The Role of Extended Cervical Mediastinoscopy in Staging of Non-small Cell Lung Cancer of the Left Lung and a Comparison with Integrated Positron Emission Tomography and Computed Tomography

Does Integrated Positron Emission Tomography and Computed Tomography Reduce the Need for Invasive Procedures?

Muzaffer Metin, MD, Necati Citak, MD, Adnan Sayar, MD, Atilla Pekcolaklar, MD, Huseyin Melek, MD, Abdulaziz Kök, MD, and Atilla Gurses, MD

Objective: Extended cervical mediastinoscopy (ECM) is a method for sampling aortopulmonary window (APW) mediastinal lymph nodes. In this study, the efficacy of integrated positron emission tomography/computed tomography (PET/CT) was compared with ECM for the detection of APW lymph node metastasis.

Methods: Fifty-five patients diagnosed of non-small cell lung cancer in whom APW or hilar lymph nodes had been reported to be positive on PET/CT, and/or who had had central tumor and/or in whom ECM had been performed for mediastinal staging due to the presence of APW lymph nodes larger than 1 cm in diameter on the CT between 2005 and 2009, were retrospectively analyzed. All patients underwent PET/CT scanning.

Results: Thirty-eight patients were identified as cN0 by standard cervical mediastinoscopy/ECM, and lobectomy, pneumonectomy, and exploratory thoracotomy were performed on 19, 13, and six of these patients, respectively. Mediastinal lymphadenectomy revealed APW lymph node metastases in four patients (ECM false negative). Seventeen patients identified as cN2 by mediastinoscopy, APW lymph node metastasis was present in nine, whereas eight had mediastinal lymph node metastasis that could only be accessed by standard cervical mediastinoscopy but had no APW lymph node metastasis were excluded from the analysis. Sensitivity, specificity, negative predictive value, positive predictive value, and accuracy of ECM/PET/CT were calculated as 0.69/0.53, 1/0.91, 0.89/0.83, 1/0.70, and 0.91/0.80, respectively.

Conclusions: ECM, which is an effective technique used in the determination of APW lymph node metastasis, was enough to rule out nodal disease with negative predictive value. PET/CT does not reduce the need for invasive procedures in detecting APW lymph node metastasis.

Key Words: Lung cancer, Diagnosis (includes staging, imaging, fiducials), Mediastinal lymph nodes, Positron emission tomography, PET/CT.

The currently used standard cervical mediastinoscopy (SCM) was performed for the first time by Carlens1 in 1959. SCM has become widely used since the mid-1960s with the routine application of mediastinoscopy in the mediastinal staging of patients with non-small cell lung cancer (NSCLC) by Pearson.2 As the evaluation of the aortopulmonary window (APW) is not possible by SCM, Specht3 (in 1965) and Kirschner4 (in 1971) showed that biopsy of anterior mediastinal lesions could be performed by “expanded” mediastinoscopy and “extended” mediastinoscopy, respectively. In 1987, Ginsberg et al.5 defined the technique of extended cervical mediastinoscopy (ECM), which was performed through the same incision used in SCM, and stated that this technique allowed for the assessment of APW lymph nodes.

Integrated positron emission tomography/computed tomography (PET/CT), which reveals the tumor bioactivities, is a technique commonly used for preoperative mediastinal staging of patients with lung carcinoma. Although there are studies reporting that PET/CT could reduce the need for invasive staging, and thus reduce the use of SCM by replacing mediastinoscopy,6 there are also studies indicating that invasive staging and mediastinoscopy are still the gold standard for mediastinal staging.7–9 Nevertheless, there are no studies comparing invasive mediastinal staging with PET/CT for APW lymph nodes (station 5; so called subaortic or aortopulmonary node and station 6; so called paraaortic or ascending aortic or phrenic node10).
The aim of this study was to compare the efficacy of PET/CT with ECM, particularly in determining the APW lymph node metastasis, and to determine whether PET/CT would reduce the need for invasive procedures specific to these lymph nodes.

PATIENTS AND METHODS

Patient Population

From April 2005 to May 2009, 207 patients with the diagnosis of NSCLC of the left lung and hospitalized for invasive mediastinal staging at the 1st Surgery Clinic of Yedikule Thoracic Surgery and Chest Disease Education and Research Hospital were investigated. Fifty-five patients underwent ECM who had

- Central tumor located in the left hemithorax and adjacent to the mediastinal region and/or
- An APW lymph node larger than 1 cm (at the smallest diameter) and/or
- The APW and/or hilar lymph nodes had been reported to be positive by PET/CT, were retrospectively analyzed.

