stabilization of the long-segmental tracheobronchomalacia has been described.⁵ This report demonstrates that this concept is effective for carinal stabilization.

A recent study of 40 children, 11 of whom had left PA sling, identified preoperative mechanical ventilatory support and duration of CPB to be significant risk factors for prolonged postoperative ventilatory support.² Repair of PA sling complex and other cardiovascular anomalies increases the complexity of surgery and duration of CPB, thus exposing patients to a higher risk of prolonged postoperative ventilatory support. Excessive endotracheal granulation at the site of mechanical irritation by the endotracheal tube often develops in patients with PA sling complex and tracheomalacia, who require prolonged ventilatory support. External stabilization of the carina permitted an uneventful and early extubation in our patient despite prolonged CPB. Covering the trachea with the pericardial flap after tracheoplasty, as previously described,⁴ was helpful in our patient to reinforce the tracheal anastomotic seal, to prevent erosion of the polytetrafluoroethylene (Gore-Tex) rings into the blood vessels, and to enable safer subsequent bronchoscopic interventions. Potential long-term

issues, if any, are yet to be described. The split in the polytetrafluoroethylene (Gore-Tex) rings should allow normal growth, and the pericardial flap will prevent erosion of the rings into the adjacent vessels.

CONCLUSIONS

This simple technique of carinal stabilization immediately stabilizes airways and can be lifesaving in patients with severe long-segmental stenosis after tracheoplasty.

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Aortic valve replacement and coronary artery bypass via left anterior thoracotomy after previous left pneumonectomy

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Left anterior thoracotomy is an infrequent approach to perform open cardiac operations. It has been used for coronary artery bypass grafting (CABG) and rarely for valvular procedures.¹⁻⁴ We describe a left anterior thoracotomy approach for combined aortic valve replacement (AVR) and myocardial revascularization in a patient with a marked shift of mediastinal structures after previous left pneumonectomy.

CLINICAL SUMMARY

An 83-year-old man presented with frequent episodes of chest pain and shortness of breath. He had undergone a left pneumonectomy for a T4 N2 M1 poorly differentiated adenocarcinoma of the left lung 8 years previously and subsequent stenting of the left anterior descending and circumflex coronary arteries. Transthoracic echocardiography and cardiac catheterization demonstrated severe stenosis of the left main and right coronary arteries, severe aortic stenosis, and moderate aortic regurgitation. Computed tomography of the chest revealed marked displacement of mediastinal structures into the left side of the chest (**Figure 1**). His pulmonary function tests included a forced expiratory volume at 1 second 48% of predicted and carbon monoxide diffusion in the lung 77% of predicted. Operation was recommended.

Given the patient's anatomy, a left anterolateral thoracotomy approach was selected. The patient was placed supine with the left hemithorax elevated 30 degrees. Left axillary artery and right common femoral artery cannulation were

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FIGURE 1. Computed tomography of the chest demonstrates shift of mediastinal structures into the left side of the chest.

performed. An anterior thoracotomy through the fifth intercostal space was then made. The right lung was retracted without entering the right pleural space. Cardiopulmonary bypass was established, and a left atrial vent was placed via the right superior pulmonary vein. A separate incision in the second left intercostal space was performed, and a crossclamp was inserted and applied. A standard AVR via CABG was then performed. The thoracotomy incision was closed in a standard fashion. The patient had an uneventful postoperative course and was discharged on the fifth postoperative day.

DISCUSSION

A left thoracotomy approach has been infrequently used for cardiac procedures. Previous reports describe the use of a left thoracotomy approach in patients with (1) severe pectus excavatum, displacement of mediastinal structures into the left chest, and adherence of right-sided heart chambers to the sternum;² (2) previous esophageal resection and reconstruction with substernal gastric conduits; and (3) mitral valve disease requiring concomitant ligation of patent ductus arteriosus, left atriotomy, or transmyocardial revascularization.² Previous authors have reported (1) a hybrid approach to perform myocardial revascularization of the anterior descending artery along with stenting of the left main and circumflex coronary arteries¹ and (2) off-pump revascularization with implantation of the saphenous vein grafts into the descending thoracic aorta.⁴ Our report is

the first to describe the use of a left thoracotomy approach for combined AVR and CABG in a patient after a left pneumonectomy.

Advantages of a left thoracotomy approach in patients who had a previous left pneumonectomy include excellent exposure of the ascending aorta and aortic root, and relatively easy exposure of coronary arteries to allow complete revascularization. Complete myocardial revascularization and AVR would have been technically challenging or even impossible through a conventional median sternotomy approach. Challenges with the left thoracotomy approach include avoiding injury to the right lung, which often expands into the left side, and using a counter incision for positioning of the aortic crossclamp. Alternative options would include the use of endoluminal balloon occlusion of the aorta, as described by Van Nooten and colleagues.³ Furthermore, institution of cardiopulmonary bypass via standard aortic and right atrial cannulation needs to be modified, and alternative cannulation sites, such as the axillary or femoral artery, are required. After displacement and rotation of the heart and hyperinflation of the contralateral lung, the internal thoracic artery may not be a viable option for CABG because of the risk of tension. Harvesting the internal thoracic artery may decrease pulmonary function and increase the risk of injury to the phrenic nerve.⁴ Therefore, saphenous vein grafts have generally been used for revascularization after left pneumonectomy.

CONCLUSIONS

The left anterior thoracotomy approach is a valid alternative in circumstances in which a median sternotomy cannot provide adequate exposure or is associated with a higher risk. This technique should be considered in patients with shift of the mediastinal structures into the left side of the chest. To our knowledge, AVR and myocardial revascularization via the left anterior thoracotomy approach in a patient who had previous left pneumonectomy have not been reported.

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