# Thoracoscopic biopsy in the diagnosis of lung and pleural diseases

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## Abstract

**Background:** Thoracoscopy is a useful procedure for evaluation and diagnosis of pleural effusion and other thoracic disorders. Our study aimed to evaluate the scope and use of thoracoscopic biopsy for the evaluation of thoracic disorders and report on the outcomes of this technique. **Methods:** Patients undergoing thoracoscopic biopsy procedure from March 2022 to May 2023 were analyzed for indications, complication and outcomes. **Results:** 85 patients underwent thoracoscopic biopsy over a period of 15 months, of which 38 (44.7%) were males and 47 (55.3%) were females. The mean age was 60 years. Cough, dyspnea and chest pain were the most common presenting symptoms. Thoracosopy was most commonly done on the right side (67.1%). Pleura (57.6%) was the most common biopsy site, followed by lungs (22.4%), lymph node (12.9%) and mediastinum (3.7%). One case was converted to open procedure. Post operative complication rate was 3.5%. Adenocarcinoma (31.8%) was the most common histology, followed by squamous cell carcinoma (9.4%). 36.5% patients had benign disease and 11.8% patients had metastatic extra-thoracic malignancy. **Conclusion:** Thoracoscopy is a safe and simple procedure for diagnosis of pleural and other thoracic disorders with the advantage of tissue sampling from lesion under direct visualization. It is a useful tool in the armamentarium of thoracic surgeons.

*Keywords: Thoracoscopy; biopsy; pleural effusion*

## Introduction

Video Assisted Thoracic Surgery (VATS), also known as thoracoscopy is a minimally invasive technique used in the diagnosis and treatment of thoracic diseases. Hans Christian Jacobeus was the first physician, in 1910 to utilize this technique initially for closed intrapleural pneumonolysis and later on for diagnosis of many sorts of pleural diseases.[1] For the vast majority of the later half of the twentieth century thoracoscopy was primarily used for pleural biopsy; whereas recently, with the development of advanced equipment, it has also been adopted for major therapeutic procedures including lung resections and esophageal

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surgeries. The benefits of thoracoscopic technique are numerous and include decreased postoperative pain, avoidance of large thoracotomy incisions, reduction in length of hospital stay and early ambulation among others.

Thoracoscopy is useful in the evaluation of pneumothorax, pleural effusions, and empyema along with staging of lung cancer and evaluation of small pulmonary nodules. Biopsy can be taken from parietal pleura, lung, mediastinal lymph nodes, pericardium, diaphragm and mediastinal masses. Furthermore, therapeutic procedures like adhesiolysis and pleurodesis may also be done during the procedure.

Our hospital is a tertiary cancer center where patients present with diagnosed and undiagnosed lung and pleural diseases. Thoracoscopic biopsy is a common procedure used in our unit for taking pleural and lung biopsies in cases of lung cancer and other diseases, where a confirmatory diagnosis was not possible by other investigations.

The aim of this study was to evaluate the scope and use of thoracoscopic biopsy as has been done in our center and report on the outcomes of this simple but important technique.

## Methods

### Patients

This was a retrospective study evaluating consecutive patients who underwent thoracoscopic biopsy procedure from March 2022 to June 2023 in the Department of Surgical Oncology (Thoracic Unit) of BP Koirala Memorial Cancer Hospital (BPKMCH). The study was approved by the Institutional Review Committee, BPKMCH. Because of the retrospective nature of the study, need for individual patient consent was waived.

Patients presenting with undiagnosed pleural effusions, indeterminate lung or pleural nodules, mediastinal lymphadenopathy not amenable to biopsy with less invasive approaches, or uncharacterized thoracic masses were offered this procedure.

The data collected included baseline patient characteristics and demographic data, presenting complaints, surgical parameters such as biopsy site, location, intraoperative and postoperative complications, duration of chest drainage and final histopathological analysis. Informed patient consent was taken prior to the procedure in all cases.

