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Role of bronchoscopy in undiagnosed pleural effusions

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Abstract
Background: Pleural effusion evaluation by fiberoptic bronchoscopy is unclear. This study investigated if fiberoptic bronchoscopy can diagnose pleural effusion when other approaches fail. This study examined fiberoptic bronchoscopy's ability to diagnose pleural effusion after other causes have been eliminated.
Materials and Methods: Between January 2021 and December 2021, researchers from the Dhanalakshmi Srinivasan Medical College and Hospital, Siruvachur, Perambalur, Tamil Nadu, India observed 100 male and female patients who had been diagnosed with pleural effusion and sought treatment at the center's outpatient clinic. Routine tests and pleural fluid analysis were performed on all patients who were medically appropriate and gave informed consent.
Results: Among the original group of 100 individuals with pleural effusion, only 40 were ultimately diagnosed following the initial evaluation. Just three of the 67 individuals who were offered bronchoscopy declined the procedure. In 18 of the 64 individuals for whom an initial workup failed to yield a diagnosis, FOB was crucial in confirming the diagnosis. For the purpose of diagnosis, pleural biopsies were performed on 26 patients.
Conclusion: Patients with parenchymal abnormalities on a chest skiagram or hemoptysis, as well as those with exudative effusion that has not been detected after pleural fluid cytology and biopsy, can benefit from a fiberoptic bronchoscopy.

Keywords: Fiberoptic bronchoscopy, pleural effusion, misdiagnose

Introduction
Abnormal accumulation of fluid in the pleural space is known as pleural effusion. It's not a disease in and of itself but rather a symptom of something more serious. There is no one cause of effusion. Transudative pleural effusions and exudative pleural effusions are the two main subtypes recognised by most categorization systems [1, 2]. When pleural fluid production surpasses pleural fluid drainage, pleural effusions develop. Parietal pleural capillaries are the normal entry point for fluid into the pleural space, with lymphatics located there to carry it out again. Both the peritoneal cavity and the interstitial spaces of the lungs can leak fluid into the pleural space through tiny diaphragmatic perforations. Twenty times as much fluid as is ordinarily generated can be absorbed by the lymphatics. Hence, an excess of pleural fluid production or a reduction in lymphatic fluid drainage can both contribute to the onset of a pleural effusion [3-5].
The aetiology of a pleural effusion should be investigated if a patient is found to have one. Identifying whether the effusion is a transudate or an exudate is the first step. Exudative pleural effusion was classified as such using Light's criteria [6], whereas transudative pleural effusion was classified as such using alternative criteria. Analysis of the pleural fluid substantially aids in pinpointing the origin of a pleural effusion. A thoracentesis is a quick and easy in-clinic technique that allows for the collection of fluid samples that may be seen under a microscope, measured, and analysed in a variety of ways. Clinicians should be able to determine the aetiology of an effusion by using a systematic approach to investigation of the fluid in conjunction with the patient's clinical presentation [7].
Finding cancer cells or particular organisms in the pleural fluid allows for a definite diagnosis in about 25% of patients. Despite standard procedures for analysing pleural fluid, many individuals are still misdiagnosed with pleural effusion. Thus, we require a low-risk and easy-to-use diagnostic method to assess unexplained effusion [8]. Fiberoptic bronchoscopy will be used in this study to provide a definitive diagnosis of effusions when pleural fluid analysis and closed pleural biopsies have failed to do so. Due to the high prevalence of neoplasm as the underlying cause of a pleural effusion that remains

unexplained after analysis of pleural fluid and closed pleural biopsy, the inclusion of fiberoptic bronchoscopy in the diagnostic work-up of pleural effusions of unknown origin appears to be warranted. The purpose of this research was to examine the diagnostic value of fiberoptic bronchoscopy in determining the root causes of pleural effusion in patients who had previously been misdiagnosed [9, 10].

Materials and Methods

Between January 2021 and December 2021, researchers from the Dhanalakshmi Srinivasan Medical College and Hospital, Siruvachur, Perambalur, Tamil Nadu, observed 100 male and female patients who had been diagnosed with pleural effusion and sought treatment at the center's outpatient clinic. Routine tests and pleural fluid analysis were performed on all patients who were medically appropriate and gave informed consent.

A proforma was developed, and approval from the ethics committee was obtained. Following an in-depth explanation of the nature of the study as well as its goals, a signed informed permission was acquired from each and every patient who participated in the research.

Inclusion Criteria

- Those older than 14 who have been diagnosed with pleural effusion.

