page 139) confirms these observations, concluding that the fiberoptic bronchoscopic procedure per se does not enhance prior ectopy among patients with coronary arterial disease or chronic pulmonary disease. Sinus tachycardia was observed uniformly among all patients with or without cardiopulmonary disease and was well tolerated.

As pointed out by Luck et al, the lack of serious arrhythmias in their study may be the result of careful selection of patients; patients with hypoxemia and unstable angina pectoris were excluded. Since a drop of 10 to 20 mm Hg in the arterial oxygen pressure (PaO₂) is frequently observed during and for several hours after a bronchoscopic procedure, the procedure may precipitate profound hypoxemia in a patient with poor baseline values for PaO₂ and thus enhance myocardial sensitivity to circulating catecholamines. The decline in PaO₂ during the bronchoscopic procedure seems to be the combined result of several factors, including obstruction of the airways, alveolar filling with lavage or anesthetic solutions, and suctioning, all of which produce a mismatching of ventilation and perfusion.

The arrhythmogenic potential of the fiberoptic bronchoscopic procedure per se (aside from that of administration of premedications and anesthetics) therefore may lie in its ability to produce hypoxemia. If extreme care is exercised in the use of premedication and anesthetic drugs and if hypoxemia is avoided by careful selection of patients and administration of supplemental oxygen during and after the procedure, then serious cardiac arrhythmias, like most other complications of the fiberoptic bronchoscopic procedure, can be prevented.

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References
4 Feldman NT, Pennington JE, Ebright MG: Transbronchial lung biopsy in the compromised host. JAMA 238:1377-1379, 1977

Lung Biopsy in Sarcoidosis

In evaluating the patient suspected of having sarcoidosis, histologic confirmation of the diagnosis is generally desired, particularly if the biopsy may be obtained with minimum morbidity. Pulmonary biopsy via open thoracotomy is the most definitive diagnostic procedure and will reveal noncaseating granulomas in essentially all cases of sarcoidosis, even in the absence of radiographic pulmonary infiltrates.1,2 Mediastinoscopy has afforded a means of obtaining paratracheal lymph nodes for histologic confirmation, again with a diagnostic yield of nearly 100 percent but with less morbidity than open lung biopsy. In recent years, transbronchial lung biopsy during a fiberoptic bronchoscopic procedure has been demonstrated to be a safe procedure with low morbidity, which also has a high diagnostic yield in sarcoidosis.3,7

In this issue of Chest (see page 122), Rosen et al review 128 granuloma-containing specimens obtained via open lung biopsy from patients with sarcoidosis. These investigators found that in 62 percent of the cases, the principal histopathologic finding was nongranulomatous interstitial pneumonitis. Rosen et al formulate an interesting hypothesis about the evolution of the epithelioid granuloma from an early lesion of interstitial pneumonitis. This careful review certainly reaffirms the nonuniformity of the granulomatous reaction in the lungs in patients with sarcoidosis. This observation is particularly relevant considering the increasing practice of obtaining small lung biopsy specimens during the
fiberoptic bronchoscopic procedure and the inherent sampling error with small biopsies.

Joyner, Nelson, and I have now performed transbronchial lung biopsies during the fiberoptic bronchoscopic procedure in 109 patients with suspected sarcoidosis. An alternate diagnosis was established in only one case in this series (atypical tuberculosis due to Mycobacterium intracellulare). In four cases studied early in our experience, inadequate samples of tissue were obtained, and mediastinoscopic examination showed noncaseating granulomas. Of the remaining 104 cases of sarcoidosis, transbronchial lung biopsies revealed noncaseating granulomas in 33 (60 percent) of 55 cases with disease of radiographic stage 1, in 33 (85 percent) of 39 cases with disease of stage 2, and in eight of ten cases with disease of stage 3.

Our diagnostic yield has improved somewhat since our original report. We have recovered noncaseating granulomas in 28 (90 percent) of the last 31 cases with radiographic parenchymal lung involvement. This increased yield is likely due to sampling a larger quantity of pulmonary tissue. We now obtain at least six transbronchial and two bronchial mucosal biopsies per patient, compared to an average of four biopsies per patient in our original publication. In spite of the increased number of biopsies per patient, complications from this procedure remain infrequent, as others have reported.

The overall rate of pneumothorax as a complication in patients undergoing transbronchial biopsies should be less than 1 percent in experienced hands. Fluoroscopic guidance is a valuable aid in the placement of the forceps for biopsy, both to avoid perforating the visceral pleura and to save time in obtaining repeated biopsies.

Clearly, the problem in cases of sarcoidosis where we fail to establish the diagnosis by transbronchial biopsy is primarily due to errors of sampling. This has been particularly true in patients with stage-1 disease, where we have encountered a number of cases with nonspecific pneumonitis as the only pathologic change on the small 1 × 2-mm biopsies. More commonly, with multiple transbronchial biopsies in the same patient, some biopsies will show interstitial pneumonitis, and others demonstrate well-defined epithelioid granulomas.

The diagnostic yield in small lung biopsy specimens (including biopsies obtained via a percutaneous needle, as well as transbronchial biopsies) will depend on several factors: (1) the quantity of pulmonary tissue obtained; (2) the stage of disease; (3) the severity of respiratory symptoms and pulmonary dysfunction, which likely correlate with the degree of granulomatous involvement in the lungs; and (4) how a granuloma is defined. These factors most likely account for the variability of diagnostic yield in different series.

Which patients suspected of having sarcoidosis should undergo transbronchial lung biopsy? Certainly, there are some asymptomatic patients with normal findings on physical examination, a negative tuberculin skin test, and bilateral hilar adenopathy alone in whom a histologic diagnosis is not required. If a patient has palpable lymphadenopathy or a suspicious cutaneous lesion, biopsy should be performed and may obviate the need for further invasive procedures. In the patient with atypical features where there is a strong clinical suspicion of malignant disease, mediastinoscopic or other biopsy of the lymph node is generally the best procedure. However, in the majority of cases where histologic confirmation of sarcoidosis is desired (particularly when there are parenchymal pulmonary infiltrates on the chest x-ray film), transbronchial lung biopsy during the fiberoptic bronchoscopic procedure is the preferred technique.

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The opinions and assertions contained herein are the private views of the author and do not necessarily reflect the position of the Department of the Army or the Department of Defense.
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REFERENCES

CHEST, 74: 2, AUGUST, 1978