became paralytic, and her symptoms returned in the evening. Complete drainage of the gastric contents also gave a good result. The patient completely recovered by the next afternoon.

Because the patient’s immediate recovery after decompression seemed rather atypical of aerophagia, we suspected that gastric air was injected by BNPAP ventilation. In reply to our question, she stated that the BNPAP ventilation system customarily injected air into her stomach when she opened her mouth. Usually, the air is soon expelled as belches and flatus, but on that day gastric distension appeared after lunch. Usually gastric distension after a meal would soon disappear, but it increasingly worsened on that day. Because of distress, she opened her mouth more frequently, and as a result a larger amount of air was injected into the stomach.

After this episode of aerophagia, we made the patient sit up for about half an hour after meals to allow the gastric air to be expelled. By this simple maneuver, severe gastric insufflation was successfully avoided thereafter.

**DISCUSSION**

On the basis of the patient’s comment, we determined that her gastric distension probably was a result of air injection by BNPAP ventilation. This opinion is supported by a report stating that aerophagia is observed in 13% of patients receiving BNPAP ventilation. Gastric insufflation is reported in up to 50% of patients receiving noninvasive positive-pressure ventilation but is rarely intolerable, probably because the lower esophageal sphincter pressure is well above the inspiratory positive airway pressure, which prevents the air from entering the gastric lumen. Sphincter pressure in this patient was possibly decreased by the weakness of the diaphragm caused by ALS, and a relatively large amount of air was injected into the gastric lumen compared to patients with normal diaphragms. In addition, the mode of the BNPAP ventilation system might have contributed to the problem. The presence of gastric insufflation shows that the length of the inspiratory phase depended on the compliance both of the chest and the abdomen. Therefore, gastric insufflation might be worsened when the compliance of the abdomen is greater than that of the chest. This condition could have occurred if the BNPAP ventilation system had injected air while the patient’s own respiratory cycle had been in the expiratory phase in which the compliance of the chest had increased while that of the abdomen had been relatively free from the respiratory cycle. This desynchronization could have occurred in this patient because the BNPAP ventilation system was in the spontaneous/timed mode. We think that these two factors (i.e., ALS and spontaneous/timed mode) were the major causes of the gastric insufflation in this patient. The gastric insufflation, which usually had been tolerated by this patient, had seriously worsened on that day. What had caused this exacerbation?

We estimate that our patient’s difficulty in the sitting position and the quality of the meal were the major causes. When a patient lies supine after a large meal, air in the stomach can be trapped below the gastroesophageal junction by overlying fluid. Although the amount of the meal (soup and noodles) was not large in this case, the soup in the gastroesophageal junction may have contributed to trapping the air in the stomach because the patient was supine. This possibility is supported by the fact that, in this case, severe gastric insufflation had been successfully avoided by sitting up for half an hour after the meal. This case is, therefore, consistent with the report that lateral position is useful in relieving the gastric distension associated with nasal-mask ventilation. Mouth opening may be also important. In patients who are using a nasal mask, mouth opening leaks the inspiratory air, disturbs the rise in inspiratory positive airway pressure, and lengthens inspiratory time. Irregular mouth opening by our patient, which makes the inspiratory time also irregular, might have caused the patient’s difficulty in synchronizing with the BNPAP ventilation system and might have made the gastric insufflation more severe. At the same time, the inspiratory flow also could have distended the upper esophagus and caused a subjective feeling of an object in the upper esophagus, and repeated attempts to swallow the “object” resulted in aerophagia with rapid gastric insufflation.

Gastric insufflation, which worsens the patient’s quality of life, can be fatal in severe cases. Therefore, to avoid this complication in patients receiving BNPAP ventilation in the supine position, about half an hour of sitting up after a meal is desirable.

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**Utility of Wang Needle Aspiration in the Diagnosis of Actinomycosis**

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An 85-year-old man had a 4-year history of recurrent...
pneumonia with a persistent pleural effusion. He underwent repeated bronchoscopy that revealed a right bronchus intermedius mass, but bronchial washes and biopsies remained nondiagnostic. A repeat bronchoscopy was performed, and a Wang needle aspiration of the mass was obtained that showed sulfur granules, diagnosing actinomycosis. The patient was started on appropriate antibiotic therapy. Actinomycosis must be considered in a patient with recurrent pneumonia and an endobronchial mass. Wang needle aspiration via bronchoscopy may be an important diagnostic tool.


Key words: actinomycosis; bronchoscopy; endobronchial; pneumonia; Wang needle aspiration.

Abbreviation: RBI = right bronchus intermedius

Actinomycosis is a chronic suppurative bacterial infection. The causative agents are Gram-positive, nonspore-forming anaerobic or microaerophilic rods. They are endogenous oral saprophytes that dwell in carious teeth, dental plaque, and gingival and tonsillar crypts. Pulmonary actinomycosis is mainly acquired through aspiration of organisms from the oropharynx. The thoracic disease accounts for approximately 15 to 20% of actinomycosis cases. The thoracic disease classically presents as either a mass lesion or pneumonitis with or without pleural involvement. Primary endobronchial actinomycosis is an exceptionally uncommon cause of a mass lesion obstructing the trachea or bronchi. We present a case of endobronchial actinomycosis diagnosed using Wang needle aspiration.

