Original Article

The Role of Mediastinoscopy in the Evaluation of Thoracic Disease and Lung Cancer

Background. Mediastinoscopy is a widely used procedure in the diagnosis of mediastinal disease and the staging of bronchogenic carcinoma. Its efficacy in the preoperative staging of lung cancer is well-established, with a procedural sensitivity of greater than 90% and specificity of 100%. Mediastinoscopy can also establish the diagnosis in greater than 90% of mediastinal disease. We conducted a retrospective study of mediastinoscopy performed at our institution between 1998 and 2001 to evaluate the safety and efficacy of mediastinoscopy.

Methods. We collected 100 consecutive mediastinoscopies performed in Thoracic Division of Taipei Veterans General Hospital, and National Yang-Ming University School of Medicine, Taipei, Taiwan, R.O.C.

Results. There were 69 men and 31 women aged from 13 to 87 (mean 60.9). Sixty-seven patients had mediastinoscopy for the staging of lung cancer, 29 patients for diagnosis of mediastinal mass or lymphadenopathy, and 4 patients for unclassified lung mass with enlarged mediastinal lymph node. Among the patients with mediastinal disease, sarcoidosis was diagnosed in 13 patients, and lymphoma in 5 patients. N2 or N3 nodal metastasis was revealed in 38 of 67 patients who had lung cancer. Fifteen patients with negative mediastinoscopy proceeded to thoracotomy for tumor resection. Seven patients with negative mediastinoscopy received neoadjuvant chemotherapy followed by resection. There were three complications, all due to bleeding, and no mortality.

Conclusions. Mediastinoscopy is a safe and effective procedure for the diagnosis of mediastinal disease and the staging of lung cancer. In cases of lung cancer, mediastinoscopy can provide more accurate evaluation than conventional diagnostic tools like computed tomography and magnetic resonance imaging. However, some thoracic surgeons still consider mediastinoscopy an overly invasive procedure due to potential morbidity and mortality, and debate for its routine use in the preoperative evaluation of lung cancer. Recently, positron emission tomography (PET scan), an increasingly noninvasive imaging, has been developed with a sensitivity of 90% in the diagnosis of lung cancer. It is certain that its role in the preoperative assessment of mediastinal nodal status in bronchogenic carcinoma is certain.

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In our institution, mediastinoscopy has been used for the diagnosis of mediastinal disease or lymphadenopathy for years. We have performed mediastinoscopy for the staging of lung cancer and conducted a study of neoadjuvant chemotherapy followed by resection for locally advanced lung cancer since the end of 1997. Herein we reviewed 100 mediastinoscopies performed between 1998 and 2001 and discuss its role in the diagnosis of thoracic diseases and the staging of lung cancer.

**METHODS**

We retrospectively collected 100 mediastinoscopies performed in our institution between 1998 and 2001. The indications for mediastinoscopy included mediastinal mass or lymphadenopathy and the staging of lung cancer. Some patients had the undetected lung mass with enlarged mediastinal lymph node, received mediastinoscopy before the lung masses were resected. For patients with lung cancer, mediastinal lymph nodes in cluding bilateral paratracheal, pretracheal, and subcarina nodes were assessed. If the results were negative, thoracotomy for tumor resection would be performed subsequently. If the results were positive for mediastinal nodal metastasis, patients would receive neoadjuvant or palliative chemotherapy and/or irradiation. For patients with mediastinal mass or lymphadenopathy, mediastinoscopy was used to approach the tumor or enlarged lymph node. Tissue was obtained for the histological diagnosis.

**RESULTS**

There were 69 males and 31 females, aged from 13 to 87 years (mean 60.9). The summary of the results is shown in Fig. 1. Sixty-seven patients of known bronchogenic carcinoma had mediastinoscopy for the staging of lung cancer, consisting of 49 men and 18 women, aged from 43 to 87 years (mean 65.2). Twenty-nine patients underwent mediastinoscopy for the diagnosis of mediastinal mass or lymphadenopathy, in cluding 16 men and 13 women, aged from 13 to 79 years (mean 50.1). Four patients with suspected lung cancer and mediastinal lymphadenopathy had mediastinoscopy, which all proved to be negative. Two of them underwent lung resection subsequently. The pathological diagnosis was organizing pneumonia and granuloma respectively.

