**DISCUSSION**

Patients with tracheobronchomalacia usually present with cough, stridor, or dyspnea. The long-standing airway obstruction may result in air trapping, hypercarbia, defective mucus expectoration, recurrent infections, and bronchiectasis. Management is a challenging problem, since the obstruction is not amenable to laser or radiation therapy. Resection of the malacic portion or external rib stenting, if feasible, involves the risk of thoracotomy. The use of an endoprosthesis provides a nonsurgical alternative.

The ideal stent should (1) be easy to install, (2) be easily retrievable by bronchoscopy, (3) be difficult to dislodge during maneuvers that increase airway pressures, (4) allow unimpeded mucus clearance, and (5) incite little or no mucosal irritation. When silicone T-tube stents were modified to a straight tube, the design allowed easier endoscopic insertion, less incidence of secretion plugging, and the added benefit of being more esthetically acceptable to patients since a stoma was no longer needed. However, with removal of the horizontal limb from the T-tube design, stent displacement has increasingly been reported. In 1990, Dumon described a silicone stent with regularly spaced external studs to minimize stent dislodgment. Further external fixation of silicone stents has been described by Colt et al. Risks factors for stent migration include using a stent too loose for the airway or stenting a short (<2.5 cm) segment with smooth mucosa. Cough is the most common symptom of stent migration. At the first sign of stent migration, rapid bronchoscopic removal should be done to avoid any further unfavorable outcome. A 1993 study noted a 10% incidence of Dumon stent migration among patients with advanced lung cancer. While stent dislodgment may be the most common cause for replacement, other reported complications include lumen occlusion by granulation tissue or inpsissated mucus, reflex otalgia, vocal cord injury, and the potential for igniting the silicone material in laser therapy.

Migration of silicone stents remains a problem. When dislodged from the airway, a silicone stent can potentially be ingested or cause asphyxiation if it remains trapped in the hypopharynx. As this case shows an ingested stent can be conservatively managed if endoscopic attempts at removal are unsuccessful.

**REFERENCES**


**Herpes Simplex Viral Pneumonia in the Postthoracotomy Patient**

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Over a 6-month period, 6 of 54 postthoracotomy patients developed pneumonia and respiratory failure. Pneumonia was secondary to herpes simplex virus type 1 in 3 of the 6 patients. Diagnostic efforts including bronchoscopy with bronchial washing, viral cultures, and cytologic examination permitted early diagnosis and successful treatment with acyclovir. A high index of suspicion for herpes simplex pneumonia must be maintained in critically ill patients with undiagnosed pneumonia.

**BW=bronchial washing; HSV=herpes simplex virus; POD=postoperative day**

**Key words:** herpes simplex; pneumonia; postthoracotomy

Herpes simplex virus (HSV) is a ubiquitous pathogen in humans and infects a wide variety of tissues including the upper respiratory tract, esophagus, genitalia, and visceral organs. Before the last decade, however, HSV infection of the lower respiratory tract was thought to occur rarely and was generally diagnosed in immunosuppressed patients at the time of autopsy. More recently, Tuxen et al. have shown HSV type 1 in the lower respiratory tract of 30% of patients with ARDS. This was the first large series of patients in whom HSV involvement of the lower respiratory tract was recognized during life. In this study, the presence of the virus was associated with significantly increased morbidity and mortality.

This report describes three patients who developed HSV type 1 pneumonia after thoracotomy. Each patient had a significant risk factor for immunosuppression including a recent history of chemotherapy, malnutrition, concurrent viral infection, or severe postoperative complications, or all of the aforementioned. All three patients were diagnosed during the acute stage of the viral pneumonia and were successfully treated with acyclovir.

**METHODS**

For the 6-month period of January through June 1992, 54 patients underwent 60 thoracotomies. Procedures included wedge resection (16), lobectomy (11), pneumonectomy (10), lobectomy with en bloc chest wall resection (5), exploration and biopsy (5), and selected Reports.

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pleuropneumonectomy with photodynamic therapy (3), pleurectomy with photodynamic therapy (3), wedge resection with en bloc chest wall resection (2), muscle flap closure of bronchopleural fistula (2), esophagectomy with colon interposition (1), evacuation of hemothorax (1), and ligation of the thoracic duct (1).

Of the 54 patients, 6 patients developed pulmonary infiltrates and required ventilatory support for more than 7 days. These six consecutive patients had further diagnostic workup for pneumonia including bronchoscopy with bronchial washings (BWS). Washings were performed by injecting two 10-mL aliquots of sterile saline solution into a lobar bronchus. The following procedures were done on the specimens: Gram stain; bacterial culture; mycobacterial culture; fungal culture; viral culture including cytomegalovirus, respiratory syncytial virus, influenza, parainfluenza, and HSV; and cytologic examination for viral nuclear inclusions and Pneumocystis carinii.