All patients had been diagnosed with NSCLC by means of bronchoscopy or transthoracic fine needle aspiration biopsy and considered to be operable according to the results of the physical examination, posteroanterior chest radiograph, thoracic CT, PET/CT, pulmonary function tests (ventilation-perfusion scintigraphy, if necessary), electrocardiography (effort electrocardiography and angiography, if necessary), cranial magnetic resonance imaging, and complete blood count and biochemical analysis. Neither of the patients had type I diabetes mellitus nor had undergone neoadjuvant chemotherapy, radiotherapy, or chemoradiotherapy for any reason.

Radiologic Imaging of PET/CT and Evaluation

PET/CT had been performed to all patients at three different PET/CT center using a multidetector CT integrated high-resolution CT scanner (Siemens Biograph LSO HI-REZ PET/CT scanner, Chicago, IL). The patients had fasted for at least 4 hours and were well hydrated before the procedure, and their blood glucose levels were measured. After verification of the blood glucose level less than 150 mg/dL, 370 to 555 MBq of 18F-fluorodeoxyglucose (FDG) was administered intravenously. After a rest of 60 to 90 minutes in a comfortable environment, whole-body PET imaging was performed on patients. On PET/CT images, mediastinal lymph nodes with a FDG uptake greater than the normal background activity of the mediastinal blood pool (approximately SUVmax > 2–2.5) was considered suspicious for malignancy and recorded on the basis of each stations.

Surgical Technique

ECM was simultaneously performed on all patients through the same cervical incision used for SCM within a maximum of 30 days (19.0 ± 4.0) following the imaging of PET/CT. Using SCM, pretracheal and paratracheal regions were accessed by blunt dissection toward the carina, and upper (station 2) and lower (station 4) paratracheal lymph nodes, as well as subcarinal lymph nodes, were routinely explored and visible lymph nodes were sampled. As defined by Ginsberg et al.,5 blunt dissection with the index finger was performed through the SCM incision between the innominate artery and the left carotid artery over the aortic arch. The fascia was incised, and the innominate triangle was accessed through a passage under the innominate vein over the aortic arch. Subsequently, the mediastinoscope was inserted through the same incision and passed through the tunnel created by finger dissection toward the left sternoclavicular joint. APW lymph nodes were accessed and sampled. A posteroanterior chest radiograph was performed on all patients postoperatively, and complications such as hoarseness, pneumothorax, surgical wound infection, or other complications developed secondary to the mediastinoscopy, if any, were recorded.

Thoracotomy and Systematic Nodal Dissection

After the histopathological examination after mediastinoscopy, patients with cN2 disease were referred to the Oncology Department for treatment. Anatomic tumor resection and systematic nodal dissection by thoracotomy were performed on patients who were identified as cN0 by mediastinoscopy. The lymph node stations (5, 6, and 7) were also sampled in patients in whom anatomic tumor resection could not be performed for any reason. Resected materials and the lymph nodes were examined histopathologically by same and specific pathologist.

Data Collection and Statistical Analysis

The patients were divided into three groups (Table 1). Group 1 consisted of patients who had been classified as cN0 according to the results of SCM/ECM (n = 38) and had undergone thoracotomy for tumor resection and systematic nodal dissection (SCM negative/ECM negative); group 2 consisted of patients who had been classified as cN2 by mediastinoscopy and had APW lymph node metastasis (SCM negative or positive/ECM positive) (n = 9); and group 3 consisted of patients who had been classified as cN2 by mediastinoscopy, had mediastinal lymph node metastasis that could only be accessed by SCM but had no APW lymph node metastasis (SCM positive/ECM negative) (n = 8). Patients in group 3 (in which SCM was positive and ECM was negative) were excluded from the analysis for the purpose of evaluating only metastatic disease found at the APW lymph nodes.

<table>
<thead>
<tr>
<th>Tumor Location</th>
<th>cN0</th>
<th>cN2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SCM (−)</td>
<td>ECM (−)</td>
</tr>
<tr>
<td>Upper lobe (n = 35)</td>
<td>24</td>
<td>3</td>
</tr>
<tr>
<td>Central (n = 20)</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>Total (n = 55)</td>
<td>38</td>
<td>5</td>
</tr>
</tbody>
</table>

SCM, standard cervical mediastinoscopy; ECM, extended cervical mediastinoscopy.
during ECM. Patients in groups 2 and 3 were referred to the Oncology Department for treatment. The PET/CT findings were compared with the results of ECM and thoracotomy regarding APW lymph nodes in groups 1 and 2, and the sensitivity, specificity, negative predictive value (NPV), positive predictive value (PPV), accuracy, false negativity, and unsuspected APW lymph nodes disease were calculated using standard formulations with 95% confidence intervals (CIs). Data were analyzed by Statistical Package for the Social Sciences (SPSS) for Windows (version 15.0; SPSS Inc., Chicago, IL). The Student’s t test and the \( \chi^2 \) test were used for comparisons between the groups (Fisher’s exact test was used if the expected cell count in one or more cells was less than 5). \( p \) values less than 0.05 were considered statistically significant.