Table 1 shows the tumor types and locations of the bronchogenic carcinoma and the clinical stage before mediastinoscopic examination. In patients with known lung cancer, mediastinoscopy revealed no evidence of...
mediastinal lymph node metastasis in 29 patients. Thirteen patients underwent thoracotomy for resection of lung cancer. Ten patients were proved to have no local lymph node metastasis. The sensitivity was 77%. Three patients had local lymph node metastasis during exploration. The metastatic sites included hilar, preaortic and subcarinal respectively. Of the 38 patients in whom mediastinoscopy revealed N2 or N3 disease, 10 patients received neoadjuvant chemotherapy followed by thoracotomy. Only two patients had negative loco-nodal metastasis after resection. Seven patients with negative mediastinal lymph node metastasis revealed by mediastinoscopy had neoadjuvant chemotherapy followed by thoracotomy. Among these 17 patients who had received neoadjuvant chemotherapy followed by thoracotomy, only two patients were clinically unresectable before chemotherapy was initiated. Three patients were proved to be stage Ib, two patients stage IIIa, and two patients stage IIIb after exploration. Among these 17 patients who had received neoadjuvant chemotherapy, five patients had improving postoperative staging. Two patients with preoperative stage IIIb became stage IIIa. Two patients with preoperative stage IIIa became stage Ia. One patient with preoperative stage IIIb became stage Ib. For patients with mediastinal disease, a definite diagnosis was established in 25 patients excluding nonbronchogenic metastatic lesions. Sarcoidosis was the mediastinal disease mostly seen in patients referred for mediastinoscopic examination in our series.

For the entire 100 mediastinoscopic studies, three complications were encountered during operation, all due to bleeding. One patient underwent partial sternotomy to stop the bleeding. The other two patients had the bleeding controlled with packing and subsequently underwent thoracotomy. There were no postoperative sequelae or mortality.

DISCUSSION

Mediastinoscopy is a conventional technique used for the diagnosis of mediastinal disease and the evaluation of mediastinal nodal status in bronchogenic carcinoma. In our study, mediastinoscopy disclosed the diagnosis of 25 among 29 patients with mediastinal mass or lymphadenopathy. The diagnostic rate was 86.2%. One of the remaining patients had exploratory thoracotomy two days after mediastinoscopic examination. Lymph node dissection was performed. The diagnosis for the lymph nodes was unresectable. He is symptom-free now with roentgenologically normal. One patient was diagnosed as a victim of tuberculous mediastinal lymph nodes was unremarkable. He is symptom-free now with roentgenologically normal. One patient was diagnosed as a victim of tuberculous mediastinum. The other patient was lost of follow-up after mediastinoscopy.

With the development of multimodality treatment for the lung cancer, some thoracic surgeons advocate routine mediastinoscopic examination in cases of lung cancer before treatment strategy is decided. They emphasize that mediastinoscopy can provide more accurate evaluation in mediastinal lymph node metastasis than computerized tomography. However, due to its invasive nature, application is limited to cases with large central tumor or enlarged mediastinal lymph node revealed by computerized tomography. In our hospital, mediastinoscopy is performed in some cases enrolled into protocol for neoadjuvant or palliative therapy. Among the patients with mediastinoscopy for staging of lung cancer, only 13 patients with negative mediastinoscopy underwent exploratory thoracotomy subse quently. Cases were too few to compare with the diagnostic rate of computerized tomography in the evaluation of mediastinal nodal metastasis.