Herpes simplex viral pneumonia was established only if all four of the following criteria were present: (1) the chest x-ray film showed an infiltrate; (2) culture was positive for herpes simplex; (3) cytologic examination of respiratory epithelial cells showed the classic findings of large multinucleated giant cells having nuclei, which are crowded and mold within the cytoplasm with a ground-glass appearance and intranuclear eosinophilic viral inclusions; and (4) no other bacterial or fungal pathogens were identified.47

Case Reports

Case 1

A 52-year-old woman underwent an abdominoperineal resection in June 1989 for well-differentiated rectal carcinoma. The patient developed left lung metastases in June 1990. She was treated with a phase 2 protocol of high-dose 5-fluorouracil and leucovorin for 18 months, and then underwent thoracotomy in January of 1992. At thoracotomy, a total of three metastases were removed from the left upper and lower lobes. On postoperative day (POD) 2, the patient developed fever, progressive hypoxia, and diffuse interstitial infiltrates in the right lung (Fig 1). Bronchoscopy with BW (bacterial cultures only) was performed, and empiric treatment was begun with ceftazidime sodium and clindamycin. By POD 4, the patient’s condition continued to deteriorate, and she required reintubation. Prior BW cultures were negative, and her chest x-ray film now showed bilateral diffuse interstitial infiltrates (Fig 2) accompanied by a low pulmonary capillary wedge pressure. Since atypical pneumonia was considered, erythromycin therapy was started and the clindamycin treatment was discontinued. On POD 5, the patient developed coagulopathy consistent with disseminated intravascular coagulation and hepatic dysfunction (peak laboratory values—total bilirubin value, 4.8; alkaline phosphatase level, 606; aspartate amino¬transferase value, 171; lactate dehydrogenase level, 1,164). Ultrasound testing of the abdomen and hepatitis screening were normal. On POD 8, repeat bronchoscopy with BW showed a diffusely inflamed mucosa. Cytologic examination of the BW specimen showed bronchial epithelial cells with typical HSV nuclear inclusions (Fig 3), and cultures grew HSV type 1. Therapy with acyclovir (5 mg/kg every 8 h for 14 days) was started. The patient showed marked improvement within 24 h. On POD 10, she developed an oral herpesvirus lesion and gave a history of such lesions in the past. She was extubated on POD 13 after 9 days on the ventilator and made an uneventful recovery.

Case 2

A 72-year-old man underwent a right lower lobectomy for squamous cell carcinoma in 1980. In February 1992, he was found to have a squamous cell carcinoma of the right upper lobe. Although the patient had lost 35 lb over several months, metastatic workup...
was negative, and a completion pneumonectomy was performed. The lesion was stage II (T2N1M0). The patient’s postoperative course was complicated by a non-Q wave myocardial infarction and pulmonary failure. On POD 3, he developed fever, hypoxia, and a left lower lobe infiltrate (Fig 4). A tracheostomy was performed, and empirically, therapy was started with ceftazidime and clindamycin after bronchoscopy with BW. By POD 5, BW cultures continued to be negative, and his chest x-ray film showed a diffuse interstitial infiltrate involving the entire left lung. It was thought that the patient might have an atypical pneumonia, and therefore, therapy was erythromycin was started and that with clindamycin was discontinued. On POD 7, bronchoscopy showed a diffusely inflamed and friable mucosa. The BW specimen revealed nuclear inclusions consistent with HSV infection, and the culture grew HSV type 1. The patient showed marked improvement within 48 h of treatment with acyclovir (5 mg/kg every 8 h for 14 days). He slowly recovered his pulmonary function and was extubated after 32 days on the ventilator. At no time during his hospitalization did he develop oral or genital herpesvirus lesions.

Case 3

A 72-year-old man with mesothelioma of the right side of the chest underwent pleuropneumonectomy with photodynamic therapy. He was extubated on POD 2 but developed fever, hypoxia, and respiratory failure on POD 4, requiring a tracheostomy and mechanical ventilation. At this time, therapy was empirically started with ceftriaxone disodium and clindamycin. The BW cytologic samples and cultures were negative for viral and bacterial infection. On POD 6, a chylothorax was diagnosed, and the patient required ligation of the thoracic duct on POD 10. On POD 11, his chest x-ray film showed a left lower lobe infiltrate, and the patient became septic. Therapy was empirically started with ceftazidime, vancomycin, and fluconazole; clindamycin treatment was continued, and that with ceftriaxone was discontinued. Multiple cultures including a BW specimen were negative for a significant pathogen. On POD 12, the patient developed a bronchopleural fistula, which was treated with open drainage. On POD 14, his chest x-ray film showed an increasing left lower lobe infiltrate, and the patient’s condition continued to deteriorate. Prior therapy with antibiotics was discontinued, and empiric treatment with imipenem was begun. On POD 16, the patient developed a herpesvirus lesion on the lower lip and gave a history of oral herpesvirus infections in the past. Bronchoscopy on POD 17 showed an erythematous and friable mucosa, and the BW specimen showed nuclear inclusions consistent with HSV. Cultures grew HSV type 1 and cytomegalovirus. Therapy was started with acyclovir (5 mg/kg every 8 h for 14 days). Over 72 h, the patient gradually improved, and his septic state resolved. He was extubated after 59 days on the ventilator.