### Thoracoscopy procedure

All procedures were done under general anesthesia with single lumen tube, with the patient in lateral decubitus position. The camera port was placed in the $5^{th}$ to $7^{th}$ intercostal space, usually along the mid axillary line according to the target lesion and surgical CO2 pneumothorax was created up to 9 mm of Hg. The thoracic cavity was visualized using 30-degree rigid telescope (thoracoscope). One or two working ports (5 mm) were then placed as per need of the procedure and adhesions were lysed using monopolar cautery if needed. Biopsy was taken from the lesion with biopsy forceps if the target lesion was in the pleura. In case of lymph nodes, dissection with monopolar electrocautery was done and the lymph node

harvested. For lung lesions either the lesion was harvested using monopolar electrocautery and the defect sutured with 3-0 polyglactin or EndoGIA staplers (Medtronic, Minneapolis, USA) were used and the lesion removed enlarging the 5 mm working port. At the end of the procedure, a 24 french chest tube drain was placed with underwater seal. Negative suction was not routinely used. All patients were extubated prior to shifting to post operative care.

Post operatively, Chest Xray was done after 24 hours. The chest tube drain was placed until there was no air leakage and the drain amount was less than 150 ml every 24 hours. Pleurodesis with 10% Povidone-Iodine or 30 units of bleomycin was done if there was continuous drainage of >300 ml of serous fluid after 5 days.

**Statistical analysis**

Data were expressed as median value and range for continuous variables and as a number and percentage for categorical variables. All data analysis was performed using SPSS version 26.

**Results**

A total of 85 patients underwent thoracoscopic biopsy procedure for various indications from March 2022 to May 2023. The common demographic details and presenting complaints have been shown in table 1.

| Table 1: Demographic and clinical characteristics | |
|---|---|
| Variable | Value |
| Median Age (range) | 60 (5- 83) |
| Sex | |
| Male | 38 (44.7%) |
| Female | 47 (55.3%) |
| Presenting symptoms | |
| Cough | 56 (65.9%) |
| Dyspnea | 55 (64.7%) |
| Chest pain | 46 (54.1%) |
| Weight loss | 18 (21.2%) |
| Anorexia | 17 (20%) |
| Hemoptysis | 14 (16.5%) |
| Fever | 13 (15.3%) |
| Asymptomatic | 9 (10.6%) |
| Pleural effusion | 46 (54.1%) |

Fifty-seven patients (67.1%) underwent thoracoscopic procedure in the right side. One patient had to be converted to an open procedure with a mini thoracotomy incision due to inadequate visualization secondary to extensive adhesions. Two intraoperative events occurred and there were three postoperative complications (Table 2). There were no mortalities.

The most common site of biopsy was the pleura in 49 patients (57.6%). Other sites in decreasing order of frequency included lung (22.4%), mediastinal lymph nodes (12.9%), and anterior mediastinal masses (2.4%). Pericardium, paraesophageal mass and right paratracheal mass were biopsied in one case each (1.2%) (table 2).

Table 2: Intra- and Post-operative complications

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|---|---|---|
| Intraoperative | | |
| Conversion to open | | 1 |
| | | 1 |
| Intraoperative SVT | | 1 |
| Difficult extubation | | |
| Postoperative | | |
| Surgical emphysema | Chest tube repositioning | 1 |
| | | 1 |
| Persistent air leak | Discharged with Heimlich valve | 1 |
| Prolonged fluid drainage | Discharged with Indwelling catheter | |

On histopathology, Malignancy was proven in 54 cases (63.5%) whereas the remaining 31 cases (36.5%) came out be benign etiology. Of the malignant cases 45 were primary thoracic neoplasms including adenocarcinoma of lung in 27 cases (31.8%), squamous cell carcinoma in 8 cases (9.4%), primary mediastinal lymphoma in 4 cases (4.7%), small cell carcinoma in 3 cases (3.5%). Mesothelioma, poorly differentiated carcinoma, and plasma cell disorder represented one case each (table 3).

Nine cases were proven to be of metastatic nature with primary in extra-thoracic location. Soft tissue sarcoma represented 4 cases (4.7%), while breast cancer and Head and neck cancer were two each. Thyroid carcinoma was represented by one case.

