What Constitutes Effective Management of Pneumothorax After CT-Guided Needle Biopsy of the Lung?

Transthoracic fine-needle aspiration biopsy of pulmonary lesions is a well-established technique for the diagnosis of malignancy, obviating the need for surgical biopsy in the majority of patients. Although the procedure was originally done under fluoroscopic guidance,1 the widespread availability of CT has made it the leading modality for guiding lung biopsies. The use of CT guidance permits small, previously inaccessible or even undetectable nodules to be amenable to transthoracic needle biopsy.2,3 Reported accuracy for the diagnosis of benign and malignant disease is in the range of 64 to 97%.2,4,5 Automated core needle biopsy confers a diagnostic advantage over fine-needle aspiration if a cytologist is not available, or in the diagnosis of lymphoma, or in obtaining a specific benign diagnosis.6

The decision to perform a needle biopsy should be determined on a case-by-case basis after evaluating the appropriateness of the indication and the technical feasibility. Risk/benefit analysis should demonstrate an advantage to the patient.7 When appropriately utilized, CT-guided needle biopsies of the lung are considered safe. Very rare fatal complications include systemic air embolism, hemorrhage, pericardial tamponade, empyema, and lung torsion.5–10

Pneumothorax is by far the most common clinically significant complication of CT-guided needle biopsy, occurring in the broad range of 15 to 45%.1,4,11,12 The rate of chest tube placement varies from 2 to 18%.2,4,11,13–19 Specific factors have been proposed to influence the rate of development of pneumothorax. However, many of the data in the literature are contradictory. The factors that have been analyzed include variables related to the patient, the lesion, and the procedure. Patient-related variables include the patient’s age, results of pulmonary function tests, and the presence of emphysema. Lesion variables include the size and depth of the lesion and whether it is in contact with the pleura. Procedure-related variables include the experience of the operator, the degree of difficulty of the biopsy, the angle of the pleural puncture, the duration of the procedure, the number of passes, and the type of needle chosen.4,5,11–13,20

Some authors16,21 have described a higher risk of pneumothorax in patients with emphysema. However, others11,21 have found a correlation only with the severity of obstructive lung disease, as measured by percent of FEV1, and the need for chest tube placement. One of the most accepted factors thought to predict the risk of pneumothorax is the depth of the lesion from the pleural surface.2,11,13,17,21 However, traversal of aerated lung seems to play a major role in causing pneumothorax.22 Data16 suggest that the pneumothorax rate depends only on the traversal of aerated lung and not on the depth of the lesion. Another factor that may influence the pneumothorax rate is lesion size. Smaller lesions often require more manipulation of the needle within the lung parenchyma than larger lesions.11,16

A variety of different techniques have been postulated to reduce the risk of postbiopsy pneumothorax and/or chest tube placement. The techniques include simple postbiopsy precautions, such as recumbent positioning and refraining from coughing, vigorous conversation, straining, lifting, or sitting up unassisted.7 Slightly more active steps include the use of nasal oxygen and puncture-side-down positioning postprocedure.23 Performance of the CT-guided lung biopsy in an ipsilateral-dependent position has been described to be feasible and possibly advantageous in some cases.24 Interventions proposed to prevent pneumothorax but which have not been widely adapted include the use of a blood patch, Gelfoam (Pharmacia; Peapack, NJ), or tissue adhesives through the needle tract7,18,19 to prevent or reduce air leak after removal of the needle. Aspiration of a developing pneumothorax using an Angiocath (Becton Dickinson; Sandy, UT), a blunt needle, or short-term placement of a small-caliber chest tube7,15,25 have all been thought to diminish the necessity of admitting outpatients and avoiding placement of a large-caliber chest tubes. Use of a marker gas during manual aspiration of an iatrogenic pneumothorax has been described26 to predict whether the outcome will be successful or if a chest
tube will be required. The infrequent, but worrisome development of a large delayed pneumothorax remains a clinical dilemma.27

The simple postbiopsy precautions entail no expense and minimal inconvenience. Therefore, only a low level of proof should be necessary to support their adoption. More active preventive or management strategies that inconvenience the patient, utilize CT scanner time, or involve additional procedural steps must be held to a higher standard of proof.

