to 8 mL/hour for 48 hours with the aim of reducing postoperative pain. The patient was discharged on the 8th postoperative day after an uneventful postoperative period.

DISCUSSION

Minimally invasive valve surgery was introduced in 1996 by a limited anterolateral thoracotomy access [Carpentier 1996]. Initially it was applied to mitral valve surgery with reports of beneficial effects on reduction of postoperative pain, reduced hospital stay, and superior cosmetic result [Grossi 2002]. Upper ministernotomy is a well known approach for aortic surgery but does not allow a good visualization of the mitral valve. It also requires a partial bone damage that we wanted to avoid in the first place. We believe that an adequate exposure can be achieved through the 4th intercostal space. The advantage lies in the satisfactory visualization of both valves. To avoid costal resection we performed a larger access by wide incision of the intercostal muscle. Videoscope assistance is



Figure 2. Cosmetic result after submammary access.

crucial to allow precise handling in a limited access and provide good visualization and control of structures far from the thoracic surface such as papillary muscles, the distal portion of the ascending aorta, and some blind spots like the right aortic commissure. Transesophageal echocardiography is necessary to identify the cannula position, the adequacy of cardioplegia delivery, and to assess the surgical result.

By adopting a Guiraudon incision the use of an atrial retractor was avoided; atrial septal stay sutures pulled through the thoracic wall allowed a good exposition of both the mitral and the tricuspid valves. The transthoracic Chitwood clamp was adequate to safely perform cross clamping by choosing the 5th intercostal space for its insertion, which allowed the displacement of the clamp from our surgical field. We believe that in patients with aortic degenerative disease the retrograde insertion of an endoclamp could bear the risk of either a dissection or an embolization [Chitwood 1997; Schneider 1998].

Cross-clamping time, cardiopulmonary bypass time, and blood loss were comparable to a conventional operation. The high thoracic epidural anesthesia that required low dosage of general anesthesia enabled a rapid extubation and guaranteed an optimal analgesia in the postoperative phase (first 3 days). We have routinely applied this kind of anesthesiologic technique with an extubation rate of 84%. In our experience, there was no incidence of reintubation and no major neurologic complication.

Our approach for combined aortic and mitral valve surgery did not require either costal resection or displacement, nor sacrifice of the right mammary artery as reported elsewhere [Kypson 2002].

The minithoracotomy access for isolated valvular heart surgery has been shown to achieve significantly shorter stay, less exposure to blood transfusion, and fewer episodes of septic and wound complications, improving the clinical outcome in their immediate perioperative course, as demonstrated by a case control study [Grossi 2001].

We believe that our modified technique combines the advantages of minimal invasiveness and good cosmetic results;

the coexistence of coronary artery bypass grafting, complex surgery on the ascending aorta, and obese patients constitute relative contraindications. Further investigations and experience are necessary to demonstrate the future role of this approach in the surgical treatment of heart valve disease.

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