Angulated Fluoroscopy with Light Localizer in Percutaneous Lung Biopsy*

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For the past six years, three remotely controlled fluoroscopic units equipped with rotating cradles and overhead tube light localizers have been used for percutaneous lung biopsies under fluoroscopic control with angulation of the fluoroscopic beam and rotation of the patients in a rotating cradle. The purpose of using this equipment was to plan our biopsy procedures traversing a minimum distance through lung tissue, avoiding interfering or vital structures. The addition of light localizer directed needle guidance further shortened the procedure and reduced the need for fluoroscopically guided needle redirection.

The result in our small series was a low complication rate, expeditious performance of the procedure, and a reasonable percentage of positive studies.

Methods

Preprocedure studies included plain chest x-ray films. In approximately one third of the cases, conventional tomography was also utilized to determine depth and location. In some cases, computed tomographic studies were also used in planning the procedure.1,2

Angulated fluoroscopy was utilized in the following manner: the appropriate imaging modalities were assessed to determine the shortest path to the lesion and avoidance of interfering structures. Under fluoroscopic guidance, the patient was turned in the cradle and the tube angulated, keeping the lesion centered to avoid parallax until the safest short path to the lesion was visualized and the skin marked. After the biopsy needle was advanced through the pleura into the lung parenchyma for approximately half the total path length, the radiologist-operator then performed fluoroscopy from the control booth. If proper alignment of the needle based on superimposition of the needle hub, tip and mass was observed, it was advanced blindly during breath holding until the lesion was felt to be entered or the predetermined depth was reached. If the needle was not "on target," the patient and/or fluoroscopic tube was reangulated from the control booth during fluoroscopy until the hub of the needle was projected over the tip. If these were also aligned with a lesion (Fig. 1, lower), the needle was advanced into the lesion. If not, the needle was redirected and the hub-tip superimposition again performed.

In approximately the last 20 cases, the overhead tube light localizer served as an ongoing guide for needle alignment using the hub-puncture site superimposition of the needle light shadow in place of fluoroscopy. Since the properly adjusted light localizer emits light following a path identical to that of the fluoroscopic beam, it may substitute for fluoroscopy. The light shadow of the needle may therefore substitute for the fluoroscopic image of the needle. When positioned properly, the shadow of the needle hub, fluoroscopic image of the needle, point of entrance in the skin, needle tip, and structure to be punctured should all be coaxial and aligned. Using the light localizer, fluoroscopy therefore may be kept to a minimum.

Eighteen gauge disposable spinal needles, 20 gauge Westcott9 or 22 gauge Rotex II1 needles were used. One or two passes were employed.

Entrance into the lesion was confirmed by "feel," or occasionally, by moving the fluoroscopic tube through an arc of up to 80° in a cephalocaudal direction, thereby creating virtually right angle projections without moving the patient.10

Following the procedure, in most cases only a postprocedure 35 x 43 cm supine expiratory chest film at 135 cm TFD was obtained with the fluoroscopic unit, since all patients were inpatients.

Forty one percutaneous lung biopsies were performed from 1980 through early 1986 using this method. Informed consent for the procedure was obtained from all patients after explaining the risks, complications, and alternatives.

All lesions were located in the lung, including lesions beneath the clavicle and scapula, and below the dome of the diaphragm on supine and prone fluoroscopy.

Results

Of the 41 patients studied, 36 patients had cytologic or histologic confirmation of malignancy. Approximately one half of these had histologic material. Of the remaining five, blood was recovered in one patient, lung tissue in one patient, and no tissue in three.

Three patients developed a pneumothorax. Chest tubes were utilized in two of these.

There were no known instances of hemoptysis or other complications in the post biopsy period of observation in the radiology department.

Discussion

The use of angulated fluoroscopy makes it possible to avoid interfering structures such as ribs,8 the clavicle, the scapula, the dome of the diaphragm, and the left ventricle. Others have utilized a hand driven rotating cradle,4 angulated fluoroscopy without a cradle during lung biopsy,4 and the axial aiming
method." However, to our knowledge, the use of the light localizer as a substitute for fluoroscopy in conjunction with the axial aiming method has not been described previously. By using the shadow cast by the hub of the needle over the point of entrance of the needle for guidance as a substitute for fluoroscopy, the amount of fluoroscopy time has been markedly reduced. Because this method has also been used fairly extensively by us for other fluoroscopically guided biopsy procedures, percutaneous nephrostomies, percutaneous transhepatic cholangiography, shoulder and other arthrography, and lumbar punctures for myelography, the radiologists employing this equipment are very familiar with its use, permitting rapid accurate placement of the needles for percutaneous lung biopsy with very minimal fluoroscopic time.

The ability to rotate the patient and angulate the fluoroscopic tube can fully utilize the information obtained from CT studies in planning the biopsy approach. Furthermore, with our technique, it is possible to subsequently reevaluate the needle-mass relationship through a compound angle change during the procedure to decide on the need for needle redirection, thereby reducing the needle manipulation and consequent complications.1,2,8,10,11

Other advantages to this method include the fact that the operator receives no radiation because the small amount of fluoroscopy required can be performed from the control booth, with the light localizer used for most of the guidance.

Total procedure time has been about ten minutes per case exclusive of preprocedure planning. The use of remotely controlled fluoroscopy together with the light localizer has actually reduced the procedure time and simplified the study for experienced operators with this equipment.

The positive yield appears to be in line with other studies, and the complication rate has been low in this small series.4,10,12

References