ORIGINAL ARTICLE

Malignant pleural effusion: Relationship between thoracoscopic findings and type of malignancy

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KEYWORDS
Thoracoscopy; Pleural effusion; Mass; Nodules; Plaques; Adhesions

Abstract Background: Pleural malignancy either primary or due to metastatic involvement can be presented by different macroscopic appearances in thoracoscopic examination of pleural cavity.

Purpose: To identify the relationship between thoracoscopic view of different malignant pleural lesions and pathological types of malignancy in malignant pleural effusion.

Patients and methods: A retrospective study reviewing medical reports of sixty-nine (69) patients who underwent medical thoracoscopy and were confirmed to be malignant pleural effusion by pleural tissue biopsy as well as macroscopic appearances of malignant pleural lesions were identified.

Results: Metastatic adenocarcinoma was the main type of malignancy (46 cases 66.7%), followed by malignant lymphoma (9 cases 13%), malignant mesothelioma (4 cases 5.8%), squamous cell carcinoma (4 cases 5.8%), small cell carcinoma (3 cases 4.3%), sarcoma (2 cases 2.9%) and lastly spindle cell tumor (single case 1.4%). Nodular appearance of malignant pleural lesions was the main thoracoscopic finding (75.45%) followed by masses (50.7%), plaques (20.3%) and lastly adhesions (14.5%) of cases. Nodules represented the main thoracoscopic finding in both metastatic adenocarcinoma and malignant lymphoma (82.6% and 77.78%, respectively) afterward masses (45.65% and 50.7%, respectively). However; masses represented the main thoracoscopic finding (100%) in malignant mesothelioma followed by nodules (50%).

Conclusion: Inspecting pleural cavity via medical thoracoscopy and identification of macroscopic appearance of different malignant pleural lesions may give a good prospect about the suspected pathological type of malignancy in malignant pleural effusion.

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Introduction

Malignant pleural effusion (MPE) is one of the most common problems faced by clinicians in their everyday practice [1]. MPE usually presents in the disseminated and advanced stage of malignancy [2]. In one postmortem series, malignant effusions were found in 15% of patients who died with
malignancies. Although there have been no epidemiologic studies, malignant pleural effusion is also one of the leading causes of exudative effusion; studies have demonstrated that 42–77% of exudative effusions are secondary to malignancy [1]. Nearly all neoplasms have been reported to involve the pleura. In most studies, however, lung carcinoma has been the most common neoplasm, accounting for approximately one third of all malignant effusions. Breast carcinoma is the second most common. Lymphomas, including both Hodgkin’s disease and non-Hodgkin’s lymphoma, are also an important cause of malignant pleural effusions. In 5–10% of malignant effusions, no primary tumor is identified [3]. The incidence of mesothelioma varies according to the geographic location. Postmortem studies suggest that most pleural metastases arise from tumor emboli to the visceral pleural surface, with secondary seeding to the parietal pleura. Other possible mechanisms include direct tumor invasion (in lung cancers, chest wall neoplasm and breast carcinoma), haematogenous spread to parietal pleura and lymphatic involvement. Interference with the integrity of the lymphatic system anywhere between the parietal pleura and mediastinal lymph nodes can result in pleural fluid formation [4]. Thoracoscopy is highly sensitive for detecting pleural neoplasia with negative pleural fluid cytology [5]. The possibility of visualizing the pleural cavity and obtaining directed biopsy specimens accounts for diagnosis of more than 90% of pleural neoplasia [6–8]. However, its precise indication in the workup of patients with pleural effusion remains controversial [9]. So; the aim of this study is to identify the relationship between thoracoscopic view of different malignant pleural lesions and pathological types of malignancy in malignant pleural effusion.

**Subjects and methods**

**Patients**

A retrospective study reviewed medical thoracoscopic reports of 69 patients with pleural effusion underwent medical thoracoscopy and confirmed to be malignant in the chest department of Mansoura University hospital between January 2013 and April 2014.

**Methods**

**Prethoracoscopy assessment**

For each patient, the following were reviewed: (1) detailed medical history, (2) investigations done to reach the final diagnosis including; chest radiographs and chest-CTs, pleural aspiration with cytology and closed pleural biopsy.

**Thoracoscopy procedure**

Prior to the thoracoscopy procedure, pleural effusion was drained and ipsilateral pneumothorax was induced, both in the endoscopy suite. Thoracoscopy was usually done under local anesthesia with spontaneous breathing and mild sedation (midazolam, fentanyl) by an experienced pulmonologist in the operating room. Patients were placed in lateral decubitus position, with the involved side upward. After skin sterilization, a small skin incision was done with blunt dissection to enter the pleural space between the third and sixth intercostal space, along the midaxillary line. The ribs were not spread. A rigid thoracoscope (Karl Storz, Germany) was inserted, and the pleural cavity was visualized. The parietal, visceral and diaphragmatic pleurae were successively inspected and any pathological lesions were described and identified as well as the mediastinal vessels and lymph nodes were inspected also. Biopsies were performed under direct visual control in all suspect areas, systematically in several parts of the parietal pleura, and sometimes in the visceral pleura, with diathermy forceps. All thoracoscopic pleural biopsies were stained by hematoxylin and eosin and examined by an expert pathologist to diagnose the histopathological type of malignancy. An intercostal tube wasinserted before wound closure to evacuate air and fluid. Chest radiographs were routinely obtained with a portable unit, immediately after the procedure and daily thereafter until chest tube removal. On malignant diagnosis cases underwent pleurodesis routinely. Once the lung had expanded and drain output had decreased to less than 50 ml per 24 h, chest tube was removed.

