THE CHIBA NEEDLE FOR PERCUTANEOUS LUNG BIOPSY

W S Chin, I Sng

ABSTRACT

In the diagnostic work-up of lung lesions, percutaneous aspiration biopsy using a fine needle has gained wide acceptance. The very fine simple Chiba needle is recommended as the needle of choice. This is based on a personal experience of 440 patients. The diagnostic accuracy is very comparable to published series in which needles of larger sizes and specialised makes were used. In addition, the complications from this simple universal needle are milder and lower in incidence.

KEY WORDS: Biopsies (technique), lunge neoplasm, lung biopsy.

SING MED J. 1988; 29: 371-373

INTRODUCTION

Percutaneous lung biopsy by needle aspiration has been firmly established as an excellent procedure for histologic and bacteriologic verification of pulmonary lesions[1, 9], including hilar and mediastinal masses[10,11]. It is particularly useful in the confirmation of lung malignancy with an accuracy well above 80%. Needles of various make and sizes are being used in the attempt to obtain an aspirate large enough for cytologic diagnosis and cell typing. The objective is to use the smallest needle in achieving the highest accuracy and lowest complications rate and extra fine needles for aspiration biopsy[12,14] are now favoured.

We wish to report a very satisfactory personal experience using the very fine Chiba needle[15] and to advocate the use of this needle for routine percutaneous aspiration lung biopsy for suspected malignant mass lesions.

PATIENTS AND METHOD

This is a personal series by the authors undertaken at the Singapore General Hospital, Mount Elizabeth Hospital and The Diagnostic X-ray Centre from July 1977 to December 1985. Clinical colleagues were invited to refer cases which were clinically or radiologically suspected of lung malignancy. The service gained appreciation quickly as the results were very rewarding right from the begining[16]. Later, suspected infective lesions were also referred for both bacteriological confirmation and the exclusion of malignancy. There was no selection of patients and even those with chronic lung disease were accepted. The end result was based on cytological or bacteriologic identification which formed the basis for immediate treatment. An attempt was also made to cell type the malignancy since the aspirate was found to be adequate. The rate of false positive diagnosis is presumed to be negligible and positive cytologic diagnosis was considered definitive and led directly to treatment. It was impractical under our circumstances to countercheck our results with long-term follow-up or histological proof from surgery or autopsy.

There were 440 patients with 320 males and 120 females. They were in the older age group with 74% above 50 years and 53% of the total case were above 60 years. A wide range of lesion size and distribution in the lungs were encountered. Lesion size 0-2 cm (32 case) > 2.4cm (163), > 4-6cm (130), > 6 cm (115). The distribution was right upper zone 94 cases, right mid-zone 69, right lower zone 55, left upper zone 66, left mid-zone 48, left lower zone 32, right hilum-right paramediastinum 30, left hilum-left paramediastinum 16, right apex 15, left apex 15. Ten patients had a repeat biopsy because of a poor yield, non-cooperation or equivocal result.

The Chiba needle was employed because of its fine make. It is currently the needle of choice in percutaneous transhepatic cholangiography. It is a simple, flexible, thin-wall spinal-type needle of 0.7 mm outer diamer and 0.5 mm inner diameter with a bevel angle of 30°.

The method is essentially similar to the modern technique of percutaneous aspiration lung biopsy expounded by Dahlgren and Nordenstrom[2] in 1966. Because discomfort is so minimal, sedation is almost never given. The lesion is localized by fluoroscopy and a direct vertical approach with the shortest distance to the lesion is used. Apical lesions are biopsied in the prone position to avoid the brachial plexus. The needle is advanced in a smooth swift stroke during suspended respiration. It was not the practice to advance the needle in steps with intermittent fluoroscopy. The depth is judged and contact with the lesion is realised on feeling the change in resistance. The position is also confirmed by the principle of parallax. Biplane fluoroscopy is ideal in confirming the position of the needle tip but is not necessary. However, it is of immense help in small soft tumours. The stylet is removed and with a 20 c.c. plastic syringe tightly attached, strong manual suction is applied continuously as the needle is moved back and forth with rotation 4 to 6 times over a distance of 1 to 3 cm. Suction is then released and the needle swiftly removed. Respiration is suspended whenever the needle is moved.

