the slow pathway anterogradely and intermediate pathways retrogradely. Again, persistent VA dissociation during ventricular pacing makes this interpretation less likely. Sixth, transient and selective damage to the lower common pathway can cause similar electrophysiologic changes except the HA interval in tachycardia which should be shorter than that preablation. Sixth, these observations can be explained best by partial damage to both the fast and common pathways. Partial damage to both pathways seems to contribute to AH prolongation. Similar HA interval during tachycardia may be explained by overall effect of damage to both pathways. The VA dissociation during pacing despite rapid VA conduction in tachycardia can be elucidated by damage to the lower common pathway. It is also possible, however, that the fast pathway forming the retrograde limb of AV node reentry is different from the normal retrograde conduction.

Partial damage to the normal conduction system results in prolongation of the AH interval and abolition of retrograde conduction in pacing. Since the retrograde fast pathway of the reentrant circuit remains intact, the tachycardia can be induced in the absence of normal retrograde conduction. Recent data showed that in patients with AV node reentry of the common variety, VA conduction block induced by radiofrequency energy was associated with retrograde fast pathway conduction block. Although some patients showed evidence of anterograde dual AV nodal pathway physiologic postablation, none developed conduction in the retrograde fast pathway. Therefore, their data appear to make this concept less likely.

In conclusion, our observations are consistent with partial damage to both the fast and lower common pathways. Since a variety of mechanisms evoke similar electrophysiologic phenomena, careful analysis of data is crucial to verify selective fast pathway ablation for treatment of AV node reentry.

ACKNOWLEDGMENT: We thank Kerry McElhaney for typing this manuscript.

REFERENCES
2 Miller JM, Rosenthal ME, Vassallo JA, Josephson ME. Atrioventricular nodal reentrant tachycardia: studies on upper and lower 'common pathways.' Circulation 1987; 75:930-40

Thoracoscopic Lobectomy With Mediastinal Sampling in 80-Year-Old Patients*

Robert J. McKenna, Jr, MD

The purpose of this study was to determine whether thoracoscopic would allow standard lung cancer operations to be performed safely and completely in 80-year-old patients. Elderly patients with lung cancer are usually offered compromise treatment (either radiation or wedge resection) for early-stage lung cancer because their operative risk for lobectomy or pneumonectomy is increased. This study consists of nine patients, 80 to 82 years of age, who underwent either lobectomy (eight cases) or left pneumonectomy (one case) with mediastinal node sampling by thoracoscopic. There were no deaths or major complications. Seven of the nine patients were discharged by the fifth postoperative day. The hospital stay was prolonged in two patients due to air leak or persistent chest tube drainage (11 and 13 days, respectively). The use of thoracoscopic does allow standard lung cancer treatment to be offered to selected elderly patients.

(Chest 1994; 106:1902-1904)

Lobectomy is the standard treatment for early-stage lung cancer if the patient can physiologically tolerate the procedure. Elderly patients are usually offered compromise treatment because their risk with standard treatment is increased. Laparoscopic cholecystectomy has substantially decreased the cost and morbidity for cholecystectomy; therefore, this study was undertaken to determine whether standard lung cancer resection can be performed by thoracoscopic with acceptable morbidity and mortality in this age group.

MATERIALS AND METHODS

Nine patients, aged 80 to 82 years, underwent lobectomy (eight patients) or pneumonectomy (one patient) and mediastinal lymph node sampling or dissection by video-assisted thoracic surgery. All patients had clinical stage I lung cancers on preoperative computed tomographic (CT) scan with normal (<1 cm) mediastinal lymph nodes. Other selection criteria included: tumor size ≤5 cm, no endobronchial tumor seen at bronchoscopy, no parietal pleural invasion, and no preoperative chemotherapy or radiation therapy. In the past, these patients would have been offered lung resection through a median sternotomy, rather than a thoracotomy. Four of the patients would have been turned down for surgery because they were physiologically quite elderly and were considered too high a risk for a standard surgical approach.

The final pathologic staging for the patients is seen in Table 1. No patients had nodal metastases. The T2 lesions were 3- or 4-cm tumors extending to the pleural surface. The T3 tumor was attached to the pericardium, so the pericardium and the phrenic nerve were resected en bloc with the left lower lobe.

A 6-cm access thoracotomy incision was made in the fourth

*From the Department of Surgery (Thoracic), University of Southern California School of Medicine, Los Angeles.
intercostal space in the mid or anterior axillary line. It was not necessary to spread the ribs apart, and major chest wall muscles were not cut. Three additional 1-cm incisions were used in the seventh intercostal space posterior to the scapula for a ring forceps to retract the lung, in the midaxillary line of the eighth intercostal space for the trocar through which the thoracoscope was passed, and in the sixth intercostal space, anterior axillary line because this offered the best angle for the transection of most branches of the artery and veins with the stapler (endo-GIA stapler, United States Surgical Corporation, J estetten, Germany). The procedure was performed primarily with the 0° lens, but occasionally the 50° lens was helpful (eg, to visualize the aortopulmonary window).