**Postthoracoscopy assessment**

The recorded major and minor complications were considered. Major complications were retrospectively defined as events requiring active medical management during the hospital stay. Minor complications were events requiring medical supervision only. The duration of drainage was measured from the day medical thoracoscopy was performed to the day on which the chest tube was removed.

**Statistical analysis**

Data were analyzed using SPSS (Statistical Package for Social Sciences) version 21. Qualitative data were presented as number and percentage. Quantitative data were presented for normality by Kolmogorov–Smirnov test. Normally distributed data were presented as mean and standard deviation. Comparison between final diagnosis was done using Chi-square test. P value < 0.05 was considered significant.

**Results**

The mean age of studied population was 53.59 years with standard deviation 11.9 with age range from 20 to 78 years. Forty-one were males (59.45%) and twenty-eight of them were females (40.6%).

<table>
<thead>
<tr>
<th>Type of malignancy</th>
<th>Frequency</th>
<th>Valid percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metastatic adenocarcinoma</td>
<td>46</td>
<td>66.7</td>
</tr>
<tr>
<td>Malignant lymphoma</td>
<td>9</td>
<td>13.0</td>
</tr>
<tr>
<td>Malignant mesothelioma</td>
<td>4</td>
<td>5.8</td>
</tr>
<tr>
<td>Metastatic squamous cell carcinoma</td>
<td>4</td>
<td>5.8</td>
</tr>
<tr>
<td>Small cell carcinoma</td>
<td>3</td>
<td>4.3</td>
</tr>
<tr>
<td>Sarcoma</td>
<td>2</td>
<td>2.9</td>
</tr>
<tr>
<td>Spindle cell tumor</td>
<td>1</td>
<td>1.4</td>
</tr>
<tr>
<td>Total</td>
<td>69</td>
<td>100.0</td>
</tr>
</tbody>
</table>
As revealed in Table 1, according to final diagnosis; cases with malignant pleural effusion were categorized into metastatic adenocarcinoma (46 cases 66.7%), malignant lymphoma (9 cases 13%) malignant mesothelioma and metastatic squamous cell carcinoma (4 cases 5.8% for each) small cell carcinoma (3 cases 4.3%), sarcoma (2 cases 2.9%) and spindle cell tumor (one case 1.4%).

As revealed in Table 2 malignant pleural effusion showed higher percentage in thoracoscopic nodules (75.45%) followed by masses (50.7%), plaques (20.3%) and last of all adhesions (14.5%). Metastatic adenocarcinoma proved to be in higher percentage in thoracoscopic nodules (82.6%) followed by mass (45.65%) while adhesions and plaques were present in 10.86% for each. Malignant lymphoma presented higher percentage in thoracoscopic nodules also (77.78%) followed by masses (66.67%) then thoracoscopic plaques 44.45% for each. Malignant mesothelioma demonstrated higher percentage in thoracoscopic mass (100%) followed by thoracoscopic nodules (50%). Thoracoscopic mass and plaques were present in all cases with sarcoma while adhesions represented in half of the cases. 2/3 of small cell carcinoma presented plaques however only 1/3 of cases presented nodules. Spindle cell tumor represented only in one case that revealed just thoracoscopic mass. All cases of metastatic squamous cell carcinoma had nodules unlike masses and plaques that were present in 25% of cases. To be noted more than one finding may be present in the patient. Significant statistical differences were present as regards all thoracoscopic findings apart from thoracoscopic adhesions.

In this study as shown in Table 3, the presence of more than one thoracoscopic finding may refer to certain diagnosis or aid in confirming the malignancy consequently presence of two thoracoscopic findings accounted for 77.8% of cases with malignant lymphoma while malignant mesothelioma presented equal percentage for one or two findings (50% for each). Metastatic adenocarcinoma showed higher percentage of one finding (54.3%) followed by two findings (41.3%) lastly three findings (4.3%), sarcoma and metastatic squamous cell carcinoma demonstrated equal percentage for two types, the former showed two and three findings and the latter showed one and two thoracoscopic findings. Spindle cell tumor and small cell carcinoma proved that one finding was present in each thoracoscopic examination.

In this study, medical thoracoscopy revealed that all cases with pleural plaques were detected on the parietal pleura however the rest of cases with pleural nodules, masses were present on in both visceral and parietal layers and cases with isolated lesions on either layer could not be delineated. In addition we could not demarcate specific lesions for pleural partitions as costal, diaphragmatic or mediastinal parts due to the degree of extension. Adhesions also were involving both pleural layers.

