COMPUTERISED TOMOGRAPHY GUIDED TRANSTHORACIC ASPIRATION BIOPSY

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ABSTRACT

We report our experience of 32 patients, which were subjected to Computerised tomography (CT) guided transthoracic fine needle aspiration biopsy (T-FNAB) with particular reference to technique, sensitivity and complication rate following the procedure. The biopsy aspirate was obtained either using a spinal or a Chiba needle. Pneumothorax occurred in 7 patients and transient postbiopsy haemoptysis in 2 patients. None of the patients with pneumothorax or haemoptysis required any treatment.

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KEY WORDS : CT guided biopsy; Transthoracic aspiration biopsy.

Introduction

CT guided T-FNAB is indicated for sampling of nodules for neoplasm or infiltrate for infectious agents. Sinner et al [1] stated that percutaneous biopsy can expedite surgical treatment. Obviously, confirmation of malignancy, metastatic or recurrent tumours is very important. In primary nodule, aspiration biopsy can distinguish small cell tumours from non small cell tumours. Many oncologists believe that small cell tumours should be treated medically rather than surgically [2].

In case of pulmonary infiltrate when the causative organism is unknown, diagnostic aspiration can obtain material for culture that can distinguish among pyogenic, fungal or opportunistic organisms. Parenchymal lesions well suited for CT biopsy also include those lesions with ill-defined edges because of the better contrast resolution on CT scans [3].

Material and Methods

During an eight month period 32 patients (26 males and 6 females) with pulmonary, pleural or mediastinal masses or focal infectious lesions were subjected to CT guided T-FNAB. The procedure was explained to the patient prior to the appointment. Uncooperative, dyspnoeic or patients having uncontrollable cough were not considered for the procedure because movement of the lung during the procedure may cause a tear of the lung by the needle that might cause air embolism, pneumothorax or bleeding. Biopsy needle used was disposable 20/21 gauge 70 or 89 mm spinal or & 7"(178 mm) Chiba needle depending on the depth of the centre of the lesion.

Technique

A formal signed consent was obtained for the procedure. The

patients were subjected to supine CT scan chest from apices to lung bases with 10 mm sections on Siemens Somatom HiQ, additional 5 mm sections were taken with the patient in appropriate position to identify the most direct approach to the lesion. The tentative entry site for biopsy was selected, with an aim to have alignment of the needle in a vertical plane so that the entire needle path could be obtained in the scanning plane. In case of small peripheral lung lesions with overlying rib or costal cartilage, the direct access to the lesion could not be achieved when scanned with the gantry in vertical position. In these cases gantry tilt was used. The degree of gantry tilt depended on the body habitus and the lesion. This allowed better access to the lesion through the intercostal space by keeping the alignment of the needle parallel to the gantry.

Following selection of tentative entry site, patient was rescaned with skin markers which consisted of multiple parallel placed hypodermic needles at several mm interval held by adhesive plaster (Fig-1). For successful biopsy procedure the final entry site and trajectory was selected in relation to the hypodermic needles and the entry point marked on the skin. Once the entry site was selected, taking adequate antiseptic precautions, local anaesthetic agent was infiltrated through the subcutaneous tissues and down to and including the pleura. Adequate anaesthesia of the pleura makes the procedure pain free and permits insertion of the needle without the patient moving. The biopsy needle was then inserted through the entry point in the direction of the lesion into the superficial tissue extending upto the pleura. At this stage a scan was made centering over the needle to verify its position and direction (Fig-2). Once the correct trajectory was determined the needle was inserted to the correct depth, scan was repeated to confirm the position of needle tip within the lesion (Fig-3). In case the needle was seen within the lesion aspiration sample was obtained using a FNAB holder to provide adequate negative pressure. However, in case the needle was not seen within the lesion inspite of minor manipulation, it was pulled out and the procedure was repeated to avoid going again into the same needle tract. Two passes into the lesion were usually required but if there was development of pneumothorax no further passes were made. The pa-

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Fig. 1 : CT scan section with skin markers to select final entry site and trajectory for biopsy.

Fig. 2 : The biopsy needle is seen inserted through the superficial tissues and extending up to the pleural surface for final assessment of trajectory.

thologist or his staff was available at the time of biopsy to make smears on slides or take samples for culture. A CT section was taken on completion of procedure at the level of biopsy to check for pneumothorax or parenchymal bleed. All patients were subjected to X-ray chest after 4 hours of the procedure to look for extension of an existing pneumothorax or the development of a delayed one.