Exclusion Criteria

- Cardiac, renal, and liver illnesses;
- Refractory hypoxemia;
- Bleeding diathesis;
- Uncooperative patients;
- Individuals who are unwilling to undergo a scan;

The Thoracic Medicine Ward at Dhanalakshmi Srinivasan Medical College and Hospital, Siruvachur, Perambalur, Tamil Nadu, admitted patients with a diagnosis of pleural effusion who met the inclusion criteria. All patients had standard blood tests, a chest x-ray, testing for acid-fast bacteria in sputum, a mantoux test, and an examination of pleural fluid. Biochemical, microbial, and cytological tests were performed on the pleural fluid that was delivered in. The patient provided both verbal and written permission. Pleural biopsies and fiberoptic bronchoscopies were performed under local anaesthesia and with meticulous asepsis on patients with exudative pleural effusion; specimens were then sent for biochemical, microbiological, cytological, and histopathological study.

Results

One hundred pleural effusion patients were included in the analysis. Diagnosis was achieved in 40 cases with the initial evaluation. The following is a summary of the analysis of bronchoscopy and pleural biopsy data.

Distribution by age and sex

Table 1: Distribution by age and sex

Years	14-25 yrs	26-50 yrs	> 50 yrs
Male	04	07	28
Female	00	09	17

Thirty-five patients whose initial diagnostic work up was unclear had pleural biopsy and fiberoptic bronchoscopy during the course of the study's 10-month timeframe. Males were more likely to be affected than females, and the incidence was highest in the oldest age bracket, lowest in the medium age range, and lowest in the youngest age bracket.

Diagnosis based on initial testing

Just 40 out of 100 individuals with pleural effusion who underwent initial testing reached a definitive diagnosis. 25 individuals were diagnosed with transudative effusion, followed by 10 patients with TB. Positive cytology for malignant cells and parapneumonic effusion were both seen in the same patient. Both pancreatitis and lymphoma were found to be present in a single patient. Just 40 cases out of 100 were diagnosed after the first workup.

Table 2: Diagnosis based on initial testing

Sr. No.	Diagnosis	Patients
1.	Transudative effusion	25
2.	Sputum AFB +ve	10
3.	Cytology +ve for malignant cells	2
4.	Lymphoma	1
5.	Pancreatitis	1
6.	Parapneumonic effusion	1
	Total	40

First work-up diagnosis

The results of the preliminary examination are depicted graphically in the form of a pie chart. Most cases of pleural effusion were diagnosed as transudative, then as pulmonary tuberculosis, then as malignant, and finally as parapneumonic.

Study participants

Table 3: Study participants

Sr. No.	Parameters	Patients
1.	Diagnosis established by initial work up	35
2.	Underwent bronchoscopy and pleural biopsy	60
3.	Patients not willing for bronchoscopy	05
	Total	100

One hundred participants made up the entirety of our research population. Thirty-five people were diagnosed after the first round of testing. Fifty-five of the remaining sixty patients declined bronchoscopy due to lack of consent. In the same number of patients (35), bronchoscopy was performed, and in the same number (35), pleural biopsies were taken. Ten patients with an unclear first workup did not have a pleural biopsy performed due to a lack of evidence of effusion.

Pleural biopsy

After receiving written agreement, pleural biopsies were performed on 60 of the 35 patients whose initial diagnostic workup was unclear. Some individuals who had mild pleural

effusion did not undergo pleural biopsy. Twenty-five individuals who had pleural biopsies received a positive diagnosis. There were 16 cases of tuberculosis diagnosed, 4 cases of adenocarcinoma, 2 cases of metastatic carcinoma, 2 cases of squamous cell carcinoma, and 1 case of small cell carcinoma.

Table 4: Thoracic biopsy

Sr. No.	Diagnosis	Number
1.	Tuberculosis	16
2.	Metastatic carcinoma	2
3.	Adenocarcinoma	4
4.	Squamous cell carcinoma	2
5.	Small cell carcinoma	1
	Total	25

FOB findings and conclusions

Just three of the original 35 inconclusive-workup patients were willing to undergo bronchoscopy. The remaining 51 patients underwent FOB after providing informed written permission. There was erythema, nodularity/sessile lesion, polypoidal lesion, and external compression seen during the bronchoscopy. Twenty-five patients' FOB tests were within normal limits. There were 4 cases of erythema, but no improvements were noticed in any of the patients.

Table 5: FOB findings and conclusions

Sr. No.	Findings	Number	Positive results
1.	Normal	21	0
2.	Erythema	04	0
3.	Nodularity/sessilelesion	10	10
4.	Poly poidal growth	04	5
5.	External compression	12	3
	Total	51	18

Subtypes of Cancer

Twelve malignancies and four incidences of endobronchial tuberculosis were identified among the 18 FOB diagnoses. Of the 10 instances of malignancy, 8 were diagnosed with squamous cell carcinoma, 4 with small cell carcinoma, and 2 with adenocarcinoma.