The article in the current issue of CHEST (see page 1159) by Yamagami et al reviews their experience in performing 134 consecutive, real-time, CT-fluoroscopically guided needle biopsies of the lung. The majority of the procedures utilized both fine and core needles. The authors found a statistically significant relationship between lesion size and depth and the risk of pneumothorax. Postbiopsy pneumothorax developed in 34% of the study population. At the time of the procedure, if the pneumothorax was judged to be moderate or large, an 18-gauge Angiocath was inserted into the pleural space and the pneumothorax was aspirated using IV connecting tubing, a three-way stopcock, and a 50-mL syringe. This technique was initially described to be feasible and effective by Yankelevitz et al28 in a series of 17 patients. In the current series, 26 patients had small pneumothoraces that were not aspirated and 20 patients had moderate or large pneumothoraces that were aspirated. The duration of the manual aspiration was not specified. Chest tubes were ultimately required in 2.2% of the study population (three patients). Two of the patients had their pneumothorax aspirated immediately after the biopsy, and one patient had delayed enlargement of a small, nonaspirated pneumothorax. This rate of chest tube insertion is within the rate described in the literature—albeit at the low end.

Therefore, although the study clearly demonstrated the feasibility of aspirating pneumothoraces after percutaneous needle biopsy of the lung, the effectiveness and cost of the technique remain indeterminate. The authors speculate that the technique might be expanded to manually aspirate even small pneumothoraces in order to diminish the rate of progression. However, the current standard of observing small pneumothoraces is appropriate because the vast majority resolve spontaneously. Additionally, manual aspiration of a small pneumothorax is technically more difficult than the aspiration of moderate or large pneumothoraces and may inadvertently lead to additional pleural punctures. The present study is not prospective and not randomized. Further study of this clinically relevant management issue would be valuable. The efficacy of aspiration of postbiopsy pneumothorax in reducing the rate of hospital admission and chest tube placement has not yet been proven. Data from a prospective, randomized series specifically designed to answer this question are warranted.

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Linda B. Haramati, MD, FCCP
Bronx, NY

Galit Aviram, MD
Tel-Aviv, Israel

Dr. Haramati is Associate Professor of Radiology, Albert Einstein College of Medicine, and Director of Thoracic Imaging, Montefiore Medical Center, Bronx, NY; Dr. Aviram is Clinical Instructor of Radiology, Tel Aviv University, and Director of Thoracic Imaging, Tel Aviv Sourasky Medical Center, Tel Aviv, Israel.

Correspondence to: Linda B. Haramati, MD, FCCP, Department of Radiology, Albert Einstein College of Medicine, Montefiore Medical Center, 111 East 210th Street, Bronx, NY 10467; e-mail: lharamati@aecom.edu

REFERENCES


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The Web Also Wheezes

The impact of the World Wide Web (WWW) on patient information gathering has been profound and wide reaching, the full implications of which are just beginning to be understood. Since the beginning of our profession, imparting information to patients has been part of our duty as physicians. Therefore, it comes as no surprise that we have become more interested and more concerned regarding the information our patients are seeing while touring the information superhighway. In this issue of CHEST (see page 1301), Croft and Peterson report on the quality of on-line asthma information. They find a rather wide variation in quality and application of medical journalism standards. Furthermore, they confirm a previously established conclusion from the printed medical literature that publications from academic centers do not guarantee quality. The authors also identify the paucity of asthma Web sites exhibiting the best of the WWW technology, including images, animation, and streaming multimedia. For those early adopters of broadband technology, there is a growing recognition that the best of the WWW is yet to come. Broadband technology truly transforms the on-line experience so that interactive-television video conferencing and virtual meetings become a reality.

The concerns addressed by the authors of this manuscript have previously been noted. The book, Silicon Snake Oil: Second Thoughts on the Information Highway, was among the earliest to express reservations as to the validity of on-line information. These authors suggested that the information superhighway was at a stage of development akin to the typical untamed frontier industries of pornography and gambling. However, as we transition from the infancy to the adolescence of the WWW, various organizations have appeared to propose quality standards and codes of on-line medical information in an effort to protect professionals and consumers alike from the sometimes disorienting hyperlinked environment of the WWW that may place conjecture next to tested fact with nary a sign of the distinction.

These growing efforts at an on-line Fleischner Report include the Health on the Net Foundation (HON) and the Internet Healthcare Coalition, and are worth the review of all clinicians. These codes of on-line medical journalism include the following elements: (1) authority, (2) complementarity, (3) confidentiality, (4) attribution, (5) justifiability, (6) transparency of authorship, (7) transparency of sponsorship, and (8) honesty in advertising and editorial policy. It is important to understand each of these elements.

The following definitions are from the HON principles of conduct. Authority speaks to the need that any medical or health advice provided on a WWW site should be given by a medically trained and qualified professional unless clearly designated otherwise. Complementarity indicates that information provided on a health-care site is designed to support and not replace the patient-physician relationship. Confidentiality of data relates to individual patients visiting a Web site, including their identity, which must not be disclosed. Confidentiality standards vary between states and countries, therefore the Web site must meet or exceed the confidentiality standards of the