Lobectomy or pneumonectomy was performed with individual ligation of the arteries, veins, and bronchi with the endo-GIA stapler. The vascular staples were used for the vessels and the 3.5-mm staples were used for the lobar bronchi. A standard 30-mm stapler with 4.8-mm staples that would be used in an open thoracotomy were used for the mainstem bronchi of the pneumonectomy case. After the vessels and bronchi were transected, the fissures were completed with many different stapling techniques. The lung specimen was placed in a bag for removal through the 6-cm access incision.

Early in the study, the mediastinal lymph nodes were then sampled. Later on, with more experience, mediastinal lymph node dissection was performed. With the lung retracted anteriorly, the subcarinal lymph nodes are easily accessible from the access thoracotomy. All the tissue from the trachea to the superior vena cava and the ayzygous vein to the subclavian artery were removed en bloc to obtain the paratracheal lymph nodes. For left lung resections, the aortopulmonary window was cleaned out. The pathologist examined as many as 21 lymph nodes per case.

**RESULTS**

There were no deaths or major complications. No cases were converted to thoracotomy. The average blood loss was 490 mL (range, 200 to 1000 mL). The average operating time for the lobectomies was 105 min (range, 45 to 200 min). Only one patient had a transfusion. Although she lost only 500 mL during the procedure, she had a transfusion because her preoperative hematocrit was only 31 percent and because she had suffered a stroke 3 weeks previously. A thorough preoperative evaluation showed no evidence of brain metastases.

Seven of the nine patients were discharged from the hospital on or before their fifth postoperative day. Two patients had prolonged stays due to either persistent air leak (one case) or prolonged serous drainage (one case).

Postoperative follow-up is short (1 to 14 months), so no comment can be made regarding survival following this procedure, although, to date, there have been no recurrences.

**DISCUSSION**

The literature reports that stage I lung cancer was found in 42 percent of patients over 80 years, compared with only 25 percent of patients 40 to 49 years of age. The 2-year survival for patients over 80 years with lung cancer, however, is only 20 percent. This may occur in part because compromise treatment is often used for older patients. When an operation is performed, a wedge resection is more often used than a lobectomy because the operative risk for thoracotomy in a patient older than 70 years is twice as high as the risk in a patient younger than 70 years. While age itself is not an absolute contraindication to thoracotomy, it is a factor in assessing a patient’s operability. In this series, four of the nine patients would not have been offered a lobectomy by thoracotomy due to their overall physiologic condition. Radiation treatment as definitive treatment for lung cancer has a 5-year survival of only 7 percent.

Thoracoscopy with wedge resection of a lung cancer has been used to treat patients with poor pulmonary function. Jensik et al and Faber and Jensik have proposed that a segmentectomy by thoracotomy can offer a reasonable 5-year survival for patients with stage I (T1N0) lung cancer. Ginsberg has recently reported the results of the Lung Cancer Study Group randomized, prospective study that showed segmentectomy or wedge resection performed via a thoracotomy has, respectively, a two or three times higher incidence of local recurrence when compared with that of lobectomy.

Lewis et al were the first to report a lobectomy performed by video-assisted thoracic surgery. Lewis has now proposed performing a tourniquet lobectomy with two rows of staples. Kirby reported the Cleveland Clinic experience using thoracoscopy to perform standard lobectomy after staging with cervical mediastinoscopy. He also described an access thoracotomy incision in the auscultory triangle. The access thoracotomy incision in the present series is directly over the hilum and allows easier

---

**Table 1—Patients 50 Years and Older Who Underwent Thoracoscopic Lobectomy and Mediastinal Node Sampling for Lung Cancer**

