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Role of VATS Biopsy in Undiagnosed Pleural Effusion - Our Institutional Experience

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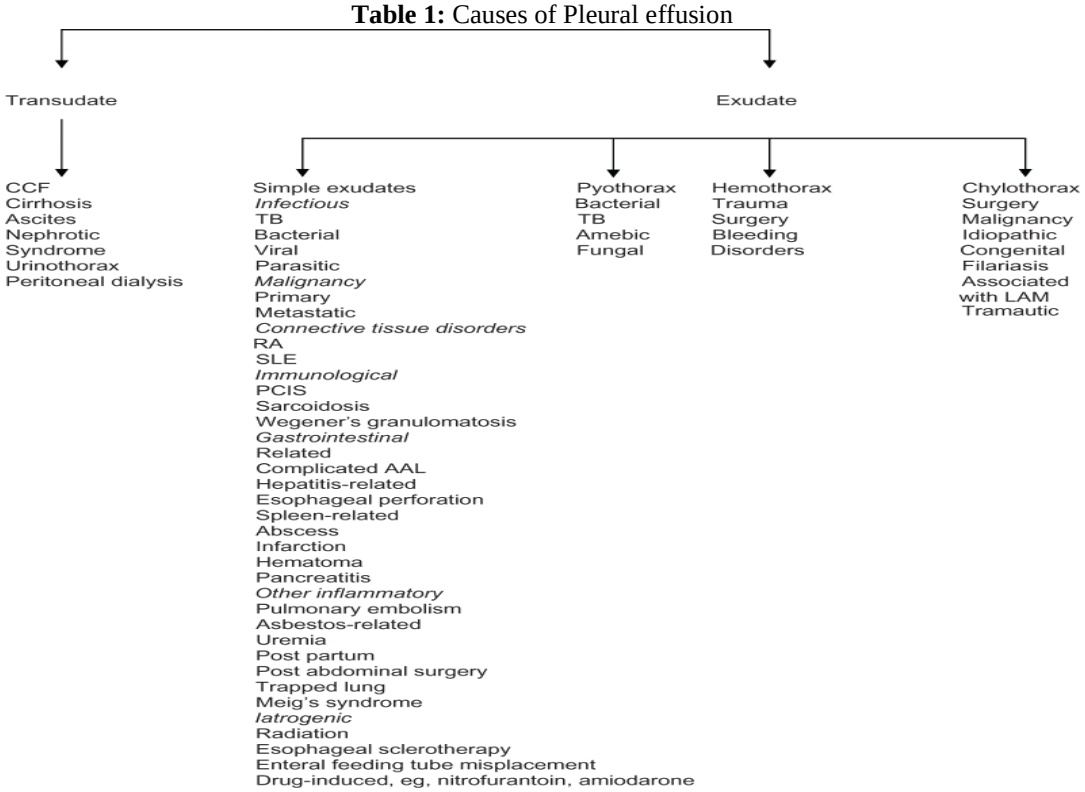
Abstract: ***Introduction: We aimed to evaluate the diagnostic efficacy of uniportal video-assisted thoracoscopic surgery (VATS) in undiagnosed pleural effusions. Methods: We examined the medical records of all consecutive patients with undiagnosed pleural effusions who underwent VATS between January 2020 to December 2021 at Rajiv Government General Hospital, Chennai. We included 20 males (66.7%) and 10 females (33.7%) with a mean age of 45 y (range, 35–88 y) in the study. VATS was performed under general anesthesia. Pleural drainage and/or biopsies were performed through a small incision. A single chest tube was placed from the port entry after the procedure. The chest tube was kept in place for a minimum of 3 days and removed when the fluid drainage was less than 100 ml/24 h. Patients were discharged the day after chest tube removal and a follow up visit was scheduled on postoperative day of 1 month for clinical evaluation and a new chest roentgenogram. Results: Pleural fluid cytology was done in all patients, whereas biopsies were performed in 25 patients (83.3%). Histopathological examination of biopsies demonstrated that 32% of patients had a malignancy of the pleura and 14 (56%) were granulomatous inflammations, and 3 (12%) were non-specific. The over-all diagnostic yield of VATS pleural biopsy in the study was 25/30 (83.3%). The most common primary lung cancer in our study was adenocarcinoma (32%). The most common metastatic tumors originated from breast cancers (3), lung cancers (2), and 5 patients with other types of malignancies. None of them had intraoperative mortality. Discussion and Conclusion: Video Assisted Thoracoscopic Surgery is well tolerated and a very safe procedure for the diagnosis and treatment of undiagnosed pleural effusions.***

