Mitral valve repair after a right pneumonectomy: a minimally invasive approach

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Abstract

A 31-year old man was admitted to our unit with severe mitral regurgitation secondary to infective endocarditis on a background of a right pneumonectomy performed 8 years previously for a central carcinoid tumour. A previous right thoracotomy for lung resection is considered a contraindication to a minimal access approach to the mitral valve. Following the right pneumonectomy, a left-to-right displacement of the mediastinum had occurred. We report our experience on performing a mitral valve repair through a right mini-thoracotomy in a patient who had undergone a right pneumonectomy. In this case, three-dimensional computed tomography reconstructions were used to guide our surgical approach. We hope that this case presentation will help further broaden the applicability of a thru-port approach to this rare subgroup of patients.

Keywords: Minimally invasive surgery • Mitral valve • Pneumonectomy

A previous right thoracotomy for lung resection is considered a contraindication to a minimal access approach to the mitral valve. We were faced with a young man with severe mitral regurgitation secondary to infective endocarditis on a background of a right pneumonectomy performed 8 years previously for a central carcinoid tumour. Following the right pneumonectomy, a left-to-right displacement of the mediastinum had occurred due to the negative pressure left by an empty hemithorax. As a consequence, the position of the heart and the great vessels could affect an optimal exposure of the mitral valve apparatus, making access to the right atrium, superior and inferior vena cava for cardiopulmonary bypass demanding if approached from a sternotomy [1]. In addition, we had concerns relating to patients’ pulmonary function subsequently a sternotomy.

We report our experience on performing a mitral valve repair through a right mini-thoracotomy in a patient who had undergone a right pneumonectomy.

A 31-year old man was admitted to our unit with signs of infective endocarditis. Investigations revealed severe mitral valve regurgitation with good heart function. He was started on the appropriate antibiotics and once his infective markers had settled, a multidisciplinary team discussion, the general consensus was that a standard sternotomy would be difficult in this setting and the use of three-dimensional (3D)-reconstructed contrast-enhanced multidetector computed tomography (MDCT) images guided our surgical preparation for a minimal access approach to repair the mitral valve (Fig. 1). The procedure has been previously described in detail [2]. To summarize, this approach involves cannulation of the femoral vessels for establishing cardiopulmonary bypass. A balloon endoclamp was used to isolate the heart and manage myocardial protection during the procedure. A 6-cm right thoracotomy was then made at the fifth intercostal space to access the left atrium. A camera was inserted through a 5-mm port in the third intercostal space, to improve illumination, magnification and visualization, and a second port was inserted at the sixth intercostal space for the delivery of CO2 (Fig. 2). The procedure was performed under video guidance. Once entered in the intercostal space, we were able to dissect down easily to the pericardium under direct vision, there were no adhesions. Then, we opened the pericardium and the mitral valve was exposed by opening the left atrium just posterior to the intra-atrial groove and anterior to the right pulmonary veins. Intraoperatively, we found that the infection had destroyed a part of the anterior leaflet and a large portion of the commissure between A1 and P1. The area involved with the endocarditis and the vegetation still present has been excised and the suture ring was placed to assess the reparability of the valve. The remaining chords of both the anterior and posterior leaflet were healthy and of good quality; for this reason, a patch replacement of the anterior commissure was performed. A triangular piece of bovine pericardium was fashioned and with 4-0 polypropylene sutures, the patch was parachuted down into the defect and was then sutured with a running 4-0 polypropylene suture to replace the involved segment. Once the patch was
sutured in an appropriate size, the ring was tied down. The water
test of the valve showed a good coaptation with trivial leak, the
result was accepted as the patient had history of poor compliance
and we were unsure if he would cooperate with a mechanical valve
(Video 1). Postoperative transoesophageal echocardiography showed
no leak (Video 2). The patient after an uneventful recovery was
discharged on postoperative day 8. At 3-month follow-up, the pat-
ient was completely asymptomatic and the transthoracic echocar-
diography showed no regurgitation on the mitral valve.

DISCUSSION
This case highlights that a thru-port approach for mitral valve sur-
gery can provide a safe approach to the mitral valve [3]. In our case,
it also provided a better exposure; furthermore, avoiding the
opening of the sternum will not expose the patient to the increased
risk of reduction in forced vital capacity. There have been previous

Figure 1: Preoperative computed tomography revealing complete mediastinal and cardiac right shift. (A) Three-dimensional volume rendering for surgical planning. (B) Sagittal scan. (C) Axial scan.

Figure 2: Postoperative picture. White arrow, 5.5 mm port in the third intercostal space used for the camera. Black arrow, right mini-thoracotomy of 6 cm at the fifth intercostal space. Tip of black arrow, 5.5 mm port inserted in the sixth intercostal space for CO₂ delivery. Asterisk, scar of the previous right pneumonectomy.

Video 1: Intraoperative video showing the excellent view to the mitral valve.
case reports of cardiac surgery carried out following pneumonectomy. A large proportion of these procedures involved off-pump coronary surgery [4]. There have been a few cases of mitral surgery following pneumonectomy via a sternotomy [5]. Our initial concern arose by a review of the current literature. Owing to the lack of evidence inherent in a right thoracotomy or a minimal access approach in this particular clinical condition, we were dubious regarding the best approach to exploit in this case. For optimization of anatomical evaluation, multiplanar reconstruction, volume-rendered reconstructions and advanced 3D off-line post-processing were performed to allow us to plan the best surgical strategy. After carefully reviewing the 3D-reconstructed contrast-enhanced MDCT images, we were confident that the appropriate intercostal space (fifth) could be identified and the mitral valve exposure would be optimal once on bypass. Once entered the post-thoracotomy space, we were able to dissect down quite easily to the pericardium under direct vision. We subsequently went onto femoral bypass giving us more space to insert the camera. Once we entered the pericardium, there were no adhesions and the procedure was carried out quite routinely. Post-procedure, we left a single pericardial drain. To prevent the risk of pneumonectomy space infection, we kept our patient on high-dose antibiotics for a week prior to the discharge. His immediate and subsequent postoperative recovery has been unremarkable, and we have proceeded to discharge him to routine cardiology follow-up after a 3-month satisfactory check.

This case presentation describes how procedural planning based on 3D imaging guided our surgical approach to this rare subgroup of patient.

Conflict of interest: none declared.

REFERENCES