The aspirated material is expressed onto glass slides to make direct smears which are immediately fixed in 95% ethyl

The Diagnostic X-Ray Centre
300 Orchard Road
#05-03 The Promenade
Singapore 0923

W S Chin MD, DMRD, FRCR

Department of Histopathology
Singapore General Hospital
Singapore 0316

I Sng, MBBS, FRCPA, Senior Consultant Pathologist

Correspondence to: Dr Chin

alcohol. On occasions where fragments of tissue or blood clot are of appreciable size, they are placed in buffered formalin and submitted for paraffin embedding and tissue sections. The direct smears are stained with Papanicolaou stains and cytologically examined for the presence of malignant cells. Where the lesion is suspected of being infective, some of the smears are stained for the identification of micro-organisms e.g. acid fast bacilli or fungi, using the Ziehl-Nielsen stain or Periodic Acid Schiff stain respectively. Aspirate diluted with saline can also be sent for bacteriologic culture.

The patient is fluoroscoped for complications immediately after the biopsy. For an out-patient, an erect chest film is taken before discharge after 1-3 hours observation. In-patients are observed and discharged the next day after a chest x-ray. The biopsy was practically performed on an out-patient basis in the latter half of the study. The patient was only admitted if the post-biopsy pneumothorax was worrisome.

RESULTS

The aim of cytologic evaluation was firstly to confirm the presence of a malignant neoplasm and secondly to determine the cell type of the tumor.

A cytologic diagnosis of malignancy was made in 278 patients or 63% of the total number of 440 patients (Table 1). In 16 cases there was cytologic suspicion of malignancy present but the material aspirated was inadequate for a confident diagnosis of malignancy and a diagnosis of "suspicious for malignancy" was made. The remaining 146 patients were found to have benign lesions with the majority of an inflammatory nature. Eighteen of these inflammatory cases showed the presence of acid-fast bacilli indicating the lesion to be tuberculous in nature. There were three fungal coin lesions; two were cyptococcosis and one aspergillosis. Other benign conditions included a sclerosing hemangioma, a pleuro-pericardial cyst and a localized herniation of liver tissue. Thus a confident diagnosis could be made in 96% of cases evaluated of which 63% of the total number turned out to be a primary or secondary lung malignancy.

An attempt at histologic typing (Table 2) was made in every case where a malignant diagnosis was made. The evaluation criteria of the histologic type of cells were based on cytological criteria elucidated by Koss[17] and Johnston and Frable[18,19]. The cytologic type of well differentiated squamous cell carcinoma and small cell undifferentiated carcinoma were identified without much difficulty. However, as in other series[20] more difficulty was experienced in attempting to type cells which lacked sufficient differentiation to determine whether they were derived from large cell carcinoma, adenocarcinoma, or poorly differentiated squamous cell carcinoma.

Table 1.
ASPIRATION LUNG BIOPSY — RESULTS

Cytologic Diagnosis	Number of Cases (%)
Malignant tumor	278 (63%)
Suspicious for malignancy	16 (4%)
Benign and inflammatory lesions	146 (33%)
Total	440 (100%)

Table 2.
ASPIRATION BIOPSY RESULTS ACCORDING TO TUMOR TYPE.

Cytologic Typing of Malignant Tumor	Number of Cases
Squamous cell carcinoma	97
Small cell undifferentiated carcinoma	27
Large cell undifferentiated carcinoma	44
Adenocarcinoma	28
Carcinoma, type not specified	74
Plasma cell myeloma	3
Malignant Lymphoma	2
Soft tissue tumor	2
Carcinoid	1
Total	278

In spite of the older age group of patients encountered, complications were relatively minor in severity and incidence. Seventy-one patients (16.1%) suffered a pneumothorax, the majority of which were small and asymptomatic except for 9 patients who were treated with a chest tube (2% of all patients). Thirty (6.8%) patients had transient minor hemoptysis. There was minor pneumonediastinum with subcutaneous emphysema in one patient whose biopsy was performed in the left hilar area. All the patients tolerated the biopsy very well and most were surprised it was that quick and not uncomfortable.

CONCLUSION

The advantages and accuracy of needle aspiration biopsy of

Table 3.
INCIDENCE OF PNEUMOTHORACES

Publications (Reference No.)	No. of Patients	Needle Size	% Pneumothoraces (% Pneumothoraces Treated)
Sargent et (8)	350	16G, 18G	26.6 (7.3)
Castellino and Blank (1)	82	18G	26 (13)
Lalli et al (4)	1223	18G	24.2 (4.4)
Poe and Tobin (5)	95	18G Rotex	35 (5.8)
Sinner (6)	2726	19G, 20G	27.2 (7.7)
Flower and Verney (9)	287	19g, 20G, Rotex	27 (7)
Wescott (77)	422	20G	27 (10)
Zornoza et al (14)	100	22G	14 (0)
Zavala and Schoell (13)	50	24G, 25G	8 (4)
Present Series	440	22G	16.1 (2)

