

Coronary Artery Bypass Graft and/or Valvular Operations Following Prior Pneumonectomy*

Report of Four New Patients and Review of the Literature

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Background: The reported experience is sparse for patients with prior pneumonectomy who are undergoing surgery for ischemic or valvular heart disease. Such surgery poses special technical challenges. To expand the experience with this challenging clinical intervention, we reviewed the reported patients with prior pneumonectomy who were undergoing cardiac surgery as well as the experience at the Cleveland Clinic.

Methods: A MEDLINE search of the literature for articles published in the English language from 1966 to August 2006 was conducted using the search terms “pneumonectomy” and “cardiac surgery.” We included all available individually described patients and also reviewed the Cardiovascular Information Registry at the Cleveland Clinic from 1972 to 2006.

Results: A total of 19 individually described patients in 13 reports were available, 15 of which had previously been reported and 4 that were newly reported from our institution (1 of whom had undergone two operations separated by 8 years). Of the 20 operations performed in these 19 patients, coronary artery bypass grafting (CABG) alone was performed in 15 patients (75%), valve replacement or repair was performed in 4 patients (20%), and CABG with both aortic valve replacement and mitral valve repair was performed in 1 patient (5%). Most patients (13; 68%) had undergone left pneumonectomy. For these 19 patients, the postoperative mortality rate was 16%. Postoperative complications followed 10 of the operations (50%).

Conclusions: Although complications and postoperative deaths occurred more frequently than in other high-risk patient groups (eg, those with COPD undergoing cardiac surgery), this experience suggests that cardiac surgery can be undertaken with a reasonable likelihood of a favorable outcome in this challenging population, justifying the approach in appropriately selected and counseled patients. (CHEST 2007; 132:295–301)

Key words: cardiac surgery; coronary artery bypass graft; outcomes; pneumonectomy; valve repair

Abbreviations: CABG = coronary artery bypass graft; ITA = internal thoracic artery; MR = mitral regurgitation; TR = tricuspid regurgitation

Assessing candidacy for cardiac surgery typically includes evaluating the patient's pulmonary status.^{1–3} For example, guidelines from the American College of Physicians³ recommend spirometry for patients with a history of smoking or dyspnea who are undergoing coronary bypass or upper abdominal surgery.

Although several authors have addressed simultaneous cardiac surgery and pneumonectomy^{4–6} and

closure of atrial septal defects or patent foramen ovale after pneumonectomy,^{7,8} little attention has been given to the issue of surgery for ischemic or valvular heart disease after prior pneumonectomy. To review the available reported experience and to better assess the outcomes of such surgery, we reviewed both the Cleveland Clinic experience of cardiac surgery for revascularization and valve repair or replacement, alone or in combination, in patients

with prior pneumonectomy and the available literature regarding this challenging clinical scenario. Our search identified four patients who had undergone operations at the Cleveland Clinic and 15 previously reported patients, whose surgical courses are the subject of this report.

MATERIALS AND METHODS

The study was reviewed and approved by the Institutional Review Board of the Cleveland Clinic. Because the study was a chart review regarding standard medical treatment, informed consent was waived.

To assess comprehensively the reported experience with cardiac surgery in patients who had undergone prior pneumonectomy, we conducted a MEDLINE search from 1966 to August 2006 using the search terms "pneumonectomy" and "cardiac surgery." We also reviewed articles cited in the resultant references and interrogated the Cardiovascular Information Registry at the Cleveland Clinic regarding patients who had undergone pneumonectomy and then underwent coronary artery bypass grafting (CABG) and valve surgery, either alone or in combination, for the interval 1972 to August 2006.

RESULTS

As reviewed in Table 1,^{9–21} the search identified 13 articles reporting 16 patients (patients 1 to 16), of whom 1 was excluded (patient 3) because the cardiac operation was a modified Fontan procedure rather than CABG or a valve procedure. A review of the Cleveland Clinic Cardiovascular Information Registry identified four additional, previously unreported patients (patients 17 to 20), whose five operations are described in the text that follows and whose courses are summarized in Table 1. Notably, patient 18 underwent two operations 8 years apart, initially CABG, then mitral and tricuspid valve repair. Brief, selected comments about each Cleveland Clinic operation (Table 1) follow.

Patient 17

The incision, a left-sided thoracotomy through the fourth interspace, was guided by the location of the

heart. It provided acceptable exposure and control of distal targets. All veins were used as coronary bypass conduits, and the proximal anastomoses were performed using an anastomotic device (St. Jude Medical, Inc; St. Paul, MN) not requiring a side-biting clamp.

Patient 18

The first operation was an emergency on-pump CABG with three vein grafts, which was performed through a median sternotomy. The postoperative course was complicated and prolonged (Table 1), but the patient ultimately recovered good functional status. Eight years after the first cardiac operation, he presented with shortness of breath, attributable to severe mitral regurgitation (MR) and tricuspid regurgitation (TR). Cardiac catheterization demonstrated patent vein grafts, and the patient remained well revascularized save for one anastomotic stenosis, which was dilated and stented before the reoperation. The second operation was performed through a re sternotomy after axillary artery and femoral vein cannulation and the initiation of cardiopulmonary bypass. The dissection was extremely difficult and dense adhesions prevented aortic cross-clamping. The patient was cooled, and when the heart fibrillated the right atrium was opened, a superior vena cava cannula was placed, and the left atrium was drained. Prosthetic annuloplasty repair of the tricuspid valve was performed during cooling. A transseptal approach to the mitral valve gave poor exposure. The mitral valve was repaired with an edge-to-edge Alfieri stitch, connecting midportions of the anterior and posterior leaflets. There was 1 to 2+ residual MR and no TR. The patient's second cardiac postoperative course was remarkably smooth.

Patient 19

This patient presented with severe MR and TR 9 years after undergoing a left pneumonectomy and subsequent mediastinal radiation; neither important coronary artery disease nor aortic calcification was found. The approach was through a median sternotomy, and pericardial adhesions were dense. Aortic and bicaval venous cannulation was used. The left atrium was entered behind the atrial septum. Exposure of the mitral valve was very difficult. Prosthetic annuloplasty repairs of both valves were performed. Residual MR required replacement of the mitral valve during a second period of aortic clamping. The postoperative course was complicated by renal failure (Table 1).

Patient 20

The patient presented with angina 37 years after undergoing left pneumonectomy and was found to

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