Percutaneous lung biopsy with a fine bore cutting needle (Vacu-Cut): improved results using drill technique

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Abstract

Background - Percutaneous transthoracic needle biopsy is used in the diagnosis of pulmonary and pleural lesions. The standard procedure using the Vacu-Cut cutting type of needle is the "thrust" technique in which the needle is rapidly forced through the lesion. In our experience this technique has a low yield of histological biopsy specimens. The diagnostic yield of a new biopsy technique ("drill" technique) using the Vacu-Cut needle was assessed.

Methods - The series comprised 29 consecutive patients, 23 with localised peripheral pulmonary lesions and six with pleural lesions. The Vacu-Cut 1.2 mm needle was rotated and drilled by hand through the lesion.

Results - Biopsy specimens 4–30 mm long were obtained in 20 of the 23 patients with pulmonary lesions; in three patients material was available for cytological examination only. The diagnostic yield in the 18 malignant pulmonary lesions was 89% and in the five non-malignant lesions 80%. Biopsy specimens 10–30 mm long were obtained in all patients with pleural lesions. The diagnostic yield in the four malignant and two non-malignant lesions was 100%.

The total diagnostic yield in malignant lesions was 20 of 22 patients and in non-malignant lesions six of seven patients. The diagnostic yield in the entire series was 26 of 29 patients (90%). Pneumothorax occurred in seven of the patients and three needed a chest tube. There was no haemoptysis and no deaths.

Conclusions - The drill technique has a high diagnostic yield in both malignant and non-malignant pulmonary and pleural lesions, and is suggested as the ideal biopsy technique when using the Vacu-Cut needle.

Keywords: lung cancer, lung neoplasm, needle biopsy of the lung.

Percutaneous transthoracic needle biopsy (TNB) of the lung is a frequently used diagnostic procedure in patients with localised peripheral pulmonary and pleural lesions. Small bore needles have been designed for cytological aspiration biopsy and larger cutting needles for histological biopsy. Our results of lung biopsies using the Vacu-Cut needle (Angiomed, D-75 Karlsruhe) have already been reported. This needle was designed to obtain biopsy specimens for histological examination. According to the designers the operator should thrust the needle through the pulmonary lesion but, although used as recommended, we obtained biopsy specimens for histological examination in only a few procedures. In order to increase the yield of histological biopsies a new biopsy technique was developed in which the needle was drilled through the lesion.

Methods

Twenty nine consecutive patients (20 men) of median age 61 years (range 45–79) with solitary pulmonary (n = 23) or pleural lesions (n = 6) were included in the study. The median diameter of the pulmonary lesions on a posteroanterior chest radiograph was 40 mm (range 10–100) and the median distance from the inside of the thoracic wall to the periphery of the lesions was 40 mm (range 0–100). The
Percutaneous lung biopsy with a fine bore cutting needle (Vacu-Cut) thickness of the pleural lesions on a postero-anterior or lateral chest radiograph was a median of 8 mm (range 5–10).

The indications for TNB followed the recommendations of the American Thoracic Society. All biopsies were performed under local anaesthesia by the same operator using a Vacu-Cut needle with a diameter of 1-2 mm and a length of 200 mm (figure), yielding a vacuum assisted full cut biopsy specimen. The biopsy principle is a modified Menghini technique. Guided by fluoroscopy in anteroposterior and lateral projections, the needle, with its trocar inserted, is introduced through the thoracic wall. When contact is made with the lesion the patient is instructed to hold his breath. The trocar is retracted in order to establish a vacuum in the needle, and the needle is then rotated and drilled by hand through the lesion. The drilling motion is created by rotating the needle to and fro between the thumb and index finger. After the needle has been retracted the biopsy specimen is pushed out with the trocar and placed on a filter paper. If material for cytological examination is available smears are prepared on glass slides. One biopsy pass was performed in five patients, two in 22 patients, and three in two patients.

A chest radiograph was routinely taken the following day in order to check for pneumothorax.

Results
PULMONARY LESIONS
In a total of 43 biopsy passes 31 histological biopsy specimens (tissue cylinders) with a median length of 20 mm (range 4–40) were obtained in 20 of 23 patients. In three patients material was available for cytological examination only.

Eighteen patients had a final diagnosis of malignancy (six adenocarcinoma, four squamous cell carcinoma, three metastatic carcinoma, two unspecified carcinoma, one each of bronchioalveolar cell carcinoma, B cell lymphoma, plasmacytoma). In 14 of these patients histological examination of the biopsy specimens disclosed malignancy, and in two the cancer was diagnosed by cytological examination. The overall diagnostic yield for malignancy was 16 of 18 patients.

Five patients had non-malignant lesions (neoplastic sarcoïd granulomatosis, sarcoidosis, Wegener’s granulomatosism, hamartoma, fibrosing pneumonia). A correct diagnosis was obtained by histological examination in four of these patients. The procedure was non-diagnostic in the patient with pneumonia in whom no biopsy specimen was obtained on two passes.

