

# Has a pleuroscopy role in the diagnosis of unknown cause pleural effusion a single-center study

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## ABSTRACT

In about 25-40% of pleural effusion cases not reached to diagnosis, so taking a pleural biopsy may decrease the number of cases with difficulty in diagnosis of pleural effusion. Using pleuroscopy has high accuracy in the diagnosis of these cases. It is safe with complications. In this study, 60 patients who underwent a pleural biopsy by pleuroscopy were studied with unknown causes of pleural effusion. The mean age was (51-/+13.2) and male to female ratio was 4 to 1. There were 36.6% of cases diagnosed with tuberculosis, 23.3% of cases diagnosed with adenocarcinoma. Pleuroscopy failed to reach a diagnosis in 16.6% only. So, the pleuroscopy yields high accuracy in the diagnosis of pleural effusion with unknown causes.

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## 1. INTRODUCTION

Pleural effusion is a fluid accumulated within pleural space, and it has a dilemma in diagnosis [1]. About 25-40% of cases of pleural effusion remain of unknown cause [2], [3]. Pleuroscopy, in addition to therapeutic purposes, is used to visualized and take a biopsy of the pleural space in cases of the undetermined cause of pleural effusion [4], [5]. The accuracy of pleuroscopy in the diagnosis of malignant or tuberculous effusion is 100% [4]. In areas with low tuberculous incidence, the malignant effusion was diagnosed in more than 50% of cases, while in endemic areas of tuberculosis, the diagnosis of exudative tuberculous pleural effusion reached about 84.5% [6], [7]. Pleuroscopy is a common intervention used under local anesthesia in an operating room or as an outpatient intervention in patients who breathe spontaneously [8]. It is a safe intervention with expert hands, its complications account for about 1-5% [9]. In this study, we describe the role of pleuroscopy in the diagnosis of the undetermined cause of pleural effusion and its complications.

## 2. Methods

### 2.1 Study design and setting

This is a retrospective cross-sectional observational study that was done in Al-Sadder Teaching Medical City, Najaf, Iraq for two years duration from January of 2018 to January of 2020. This included sixty patients (out

of 214 patients of pleural effusion as total) with unknown cause for pleural effusion whose either referred from the respiratory department of the same hospital or other hospitals.

### **2.2 Data collection**

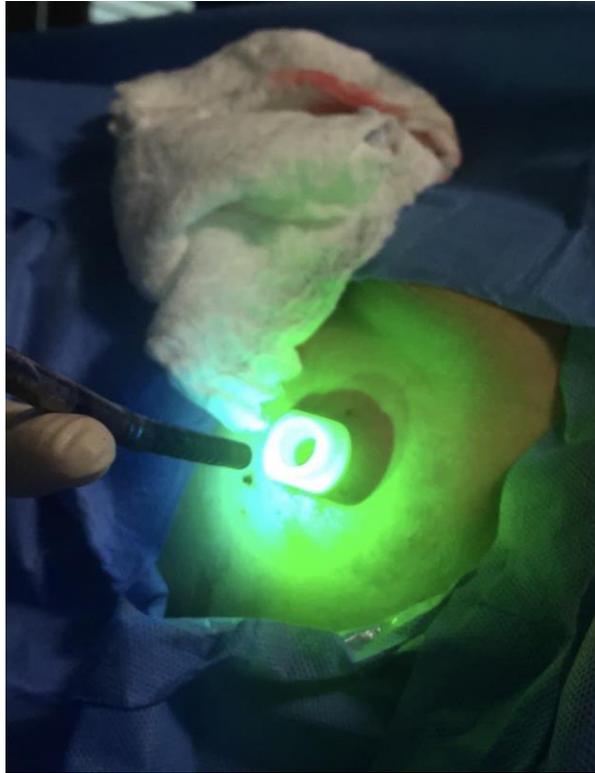
All patients presented with pleural effusion were giving a detailed history of pleural effusion including presenting symptoms, its duration, past-medical and surgical history, drug history, social and family histories. All patients were examined in the cardiothoracic unit and send for general blood tests, chest x-ray, and CT scan with or without contrast of chest and abdomen.

