we are not aware, has been done in Japan and has been proven negative, that would not exclude a role for a ubiquitous low-level pathogenic agent, present in Japan, but not in other parts of the world. Only in travelers such as our patient would this pattern be apparent. Determination of whether travel history to Japan is truly a risk factor or coincidental in the development of this disease will require identification of additional patients who are diagnosed with diffuse panbronchiolitis.

REFERENCES

Air Embolism in Single-Lung Transplant Patients After Central Venous Catheter Removal*

Patrick M. McCarthy, MD; Nan Wang, MD; Frank Birchfield, RN; and Atul C. Mehta, MD, FCCP

A 53-year-old woman had a serious air embolism from the central venous catheter tract after lung transplantation. Lung transplant patients appear to be at increased risk for this complication, and four other known cases are reported. (Chest 1995; 107:1178-79)

CVP=central venous pressure

Key words: lung transplantation; postoperative complication; venous air embolism

Lung transplantation is associated with a host of postoperative problems. We encountered an unusual complication of central venous line removal, air embolism, in a patient who had an otherwise uneventful posttransplant course. A review of this patient, and four other cases, suggests that lung transplant patients may be very susceptible to this complication.

CASE REPORT

The patient was a wheelchair-bound 53-year-old woman with smoking-induced emphysema (FEV1 of 0.5 L). She underwent right single-lung transplant and was transferred out of the ICU on the third postoperative day. Before her transfer from the ICU, a right internal jugular Swan-Ganz catheter was changed over a guide wire to a triple-lumen central venous pressure (CVP) line. In anticipation of her discharge, the CVP line was removed on the ninth postoperative day while she was in the semi-upright position. Immediately after removal of the line, she inhaled deeply, and a sucking noise was heard by the nurse in the room. The patient became cyanotic and dyspneic. As her condition rapidly worsened, she was immediately turned to the right lateral decubitus position with her head down. On auscultation of the precordium, a "machinery murmur" was heard. The catheter wound was occluded and then sutured closed. With these maneuvers, transient stabilization was achieved; however, the patient required urgent intubation on arrival in the ICU. An echocardiogram was obtained, but by this time there was no evidence of significant air in the right side of the heart. She steadily improved and was extubated the following day. She was discharged to home 2 days later and remained in functional class I 12 months after transplantation.

DISCUSSION

Massive air embolism from CVP line removal is an unusual problem in clinical practice, but it is not rare after lung transplantation. To our knowledge, at least five cases of air embolism after lung transplant have occurred (Table 1). The Montefiore Group (Loma Linda, California) and the Toronto Lung Transplant Group each had a fatality from air embolism when the CVP line was removed. A third patient from St. Louis, Missouri also developed air embolism associated with line removal. This patient's clinical course paralleled that of our patient in that the event occurred just before anticipated discharge, and resuscitative efforts resulted in a favorable outcome. The fourth patient from Stanford, California, suffered a stroke when air shunted into the arterial circuit, but had near complete resolution of neurologic deficits.

Lung transplant patients can generate an enormous negative intrathoracic pressure when the diseased lung is replaced with a normal lung. Also, lung transplant patients

Table 1—Cases of Air Embolism From Central Venous Pressure Line Removal After Single-Lung Transplantation

<table>
<thead>
<tr>
<th>Institution</th>
<th>Diagnosis</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Montefiore Group</td>
<td>Pulmonary fibrosis</td>
<td>Fatal</td>
</tr>
<tr>
<td>Toronto Lung Transplant Group</td>
<td>Pulmonary fibrosis</td>
<td>Fatal</td>
</tr>
<tr>
<td>Stanford University</td>
<td>Pulmonary fibrosis</td>
<td>Cerebrovascular accident, alive</td>
</tr>
<tr>
<td>Washington University</td>
<td>Pulmonary fibrosis</td>
<td>Alive</td>
</tr>
<tr>
<td>Cleveland Clinic</td>
<td>Emphysema</td>
<td>Alive</td>
</tr>
</tbody>
</table>

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Air Embolism in Single-Lung Transplant Patients After CVC Removal (McCarthy et al)
generally are emaciated and have little subcutaneous tissue, allowing for a short tract from the CVP insertion site to the opening of the central vein. Air embolism appears to be more common after lung transplantation because in other reported surgical series it is very rare. Reports include occurrence in 2 of 1,500 patients and 1 of 3,000 patients.\(^4\)\(^5\)

Prompt intervention (manually occluding the tract while turning the patient to the left side with the head down) with intubation and positive airway ventilation to reverse the transthoracic pressure gradient (preventing further air aspiration) is not always adequate. The mortality from combined series with air embolism is 50%.\(^6\)

Unfortunately, right-to-left shunting may occur, and this can result in coronary embolism, causing ventricular fibrillation (the Montefiore and Toronto patients), or in cerebral embolism, resulting in stroke (the Stanford patient). The problem, therefore, is best avoided. Care should be taken to avoid air embolism during both line insertion and removal. Responsibility for these procedures should be given to a physician well aware of the potential for problems. The central line should be removed with the patient in the Trendelenburg position and with the use of an occlusive dressing. If the catheter is large, the tract should be sutured closed. Attention to these simple details may be life-saving measures in the lung transplant recipient.

**REFERENCES**