In total, a clinically relevant diagnosis was obtained in 20 of 23 patients.

PLEURAL LESIONS
In a total of 12 biopsy passes 10 histological biopsy specimens (tissue cylinders) with a median length of 15 mm (range 10–30) were obtained from all six patients. Four patients had malignant lesions (two mesothelioma, two adenocarcinoma), and in all these histological examination disclosed malignancy. Two patients had non-malignant lesions (one fibrosis, one post-traumatic organising haematomata); a correct diagnosis was obtained by histological examination in both patients. Thus, a clinically relevant diagnosis was obtained in all six patients.

COMPLICATIONS
Pneumothorax was observed in seven of the 23 patients with pulmonary lesions and in one of the six patients with pleural lesions – that is, in total eight of 29 patients (28%) developed a pneumothorax. Of these, five patients managed without treatment while three with pulmonary lesions required a small bore chest tube. No haemoptysis or mortality was observed.

Discussion
Fine bore needles used for TNB are designed to yield cytological biopsy specimens. In most cases cytological examination is sufficient to identify malignant cells in the lesion, but often the specific type of cancer cannot be classified. Likewise, the diagnostic yield from cytological examination in non-malignant lesions is very low.

Cutting needles provide biopsy specimens for histological examination, giving the pathologist the opportunity to use special staining techniques to classify the tumour. In non-malignant lesions histological examination is necessary to make a reliable diagnosis.

The Vacu-Cut 0.95 mm needle was described by Köhler et al in 1987. The authors used a guide needle to introduce the Vacu-Cut. The biopsies were taken with the thrust technique and specimens for histological examination were obtained in 44 of 49 patients, giving a diagnostic yield of 90% in the entire series (33 malignant, 11 non-malignant). The diagnosis in eight patients was unspecified inflammation.

In a retrospective study of TNB with the Vacu-Cut 1.2 mm needle involving two operators (including the present author) both using the thrust technique, the diagnostic yield in malignant lesions after one biopsy pass was 67%, almost exclusively by cytological examination. Due to the overall scarcity of specimens for histological examination the Vacu-Cut did not yield a diagnosis in patients with benign lesions. In another series (Milman N, unpublished data) using the thrust technique the diagnostic yield in malignant lesions was 16 of 24 patients (67%), almost exclusively by cytology, and the total diagnostic yield (malignant + non-malignant) was 16 of 28 patients (57%).

In the present series biopsy specimens for histological examination were obtained in 31 of 55 of the biopsy passes. The diagnostic yield in malignant lesions was 20 out of 22 patients, and in non-malignant lesions six out of seven patients. The diagnostic yield in the entire series was 26 of 29 patients (90%), which is
Single lung transplantation for end stage emphysema

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Abstract

**Background** – The first successful single lung transplantation was carried out in 1983 for pulmonary fibrosis. Because of the inherent advantages of single lung transplantation, a transplantation programme has been started for patients with end stage lung disease due to emphysema.

**Methods** – Between October 1990 and August 1993 25 patients with severe emphysema (15 men, mean age 51 years) received a single lung transplant at our institution. All patients were severely disabled with a mean (SD) 12 minute walking distance of 281 (165) metres. There were five deaths in the series, four in the first 20 days and one on day 503. Two patients suffered graft compression by air trapping in the native lung. Bronchial narrowing requiring insertion of endobronchial stenting occurred in four patients.

**Results** – Mean (SD) FEV₁, improved from a preoperative value of 17·8(13)% predicted to a six month value of 53·6(13)% and FEV₁/FVC from 23·8(12)% to 68·6(15)%.

After the transplant 12 patients are in New York Heart Association (NYHA) class I and the rest of the survivors are in NYHA II. Actuarial survival was 82% at one year and 74% at three years.

**Conclusions** – Single lung transplantation is an effective treatment for end stage lung disease due to emphysema and carries an acceptable mortality and morbidity.

(Thorax 1995;50:562–564)

Keywords: single lung transplantation, emphysema.

Since 1983 single lung transplantation has been an acceptable form of treatment in patients with end stage lung disease due to pulmonary fibrosis. Because of its inherent advantages over other forms of lung transplantation, namely the ability to treat twice the number of patients and the avoidance of cardiopulmonary bypass in most patients, we have embarked on a programme of single lung transplantation in patients with emphysema.

**Methods**

**SELECTION CRITERIA**

Patients selected for transplantation had reached the end stage of their disease and were beyond the scope of any further medical treatment with a short life expectancy. Exclusion criteria included chronic infection assessed by repeated sputum culture, and bronchiectasis identified by high resolution computed tomographic scans. Patients had to have adequate cardiac function as determined by echocardiography without any significant coronary disease (men over 40 and women over 45 underwent coronary arteriography).