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Frequency of Malignancy on Video-Assisted Thoracoscopic Pleural Biopsy in Patients with Exudative Pleural Effusion

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ABSTRACT

Objective: To identify the frequency of malignancy upon Video-assisted thoracoscopic pleural biopsy in patients with exudative pleural effusion.

Study Design: Retrospective longitudinal study.

Place and Duration of Study: Thoracic Surgery Department, CMH Rawalpindi, Pakistan from Jan 2022 to Aug 2023.

Methodology: The study included 273 patients having exudative pleural effusion diagnosed upon pleural tap. Patients who had negative cytology and mycobacterial cultures were included in the study. The previous diagnostic procedures, histopathology, along with culture reports, were collected for all patients. Any additional procedures and complications of VATS were also documented in the patients.

Results: Of 273 patients, 183(67.03%) male and 90(32.96%) females. VATS pleural biopsy revealed cancer in 81(29.67%) patients. Lung cancer was the most frequent malignancy, accounting for 49(17.94%) cases. Mesothelioma was found in 11(4.02%) cases, metastatic carcinoma in 21(7.69%) cases. 128(46.88%) were proven to have tuberculosis, non-specific inflammation was diagnosed in 64(23.44%) cases. VATS-related complications occurred in 34(12.45%) patients. No mortality was observed within 30 days of admission.

Conclusion: The diagnosis of exudative pleural effusions can be safely and efficiently made by VATS pleural biopsy. The most prevalent diagnosis in our setup was pulmonary tuberculosis, followed by malignancies.

Keywords: Exudative Pleural Effusion, Malignancy, Pleural Biopsy, Tuberculosis, VATS.

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INTRODUCTION

Exudative pleural effusion is a common clinical problem by physicians and is a frequent reason for referral to thoracic surgeons. The condition is identified by an effusion with pleural fluid protein to blood protein ratio over 0.5 or an LDH level more than two–thirds of the upper limit of normal serum LDH levels. Exudative pleural effusion is attributed to several prominent etiologies, including malignancies, tuberculosis (TB), and para-pneumonic effusions.[1,2] Cancer is a primary cause of exudative pleural effusions, which accounts for around 30% of cases.[3,4] The most common malignancies linked to exudative pleural effusions are lung, breast, lymphoma, and mesothelioma.[5] The detection of malignant cells in the pleural fluid is a marker for malignant pleural effusion. Nevertheless, further diagnostic workup becomes essential when the pleural fluid does not exhibit malignant cells.[6] VATS provides us with visualization of the pleural lesions and a collection of pleural fluid specimens for cytology, analysis, and biopsy of the suspicious lesions for histopathology and cultures. Using a thoracoscope and instruments through small incisions in the chest, the questionable spots can be biopsied under vision, increasing the diagnostic yield of VATS.[7,8] The study aims to investigate the frequency of malignancy in patients with exudative pleural effusion who had VATS pleural biopsy to identify the most often seen malignancies and non-malignant conditions in this particular patient population.

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METHODOLOGY

The retrospective longitudinal study was conducted at the Thoracic Surgery Department Combined Military Hospital Rawalpindi, Pakistan from January 2022 to August 2023 after approval from the Institutional Review Board (IRB letter ref. no. 484 dated 16-11-2023). The sample size was calculated using the WHO Sample Size Calculator. Non-probability consecutive sampling was used.

Inclusion Criteria: All patients with exudative pleural effusion diagnosed on pleural tap are negative for malignant cytology and mycobacterial cultures. Patients having previously treated pulmonary TB but recurrent indeterminate pleural effusion fall in the

criteria. Patients who started with ATT but did not respond to treatment were also included.

Exclusion Criteria: Patients with cytology-proven malignancy in exudative pleural effusions and those having diagnosed TB effusions were excluded.

A total of 273 patients with exudative pleural effusion and undiagnosed cause were subjected to VATS pleural biopsy. Throughout the study, patient confidentiality and data privacy were rigorously observed. The data, including age, gender, and previous diagnostic procedures, was acquired from the patient's medical records. Histopathology, along with culture reports, was collected for all patients. Any additional procedures and complications of VATS were also documented in the abovementioned patients.

Standard Package for the Social Sciences (SPSS) version 29.00. was used for data analysis. Quantitative variables were expressed as Mean±SD and qualitative variables were expressed as frequencies and percentages.

RESULTS

The study included two hundred seventy-three patients with diagnostic VATS and pleural biopsy. The gender distribution, mean age 56.1±9.2 years, was calculated. Most patients, 216(79.12%), had previously undergone diagnostic procedures, while 244(89.3%) had negative bacterial cultures, as shown in Table-I.

Table-I: Gender, Age distribution, previous diagnostic procedures/ cultures of the Patients (n=273)

Characteristics	n(%)
Gender	
Male	183(67.03%)
Female	90(32.96%)
Age range	24-87 years
Mean age mean±SD	56.1±9.2 years
Patients with previous diagnostic procedures	216(79.12%)
Negative bacterial cultures	244(89.37%)

The histopathology results of these 273 patients who underwent VATS pleural biopsy for exudative pleural effusion were analyzed. The most common diagnosis was tuberculosis, followed by malignancy, with 128(46.9%) of patients being diagnosed with this condition. In the malignant group, carcinoma lung was the most common cause, followed by mesothelioma and then metastasis from different tumors, including breast, stomach, ovarian carcinoma, sarcoma, and lymphomas, all collectively making 21(7.69%) patients. Non-specific inflammation, including acute on chronic inflammation, non-specific mesothelial proliferation, pleuritis, and pleural fibrosis, was seen in 64(23.5%) patients. In 3(1.09%) cases, the pleural sample revealed inadequate specimens for diagnosis. A review of the specimen revealed metastatic carcinoma in 01 specimen and acute or chronic inflammation in the remaining 02 specimens. Six (2.19%) patients had a suspicion of malignancy, as shown in Table-II.

