Getting the Bugs Out of BAL

Until recently, culture of BAL fluid for aerobic bacteria was not considered specific for the diagnosis of pneumonia caused by bacteria which normally colonize the respiratory tract. However, in 1987, Thorpe and coworkers1 and Kahn and Jones2 published reports on the ability of semiquantitative BAL cultures to identify the cause of bacterial pneumonias in a wide variety of patients. Collectively, these studies demonstrated that the presence of >10^5 cfu/ml of aerobic bacteria in a BAL specimen was highly sensitive and specific for separating patients with bacterial pneumonia from patients with either chronic bronchitis, resolving bacterial pneumonia, or other nonbacterial lung disorders. An additional report in 1988 by Johanson and coworkers3 bolstered confidence further that semiquantitative cultures of BAL might have a reliable clinical role in the diagnosis of pneumonia. In studies with intubated and mechanically ventilated baboons, Johanson and coworkers revealed that BAL reflected, both quantitatively and qualitatively, the bacterial burden of the lung to a greater degree than protected brush specimens or needle aspirates.

Based upon the growing interest and literature concerning this topic (reviewed in this issue of Chest by Meduri and coworkers [see page 179]) it is reasonable for the clinician to ask, “Should I routinely use semiquantitative cultures of BAL fluid in the diagnosis of pneumonia in my patients?” There are several reasons why I believe the answer to this important question at this time is “no.”

First, while the studies by Thorpe and coworkers and Kahn and Jones used similar (but not identical) methodologies, many technical questions concerning the BAL procedure and the processing of the sample remain unanswered. These include, but are not limited to the following: Aspiration of oropharyngeal secretions occurs during fiberoptic bronchoscopy. Kahn and Jones addressed this issue in their study by assessing the percentage of BAL cells that were squamous epithelial cells (SEC). The presence of >1 percent SEC in a BAL fluid sample indicated heavy contamination of the sample by oropharyngeal bacteria, and the cutoff of 10^5 cfu/ml no longer accurately identified the bacteria responsible for the pneumonia. The use of any other method for quantitating SEC might make the reliability of the 10^5 cfu/ml cut off sufficiently suspect to obviate its benefit. It appears that some assessment of oropharyngeal contamination of a BAL sample should be performed. However, we do not have confirmation that the >1 percent SEC cut off is reproducible by other laboratories, and we do not know whether using methods other than those detailed by Kahn and Jones yields reliable results.

Another technical issue of importance is the volume of fluid used for the BAL. Thorpe and coworkers and Kahn and Jones instilled a total of 150 and 240 ml, respectively, of saline solution in performing BAL studies. Other studies have used lesser volumes of instillate.4,5 Semiquantitative culture results might be influenced significantly by variations in the volume instilled and in the volume retrieved. Furthermore, should we discard the first aliquot6 and submit for culture a portion of a pool of the remaining aliquots, or pool all aliquots prior to culture? Should we centrifuge the entire BAL sample and resuspend it in a smaller volume of physiologic solution prior to culture4,7 or should we culture the BAL sample directly?3,5

Second, results of the semiquantitative culture of BAL fluid from patients intubated and on mechanical ventilation have not been as consistent and encouraging. While Guerras and colleagues8 found that BAL cultures containing >10^5 cfu/ml may have been useful in identifying the presence and etiology of pneumonia, and Torres and colleagues9 determined, using a cut off of ≥10^5 cfu/ml, that BAL cultures agreed reasonably well with those obtained with a telescoping plugged catheter, Chastre and colleagues8 found that semiquantitative culture of BAL fluid was of little value in identifying aerobic pneumonias in mechanically ventilated patients.

Third, even if semiquantitative cultures of BAL fluid accurately identify bacteria responsible for lower respiratory tract infections, any recommendation for the noninvestigational use of the procedure in clinical medicine rests upon the presumption that the clinician's knowledge of the culture results translates into a more favorable outcome for the patient. Thus, we can only presume at this time that despite the additional monetary cost of performing BAL and culturing the sample that the patient would benefit medically, that the overall costs to the patient might be less, or that if higher, these costs could be justified by the benefits to the patient.

Therefore, the cumulative data suggest (but do not yet prove) that semiquantitative cultures of BAL fluid constitute helpful information for the clinician in selected patients. Until we have data that suggest better methods, I believe the clinician should follow...
as closely as possible the complete methods of Thorpe and coworkers or Kahn and Jones. However, the temptation to lend too much credence to the results of BAL semiquantitative cultures should be resisted. More studies are necessary to answer many unresolved methodologic details. More extensive trials to define clearly the population of patients who will benefit from this procedure and to determine the cost-benefit ratio will be necessary before the clinician would be justified in the routine use of semiquantitative cultures of BAL fluid.

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Complications of Endoscopic Variceal Sclerotherapy

Endoscopic variceal sclerotherapy is an effective means of controlling acute bleeding esophageal varices in patients with portal hypertension.1-3 It is associated with improved long-term survival and reduced cost when compared with medical therapy3-5 or portal-systemic shunting procedures.7,8 Given the immediate and long-term efficacy of variceal sclerotherapy and its widespread use, it is imperative that physicians become familiar with the complications of this procedure. The May issue of Chest includes a thorough review by Edling and Bacon10 of the pleuro-pulmonary complications of variceal sclerotherapy.

Endoscopic variceal sclerotherapy involves the use of a flexible fiberoptic endoscope to inject one of several sclerosing agents directly into the esophageal varices. The sclerosant thromboses the varices both by inducing injury to the cells of the vascular endothelium11 and by direct activation of the clotting mechanism.12 Repeated sclerotherapy obliterates the varices, reducing the risk of rebleeding. In addition to the expected thrombosis there is also superficial and deep necrosis of the esophageal wall and substantial inflammation of the esophagus and periesophageal tissue.13,14 This inflammation often causes esophageal ulceration,15 mediastinitis and pleurisy.16 Rarely, esophageal perforation occurs causing mediastinal infection and empyema.17

The mediastinal and pleural inflammation is manifested clinically by fever, chest pain, dysphagia and pleural effusions. We studied these symptoms and signs in our institution16 and found that chest pain occurred following 23 percent of sclerotherapy sessions, and fever greater than 37.5°C occurred following 40 percent of sessions. About half of all patients had pleural effusions, although two thirds were small (less than 10 percent of the hemithorax). The symptoms of fever and pain usually resolved without therapy within 24 to 48 hours and the effusions within several days.

This presents a challenge to clinicians. We must recognize the signs and symptoms of mild mediastinal and pleural inflammation resulting from variceal sclerotherapy for the benign, transient problems that they usually are and avoid unnecessary invasive procedures. At the same time, we must remain alert for those clinical situations where the probability of mediastinitis or empyema due to esophageal perforation is high and intervene promptly with appropriate diagnostic tests and therapy.

The risk of serious complication is increased when one or more of the following criteria are met: a moderate to large pleural effusion, fever of greater than 38°C which persists for more than 24 hours, or substernal chest pain which is not easily controlled with narcotics. When one of these three signs is present, thoracostentesis is indicated for patients with a pleural effusion in order to pursue the possibility of empyema, and a barium swallow or repeat endoscopy should be considered to exclude esophageal perforation.

Rarely, adult respiratory distress syndrome has been reported in association with variceal sclerotherapy.18 The mechanism proposed for the lung injury is that sclerosant passes from the varix via the azygos vein to the pulmonary circulation damaging the alveolar-capillary membrane. However, only a small portion of the injected sclerosant has been demonstrated to reach the pulmonary circulation10 and animal and...