

Thoracoscopic Assisted Pneumonectomy

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ABSTRACT

A lung carcinoma with tumor involving more than one lobe or in close proximity to the mainstem bronchus often requires pneumonectomy for surgical cure. Inflammation, bulky tumors, and dense adhesions limit the operative field of vision and may result in the abandonment of procedures with potential for complete extirpation. This case illustrates the utility of thoracoscopy in visualization of the hilum and other neurovascular structures in a patient with a proximal tumor and dense intrathoracic adhesions. Successful resection was made possible by use of combined open and thoracoscopic modalities.

Key Words: Thoracoscopy, Pneumonectomy

BACKGROUND

Thoracoscopy's main use in its initial inception and currently is evaluation of pleural disease. Jacobaeus in 1910¹ reported this technique using a cystoscope for pneumolysis in treatment of tuberculosis. Landreneau demonstrated the feasibility of thoracoscopy in treatment of eighty-five patients requiring pulmonary resections for small peripheral lesions.² Morbidity consisted of atelectasis and pneumonia in two patients, with bleeding and persistent air leak each in one patient. Similarly, Miller and colleagues successfully employed videoscopic resection in evaluation of small peripheral indeterminate pulmonary nodules, diffuse pulmonary infiltrates, and recurrent pneumothoraces in a series of ten patients.³ The wider utility of thoracoscopy was shown by Mack et al. in seventy patients, with excision of pulmonary nodules, pericardial drainage, thoracic sympathectomy, and pleurodesis.⁴ Length of hospital stays averaged three days and in some instances patients were discharged on postoperative day one.

Walker from the City Hospital in Edinburgh reported the first video-assisted left pneumonectomy in a 51-year-old woman with an adenocarcinoma involving both upper and lower lobes.⁵ A limited submammary incision was made through which conventional bronchial and vascular staplers were introduced. The intact lung was delivered through the fourth interspace thoracotomy and a mediastinal node dissection performed with video assistance. Final pathology showed a T2N1 tumor with negative station 10 and aortic nodes.

CASE REPORT

We report the case of a 54-year-old white man who presented to his primary care physician with a chief complaint of cough, fever, and hemoptysis of two weeks dura-

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Figure 1. Posterior-anterior view chest radiograph demonstrating right upper lobe atelectasis.

tion. He denied associated weight loss or chest pain, but did experience dyspnea with mild exertion. A forty pack/year history of smoking was noted, the patient having quit tobacco use for the past five years, along with no reported exposure to tuberculosis. Initial chest radiograph showed a right upper lobe infiltrate. After intermittent oral antibiotics for six weeks and no resolution of his symptoms a repeat chest radiograph (**Figure 1**) demonstrated progression of his infiltrate to lobar atelectasis.

Further evaluation with computed tomography of the chest (**Figure 2**) showed an irregular mass obstructing the right upper lobe bronchus and dense consolidation of the lobe immediately adjacent to the posterior thorax and pericardium. Pulmonary function tests yielded an FEV1 of 2.1 L (74% predicted) and a room air PaO₂ of 81 Torr. Fiberoptic bronchoscopy and biopsy allowed visualization of a focal carcinoma *in situ* with areas of microinvasion and severe dysplasia in the right upper lobe and bronchus intermedius.

After placement of a thoracic epidural catheter for post-operative analgesia, and a double lumen endotracheal tube for selective lung ventilation, a standard posterolateral thoracotomy was performed through the fourth interspace. Dense pleural adhesions with a semi-fixed, non-compressible right upper and middle lobe were encountered on entry to the thorax. After initial lysis of adhesions broad fibrous bands tethered the atelectatic upper lobe to the subclavian vessels, azygous vein, and esophagus. Inability to retract the upper lobe precluded visualization of these structures which were not amenable to