Table 6: Subtypes of Cancer

Sr. No.	Type	Number
1.	Squamous cell Carcinoma	8
2.	Small cell carcinoma	4
3.	Adenocarcinoma	2
	Total	14

Discussion

After analysing the pleural fluid and performing a pleural biopsy, the aetiology of pleural effusion remains unknown in 19–25% of individuals. Patients with unexplained pleural effusion might benefit from a fiberoptic bronchoscopy.

Chang *et al*. performed bronchoscopy, thoracentesis, and pleural biopsies on 140 patients with pleural effusion. In the group of patients with solitary pleural effusion and no hemoptysis or pulmonary abnormalities on the chest radiograph, the yield from bronchoscopy was 16%, whereas the yield from pleural investigation was 61%. Pleural effusion with hemoptysis or pulmonary abnormalities was associated with a higher yield from bronchoscopy (over 70%) than from pleural investigation (less than 35%) [9, 11].

Twenty-eight people with idiopathic pleural effusion were studied by Williams *et al*. to evaluate FOB's role in the condition. Using FOB, we were able to diagnose three people with cancer and one with tuberculosis in this sample. FOB was proven to be useful in evaluating patients with unexplained pleural effusion. In our study, 18 of 64 participants whose first examination failed to produce a diagnosis benefited from FOB. Pleural biopsies were useful in diagnosing 26 cases [12, 13].

The article "Application of fiberoptic bronchoscopy in the detection of bronchogenic carcinoma" by R H Poe, P C Levy, R H Israel, C R Oritz, and M C Kallay should be consulted for further information. Patients with malignant effusion and no detectable primary tumour may benefit from fiberoptic bronchoscopy, as shown in a study of adults with idiopathic pleural effusions. Bronchogenic carcinoma is responsible for up to a third of malignant pleural diseases. When the yield is about the same as in patients who present with hemoptysis or infiltrates on chest x-ray pictures, it is considered to be successful. Fiberoptic bronchoscopy, according to the authors [14–17], is likely to be beneficial and should be done when an isolated effusion is significant.

As neoplasm is commonly the source of a pleural effusion that remains unexplained after examination of pleural fluid and closed pleural biopsy, Shi-Chuan Chang, MD, Reury-Perng Perng found that fiberoptic bronchoscopy is warranted in the diagnostic work-up of pleural effusions of unknown origin. In this study, individuals with unexplained pleural effusions who exhibited hemoptysis or pulmonary abnormalities on chest x-ray images benefited more from fiberoptic bronchoscopy than those who did not [18-20].

According on the findings of a review research by Marios E. Froudarakis, FOB is recommended whenever an endotracheal and/or endobronchial lesion is found (30). When second opinions were sought for individuals with unexplained pleural effusions, more than 30% were found to have bronchogenic malignancy. In addition to its diagnostic use, FOB may be used to assess the degree to which the disease has progressed along the tracheobronchial tree [21], with important implications for treatment and prognosis.

According to a study by Heaton RW and Roberts CM titled "The Role of Fiberoptic Bronchoscopy in the Investigation of Pleural Effusion," only 6 of 32 patients had a diagnosis obtained using FOB, and of those 6, the diagnosis was independently confirmed by less invasive techniques in 4 of the patients. Radiographs taken of the other two patients revealed evidence of a tumour in the bronchi. Findings suggest that FOB should only be performed on those with additional symptoms and indicators indicating bronchial cancer [22, 23].

Pleural biopsies are necessary for TB diagnosis and will modestly increase malignancy yield. If the origin of the exudative effusion is uncertain after analysing the pleural fluid and the patient also shows parenchymal abnormalities on the chest radiograph or hemoptysis, fiberoptic bronchoscopy is a useful next step. Following a comprehensive first evaluation including a pleural biopsy and fiberoptic bronchoscopy [24–26], 87 of 100 individuals were found to have tuberculosis.

Conclusion

Hemorrhagic and non-hemorrhagic pleural effusions of unclear origin are common in tertiary care centres, even after thorough diagnostic testing has been performed. When the standard diagnostic workup has failed to pinpoint the cause of a pleural effusion, fiberoptic bronchoscopy can help. For patients over the age of 50 with a pleural effusion of unclear cause, fiberoptic bronchoscopy can be an

invaluable tool in establishing a definitive malignancy diagnosis. Fiberoptic bronchoscopy is particularly helpful in identifying pleural effusions caused by benign conditions like tuberculosis in patients younger than 50. Hence, fiberoptic bronchoscopy is a good method for diagnosing exudative pleural effusion in patients who have not been given a definitive diagnosis after pleural fluid cytology and who have parenchymal abnormalities on chest skiagram or a history of hemoptysis.

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