CASE REPORT

An 85-year-old black man was admitted in August 1999 with a 1-day history of nausea, vomiting, and left flank pain. On review of symptoms, he reported having mild shortness of breath at rest off and on for the past 4 years. Since February 1996, he has had recurrent episodes of pneumonias and persistent bilateral pleural effusions. An extensive workup had been done over time, which included a CT scan of the chest showing right middle and lower lobe atelectasis with bilateral pleural effusion, and calcified lymph nodes in the prescapular and right hilar areas. Repeated bronchoscopy revealed a right bronchus intermedius (RBI) mass occluding 90% of its orifice. However, sputum obtained, mucosal biopsies of the mass and wash collected from the RBI, multiple thoracentesis, and a pleural biopsy remained nondiagnostic.

His medical history was also significant for a tooth abscess in February 1996 preceding his initial pneumonia, diabetes mellitus type II, hypertension, atrial fibrillation, chronic renal insufficiency, a 30-pack/year history of smoking ending in 1976, and a moderate history of alcohol use. On physical examination, the significant findings were mild respiratory distress and pallor. The lungs had percussion dullness in the right base with decreased air entry on auscultation and decreased tactile fremitus. The pulse was irregular. There was mild palpation tenderness over the left costovertebral angle and left lower quadrant. There was two-plus edema on the lower extremities.

Laboratory analysis revealed a urinary tract infection and low hemoglobin. Chest radiography showed increased right pleural effusion compared to June 1999. A CT scan of the chest done 3 weeks prior to hospital admission showed interval increase in right-sided pleural effusion and nonvisualization of a short segment of the bronchus intermedius. Bronchoscopy was repeated, and the mass obstructing the RBI was seen again (Fig 1). Wash was collected from the RBI, and Wang needle aspiration was done of the mass. The Wang needle aspirate showed colonies of Actinomyces with sulfur granules (Fig 2). Thoracentesis was not repeated. He was started on penicillin G, 2 million U q6h, and

Figure 1. Bronchoscopy picture of right mainstem bronchus, showing the endobronchial mass occluding the RBI and a patent upper-lobe bronchus.

Figure 2. Fine-needle aspirate. Granule of actinomycosis surrounded by an intense reaction of leukocytes (hematoxylin-eosin, original × 40). Insert: Higher magnification of the organized aggregate of filamentous bacteria forming a spherule with an eosinophilic rim representing the Splendose-Hoeppli phenomena (hematoxylin-eosin, original × 450).
then switched to ceftriaxone, 2 g once daily for 4 weeks, and then switched to amoxicillin for an additional 5 months.

**Discussion**

A diagnosis of actinomycosis cannot be made from sputum cytology and/or culture unless obtained directly from the bronchus, as it can be found in 30 to 50% of normal saliva specimens. Thoracic Actinomyces were diagnosed by thoracotomy in the past. Fiberoptic bronchoscopy allows a minimally invasive approach to make the diagnosis. However, the reported diagnostic yields on BAL, bronchial wash, and bronchial biopsies reported have been low. It has been reported that physiologic saline solution, which is commonly used for BAL, inhibits the growth of pathogenic Actinomyces. Some authors have suggested that in a small crushed bronchial biopsy, the morphologic appearance of the sulfur granule may get distorted, making diagnosis difficult. The Wang needle aspirate obtained a submucosal tissue sample unlike the mucosal biopsies and was diagnostic of Actinomyces. A literature review of the past 25 years uncovered no reported case of endobronchial actinomycosis diagnosed using Wang needle aspiration. Dissemination by biopsy is a theoretical possibility, but no reference could be found in the literature regarding it. In our case, the history of a tooth abscess preceding the patient’s initial pneumonia may be relevant. A diagnosis delayed up to 44 months from the beginning of symptoms is reported by all authors, as was the case in our patient. The hallmark of actinomycosis is the formation of yellow sulfur granules. Although they may be abundant, only a single granule was identified in 26% of specimens in one series.

**Conclusion**

Endobronchial actinomycosis is rare and should be considered in a patient with recurrent pneumonia and an endobronchial mass. Fiberoptic bronchoscopy could help avoid a surgical procedure and aid in making a diagnosis. Wang needle aspirate by bronchoscopy may be used to obtain clinical material for diagnosis.

**References**


**The Use of Endoscopic Argon Plasma Coagulation in Airway Complications After Solid Organ Transplantation**

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The objective of the study was to describe a safe and effective treatment option for endobronchial complications after solid organ transplantation. A retrospective analysis was performed in a tertiary-care university hospital. The use of bronchoscopic argon plasma coagulation (APC) for the treatment of endobronchial lesions was studied in five solid organ transplant recipients. Four patients presented with variable degrees of endobronchial obstruction, and one patient presented with massive hemoptysis. Two of the patients with endobronchial obstruction were double lung transplant recipients who developed anastomotic strictures. The strictures were opened with endobronchial stents but became obstructed again by inflammatory granulation tissue overgrowth through the stent mesh. APC was used to maintain airway patency. One kidney transplant recipient developed pulmonary zygomycosis with secondary obstruction of the left main bronchus because of granulation tissue growth through endobronchial stents. Airway patency was reestablished with several treatments with APC. Another kidney transplant recipient developed subglottic and tracheal papillomatosis that was effectively removed with APC. A heart transplant recipient was referred with recurrent massive hemoptysis refractory to bronchial artery embolization. The bleeding was caused by hemorrhagic polypoid lesions, which were completely ablated by APC. Bronchoscopic use of the argon plasma coagulator is a safe and simple technique that can be used effectively to treat endobronchial pathology in solid organ transplant patients.

Key words: argon plasma coagulation; endobronchial obstruction; hemoptysis; transplant

Abbreviations: APC = argon plasma coagulation; FEF25–75 = forced expiratory flow, midexpiratory phase

Therapeutic bronchoscopy has developed several alternatives to overcome endobronchial obstruction that originates from endobronchial neoplasias or from benign...