of thoracic diseases. Its true place will be defined over several years of careful evaluation. The Society of Thoracic Surgeons and the American Association for Thoracic Surgery have taken the initiative to assure the quality of surgeons performing these procedures and to carefully evaluate this new technology at its infancy. This will avoid indiscriminate or inappropriate application and establish treatment protocols which will minimize or eliminate potentially disastrous procedure-related complications.

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Bronchoalveolar Lavage in the Diagnosis of Lung Cancer

The flexible fiberoptic bronchoscope was introduced by Ikeda in the late 1960s. The major motivation for the development of this instrument and its initial clinical application was the need for an aid in obtaining tissue for the diagnosis of lung cancer. A variety of other diagnostic and therapeutic clinical applications for fiberoptic bronchoscopy have since been developed. As would be expected with a widely utilized clinical procedure, there are a large number of variations both in the technical performance of bronchoscopy and in the application of this procedure in clinical settings. As a means to understand how bronchoscopy is used in clinical practice, the American College of Chest Physicians sponsored a survey of practitioners of this procedure regarding clinical practices.

Prakash and colleagues, in reviewing the findings of that survey, pointed out several important aspects of clinical practice. With regard to the performance of the procedure, for example, the routine preprocedure evaluation varies widely. It is likely that the elimination of some "routine" prebronchoscopic laboratory tests not widely felt to be necessary will both streamline the procedure and reduce its cost. The most common clinical indication for the use of bronchoscopy remained the diagnosis of cancer. The next most common clinical indication was the diagnosis of pneumonia in immunocompromised hosts. Biopsies, brushings, and needle aspiration were all "routinely" used for the diagnosis of cancer. In contrast, bronchoalveolar lavage (BAL), which was widely used in the diagnosis of infections, was uncommonly used as a tool in the diagnosis of cancer.

Bronchoalveolar lavage was first performed through fiberoptic bronoscopes shortly after their introduction. The procedure remained largely a research tool, providing access to lower respiratory tract cells and proteins, until the demonstration that the diagnosis of opportunistic infections in immunocompromised patients could be made with BAL. The number of immunocompromised patients has increased rapidly with the spread of AIDS, the wider application of organ transplantation, and the use of increasingly potent cytotoxic therapy for malignancy. Because of the frequency of pulmonary infections in these patients, BAL is commonly used by, and is thus familiar to, most practitioners of bronchoscopy. In addition, appropriate support services for the evaluation of the cytologic material is available in most centers. It was surprising, therefore, that Prakash and colleagues found that BAL was rarely used in the diagnosis of lung cancer.

The report by Pirozynski in the current issue (see page 372) is therefore of considerable interest. Previous reports have demonstrated that BAL can provide diagnostic material in both primary and metastatic malignancy to the lung. Pirozynski focused his study on peripheral lesions that were not endoscopically visible. In the 1,864 cases reviewed, there were 145 such peripheral malignancies. For the peripheral malignancies, BAL was the most effective of the various procedures used to obtain diagnostic material, yielding malignant cells in nearly 65 percent of cases. The diagnostic yield was nearly twice that for forceps biopsy, probably the most commonly used technique of North American practitioners. Not unexpectedly, Pirozynski reports that diagnostic yield depends on lesion size. In addition, cytologic diagnosis of cancer does not necessarily define cell type, agreeing with previous reports regarding BAL.

The superior diagnostic yield of BAL for the diagnosis of peripheral lesions is combined with its relative safety. Fever after BAL and a transient decline in lung function are well recognized, but are not generally considered serious complications. Bleeding and pneumothorax can occur, but are much less frequent than after forceps or needle biopsy. It would seem, therefore, that BAL is distinctly underutilized in the diagnosis of lung cancer in North America. Conversely,
more invasive biopsy techniques with higher risk may be overutilized. In many cases, BAL may be a preferable procedure to transbronchial biopsy.

It will be of considerable interest to follow up on the ACCP survey in several years to learn whether clinical practices have changed. Based on the recent publications by Prakash et al.1,2 and Pirozynski, it appears likely that bronchoscopies will become streamlined (and, hopefully, less expensive) with fewer preprocedure laboratory procedures and that BAL will become more widespread.

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Survival of the Fittest

Exercise Testing in the Evaluation of Thoracotomy Candidates

Surgical resection is the preferred treatment for patients with localized non-small cell carcinoma of the lung. Unfortunately, some individuals are denied resection because the risk of surgery is deemed prohibitive. Removal of lung tissue from a patient with an already compromised respiratory status may eventuate in cardiopulmonary failure and death. A forced vital capacity (FVC) less than 50 percent of predicted, an FEV1 less than 50 percent of the FVC (or less than 2 L), a diffusing capacity less than 50 percent of predicted, or a maximal voluntary ventilation of less than 50 percent of predicted identify the individual with an increased risk at thoracotomy.1,2

Most cardiopulmonary complications develop in patients who fail these criteria. If these criteria are rigidly applied, however, many patients who could tolerate surgery will be denied the chance for curative treatment. Additional tests, including bronchopulmonary function, measurement of the pulmonary artery pressure during occlusion of the vessel to the diseased lung, and prediction of the postoperative pulmonary function from a quantitative radiouclide perfusion lung scan, have been proposed to identify those individuals with poor results on routine pulmonary function tests who would tolerate resection.3-7 The latter test has proved particularly useful. Patients whose predicted postoperative FEV1 is greater than 500 ml or 40 percent of predicted tolerate resection with an acceptable morbidity.7,8

The role of exercise testing in the preoperative assessment of thoracotomy candidates has evolved over the past several decades. Van Nostrand and colleagues9 noted that routine pulmonary function tests did not discriminate between those who did and those who did not develop complications but observed that patients who could not climb one flight of stairs without dyspnea had a high (50 percent) mortality following pneumonectomy. Reichel10 exercised patients on a treatmilt prior to pulmonary resection; all 14 individuals who completed the exercise test did well postoperatively, while two of the three who could not tolerate level walking for 4 min died, and the other survived serious complications. Eugene and colleagues11 measured maximal oxygen uptake (VO2max) during incremental exercise; they found that those postoperative deaths occurred in the four patients with a VO2max of less than 1 L/min, while all 15 patients with a VO2max of more than 1 L/min survived. Smith et al12 related maximal oxygen uptake to body weight and found similar results. Patients with a VO2max of 20 ml/kg/min or greater had minimal morbidity, whereas six patients with a VO2max of less than 15 ml/kg/min all had cardiopulmonary complications, including two fatalities. Colman and colleagues13 failed to find a relationship between postoperative complications and preoperative exercise capacity; however, they included technical problems, such as persistent air leaks, among the complications tabulated. Subsequent studies14-17 have confirmed the relationship between exercise performance and cardiopulmonary...