**RESULTS**

All patients (\( n = 55 \)) were men, and their mean age was 56.7 years (range, 40–76 years). Histopathologic tumor type was squamous cell carcinoma in 28 patients (50.9%), adenocarcinoma in 18 patients (32.7%), adenosquamous carcinoma in two patients (3.6%), large cell carcinoma in two patients (3.6%), and unclassified NSCLC in 13 patients (9.0%).

Localization of the tumor was left upper lobe in 35 patients (63.6%). Twenty-eight of these patients had a negative FDG uptake for APW lymph nodes, whereas the remaining seven patients had a positive FDG uptake for APW lymph nodes. Tumor was located centrally in 20 patients (36.4%). Six of these patients had a positive FDG uptake, whereas the remaining 14 patients had a negative FDG uptake for APW lymph nodes.

Thorax CT revealed APW lymph nodes with pathologic size in 28 patients (50.9%). Nineteen of these patients had a negative PET scan for APW lymph nodes, whereas the remaining nine patients had a positive PET scan for APW lymph nodes. No enlarged APW lymph nodes were observed in the remaining 27 patients (49.1%). Nevertheless, four of these patients had a positive PET scan for APW lymph nodes.

PET/CT reported that there was APW lymph node involvement in 13 patients (23.7%) regardless of the size. Three of these 13 patients with the adenopathy limited to the paratracheal or subcarinal space without infiltrating the paraortic or subaortic spaces were also excluded from the study as mentioned earlier. Metastasis was detected by ECM or thoracotomy in 7 of 10 patients reported as APW lymph nodes involvement by PET/CT (PET true positive, \( n = 7/10 \)). APW lymph nodes metastasis was demonstrated by ECM in five patients (station 5 in three patients and stations 5 and 6 in two patients) and by thoracotomy in two patients (station 5 in one patient and stations 5 and 6 in one patient). APW lymph node metastasis was not detected by ECM or thoracotomy in 3 of 10 patients reported as APW lymph nodes involvement by PET/CT (PET false positive, \( n = 3/10 \); Figure 1).

PET/CT reported that 42 patients (76.3%) had negative APW lymph nodes regardless of the nodes size. Five of these 42 patients with the adenopathy limited to the paratracheal or subcarinal space without infiltrating the paraortic or subaortic spaces were also excluded from the study as mentioned earlier. In 31 of the remaining 37 patients, no APW lymph node metastasis was detected by ECM or thoracotomy (PET true negative, \( n = 31/37 \)). Nevertheless, APW lymph node metastasis was detected by ECM or thoracotomy in six of these patients (PET false negative, \( n = 6/37 \); Figure 1). APW lymph nodes metastasis was demonstrated by ECM in four patients (station 5 in two patients, station 6 in one patient, and stations 5 and 6 in one patient) and by thoracotomy in two patients (station 5 in two patients). Integrated PET/CT showed an overall sensitivity of 53.8% (95% CI: 0.26–0.89), specificity of 91.1% (95% CI: 0.81–1), PPV of 70.0% (95% CI: 0.41–0.98), NPV of 83.7% (95% CI: 0.71–0.95), and accuracy of 80.8% (95% CI: 0.69–0.92) for the detection of APW lymph nodes metastases on a per-patient basis (Figure 1, Table 2).

Unsuspected APW lymph node disease was found in six patients (PET/CT false negative for APW lymph nodes; 16.2%). Patients with adenocarcinoma showed higher unsuspected APW lymph nodes metastatic rates than those

**TABLE 2. Accuracy Measures of Extended Cervical Mediastinoscopy and Positron Emission Tomography-Computed Tomography**

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>NPV</th>
<th>PPV</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECM (%)</td>
<td>69.2</td>
<td>100.0</td>
<td>89.4</td>
<td>100.0</td>
<td>91.4</td>
</tr>
<tr>
<td>PET/CT (%)</td>
<td>53.8</td>
<td>91.1</td>
<td>83.7</td>
<td>70.0</td>
<td>80.8</td>
</tr>
</tbody>
</table>

ECM, extended cervical mediastinoscopy; PET/CT, positron emission tomography-computed tomography; NPV, negative predictive value; PPV, positive predictive value.
with other NSCLC cell types, although this difference was not statistically significant ($p = 0.074$). Accuracy of PET/CT showed no difference for tumor localization ($p = 0.970$).