During VATS procedures for exudative pleural effusion, no death was reported within 30 days. Complications occurred in 38(13.91%) patients, including loculated effusions and inadequate expansions. Loculated effusions were managed by adjustment of chest drains, and inadequate lung expansion was managed by prolonged chest tube drainage. Mild subcutaneous emphysema was also noted in a few postoperative patients. Some of these overlap with patients with inadequate lung expansion. Four (1.46%) patients had trapped lungs. VATS Decortication in the first surgery was performed in 24(8.79%) patients, 03(1.09%) in the malignancy group, and 21(7.69%) in the non-malignancy group. As shown in Table III, Talc pleurodesis was performed in 28 patients (10.3%) during the VATS procedure.

Table-II: Histopathology results on Video-assisted thoracoscopic (VATS) Pleural Biopsy (n=273)

Histopathology results	n(%)
Malignancy	81(29.67%)
Carcinoma lung	49(17.94%)
Mesothelioma	11(4.02%)
Metastatic tumors	21(7.69%)
Breast	04(1.46%)
Ovarian	03(1.09%)
Stomach	04(1.46%)
Sarcomas	03(1.09%)
lymphomas	07(2.56%)
Suspicion of malignancy	06(2.19%)
Tuberculosis	128(46.88%)
Non-specific inflammation	64(23.44%)
Acute on chronic inflammation	28(10.25%)
Non- specific mesothelial proliferation	10(3.66%)
Pleural fibrosis	9(3.29%)
Pleuritis	17(6.22%)
Inadequate pleural sample	3(1.09%)

DISCUSSION

The findings of our study provide valuable insights into the challenges and nuances of managing patients with exudative pleural effusion, particularly in malignancies and complex pleural conditions.

Table-III: Complications/ additional procedures during Video-assisted thoracoscopic (VATS) Pleural Biopsy (n=273)

Complications/ procedure	Frequency (%)
Complications	
Death within 30 days	0
Loculated Effusion	5(1.83%)
Inadequate lung expansion/ prolonged tube drainage	16(5.86%)
Malignant Group	9(3.29%)
Non-malignant Group	7(2.56%)
Subcutaneous Emphysema	13(4.76%)
Trapped Lung	4(1.46%)
Procedures during Video-Assisted Thoracoscopic (VATS)	
VATS Decortication	24(8.79%)
Malignancy Group	3(1.09%)
Non-malignant Group	21(7.69%)
Talc Pleurodesis	28(10.25%)

Exudative pleural effusion is a common clinical issue encountered by physicians/pulmonologists, which may be a presentation of several disease processes. Most of the time, diagnosis cannot be established, which makes this condition a frequent cause of referral to thoracic surgeons for diagnostic VATS and biopsy. Literature has documented the sensitivity of VATS to 95% in diagnosing malignant pleural effusion.[9] This study found diagnostic VATS and pleural biopsy safe and effective. The average age of the patients in our study was 56 years; other studies have shown a greater frequency of pleural effusion in older individuals[10]. The most common diagnosis in the study was tuberculosis, which is still a significant cause of pleural effusion of concern in developing countries.[11] This highlights the necessity of evaluating TB as a differential diagnosis in patients with exudative pleural effusion, mainly where this disease is common. In this study, cancer was the second most prevalent diagnosis, with lung carcinoma being the most common malignancy. Previous studies identified lung cancer as the leading cause of malignant pleural effusion.[12,13] Mesothelioma, breast carcinoma, sarcomas, ovarian cancer, and metastatic gastric cancer were also observed in a small percentage of patients, highlighting the importance of considering these conditions in the differential diagnosis of pleural effusion. In this study, the overall complication rate of VATS pleural biopsy was 38(13.91%), with no reported fatalities within 30 days. This is similar to earlier studies showing VATS as a safe technique with minimal complication rates [14,15]. In this research, the most frequent problems were loculated effusions and inadequate lung expansion, which were more common in the cancer group. This occurred because these patients had tumor masses or adhesions resulting in trapped lungs. Decortication and talc pleurodesis were done in a modest number of VATS patients, consistent with earlier studies that found them beneficial in treating pleural effusion [16-,18]. Malignancy patients requiring palliative care were treated with prolonged chest tube drainage that was later converted to pleural catheter placement.

CONCLUSION

VATS pleural biopsy is a safe and effective procedure for diagnosing exudative pleural effusions in patients where the diagnosis cannot be established. It allows direct visualization of the pleural and lung surfaces and mediastinal lymph nodes and accurately allows the biopsy of suspicious/ most questionable lesions. The most common diagnosis in our setup was tuberculosis, followed by malignancy, with lung cancer being the most common malignant cause. Adequate tube drainage was achieved in most patients, and patients with malignancy were effectively treated with pleurodesis and pleural drainage catheters/tubes. There were no reported deaths within 30 days.

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Authors' Contributions:

Following authors have made substantial contributions to the manuscript as under:

FU & FAM: Data acquisition, data analysis, critical review, approval of the final version to be published.

BU & MUJ: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

WF: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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