### **2.3 Specimens processing**

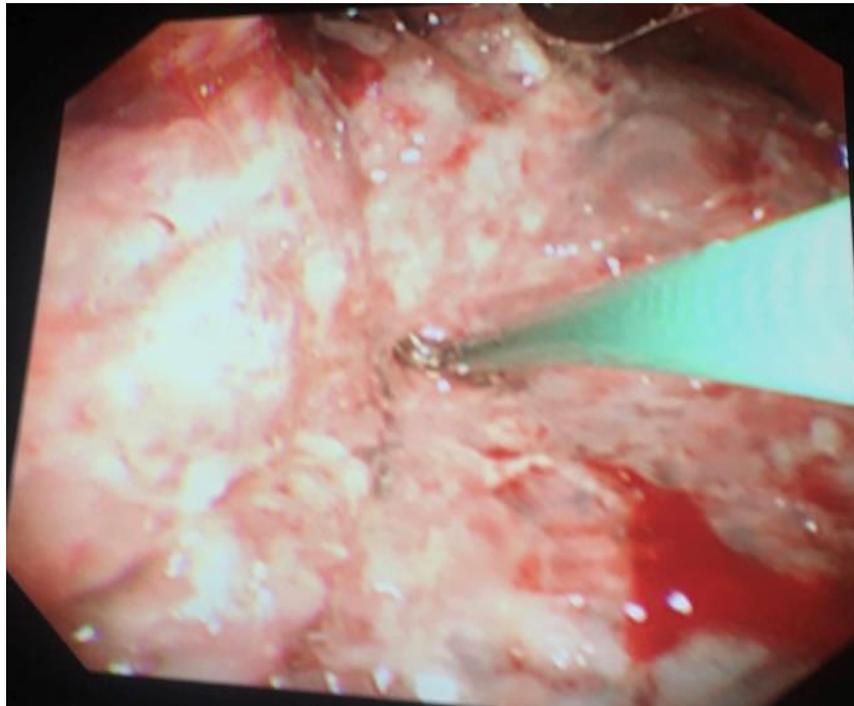
The pleural effusion was evacuated using either pleurocentesis (from the back of patients through 10<sup>th</sup> or 11<sup>th</sup> intercostal spaces) or tube thoracostomy (through 5<sup>th</sup> intercostal space, mid-axillary line). The aspirated fluid for all 214 patients was sent for cytology, acid-fast bacilli test, adenosine deaminase test, LDH, gram stain, glucose, protein, and triglycerides levels. All patients under bronchoscopy and a brush or true-cut biopsies or bronchial wash were taken. The wash or biopsies were sends for cytology, acid-fast bacilli test, gram stain (for bronchial wash), and histopathology study (for biopsy). The study excluded all patients with pleural effusion who are not reached to diagnosis by pleural fluid or bronchial wash or biopsy analysis and all patients with transudate pleural effusion.

### **2.4 Procedure**

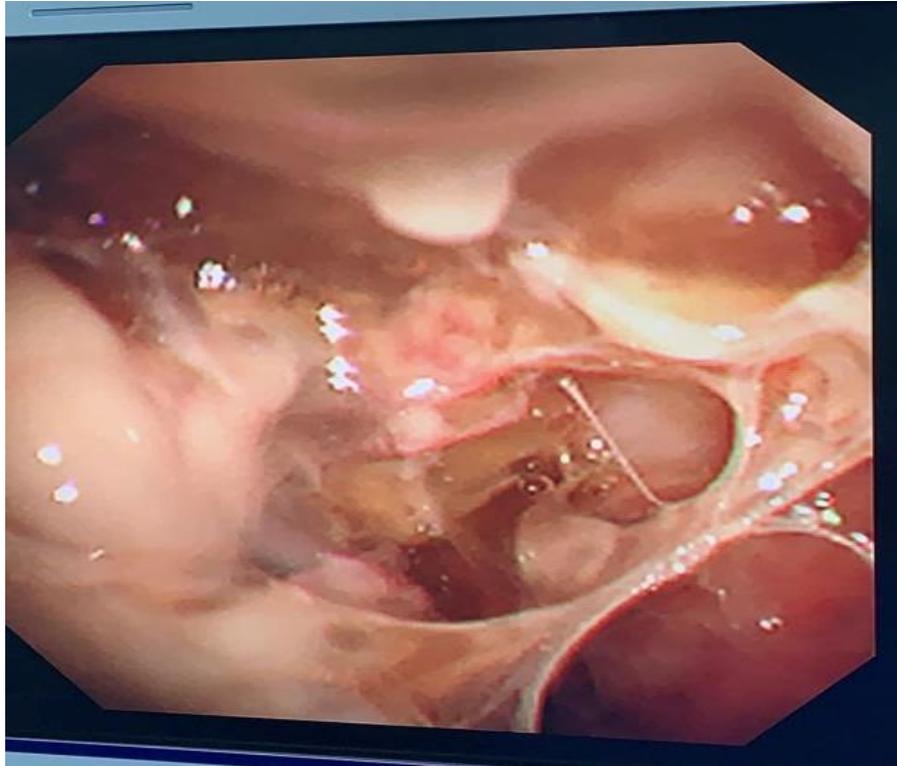
The study included 60 patients with negative pleural fluid and bronchial wash for cytology, acid-fast bacilli test, gram stain, and negative bronchoscopy. All patients underwent a pleuroscopy under local anesthesia (3 mg/kg lidocaine), sedation, and analgesia (using midazolam and opioids) in the operating room through the same incision of the thoracostomy tube (mid-axillary line, 5<sup>th</sup> intercostal space). A semi-rigid pleuroscope used was of OLYMPUS type (EVIS LUCERA, ELITE, CLV-290SL). Pleuroscopy induces pneumothorax, in cases of mild pleural effusion, and the scope inserts through a plastic trocar (5 mm) into the chest as in photo (1) below. Multiple pleural biopsies were done by use flexible forceps, then the samples were stored in normal saline-containing tubes for histopathological study. A Thoracostomy tube (24 f size tube) was used in the same position of the scope. We take 4 pleural samples by using the lifting and peel technique as in the photo (2 and 3). The biopsy was taken from looking abnormal pleura-like redness, nodules, and thickening after partial release of adhesion if present.



