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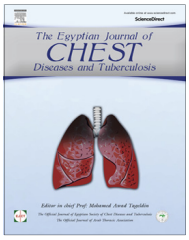

ORIGINAL ARTICLE

CT-guided biopsy versus conventional Abram's needle biopsy in malignant pleural effusion

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KEYWORDS

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Abstract *Objective:* We aimed to evaluate CT guided biopsy (CTGB) vs. standard closed pleural biopsy (CPB) in the histopathological diagnosis of the type of malignancy in patients with malignant pleural effusion.

Patients and methods: We studied 31 patients (21 male and 10 female) with malignant pleural effusion diagnosed by aspiration cytology and admitted to the medical ward of a general teaching hospital over a period of 1 year. Patients were randomized into two groups: group 1 (n = 16) underwent CTGB biopsy and group 2 (n = 15) underwent Abram's CPB. The diagnostic yield of both methods was compared.

Results: The mean age of patients was 54 ± 16 years. History of smoking was obtained in 15 (48.4%) patients. Dyspnea was reported in 22 (71%) and chest pain in 15 (48.4%). Malignant pleural effusion was left-sided in 17 (54.8%), and massive in 21 (67.7%) patients. Of note, CT imaging revealed parietal pleura as a tumor site in 20 (64.5%) patients. Pathological diagnosis of the type of malignancy was achieved in 14 (87.5%) of group 1 using CTGB and 6 (40%) of group 2 patients using Abram's CPB. The diagnostic value of CTGB was significantly higher than CPB (P = 0.009).

Conclusion: CT-guided biopsy was found to be a reliable and safe method in the histopathological diagnosis of malignant pleural effusion. Its diagnostic potential was much superior to the standard closed pleural biopsy.

Introduction

Pleural disease may present as focal pleural nodules or diffuse pleural thickening and could be due to benign or malignant etiologies. Effusion is frequently an early sign of pleural

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disease, and pleural fluid cytology is accepted as the first diagnostic test in the evaluation of unilateral pleural effusion [1].

Malignant pleural effusion (MPE) is a common complication and sometimes the initial manifestation of underlying intrathoracic, extrathoracic or far-advanced malignancies. Common cancer types causing MPEs include lymphomas, mesotheliomas, and carcinomas of the breast, lung, gastrointestinal tract, and ovaries. However, almost all tumor types have been reported to cause MPEs. The median survival after diagnosis of MPE is 4 months [2].

Standard pleural fluid cytology is a simple, safe and minimally invasive method to diagnose pleural malignancy. It could help to characterize up to 60% of malignant effusions [1]. However, in malignant mesothelioma, it is diagnostic in as low as 30% of cases [3]. Noteworthy, cytological evaluation of the pleural effusion has besides problems with sensitivity, difficulties with specificity because of limitations in differentiating between different types of cancer like adenocarcinoma, mesothelioma, lymphoma and non-malignant reactive lymphocytosis. Additional tests like assay of pleural fluid for tumor markers might improve the diagnostic yield of cytology. The diagnostic value of tumor markers for MPE, however, remains limited, with no single marker being sufficiently sensitive or specific to be introduced into routine practice [4]. Moreover, pleural fluid cytology sometimes fails to subclassify the malignant cell types, which is essential for further management of chemosensitive malignancies [5].

Pleural biopsy is still an important diagnostic tool in further characterizing the nature of pleural disease. Nonsurgical, percutaneous pleural biopsy in patients with pleural effusion was first described in the 1950s by Abrams and Cope [6,7]. This biopsy procedure can be performed at bedside, without any imaging for guidance. The use of the Abrams pleural biopsy needle has a sensitivity of up to 90% for the diagnosis of tuberculosis [8,9]. This high sensitivity rate is thought to be due to the diffuse nature of pleural involvement by tuberculosis, as opposed to the more patchy distribution demonstrated in malignant disease.

In malignant effusion, the diagnostic yield of blind pleural biopsy using Abrams or Cope needle is between 48% and 56%. The sensitivity for diagnosis of malignant mesothelioma is only 21–43%. Furthermore, the absence of pleural effusion precludes the safe deployment and use of these needles. Complications are encountered in up to 9.3% of patients and may include pneumothorax, hemothorax and vasovagal reaction [9].

Recently, image-guided biopsy of focal pleural nodules or diffuse pleural thickening has been advocated as the preferred method for diagnosis of both benign and malignant pleural diseases. It has a greater sensitivity for the diagnosis of malignant diseases compared with the Abrams biopsy and has been shown to be accurate in diagnosing malignant pleural mesothelioma [10]. Using CT or ultrasound (US) guidance, image-guided percutaneous biopsy allows a focal area of pleural abnormality to be sampled. Both CT and US can be used to localize the most suspicious area within the pleura, but the field of view for US is more limited than that of CT. Cutting needle biopsy is preferred over fine needle aspiration (FNA) because it has a higher sensitivity in the diagnosis of malignant pleural disease [10].

We aimed to assess the diagnostic yield of CT-guided pleural biopsy using a semi-automated biopsy gun versus the classic Abrams closed pleural biopsy in patients with malignant pleural effusion.

Patients and methods

We included 31 consecutive adult patients (age >18 years) with cytology-positive malignant pleural effusion. Patients were admitted to the department of Chest Medicine between May 2012 and June 2013. Patients with evidence of bleeding disorders were excluded from the study. All patients were subjected to the following: full history taking, thorough clinical examination, routine blood investigation, chest X-ray, and chest CT scan. Patients were randomized into two groups: group 1 ($n = 16$, 10 male and 6 female) underwent CT guided biopsy (CTGB) and group 2 ($n = 15$, 11 male and 4 female) underwent closed pleural biopsy (CPB). Confirmation of malignancy by pleural fluid cytology was a prerequisite prior to either closed pleural biopsy by Abrams needle or CTGB by semi-automated biopsy gun 16 French. All included patients accepted the procedure by written consent.

Cytology

Fifty milliliter sample aspirated from pleural fluid was sent for cytological exanimation. If the first sample was negative for malignant cells, a second sample was obtained which if also deemed negative a third sample in sequence was taken to confirm or rule out malignancy. The fluid was stained with Papanicolaou stain and hematoxylin eosin stain. The stained smear was then examined for the presence of malignant cell.

Closed pleural biopsy technique

Patients were given 1% lidocaine as local anesthetic. A small incision was made by a surgical blade. The reverse-beveled pleural biopsy needle (Abrams needle) was advanced into the pleural space as confirmed by free flow of fluid while aspirating and pulled back to "hook" the pleura to collect a biopsy sample. Four to six passes were usually required to obtain an adequate diagnostic specimen as described previously [8,11]. The tissue specimens were examined by an experienced pulmonary pathologist. The main contraindications for this procedure were INR >2 or low platelets' count $<50{,}000$ [12].

Technique of CT guided pleural biopsy [13]

Intravenous access, continuous pulse oximetry and vital monitoring were established prior to the procedure. Patient's position depended on the site of the lesion. Patients were asked to take small inspirations so that there would be minimal motion once the needle has passed through the pleura. This is because deeper inspirations might cause significant needle movement with greater chances of tearing the pleural surface. The grid superimposition technique was used. The skin entry site was marked using a measuring scale and laser light in correspondence to midline. After cleansing the area, a small plastic marker or hypodermic needle was placed on the skin mark and a scan was obtained at that level for confirmation. Next, a local anesthetic (1–2% lignocaine) was injected. All the needle manipulations were performed with the patient in