Keywords: Pleural effusion, Video assisted thoracoscopic surgery, Malignancy

1. Introduction

Pleural effusion (PE) is defined as excessive accumulation of fluid in the pleural space. It has more than 60 different causes of which, Congestive heart failure (CHF), malignancy, pulmonary infection and embolism account for over 90% of pleural effusions [1]. Causes of pleural effusion have been shown in the table below (Table 1) To treat pleural effusion appropriately, it is important to determine its cause and the clinical picture and investigations can help. With possible symptoms including pleuritic chest pain, dyspnea, and a dry, nonproductive cough and with the advent of pleural fluid cytology and biochemistry around 80 % can be diagnosed [3]. what about the remaining 20 %?. A need for diagnosis arises from that the underlying diseases could be malignancy and the delay in diagnosis could impact survival time and treatment options. Here we look at the feasibility of video assisted thoracoscopy in undiagnosed pleural effusion in a south indian population.

Table 1: Causes of Pleural effusion



2. Aims and Objectives

In this study, we aimed to highlight the various cases which underwent VATS and to summarise the various demographic, pathologic and prognostic variables that occurred in our institute. The age group, sex distribution, conversion rate of VATS to open thoracotomy, average length of stay, Inter costal tube drainage (ICD) removal and post-operative complications, and histopathology reports were considered.

3. Materials

30 patients with undiagnosed pleural effusion were included in the study. They were selected from Rajiv Gandhi Government General Hospital associated with madras medical college. The study duration extended between Jan 2020 and Dec 2021

All patients were subjected to preoperative assessment. It included history taking, physical examination, laboratory investigations, radiological examinations, and pleural fluid aspiration and analysis and undiagnosed candidates were taken for the study.

The exclusion criteria were: patient refusal, patient younger than 18 years of age, poor general condition or any contraindications for general anesthesia and single lung ventilation like recent Myocardial infarction or severe chronic obstructive pulmonary disease, respiratory distress requiring 100 % FiO2, coagulopathies etc.

4. Methodology:

We analysed 30 patients with undiagnosed pleural effusions who underwent VATS. All procedures were conducted in the operating room with patients in full lateral decubitus position. At admission, patients underwent complete laboratory assays, ABGs, chestroentgenograms, electrocardiograms, and eventually, chest CT scans. An informed and written consent was obtained for the VATS pleural drainage, biopsy and pleurodesis procedure from each patient. The study was conducted in accordance with the principles of the Declaration of Helsinki.

In our study of 30 patients, VATS was performed under general anesthesia with a double-lumen endotracheal tube for ipsilateral lung collapse. Patients were positioned and draped as for a standard posterolateral thoracotomy. A small anti-decubitus mattress was placed below the dependent hemithorax. The safest point for thoracentesis was planned preoperatively according to the chest radiograph, CT chest or ultrasound chest. In most cases, an intersection of the midaxillaryline and the 5^{th} or 6^{th} intercostal space was the site of thoracentesis, and eventually, the site of thoracoport entry. A 10.5-mm single thoracoport was used to enter the thoraxafter a single-skin incision. A 10-mm thoracoscope with a6-mm working channel was used.

In all patients, pleural fluid was drained gradually to avoid the risk of re-expansion pulmonary edema. Apleural biopsy is taken with a cup biopsy forceps via the thoracoscope for the patients with unknown primary cancer and those with pleural nodules or any patient with pleural abnormality. At the end of the VATS procedure, a 32-F single-thoracic drain was placed via the thoracoport site. The chest tube was left insitu for a minimum of 3 days, and then, removed when the drain was less than 100 ml/day. Patients were discharged the day after ICD removal, and a return visit was scheduled on 30^{th} postoperative day for reassessment and a new chest radiograph. Descriptive statistical methods were used in the data analysis [mean± standard deviation (SD) or/and range].

5. Results

In our study there were 10 females and 20 males. The median age of the study population was 45yrs of age. Outcome of procedure-55% of the cases turned out to be malignant and 45 % were having infective etiology. Out of the infective cases 22.5% were diagnosed to have Tuberculosis.

There were 20 males (66.7%) and 10 females (33.3%) with a mean age of 45 y (range, 35–88 y). For 20patients, pleural fluid occurred in the right side and for 10in the left (Table I). Overall, VATS pleural biopsies were performed in 25 (83.3%) patients. Of these biopsies, 8 (32%) samples were malignant, 14 (56%) were granulomatous inflammations, and 3 (12%) were non-specific. The over-all diagnostic yield of VATS pleural biopsy in the study was25/30 (83.3%). VATS was performed under general anesthesia with a double-lumen endotracheal tube.