**Photo (1):** semi-rigid pleuroscopy insertion through a 5 mm plastic trocar.



**Photo (2):** forceps biopsy from an abnormal visceral pleura done by use of semi-rigid pleuroscopy.



**Photo (3):** pleural adhesion as seen by pleuroscopy.

### ***2.5 Ethical approval***

The Al-Sadder Teaching Medical City scientific committee give the approval for the study (No. 103 in December 2017). Patients informed consent was taken from all those included in this study.

### ***2.6 Statistical analysis***

The statistical analysis was done using SPSS version 20. Continuous variables were expressed as mean  $\pm$ SD while categorical variables were expressed as frequencies and percentages.

### **3. Results**

This study included 60 out of 214 patients with unknown causes of pleural effusion (28.03%) admitted for pleural biopsy by using pleuroscopy. The mean age was (51 $\pm$ 13.2 years) with an average of 22-71 years old. There were 48 male and 12 female patients (male to female ratio was 4 to 1). The left side was affected in 34 patients while the right side was affected in 26 patients, no case presented with bi-lateral effusion. The mean duration of the procedure was 48 $\pm$ 10.9 minutes (range from 32-75 minutes). The diagnosis of pleural effusion with unknown cause reached 50 cases out of 60 (83.3%). There were 22 patients diagnosed with tuberculosis, 14 patients with adenocarcinoma of the lung, 10 patients with squamous lung cancer, 2 cases with mesothelioma, and 10 cases without diagnosis just chronic inflammation on histopathological studies as in table (1).

Regarding the complications of the procedure, there were 3 out of 60 patients who had a complication (5%). There were two cases (3.3%) that developed chest pain (range from 2-6 grades on pain score) to the side of the procedure. The pain was resolved on pain killer medications within 1st day in both patients. There was a single case that developed atelectasis (1.6%), that was treated with chest physiotherapy and using incentive spirometry. There was no injury to adjacent structures, no subcutaneous emphysema, no case of developed pneumonia, and no mortality by the procedure as in table (2). Regarding the pleuroscopy findings, there are

29 cases with nodules (18 case is uniform and 11 cases are multiform), 27 cases with adhesions (12 cases have few adhesions and 13 cases have extensive adhesion) and four cases with normal pleura as in table (3).

**Table (1):** Patients characteristics and results of the histopathological study.

| <b>character</b>        | <b>No. (%) / mean±SD</b> |      |
|-------------------------|--------------------------|------|
| <b>Age (years)</b>      | 51±13.2                  |      |
| <b>Gender</b>           |                          |      |
| <b>Male</b>             | 48                       | 80   |
| <b>Female</b>           | 12                       | 20   |
| <b>Side of effusion</b> |                          |      |
| <b>Left</b>             | 34                       | 56.6 |
| <b>Right</b>            | 26                       | 43.3 |
| <b>Bi-lateral</b>       | 0                        | 0    |
| <b>Duration (min)</b>   | 48-/+10.9                |      |
| <b>Diagnosis</b>        |                          |      |
| <b>Tuberculosis</b>     | 24                       | 40   |
| <b>Adenocarcinoma</b>   | 14                       | 23.3 |
| <b>SCC</b>              | 10                       | 16.6 |
| <b>Mesothelioma</b>     | 2                        | 3.3  |
| <b>Negative</b>         | 10                       | 16.6 |

**Table (2):** Complications of pleuroscopy.

| <b>Complications</b>              | <b>No. (%)</b> |
|-----------------------------------|----------------|
| <b>Chest pain</b>                 | 2 (3.3)        |
| <b>Bleeding</b>                   | 0              |
| <b>Injury to other structures</b> | 0              |
| <b>Atelectasis</b>                | 1 (1.6)        |
| <b>Air leak</b>                   | 0              |
| <b>Pneumonia /empyema</b>         | 0              |
| <b>Post-operative fever</b>       | 0              |
| <b>Systemic complications</b>     | 0              |
| <b>Mortality</b>                  | 0              |
| <b>Total</b>                      | 3 (5)          |