Results

The details of age, sex, biopsy results and complications were recorded (Table 1-4). 26 males and 6 females (Table-1) were studied between the age 21 to 70 years (average age 48.2 years). All biopsies were successful except one (Table-3), a case of peripheral nodular lung lesion, which resulted in pneumothorax pushing the nodule medially prior to obtaining the biopsy aspirate. The procedure was terminated and the patient failed to report later. The incidence of pneumothorax was seen in 7 cases ie. 21.9% (Table-4). All cases of pneumothorax occurred at the time of biopsy, they

Fig. 3 : Shows the accurate placement of tip of biopsy needle within the mass.

Fig. 4 : CT scan section with patient in prone position shows a large nodular cavitating lesion with normal lung parenchyma posterior to the lesion.

were small, and there were no delayed episodes. None of the patients with pneumothorax required pleural drainage. Transient postbiopsy haemoptysis occurred in 2 patients ie 6.3% (Table-4). It was fresh blood, small in quantity (<5ml) in both the patients and occurred immediately after the biopsy, no treatment was required and there was no delayed episode of haemoptysis. Localized haemorrhage in the lung parenchyma occurred following the biopsy in 8 patients (25%) but was of no significance (Fig-4,5). Small localized surgical emphysema at puncture site was seen in one case which resolved on its own (Table-4).

TABLE 1

Age distribution in years

< 40	40-60	60 and above	Total
10	13	9	32

Fig. 5 : Same case as in fig. 4, the needle tip is in the wall of the cavitating lesion, which should be ideally targeted for best results. The infiltrate adjacent to the needle represents parenchymal haemorrhage secondary to the biopsy. This patient had mild postbiopsy haemoptysis (< 5 ml).

Fig. 6 : CT scan in right decubitus position, the needle tip is seen in the lesion, there is pneumothorax adjacent to the lesion seen as complication of biopsy.

TABLE 2

Sex distribution

Male	Female	Total
26	6	32

Discussion

The sensitivity of the technique in diagnosis in our series was close to levels reported in literature [3,4]. The incidence of pneumothorax in this study was 21.9%, which is quite comparable to that reported by Brown as 25% [4]. The indication for transthoracic

TABLE 3

Biopsy results

Biopsy result	No. of patients
Bronchogenic carcinoma	9
Metastasis	5
Tuberculous	7
No malignancy	3
Fungal	3
Hamartoma	1
Hydatid cyst	1
Abscess	1
Haematoma	1
Failed	1
Total	32

Fig. 7 : Patient in prone position, the needle tip seen in mediastinal node.

Fig. 8 : CT scan section shows a nodular peripheral lung lesion (with bronchiole dilated with the nodule) underneath the overlying rib (0° gantry position).

Fig. 9 : Same case as fig. 8, with (-) 10° gantry tilt, this provided easy and direct biopsy path to the lesion through the intercostal space.

needle biopsy in patients with suspected chest malignancy is now well established [3]. The complications of haemoptysis and pneumothorax are well known. Air embolism and seeding of tumour along the needle track are rare complications [3], not observed in any case during this study. A patient who fails to hold breath on demand or is fidgety should not be considered for the procedure [3,5]. Patients with bleeding disorders can have coagulation abnormalities corrected as part of pre-procedure work up. Pulmonary hypertension usually places the patient at increased risk of haemorrhage but some authors [4,5] suggest that such patients can safely undergo the procedure. However, patients with advanced emphysema can undergo lung biopsy [5] with increased frequency of pneumothorax as a complication.

In some patients it can be difficult to get a direct needle path to the lesion, especially in case of small peripheral lung lesions with overlying rib or costal cartilage where the direct access to the lesion cannot be achieved, in these cases gantry tilt is most helpful. The degree of gantry tilt depends on the body habitus and the lesion. This allows better access to the lesion through the intercostal space [6]. Gantry tilt was used during this study in 2 cases, which provided direct

TABLE 4

Complication rate

Complication	No of patients	Percentage
Pneumothorax	7	21.9
Haemoptysis	2	6.2
Haemorrhage (parenchymal)	8	25.0
Surgical emphysema	1	3.1

access to the lesion, it often prevents traversing the lung tissue (Fig-8,9). CT section in a patient with peripheral lung nodule revealed bronchi leading into and dilated within the nodule (Fig-8) suggesting inflammatory etiology [7] and aspiration biopsy confirmed it to be a tuberculoma. If the nodule being biopsied contains an area of calcification, the calcified area should be avoided, if the nodule is cavitated the periphery should be targeted (Fig-5) for best results.

The use of CT enables the radiologist to plan an approach to the lesion with confidence avoiding large vessels and bullae and thereby reducing potential complications. It is a simple and reliable technique with real advantage of showing the exact position of the needle tip in the target lesion.

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