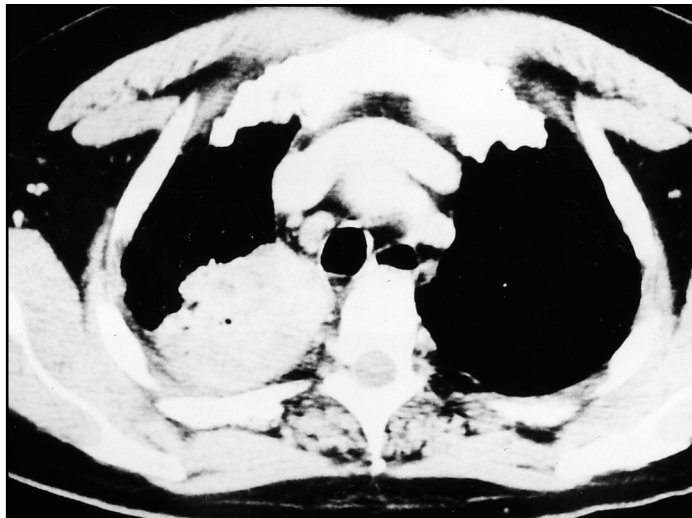
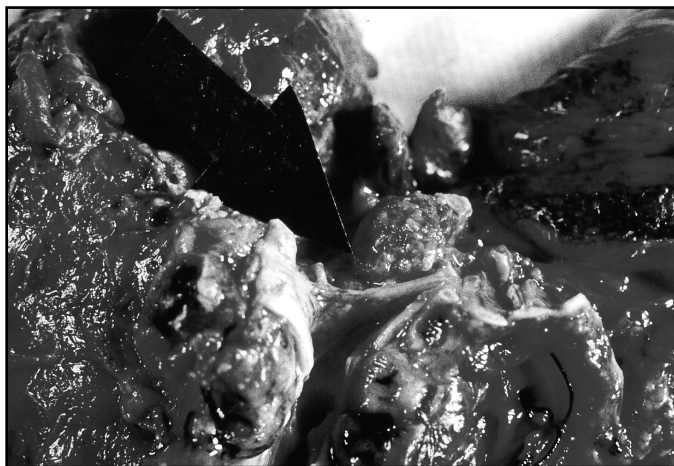


Figure 2. Computed tomogram of the chest with intravenous contrast. A solid mass adjacent to the pericardium and subclavian vessels is noted.

simple blunt dissection. Introduction of a 30-degree thoracoscope and use of laparoscopic electro-surgical and scissor dissection allowed continued progress. Multiple biopsies of fibrous tissue encountered and adjacent pleura were sent for frozen section to insure the absence of malignant cells and hence, resectability of the tumor.

Having completed division of the adhesions from the upper lobe, the thoracoscope was employed to assist in dissection of the pulmonary artery and superior pulmonary vein. The resection was completed with stapling of the right mainstem bronchus and individual pulmonary vessels. The bronchial margin was free of tumor. A moderately differentiated, deeply infiltrating squamous cell carcinoma of the right upper and middle lobe bronchi was

Figure 3. Gross specimen demonstrates a deeply infiltrating squamous cell tumor of the right upper and middle lobe bronchus.



found on pathological examination. (Figure 3) Station 2, 4, 7, and 9 nodes were free of tumor.

DISCUSSION

Applications of thoracoscopy include pleural evaluation, lung biopsy, operations on patients with limited pulmonary reserve, pericardial procedures, and lymph node dissection for lung carcinoma staging. Decortication and pleurodesis, lung volume reduction, blebectomy in treatment of spontaneous pneumothorax, coronary revascularization, and major lung resection are modalities currently being investigated.

Alternatives to thoracoscopic assistance as described in this case include a median sternotomy approach with isolation of the intrapericardial segments of the pulmonary vessels and more direct access to the subclavian vessels and brachial plexus. Similarly, laser bronchoscopy with tumor ablation might be employed preoperatively to allow resolution of the acute inflammatory process and facilitate a standard resection. While in this case a pneumonectomy was mandated, thick fibrous adhesions limiting operative exposure can also occur in a subgroup of patients who might require only a simple lobectomy. Standard posterolateral thoracotomy with a counter incision through the second interspace or disarticulation at the costomanubrial junction is also possible to achieve wider field of vision.

The feasibility of pneumonectomy through a limited thoracotomy without compromising surgical margins or lymph node sampling has been demonstrated. Our work

shows that thoracoscopy is an invaluable tool when used as a primary surgical modality or in concert with open thoracotomy and should be considered as an option when visualization is restricted by fixed structures (i.e., chest wall, inflammatory mass, tumor). Accurate evaluation with optimal visualization of the surgical field can profoundly affect the decision to proceed with or abort a potentially curative resection. Success of thoracoscopic lysis of pleural adhesions suggests the option of limited thoracotomy in pneumonectomy even in the presence of an active inflammatory process.

Cost-containment and managed care issues notwithstanding, the decrease in postoperative intercostal neuritis and reduction in recovery time enjoyed by patients undergoing thoracoscopy versus thoracotomy invites us to expand the role of thoracoscopy to the most complex of thoracic procedures including pneumonectomy.

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