It is well known that there are some limitations of mediastinoscopy. Several areas of lymphatic drainage from the lung in the superior mediastinum are inaccessible for exposure and biopsy by mediastinoscopy. Nodes lo-

Table 1. Tumor types and locations of patients with lung cancer (n = 67)

<table>
<thead>
<tr>
<th>Types</th>
<th>No.</th>
<th>Locations</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Squamous cell carcinoma</td>
<td>22</td>
<td>RUL</td>
<td>24</td>
</tr>
<tr>
<td>Adenocarcinoma</td>
<td>34</td>
<td>RML</td>
<td>4</td>
</tr>
<tr>
<td>Large cell carcinoma</td>
<td>1</td>
<td>RLL</td>
<td>11</td>
</tr>
<tr>
<td>Others</td>
<td>10</td>
<td>LUL</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LLL</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other</td>
<td>1</td>
</tr>
</tbody>
</table>

RUL = right upper lobe; RML = right middle lobe; RLL = right lower lobe; LUL = left upper lobe; LLL = left lower lobe.
labeled in the anterior mediastinum, in the root of the aortic arch and posterior subcarinal region, cannot be assessed by mediastinoscopy. In an earlier series consisting of 1000 mediastinoscopies for preoperative evaluation of mediastinal nodal status in lung cancer, Luke et al. disclosed that 52 of 590 patients with negative mediastinoscopic results were found to have abnormal mediastinal nodes.2 In most cases, the abnormal nodes found at thoracotomy were inaccessible by mediastinoscopy. In our series, 13 patients with negative mediastinoscopic evaluation underwent thoracotomy for tumor resection. Local nodal metastases were found during exploration in three cases, one at the preaortic, one at hilum, and one at subcarinal region respectively. The only case might be technique-related (failure in detecting the metastatic subcarinal node). The sensitivity in our study was 77%. However, according to Pearson et al., posterior subcarinal area is one of the mediastinal lymph node groups that cannot be approached by mediastinoscopy.2

There were some series discussing the value of mediastinoscopy in preoperative staging of bronchogenic carcinoma compared with computed tomography (CT). A prospective study from Patterson et al. found that the sensitivity, specificity, positive and negative predictive values and accuracy of mediastinoscopy all exceeded those observed in magnetic resonance imaging and computed tomography.5 De Leyn et al. reported that in 235 patients with potentially operable lung cancer without enlarged mediastinal lymph node on CT scan, preoperative mediastinoscopy was positive in 47 patients (20%).8 Recently, PET has gained increasing interest as a supplementary measure for improving the detection of non-small-cell lung cancer staging. Steinert et al. concluded that the sensitivity, specificity, and accuracy of PET and CT for the staging of N2 and N3 were 89% and 57%, 99% and 94%, 96% and 85%, respectively.9 Gupta et al., in their study consisting of 103 patients with suspected or proven non-small-cell lung cancer, also dem onstrated that PET scan was significantly more sensitive, specific and accurate than CT scanning in detecting metastatic mediastinal lymph node in patients with lung cancer.10 How ever, the cost and the lack of tissue proof limited its application in the preoperative staging of lung cancer.

The prognosis is poor for patients with non-small-cell lung cancer met a static to mediastinal lymph node or extend ing directly into the mediastinum. Surgery alone can lead to only about 20% of 5-year survival.12 There have been numerous postoperative randomized trials of chemotherapy or chemoradiotherapy at clinical stage II-IIII. Phase IIIs are encouraged by the results of two phase III clinical trials in patients with stage III lung cancer published in 1994.13,14 Rosell et al. reported a median survival of 26 months in the patients treated with preoperative chemotherapy plus surgery, as compared with 8 months in the patients treated with surgery alone. An other randomized trial for resectable stage IIIa non-small-cell lung cancer done in Spain showed the estimated 2- and 3-year survival rates to be 60% and 56% with perioperative chemotherapy and 25% and 15% with surgery alone, respectively. The results were quite promising, but some articles in di cated that the neoadjuvant chemotherapy may increase the perioperative complications.15 We conducted our neoadjuvant chemotherapy in our patients since 1997. While the long-term result is still pending, the effect of chemotherapy makes the decision difficult and cause more blood loss during operation. The postoperative care was also more complicated. Among 17 patients who had neoadjuvant chemotherapy followed by tumor resection, 7 patients had negative mediastinoscopy. The postoperative staging was the same or worse in 12 patients. Five patients had improved staging after operation. Only one patient with positive mediastinoscopy had negative mediastinal lymph nodal metastasis after treatment.

From our limited experience, we conclude that mediastinoscopy can provide accurate evaluation of thoracic disease and the mediastinal nodal status in lung cancer with low mortality and morbidity, and maybe more accurate in experienced hands.

REFERENCES