Moreover, 20 (66.6%) patients with undiagnosed pleural effusion had no history suggestive of malignancy. VATS pleural biopsies were done in 25 patients. Histopathological examination revealed the presence of malignant pleural metastasis in pleural specimens in 8 (32%) of these patients. Also, pleural biopsy specimens showed granulomas with caseous necrosis in 7 (28%) of these patients. These 7 patients with TB were referred promptly to the chest clinic and started on anti-tuberculosis treatment.

Additionally, 10 (40%) patients with undiagnosed pleural effusion had a history of malignancy (3 breast cancers, 2 lung cancer, and 5 other types of malignancies). VATS pleural biopsies were performed in 10 of these patients. Pathological examination revealed the presence of positive findings for malignancy in the pleural biopsy in 8 (32%) of these patients. The nature of pleural effusion in 8 patients (32%) was malignant and non-malignant in 17 patients (68%). In patients with malignant effusion, metastatic adenocarcinoma lung (n=2) was the most common malignancy encountered.

There were no intraoperative mortalities and no major complications. Only in 1 patient, prolonged air leak was observed in the postoperative periods. The duration of postoperative pleural drainage ranged between 3 and 12days (mean, 4 days). The postoperative hospital stay ranged between 3 and 15 days (mean, 5 days).

6. Discussion

Exudative pleural effusion may remain undiagnosed despite the repeated cytological and biochemical analysis of pleural fluid, and a pleural biopsy for histological confirmation becomes necessary to define its etiology. Carcinoma can metastasize to the pleura, and the detection of malignant cells in pleural fluid or tissue indicates an advanced disease and hence poor prognosis. Malignant pleural effusion is estimated to affect more than 100.000 persons each year across European and 150.000 people in the United States of America as per previous studies. Lung cancer is the most common metastatic tumor to the pleura in men and breast cancer in women, and both malignancies together account for 50%–65% of all malignant effusions. In our study, we also found that the most common metastatic tumors originated from the lung (40%). VATS is usually performed under a general anesthesia in an intubated patient in the operation theatre and requires at least three ports of entry to the thoracic cavity. VATS has the advantage of a small incision, which minimizes the transmission of infection to the incision line and the infiltration of the tumor to the skin, subcutaneous tissues, and chest wall in cases of malignant diseases, such as mesothelioma. In our study, we performed VATS through a small incision under general or local anesthesia. VATS have the advantage of performing a biopsy for pleural lesions and nodules under direct vision. Inspite of lesser invasive methods, which have their limitations in their therapeutic effectiveness as fibrous septa and dense viscous liquid, VATS has got better the ability to merge pouches, aspirate fibrin debris, and also allowsa very efficient drainage of loculated effusions. In addition to all, its possible to do pleurodesis simultaneously. In special caseslike trapped lung, partial decortication can be done to ensure lung expansion and it can be easily performed. VATS was found to be a safe, effective, and well-tolerated surgical procedure in patients who doesn't show any improvement with initial treatment using fibrinolytics. In our study, the overall diagnostic yield of VATS pleural biopsy in 25 patients with undiagnosed pleural effusion was 83.3%. Similar experiences with Video assisted thoracoscopy were reported in previous literature. Studies conducted in England reported a sensitivity of 80.3% for diagnosis in their study that included 102 patients and from India reported a diagnostic yield of 74.3% in 35 patients. Thediagnostic yield of VATS has been reported to be 82.3% for cytological negative exudates with only 1 significant complication (4% rate) and no deaths. The complication rate of our study was 1%. There were no intraoperative mortalities or major complications. Only in 1 (4%) patient, prolonged air leak was observed in the postoperative period, and there were no complications were noted in the preoperative period. None of our patients experienced empyema or acute respiratory failure

7. Conclusion

VATS is a well tolerated and safe procedure for the diagnosis and treatment of undiagnosed pleural effusions, and thisstudy adds to the substantial data that VATS can be considered as a gold standard investigation for the diagnosis of suspected cases of malignant pleural effusions.

Limitations to the Study:
It was conducted at a single center with a small sample size.

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Ethics Committee Approval:
All procedures performed in studies involving human participants were in accordance with the ethicalstandards of the institutional and/or national research committee and the 1964 Helsinki declaration and its later amendments orcomparable ethical standards.

Peer review: Externally peer-reviewed.

Conflict of Interest: None declared.

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