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DIAGNOSTIC UTILITY OF THORACOSCOPY IN UNDIAGNOSED AND MISDIAGNOSED PLEURAL EFFUSION AT A TERTIARY CARE CENTRE

Respiratory Medicine

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ABSTRACT

Background Pleural effusion results from accumulation of abnormal volumes ->(10-20) ml of fluid in pleural space . Significant number of cases of pleural effusion remains undiagnosed after simple diagnostic pleural aspiration. Thoracoscopy allows direct visual assessment of the pleura and subsequent biopsy of visually abnormal areas, hence maximising diagnostic yield. **Methods** A retrospective study of all Thoracoscopic procedure performed with rigid and semi- rigid scope in patients admitted in Respiratory department of SRMS, Bareilly. Post-procedural diagnoses were obtained from the clinical records and using relevant hospital databases. **Results** A total of 40 patients underwent Thoracoscopy in time span of 2020-2021 to diagnose a wide spectrum of benign and malignant conditions. The diagnosis of 23 malignant conditions - 13 Adeno Carcinoma, 3 Non – small cell carcinoma and 7 cases of other malignancies , along with 17 benign cases were made . **Conclusion** Thoracoscopy can be used as a diagnostic tool for investigation of various pathologies of undiagnosed pleural effusion . In our study the sensitivity of thoracoscopy was more than 90%

KEYWORDS

INTRODUCTION:

Medical thoracoscopy, also referred to as pleuroscopy, is a minimally invasive procedure involving endoscopic evaluation of the pleural space 1). Chest physicians are increasingly using diagnostic thoracoscopy worldwide, due to technical advancements and better instrumentation as well as acceptable manner of this minimally invasive procedure (2).

The major indication for thoracoscopy is evaluation of undiagnosed pleural effusions, which generally results from accumulation of abnormal volumes (>10-20 ml) of fluid in pleural space. A significant number of cases of pleural effusion remain undiagnosed after simple diagnostic pleural aspiration, suggesting thoracoscopy as a viable and effective solution. The accurate diagnosis of pleural disease therefore, presents a significant challenge. Evidence suggests that nearly 25% cases involving pleura are not attributed to a specific diagnosis, even after thoracentesis and closed pleural biopsy (3).

With thoracoscopy, one can visualize the entire visceral and parietal pleura and take pleural biopsy from suspicious sites under vision. Larger biopsy specimens taken under direct vision allows a greater diagnostic yield up to 90 percent (4). Diagnosis of pleural TB can be achieved in (99%) of patients with thoracoscopy, which is higher than the yield for closed pleural biopsy(51%). Similarly, yield of thoracoscopic pleural biopsy is higher in patients with suspected pleural malignancy. A diagnosis could be achieved in 95% of patients as against 44% patients using closed pleural biopsy (5).

Despite better instrumentation and simpler sedation protocols, lack of proper exposure and facility for its training and learning has limited its acceptability and popularity (6). Hence, this study was undertaken to describe the experience from a tertiary care hospital assessing the usefulness of thoracoscopy in patients of undiagnosed or misdiagnosed pleural effusion.

METHODOLOGY:

This was a retrospective analysis of the patients who underwent thoracoscopy procedure in the Department of Pulmonary Medicine, in a tertiary care teaching hospital in Bareilly (UP), between July 2020 to June 2021 (one year span). Thoracoscopy with rigid and semi-rigid scope was conducted for diagnosis of undiagnosed pleural effusions. Undiagnosed pleural effusion was defined as failure to achieve a diagnosis by initial pleural fluid analysis. All patients underwent a detailed clinical evaluation with proper history and clinical examination. Post-procedural diagnoses were obtained from the clinical records and using relevant hospital databases.

All patients undergoing thoracoscopy were investigated with complete blood count (hemogram) and patients presenting with abnormalities in hemogram suggesting bleeding disorders were not selected for the procedure.

1 to 1.5 cm long skin incision along the line of intercostal space was given in 4th or 5th intercostal space in mid-axillary line using sterile surgical blade. After blunt dissection of subcutaneous tissue and the intercostal muscles with curved artery forceps, a cannula of 10mm diameter with blunt trocar was inserted into the pleural cavity. The trocar was then replaced with rigid/semi-rigid video thoracoscope (Richard Wolf GmbH, Knettligen, Germany). Pleural fluid was suctioned to enable clear visualisation of entire pleural surface.

If no gross abnormalities were present at parietal pleura, biopsies were taken from different sites. A lateral lift and peel technique were used to take pleural biopsies. Adhesions wherever present were broken gently by biopsy forceps. After taking biopsies pleural cavity was properly examined for active bleed. Chest tube size 28 F to 32 F was introduced through trocar site and connected with under water seal followed by proper suturing of the wound. Once the lung had expanded and drain output had decreased to less than 50mL per 24 hours, chest drain was removed.