<table>
<thead>
<tr>
<th>Patient No./ Age, yr</th>
<th>Stage</th>
<th>Operation</th>
<th>LOS, d</th>
<th>FEV₁ (%)</th>
<th>Complication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/81</td>
<td>T1N0</td>
<td>LUL</td>
<td>2</td>
<td>0.82 (56)</td>
<td>None</td>
</tr>
<tr>
<td>2/81</td>
<td>T1N0</td>
<td>LUL</td>
<td>3</td>
<td>1.7 (63)</td>
<td>None</td>
</tr>
<tr>
<td>3/81</td>
<td>T1N0</td>
<td>RLL</td>
<td>13</td>
<td>2.24 (75)</td>
<td>Serous leak</td>
</tr>
<tr>
<td>4/82</td>
<td>T1N0</td>
<td>RUL/RML</td>
<td>11</td>
<td>1.7 (64)</td>
<td>Air leak</td>
</tr>
<tr>
<td>5/80</td>
<td>T1N0</td>
<td>RML</td>
<td>2</td>
<td>2.15 (97)</td>
<td>None</td>
</tr>
<tr>
<td>6/82</td>
<td>T1N0</td>
<td>RUL</td>
<td>2</td>
<td>2.49 (128)</td>
<td>None</td>
</tr>
<tr>
<td>7/80</td>
<td>T3N0</td>
<td>LLL</td>
<td>4</td>
<td>1.26 (52)</td>
<td>None</td>
</tr>
<tr>
<td>8/80</td>
<td>T2N0</td>
<td>L Pneum</td>
<td>4</td>
<td>1.52 (86)</td>
<td>None</td>
</tr>
<tr>
<td>9/80</td>
<td>T2N0</td>
<td>RUL</td>
<td>5</td>
<td>2.1 (86)</td>
<td>None</td>
</tr>
</tbody>
</table>

*LUL=left upper lobe; RLL=right lower lobe; RUL=right upper lobe; RML=right middle lobe; LLL=left lower lobe; LOS=length of stay; L Pneum=left pneumonectomy.*
access for hilar dissection.

Overall, the worldwide experience with this procedure is limited, so the appropriate use of thoracoscopy is currently being defined. One of the concerns regarding the use of thoracoscopy for lung cancer surgery is the adequacy of the cancer surgery performed by this fashion. In this series, all of the lung specimens were removed in tact and routine sampling or dissection of mediastinal lymph nodes was performed. Nine to 21 (average, 14) lymph nodes were submitted for pathologic examination per case. Thus, standard lung cancer surgery was performed.

Conclusions

This study was undertaken to perform lobectomy or pneumonectomy with mediastinal node sampling the standard, rather than a compromise operation, for patients 80 years of age or older. All operations were performed with video-assisted thoracic surgery. All patients underwent a standard anatomic resection with mediastinal node sampling or dissection. There were no deaths or major complications in this preliminary experience, so video-assisted thoracic surgery allows lung cancer surgery to be performed in selected elderly patients with minimal morbidity.

References


Pneumomediastinum and Bilateral Pneumothoraces in a Patient With Hyperemesis Gravidarum*

Marlene Schwartz, M.D.; and Leonard Rossoff, M.D.

Hyperemesis gravidarum (HG) is a severe form of the more common nausea of early pregnancy. We report an unusual case of pneumomediastinum and bilateral pneumothoraces presenting in the tenth week of pregnancy complicating HG.  (Chest 1994; 106:1904-06)

Hypertension gravidarum (HG) is the extreme manifestation of the more frequent nausea of early pregnancy. The vomiting of HG can be severe enough to cause fluid and electrolyte abnormalities and occasionally nutritional deficiencies. Risk factors include nulliparity, younger age, increased estrogen levels, and an emotional response to stress.1 The incidence of HG is 3.5 per 1,000 deliveries and it usually resolves by the third month. Barotrauma has been well documented in association with severe and protracted vomiting2-5 and labor.4-6 We report an unusual case of pneumomediastinum and bilateral pneumothoraces early in pregnancy as a complication of HG.

Case Report

A 26-year-old woman, GIPO, was admitted to the hospital in the tenth week of gestation with retching and some vomiting daily for 2 months. One week prior to hospital admission, she noted hematemesis followed by severe nonpleuritic chest pain without dyspnea. Swelling of the head, neck, and anterior chest prompted her presentation and admission to the hospital. On admission, her temperature was 36.8°C orally; respiratory rate was 16/min; blood pressure was 96/60 mm Hg; pulse was 108/min both without postural change. The only physical finding was extensive subcutaneous emphysema. Initial room air blood gas revealed a pH of 7.53, PaCO2 of 33, PaO2 of 97, and an SO2 of 99 percent. The chest radiograph (Fig 1) revealed pneumomediastinum, bilateral small apical pneumothoraces, and extensive subcutaneous emphysema. An esophageal barium dye study did not reveal extravasation into the periesophageal space. Esophagoscopy, which might miss small leaks and extend a perforation, was deferred as was computed tomographic (CT) scan of the mediastinum because of the undesirable fetal radiation exposure. The patient received nothing by mouth. Total parenteral nutrition and systemic antibiotic therapy were initiated. Initial white blood cell count was 9.5 10^9/L with a normal differential but repeated 3 and 7 h after admission. They were 24.5 10^9/L and 23.8 10^9/L, re-

*From the Division of Pulmonary/Critical Care, Long Island Jewish Medical Center, The Long Island Campus for the Albert Einstein College of Medicine, New Hyde Park, NY.