Results

Six (11%) of 54 postthoracotomy patients developed pneumonia and respiratory failure over 6 months. Three (50%) of the 6 patients developed HSV type 1 pneumonia. All 6 patients had carcinoma, but only the 3 who contracted HSV pneumonia had another recognizable risk factor associated with immunosuppression, namely, a recent history of chemotherapy (case 1), malnutrition (case 2), and concurrent viral infection as well as severe postoperative complications (case 3). Two out of 6 of the patients (cases 1 and 2) had an oral herpesvirus lesion in the hospital, and both these patients also developed HSV pneumonia. Two out of 6 of the patients (cases 1 and 3) had a history of oral herpesvirus infection, and both patients developed HSV pneumonia.

Discussion

The incidence of pneumonia in critically ill ventilated patients ranges from 10 to 67% and causes a mortality of at least 25%.

Pneumonia is even more ominous in postthoracotomy patients who have diminished pulmonary reserves. It is particularly frustrating, therefore, that only 30-50% of patients suspected of having bacterial pneumonia are actually proven to have pneumonia by bronchoscopic protected brush cultures. Based on our recent experience, it is our belief that many of these undiagnosed pneumonias may represent HSV pneumonia.

Prior to the last decade, HSV infection of the lower respiratory tract was thought to occur rarely and was generally diagnosed in immunosuppressed patients at the time of autopsy. In a particularly thorough autopsy study, Ramsey et al. identified 20 patients with HSV pneumonia; 18 of these patients had recent treatment with immunosuppressive or cytotoxic drugs. Most of these cases were thought to be the result of reactivation of endogenous herpesvirus. These investigators identified two patterns of HSV pneumonia: a localized pneumonia caused by direct spread of virus from lesions in the upper respiratory tract and a diffuse pneumonia secondary to hematogenous dissemination from oral or genital lesions.

Recent studies have increasingly suggested that HSV viral infection of the lower respiratory tract may be more common than previously thought. For example, in a study of 525 allogeneic bone marrow transplant recipients, viral pneumonia occurred in 101 (47%) of 215 patients with nonbacterial pneumonia. Nine (4.2%) of the cases of viral pneumonia occurred secondary to herpesvirus. In an

Figure 4. Left lower lobe infiltrate associated with fever and hypoxia (case 2).
interesting study, Tuxen et al.9 have shown HSV type 1 in the lower respiratory tract in 14 (30%) of 46 patients with the ARDS. This was the first large series of patients in whom HSV involvement of the lower respiratory tract was recognized in life. It is unclear, however, whether these patients had HSV pneumonia or tracheobronchitis. In either case, the presence of the virus was associated with significantly increased morbidity and mortality. In a follow-up study, Tuxen et al.10 showed that prophylactic administration of acyclovir prevented the high incidence of HSV but failed to alter patient outcome. They concluded that HSV usually is not a significant pathogen in the lower respiratory tract and only should be treated if (1) it occurs in immunosuppressed patients (for example, patients with malignancy, burns, or after cytotoxic therapy); (2) there is evidence of pulmonary parenchymal invasion; or (3) there is unexplained clinical deterioration.

It is well established that cell-mediated immunity is crucial in preventing reactivation as well as primary herpes viral infection. In light of the present study, it is interesting to note that cell-mediated immunity is depressed in surgical patients, especially those who are critically ill with serious postoperative complications.15-17 Porteous et al.15 have shown oral shedding of HSV type 1 in 18 (42%) of 44 critically ill surgical patients and 4 (10%) of 42 patients undergoing elective surgery. They suggest that viral shedding is secondary to reactivation of endogenous virus rather than primary infection and reflects impairment of both cell-mediated and humoral immunity in critically ill patients.

Recent studies suggest that cardiac patients represent an immunocompromised group, especially in the setting of concurrent cytomegalovirus infection.18,19 Thoracic oncology patients represent another group with underlying impairments in the immune system.20 This may explain the high rate of HSV pneumonia found in our present study.

In summary, our results suggest that HSV pneumonia may be a common phenomenon in critically ill postthoracotomy patients and, perhaps, in all severely ill ventilated patients. In the present study, diligent diagnostic efforts employing bronchoscopy with BW, viral culture, and cytologic examination permitted early diagnosis and treatment of HSV pneumonia. Like Ramsey et al.,4 we believe that a high index of suspicion for HSV pneumonia must be maintained in critically ill patients with an undiagnosed case of pneumonia—especially one that manifests as a focal or diffuse interstitial infiltrate. Furthermore, we suggest (1) delaying surgery in patients with active or recent herpesvirus lesions and (2) aggressively treating critically ill patients who develop herpesvirus lesions in the postoperative period. We are currently studying the role of prophylactic administration of acyclovir in high-risk patients who are seropositive for herpes simplex.

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