peripheral or central lung lesions are now well known. In a nation-wide survey on closed biopsy techniques, which included tissue core, trephine, bronchial brush and transbronchial biopsies, Herman and Hessel[3] found aspiration biopsy to be the procedure of choice for evaluating neoplastic and inflammatory lung lesions. In the diagnostic work up for malignancy, this is of great time-saving potential when used early[12]. The majority of workers using this procedure believe it is the quickest, least painful and most economical way of establishing a diagnosis histologically. The diagnosis is available within hours and the biopsy can be repeated within the same day if the result is equivocal. The choice of a very fine needle has by now gained wide acceptance. We strongly recommend the fine Chiba needle for the investigation of lung carcinoma and to extend its use to cover infective lesions for specific bacteriologic confirmation.

The biopsy is well tolerated with relatively low complication rate and severity. The quantity of aspirate was found to be sufficient for a confident cytologic diagnosis and even cell typing. The flexibility of the fine needle is not a problem after some experience. Our results are very comparable to those reported in the literature using other needles and with the added advantage of less and milder complication (Table 3).

The biopsy can be performed on an outpatient basis in the majority of patients.

ACKNOWLEDGEMENT

To our clinical colleagues in Singapore for referring patients to us.

REFERENCES

1. Castellino RA, Blank N: Etiologic diagnosis of focal pulmonary infection in immunocompromised patients by fluoroscopically guided percutaneous needle aspiration. Rad 1979; 132: 563-7.
2. Dahlgren S E and Nordenstrom B: Transthoracic Needle Biopsy., Chicago, Year Book Medical 1966.
3. Herman G H, Hessel S J: The diagnostic accuracy and complications of closed lung biopsies. Rad 1977; 125: 11-4.
4. Lalli A F, McCormack L J, Zelch M et al: Aspiration biopsies of chest lesion Rad 1978; 127: 35-40,
5. Poe RH, Tobin RE: Sensitivity and specificity of needle biopsy in lung malignancy. Am Rev Respir Dis 1980; 122: 725-9.
6. Sinner W N: Pulmonary neoplasm diagnosed with transpthoracic needle biopsy. Cancer 1979; 43: 1540-53.
7. Westcott JL: Direct percutaneous needle aspiration of localized pulmonary lesions "Results in 422 Patient". Rad 1980; 137: 31-5.
8. Sargent EH, Turner AF, Gordonson J, et al: Percutaneous pulmonary needle biopsy. Report of 350 patients. AJR 1974; 122: 758-68.
9. Flower CDR and Verney GI: Percutaneous needle biopsy of thoracic lesions — An evaluation of 300 biopsies. Clin Radiol 1979; 30:215-8.
10. Westcott JL: Percutaneous needle aspiration of hilar and mediastinal masses. Rad 1981; 141: 323-9.
11. Roseberger A, Adler O: Fine needle aspiration biopsy in the diagnosis of mediastinal lesions. AJR 1978; 131: 239-42.
12. Jereb M, US-Krasovec M: Thin needle biopsy of chest lesions: Time-saving potential. Chest 1980 78: 288-90.
13. Zavala D C, Schoell J E: Ultrathin needle aspiration of the lung in infectious and malignant disease. Am Rev Respir Dis 1981; 123: 125-31.
14. Zornoza J. Snow J, Lukeman J M, Libshitz H I: Aspiration biopsy of discrete pulmonary lesions using a new thin needle. Rad 1977 123: 519-20.
15. Okuda K, Tanikawa K, Emura T, et al: Nonsurgical percutaneous transhepatic cholangiography — diagnostic significance in medial problems of the liver. A M J Dig Dis 1974; 19: 21-36.
16. Chin W S, Sng Ivy T Y: Percutaneous aspiration biopsy of malignant lung lesions using the Chiba needle. An initial experience. Clin Radiol 1978. 29: 617-9.
17. Koss L G: Diagnostic Cytology and its Histopathologic bases, J B Lippincott 1979.
18. Johnsont W W, Frable W J: The cytopathology of the respiratory tract. A review. Am J Pathol 1976 84: 372-414.
19. Johnstone W W, Frable W J: Diagnostic respiratory cytopathology. Masson Publishing USA, Inc 1979.
20. Kanhouwa S B, Matthews M J: Reliability of cytologic typing of lung cancer. Acta Cytol 1976 20: 229-32.