**Table (3):** Findings of pleuroscopy.

| <b>Pleuroscope findings</b> | <b>No. (%)</b> |
|-----------------------------|----------------|
| <b>Adhesion</b>             |                |

|                      |           |
|----------------------|-----------|
| few                  | 14 (23.3) |
| Extensive            | 13 (21.6) |
| <b>Nodules</b>       |           |
| Uniform              | 18 (30)   |
| Multiform            | 11 (18.3) |
| <b>Normal pleura</b> | 4 (6.6)   |

#### 4. Discussion

Pleural effusion is a common state that faces both chest doctors and thoracic surgeons in Iraq, and the cause behind the effusion is so difficult to reach in about 25% of cases [2], [10]. The effusion may be transudate or exudate according to Light's criteria [11]. The most common causes of effusion in Iraq are tuberculosis and cancer [12]. The diagnosis of pleural effusion is done after taking a history and examination, with investigations like CXR, CT scan of the chest, and thoracentesis for fluid analysis [1]. When the pleural effusion is large and symptomatic with dyspnea, it needs to be drained. Thoracentesis may be repeated, which may cause many complications like hemothorax, pneumothorax, and infection [13]. Thoracentesis may be done blindly or under an ultrasound guide, so the last choice has a lower incidence of complications compared to the traditional blind thoracentesis [14]. The diagnosis and treatment of pleural diseases may be done with closed pleural biopsy (CPB), medical thoracoscopy or pleuroscopy (MT), and surgical approaches [15]. MT has higher diagnostic features, fewer complications, and mortality than CPB [16]. The diagnostic yield of pleuroscopy is as high as in study. Its sensitivity was 91%, specificity was 100% and the rate of major complications was 1.5% [17].

In this study, we use midazolam as a sedative rather than propofol to avoid episodes of hypoxia that increased with using of propofol [18]. We used the semi-rigid pleuroscopy in this study because it is the only available scope in our center and the more familiarity of the surgeon with it, in addition to the patient's condition that not allowed to use the more complex rigid one. The biopsy was taken from looking abnormal pleura like redness, nodules, and thickening. The adhesion is partially released to avoid bleeding.

In our study, the diagnosis of pleural effusion with unknown etiology was reached in 50 cases out of 60 (83.3 %) while in study, the diagnosis with MT occurred in 93.2 % and controlled trial by the diagnosis reached in 86.2% [16], [19]. These variabilities in incidence depend on many factors including the size and site of pleural biopsies and incidence of the disease itself. Regarding the complications, the total number of cases end with complications in this study are three (5 %) and mainly was post-procedure chest pain in two cases (3.3 %). In the complication rate was 10.3 % and mainly is subcutaneous emphysema in about 6.8% [19]. In study, only five cases (6.09%) had pain, three patients (3.65%) had subcutaneous emphysema, and one case (1.21%) had to bleed [20]. These differences depend on the experience use of pleuroscopy and the used technique like avoiding the excessive release of adhesion.

Regarding the diagnosis, in our study there were 24 patients (40%) diagnosed with tuberculosis, 14 patients (23.3%) with adenocarcinoma of the lung, 10 patients (16.6%) with squamous lung cancer, 2 cases (3.3%) with mesothelioma and 10 cases (16.6%) without diagnosis just chronic inflammation on histopathological studies, while in study, there was 11% of cases were malignancy, 74.4% were TB, 11% were acute and chronic inflammation [21]. In study, 84.5% of patients were diagnosed with tuberculosis and 5.2% of patients were malignant [7]. In study, 47% of cases were tuberculosis and 42% of cases were malignancy [22]. In pleuroscopy findings, there are 29 cases with pleural nodules, 27 cases with pleural adhesions, and four cases with normal pleura. In study, there are 33 patients with nodules, 26 patients with pleural adhesions, and one patient with normal pleura [2]. The presence of nodules on examination increase the possibility of diagnosis,

in tuberculosis cases, the nodules present are uniform with variable adhesion, while in malignancy cases, the multiform type nodules are presented. In such a patient we never use the video-assisted thoracoscopy because pleuroscopy has been reported to be a less invasive, simpler, and cost-effective alternative, without significantly compromising the diagnostic yield [8].

## 5. Conclusion

Pleuroscopy has a high accuracy rate in the diagnosis of pleural effusion with unknown causes especially tuberculosis and hidden malignancy, so the role of pleuroscopy should not be missed in such a case. Finally, this study has a limitation in sample size which is small so, the possibility of error is high and a larger trial is required.

## 6. Conflict of interesting

None

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