Complications reported in this study were few and of low risk. Five patients (7.25%) had thoracoscopic-related complications during this study. Two of them had empyema (2.89%); one had a residual pneumothorax (1.45%), one had subcutaneous emphysema (1.45%) and one had tumor implantation at the site of medical thoracoscopy tract (1.45%). These complications were properly managed. No bleeding or mortality was reported in our study and mortality rate was 0%.

Discussion

Over the time, medical thoracoscopy (MT) is still confirming that the dilemma of pleural effusion could not be actually worked out without its help. In this study sixty-nine patients underwent MT and showed malignant etiology of pleura effusion. Various types of macroscopic features (mass, nodules, plaques and adhesions) in pleural layers; visceral and parietal; can be visualized including costal, mediastinal and diaphragmatic partitions. For these, MT can be valuable in magnification of panoramic view of the hemithorax with high resolution for details as well as allows adequate biopsy specimens access.

Table 2  Relation between thoracoscopic findings and type of malignancy in the studied cases.

<table>
<thead>
<tr>
<th>Type of malignancy</th>
<th>Mass</th>
<th>Nodule</th>
<th>Plaques</th>
<th>Adhesion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metastatic adenocarcinoma (n = 46)</td>
<td>21</td>
<td>38</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>%</td>
<td>45.65%</td>
<td>82.6%</td>
<td>10.86%</td>
<td>10.86%</td>
</tr>
<tr>
<td>Malignant lymphoma (n = 9)</td>
<td>6</td>
<td>7</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>%</td>
<td>66.67%</td>
<td>77.78%</td>
<td>44.45%</td>
<td>44.45%</td>
</tr>
<tr>
<td>Malignant mesothelioma (n = 4)</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>%</td>
<td>100%</td>
<td>50%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Metastatic squamous cell carcinoma (n = 4)</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>%</td>
<td>25%</td>
<td>100%</td>
<td>25%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Small cell carcinoma (n = 3)</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>%</td>
<td>0.0%</td>
<td>33.33%</td>
<td>66.67%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Sarcoma (n = 2)</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>%</td>
<td>100%</td>
<td>0.0%</td>
<td>100%</td>
<td>50%</td>
</tr>
<tr>
<td>Spindle cell tumor (n = 1)</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>%</td>
<td>100%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Total (n = 69)</td>
<td>35</td>
<td>52</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>%</td>
<td>50.7%</td>
<td>75.4%</td>
<td>20.3%</td>
<td>14.5%</td>
</tr>
<tr>
<td>P value</td>
<td>0.05*</td>
<td>0.013*</td>
<td>0.004</td>
<td>0.086</td>
</tr>
</tbody>
</table>
for histologic, and possibly immunocytologic examination [10], and also gives the option for therapeutic procedures to be performed like decortication, pleurectomy, mechanical pleurodesis, talc insufflation and last but not least, visual directed placement of chest drains [11].

As revealed in Table 2 malignant pleural effusion showed higher percentage in thoracoscopic nodules (75.45%) followed by masses (50.7%), plaques (20.3%) and lastly adhesions in 14.5% of cases. This may be due to higher number of cases of metastatic adenocarcinoma and malignant lymphoma (Table 1) that are mainly presented by nodules (82.6% and 77.78%, respectively) (Table 2). This was in agreement with study done by Jiang et al. (2013) [12] who found that; the endoscopic findings of malignant pleural effusion mostly showed nodules of varying sizes. The nodules could be grape-like, cauliflower-like, fused into masses, or diffused small nodules and the main pathological diagnosis of malignant pleural effusion was pleural metastases (37.8% of cases). Metastatic adenocarcinoma proved to be in higher percentage in thoracoscopic nodules (75.45%) followed by masses (50.7%), plaques (20.3%) and lastly adhesions in 14.5% of cases. Significant statistical differences were present in all thoracoscopic findings apart from adhesions.

A study done by Rodríguez-Panadero et al. (1989) [15] and Light (2001) [16], demonstrated that involvement of the parietal pleura is frequently patchy and that the parietal pleura is involved later in the course of malignancy than the visceral one.

Two thirds of small cell carcinoma presented plaques however only one third presented nodules. Spindle cell tumor was represented only in one case that revealed just thoracoscopic mass and plaques were present in all cases with sarcoma due to fleshy tumor type while adhesions represented in half of the cases.

In our study thoracoscopic mass and plaques were present in all cases with sarcoma due to fleshy tumor type while adhesions represented in half of the cases.

In this study malignant mesothelioma demonstrated higher percentage in thoracoscopic mass (100%) followed by thoracoscopic nodules (50%); this due to small number of cases as well as most of them were of mixed subtype. For histologic, and possibly immunocytologic examination [10], and also gives the option for therapeutic procedures to be performed like decortication, pleurectomy, mechanical pleurodesis, talc insufflation and last but not least, visual directed placement of chest drains [11].

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Malignant pleural effusion

Conflict of interests

There is no conflict of interests in this study.

References