31 cases were proven to be benign entities. Non inflammatory conditions were present in 8 cases (9.4%) whereas non-specific pleuritis in 7 cases, pulmonary tuberculosis in 7 cases, pneumonitis in 6 cases, reactive lymphadenitis in 2 cases and one case of pneumoconiosis.

| Table 3: Final Histopathology Report | |
|---|---|
| Benign | 31 (36.5%) |
| Benign fibrosis/ fibrofatty tissue | 8 (9.4%) |
| Non specific pleuritis | 7 (8.2%) |
| Tuberculosis | 7 (8.2%) |
| Pneumonitis | 6 (7.1%) |
| Reactive lymphadenitis | 2 (2.4%) |
| Pneumoconiosis | 1 (1.2%) |
| Primary Thoracic malignancy | 45 (51.8%) |
| Adenocarcinoma | 27 (31.8%) |
| Squamous cell carcinoma | 8 (9.4%) |
| Lymphoma | 4 (4.7%) |
| Small cell carcinoma | 3 (3.5%) |
| Poorly differentiated carcinoma | 1 (1.2%) |
| Mesothelioma | 1 (1.2%) |
| Plasma Cell Disorder | 1 (1.2%) |
| Extra-Thoracic malignancy | 9 (11.8%) |
| Soft Tissue Sarcoma | 4 (4.7%) |
| Breast Carcinoma | 2 (2.4%) |
| Head and Neck Cancer | 2 (2.4%) |
| Papillary Thyroid Carcinoma | 1 (1.2%) |

**Discussion:**

This was a single center retrospective study, where we aimed to evaluate the usefulness of thoracoscopy for diagnostic evaluation of thoracic disorders. The main indication for thoracoscopy was to procure adequate tissue samples for diagnosis of malignancy. Evaluation of undiagnosed pleural effusion and evaluation of indeterminate lung nodules were other indications. We evaluated 85 patients who underwent VATS biopsy over a period of 15 months. The overall diagnostic yield was 77/85 (90.5%) in our study. This

result is comparable to that published by Hansen et al[2], and Blanc et al[3] who had diagnostic sensitivity of 90.4%[2] and 93.3%, respectively.

The most common site of biopsy was pleura in 57.6% of cases followed by lung, lymph nodes, mediastinal mass and other masses respectively. This is in contrast to Wan et al[4], Hansen et al[2], and Patil at al[5] where almost all biopsies were taken from the parietal pleura. The reason for this discordance is that in many countries diagnostic evaluation of pleural disease using pleuroscope or thoracoscope has increasingly been done by pulmonologists. But in our center, surgeons have been doing the procedure, hence more complicated biopsies of lungs, lymph nodes and mediastinum can also be proceeded.

Our series had a low rate of complications. There were no mortalities. One patient had to be converted to open throracotomy (1.2%) and two other patients developed cardiorespiratory issues intraoperatively, which were managed successfully in the operation theatre itself. Post-operative complications occurred in three patients and all were successfully managed. Our overall complication rate of 3.5% seems acceptable and is comparable to Hansen et al[2] and better than Sugino's complication rate of 12.6%[6].

In our series, biopsy yielded positive for malignancy in 63.5% of cases, of which primary thoracic malignancies represented 51.8% and non-thoracic metastases represented 11.8% cases. Hucker et al reported malignancy in 59% of cases[7]. Hansen at al[2] and Patil at al[5] reported malignancy rates of 62% and 56.6%, respectively. Our series has a slightly higher malignancy positivity rate probably because we are a cancer center and most patients present with suspicion of cancer.

The most common malignancy was metastatic lung cancer which was identified in 39 patients (72% of all malignancies diagnosed)), which is expected as it is the second most common cancer worldwide.[8] Other malignancies included lymphoma, mesothelioma, and plasma cell disorder. Adenocarcinoma was by far the most common variant of lung carcinoma involving 27 out of 39 patients (69.2%). This result is comparable to Joubert et al, where adenocarcinoma represented 77.6% of cases.[9] Extrathoracic malignancies comprised 9 out of 54 malignancies (16.6%). We had previously reported our experience in a small cross sectional study where the results were similar.[10]

The limitation of the study is its retrospective nature and relatively small sample size.

## Conclusion

Our data suggests thoracoscopy biopsy to be a low risk, well tolerated procedure for the diagnostic evaluation of pleural and other thoracic disorders. Besides diagnosis of pleural effusion, it also provides the opportunity for resection of lung or mediastinal nodules. Therefore, thoracoscopy should be considered for the diagnosis of such disorders after the exhaustion of less invasive methods.

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