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VATS versus ultrasound-guided Abrams needle biopsy in undiagnosed pleural effusion: Old wisdom and new insights

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ABSTRACT

Background: Video Assisted Thoracoscopic surgical Biopsy (VATS) biopsy and transthoracic ultrasound-guided Abrams needle biopsy (TUS-GANB) are important tools in management of undiagnosed pleural effusion due to their high diagnostic yield in comparison to blind closed pleural biopsies.

Methods: From November 2015 to July 2017, a prospective study included a total number of 90 patients of undiagnosed pleural effusion who were randomly divided into two groups: group A (45 patients who underwent VATS biopsy), and group B (45 patients who underwent TUS-GANB). Safety and efficacy of both procedures were compared.

Results: Both procedures were safe with no perioperative mortality. A definitive histopathological diagnosis was obtained in 43 patients (95.6%) in group A and in 39 patients (86.7%) in group B ($p = 0.266$). VATS was superior to ultrasound guided biopsy in diagnosing pleural effusion due to pulmonary causes ($p = 0.02$). Both VATS and ultrasound guided biopsy were effective in diagnosing pleural effusion due to pleural causes ($p = 0.358$). Complications in group A were minor bleeding in 3 (6.7%), pain in 5 (11.1%), surgical emphysema in 1 (2.2%), prolonged air leakage in 3 (6.7%), pneumothorax in 5 (11.1%) and wound infection in 2 (4.4%). Complications in group B were minor bleeding in 1 (2.2%), pain in 2 (4.4%), surgical emphysema in 1 (2.2%), pneumothorax in 2 (4.4%) and haemoptysis in 2 (4.4%).

Conclusions: VATS was superior to ultrasound guided biopsy in diagnosing pleural effusion due to pulmonary causes. Both VATS and ultrasound guided biopsy were effective in diagnosing pleural effusion due to pleural causes.

1. Introduction

Pleural effusion is a very common clinical problem in patients with respiratory symptoms. The most common causes of exudative pleural effusion are parapneumonic effusion, malignant pleural effusion and tuberculous pleural effusion.

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However, there is a limited ability to diagnose all cases by conventional investigations such as cytology, bronchial lavage, cultures, and radiological investigations. After thoracocentesis, nearly 25–40% of cases of pleural effusions remain undiagnosed; so, the next step for a definitive diagnosis is a pleural biopsy [1].

Blind closed pleural biopsy plays an important role in diagnosing tuberculous pleural effusion with a sensitivity reaching up to 85% due to the diffuse involvement of the pleura by tuberculosis. However, it has a low diagnostic yield in diagnosing malignant pleural effusion with a sensitivity ranging between 48% and 56% due to the patchy pleural involvement in case of malignant pleural effusion [2]. Moreover, the malignant pleural deposits are predominant close to the midline and diaphragm which are very dangerous areas that should be avoided during taking blind closed pleural biopsies to avoid injury of vital vessels and structures at these areas. So, the diagnostic yield of blind closed pleural biopsies for malignant pleural deposits will be markedly affected after avoiding these areas [3].

Various new techniques were used to overcome the low diagnostic yield of blind closed pleural biopsies. VATS biopsy and transthoracic ultrasound guided Abrams needle biopsy (TUS-GANB) are important tools in the management of undiagnosed pleural effusion due to their high diagnostic yield in comparison to closed pleural biopsies [1].

In the modern era, it is evident that blind closed pleural biopsy is a cost-effective option for diagnosing tuberculous pleural effusion especially in a population with a high probability of tuberculosis [4].

Thoracoscopy is reported to be the golden standard for diagnosing malignant pleural effusion. However, some studies concluded that closed pleural biopsy guided by ultrasound or computed tomography (CT) imaging has a similar diagnostic yield to that of thoracoscopy [5].

TUS-GANB could provide a safe access to the lowermost portion of the parietal pleura, where pleural metastases are more likely to be initially found, leading to improvement of its diagnostic yield [6].

2. Patients and methods

From November 2015 until July 2017, a prospective study included a total number of 90 patients with undiagnosed pleural effusion after approval from the institutional Ethics Committee. Informed consents were obtained from all patients. Patients were randomly divided into two groups: group A and group B. Randomization was done by using a computer program named Random Number Generator which generates random numbers in a random number table. Group A (45 patients who underwent VATS biopsy), and group B (45 patients who underwent TUS-GANB).

Aspiration and complete analysis of pleural fluid were done at least twice prior to biopsy in all patients. All cases of undiagnosed pleural effusion had an exudative pleural effusion.

Pleural effusion was considered as an undiagnosed pleural effusion after the failure of establishing its causes after clinical examination, radiological investigations (including chest x-ray, CT scan of the chest) and laboratory investigations (including biochemical, microbiological and cytological analysis of the pleural fluid). So, any patient with a diagnosed cause of pleural effusion (by those previous investigations) was not included in this study. The study included only those patients with undiagnosed pleural effusion after the failure of establishing its causes after clinical examination, radiological investigations and laboratory investigations.

2.1. Video-assisted thoracoscopy group (group A)

Patients were prepared for general anesthesia with double lumen intubation in this group. After intubation, patients were placed in lateral position. A 1–2 cm incision was done on the affected side in the 6th or 7th intercostal space at midaxillary line passing through skin, muscles and pleura and it was used as a camera port. After excluding lung adherence to the parietal pleura by introducing a finger into the intercostal space and ensuring lung collapse, the camera was introduced through this port. Then the next trocar was entered under direct visualization through the proper space. All suspicious areas were biopsied by biopsy forceps.

In some cases, when no specific histopathology results were obtained, patients were followed up for six months. If there were no new lesions or no recurrence of pleural effusion after this interval, the non-specific pathology would be considered as a definitive diagnosis. If a new lesion appears or there was a recurrent pleural effusion during or after this 6 months interval and it was not diagnosed by routine workup, a revision VATS was done to obtain a definitive diagnosis.

2.2. Transthoracic ultrasound guided Abrams needle biopsy (TUS-GANB) (group B)

The ultrasonography machine used in our study was PHILIPS EPICQ 7G. The procedure was done while the patient was sitting with folded arms across the chest and supported by a bedside table. Ultrasound examination was achieved by a standard 3.75 MHz sector probe after a full evaluation of the affected side. The requirements for successful biopsy were: the presence of a suitable ultrasound window with no air or bone overlying the lesion, absence of any possible vital organ along the Abrams needle pathway, and presence of a suitable angle of needle entry with a suitable lesion depth. Safety was always the main target. After identification of the best biopsy site and disinfection of its surrounding area, an infiltration of lidocaine 2% was done. TUS-GANB was performed by 14 or 16 gauges Abrams needle. At least 3 Abrams needle biopsies were obtained and transported in ten percent formalin. At least one biopsy was sent for microbiological investigation and was transported in normal saline.