Demographic characteristics of the patient including the age, gender, clinical diagnosis, pleural fluid analysis, including total and differential count, protein and glucose values, ADA levels, cytology findings and findings of the CT of the chest were recorded. Data are presented in a descriptive fashion using SPSS software (SPSS v23.0).

RESULTS:

A total of 40 patients were finally included in the study who underwent thoracoscopy in the study time span after satisfying the inclusion and exclusion criteria. Out of these 40 patients, 23 (57.5%) were males and rest were females, with an age range of 31 to 66 years. Majority of patients (47.5%) were in the >60 year age group, followed by 32.5% in the 50-59 year age group. The 30-39 year age group had only 7.5% patients (Table 1).

Majority of patients presented with breathlessness (90.0%), cough (85.0%), and chest pain (82.5%), while the less common symptoms were weight loss (37.5%), fever (35.0%), and hemoptysis (5.0%) (Figure 1). All patients had undergone CT evaluation and description of findings was reported. A majority of patients showed pleural effusion and lung collapse (75.0%) on CT evaluation. A smaller proportion of individuals presented with an unidentifiable mass (27.5%), enhancement (20.0%), and nodular thickening (15.0%). The nature of pleural effusion was malignant in 60% of patients and non-malignant in 40% patients. Among the patients with non-malignant effusion, granulomatous infection consistent with tuberculosis was most common finding in 30% patients and chronic nonspecific inflammation was observed in 10% patients (Table 2).

Pleural fluid ADA levels among study participants were categorized under and above 40 IU/L. A similar proportion of individuals had ADA

levels above (47.5%) and below (52.5%) the cutoff value. A total of 24 cases (60.0%) of malignancy were diagnosed by thoracoscopy. However, nearly 80.0% of the total subjects had a negative M-cell presence in pleural effusion, and only 10% showed positive and atypical M-cells each. Among subjects with a confirmed diagnosis of malignancy via thoracoscopy, 16 (67%) had a negative M-cell presence (Table 3).

Upon comparing pleural effusion ADA levels with thoracoscopy diagnosis, a non-significant (P- value- 0.067) relationship was observed, indicating that ADA levels were not indicative of the final diagnosis (Table 4). Upon comparing mean values of Polymorph, Lymphocytes, Sugar, Protein and ADA Levels among patients with benign and malignant findings, it was observed that none of the parameters were significantly associated with thoracoscopy diagnosis, indicating that Polymorph (P- value- 0.161), Lymphocytes (P- value- 0.133), Sugar (P- value- 0.231), Protein (P- value-0,073) and ADA Levels are less indicative of final diagnosis (Table 5).

The most common type of malignancy was Adenocarcinoma, observed among 13 individuals, followed by 3 patients having non small-cell carcinoma, and 8 patients having other carcinomas (Figure 2). The cut-off ADA levels were obtained utilizing ROC curve analysis. The optimum ADA levels for detecting malignancy (with a specificity of 58.3%, and sensitivity of 77.8% was <47.5 IU/L in the present study (Figure 3).

Table 1: Age Distribution:

Age Group	N	%
30 - 39 yr	3	7.5
40 - 49 yr	5	12.5
50 - 59 yr	13	32.5
>= 60 yr	19	47.5
Total	40	100.0

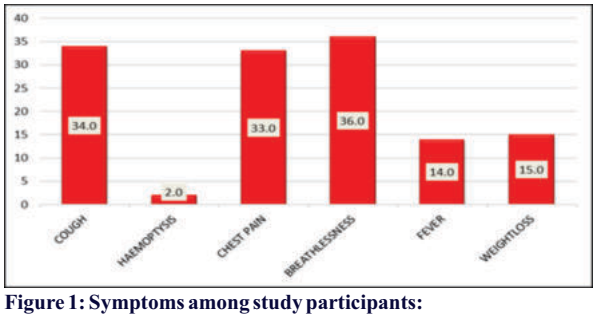

Figure 1: Symptoms among study participants:

Table 2: CT findings and Thoracoscopy findings:

CT Finding	N	%
Effusion & Collapse	30	75.0
Enhancement	8	20
Mass	11	27.5
Nodular Thickening	6	15.0
Thoracoscopy findings	N	%
Granulomatous	12	30.0
Inflammation	4	10.0
Malignancy	24	60.0
Total	40	100.0

Table 3: Pleural effusion ADA levels and M-cells observed among study participants:

ADA Level	N	%
< 40	21	52.5
>= 40	19	47.5
Total	40	100.0

M-cells type	N	%
Positive	4	10.0
Atypical	4	10.0
Negative	32	80.0

M-cells with malignancy	N	%
Positive	4	16.7%
Atypical	4	16.7%
Negative	16	66.7%

Table 4: Association of ADA Level with thoracoscopy diagnosis:

ADA		Diagnosis						chi sq	P -value
		Granulomatous		Inflammation		Malignancy			
		No.	%	No.	%	No.	%		
Category	< 40	4	33.3%	4	100.0%	13	54.2%	5.41	0.067
	>= 40	8	66.7%	0	0.0%	11	45.8%		
Total		12	100.0%	4	100.0%	24	100.0%		

Table 5: Descriptive Summary of Polymorph, Lymphocytes, Sugar, Protein and ADA Levels and its comparison between Benign and Malignant Cases:

PARAMETER	Mean	Mean	Mean
SUGAR	106.67	83.50	71.79
PROTEIN	4.24	2.25	4.47

Parameter	Granulomatous	Inflammaton	Malignancy
Polymorphic	0	3	10
Lymphocytic	12	1	14

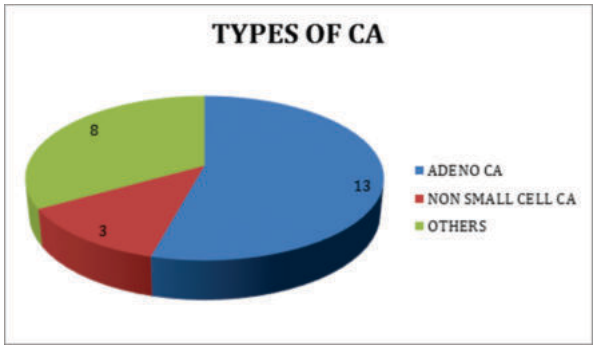

Figure 2: Type of Malignancy observed among study patients:

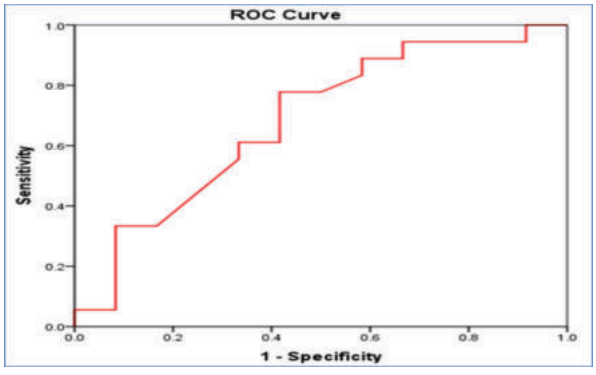

Figure 3: ROC Analysis to find optimum cut-off ADA levels for detecting Malignancy:

DISCUSSION:

The primary objective of this study was to identify undiagnosed and misdiagnosed pleural effusions after thorough biochemical and cytological evaluations. Since thoracoscopy offers a direct vision of the pleural surface, it offers a diagnostic advantage than blind needle biopsies. In the present study, a total of 40 cases of undiagnosed pleural effusion were assessed retrospectively during the study duration. CT- or ultrasound-guided pleural biopsies are quite sensitive and safe, with the only reported complications being local hematoma,pneumothorax and minor hemoptysis (7, 8). Image-guided pleural biopsies have been shown to be superior to blind pleural biopsies in the diagnostic efficacy for malignant pleural effusion (9).

In the present study, we found that malignant pleural effusion is much more common than the other exudates, such as granulomatous and infectious effusions. This is consistent with the study conducted by Wang XJ et al (2015) (10), wherein 41.1% patients were confirmed to have malignant effusion. In other studies of undiagnosed pleural effusion, malignancy was the most frequent etiological cause observed in 50% (11), 54% (12), 69% (13), and 83% (14). Published observations suggest that the procedure is safe with minimal complications (15). The diagnostic yield with medical thoracoscopy increases even in those cases where there are no significant pleural abnormalities visible on chest CT (16).

The most common symptoms in the present study were breathlessness (36.0%), cough (34.0%), and chest pain (33.0%). This was consistent with another study conducted by Groot M de (1998) (11), wherein dyspnea, cough and chest pain were the most commonly reported symptoms.

Adenocarcinoma is the most common sub-type reported in undiagnosed pleural effusions. In our study, 13 of the 24 patients with a conclusive histopathology were diagnosed to have adenocarcinoma. Similar observations were reported in other studies (17, 18). After obtaining biopsies from thoracoscopy, all patients with pleural effusions were diagnosed definitely, amounting to a high overall diagnostic efficiency, sensitivity of our study is more than 90 %, which was similar to those reported by the others (19, 20).

In our study there were 8 patients who were being misdiagnosed as a case of tubercular effusion because pleural fluid was predominantly lymphocytic with high ADA value and negative malignant cells. 5 of these patients had already been taking ATT on empirical basis before being referred to tertiary care center i/v/o lack of relief in symptoms. These patients were diagnosed with malignancy on thoracoscopic guided pleural biopsies In conclusion, thoracoscopy is an efficacious procedure in the diagnosis of undiagnosed / misdiagnosed pleural effusions with excellent safety. In the developing countries such as India, thoracoscopy is particularly helpful for patients with clinically suspected malignant and/or tuberculous pleural effusion.

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