Mediastinoscopy sampled a total of 326 nodal stations (mean: 5.92, range: 4–7). ECM was successful at harvesting one or more APW lymph nodes in 53 patients (96.3%) (stations 5 and 6 in 43 patients, only station 6 in seven patients, and only station 5 in three patients).

Mediastinal lymph node metastasis (cN2) was observed in 17 patients by mediastinoscopy. Eight patients were excluded from the study due to the presence of mediastinal lymph node metastasis that could only be accessed by SCM (SCM positive/ECM negative; group 3) as mentioned earlier (Table 1). APW lymph nodes metastasis was demonstrated by ECM in nine patients (station 5 in five patients, stations 5 and 6 in three patients, and station 6 in one patient) (ECM true positive, $n = 9/47$). Tumor localization was left upper lobe in seven and central in two of nine patients. In four of these nine patients with the adenopathy limited to the paraortic or subaortic spaces, there was no infiltration of paratracheal or subcarinal space (only positive in ECM but negative in SCM; 4/55, 7.2%).

Thoracotomy was performed on 38 patients due to the absence of mediastinal lymph node metastasis (group 1; Table 1). Lobectomy was performed to 19 patients (in three patients with en bloc resection of thoracic wall and in two patients with bronchial sleeve resection), whereas pneumonectomy was performed to 13 patients (in two patients with en bloc resections of thoracic wall and in one patient with intrapericardial ligation of the vessels). Moreover, six patients underwent exploratory thoracotomy. Two of these six patients were considered unresectable because of the direct mediastinal infiltration, which was not accessible through ECM. In the remaining of four patients, pneumonectomy was the required operation to achieve complete resection but was contraindicated because of two patients had multiple N2 (stations 5 and 8 in one patient and stations 5 and 9 in one patient) and two patients had cardiopulmonary instability.

Thoracotomy was successful at dissecting one or more APW lymph nodes in 35 patients (92.1%) (stations 5 and 6 in 30 patients, only station 5 in four patients, and only station 6 in one patient). Thoracotomy was not successful at dissecting one or more APW lymph nodes in three patients (7.9%). Two patients were considered unresectable who had cardiopulmonary instability. One patient who underwent lobectomy had no APW lymph nodes detected in the APW space.

The pathological results of systematic nodal dissection revealed metastasis at station 8 in one patient and at station 9 in another patient (lymphatic nodal group not accessible by ECM; considered true-negative results) and at APW lymph nodes in four patients (ECM false negative, $n = 4/38; 10.5%$; Figure 2). False negativity was only determined in station 5, and tumor was in the upper lobe in these patients. Lobectomy was performed to two of these four patients. The remaining two patients underwent exploratory thoracotomy because they had multiple N2 (stations 5 and 8 in one patient and stations 5 and 9 in one patient), and pneumonectomy was the required operation to achieve complete resection. Patients with adenocarcinoma showed higher false-negative rates for APW lymph nodes than those with other NSCLC cell types, although this difference was not statistically significant ($p = 0.592$). There were no false-negative cases of mediastinoscopy at the subcarinal nodal station.

According to these results, the sensitivity, specificity, PPV, NPV, and accuracy of ECM were calculated as 69.3% (95% CI: 0.44–0.94), 100%, 100%, 89.4% (95% CI: 0.79–0.99), and 91.4% (95% CI: 0.81–1), respectively (Table 2, Figure 2). Four patients (7.2%) had complications due to mediastinoscopy, including hoarseness in three patients, and pneumothorax in one patient.

Thirteen patients (27.6%) with N2 disease had APW node involvement, which was demonstrated by ECM in nine patients and by thoracotomy in four patients. APW lymph nodes metastasis rates for upper lobe tumors were higher than that for central tumors, although this difference was not statistically significant ($p = 0.79$). Patients with adenocarcinoma showed higher APW lymph nodes metastasis rates than those with squamous cell carcinoma, although this difference was not statistically significant ($p = 0.492$). Among all patients, the number of patients with APW lymph node metastasis alone was eight (17%) of which four patients were detected by ECM and four were detected by thoracotomy.

**DISCUSSION**

Maximum effort should be performed for accurate staging as mediastinal staging is the most important prognostic indicator and the criteria for treatment selection in NSCLC without distant metastasis. Recently, many surgeons recommend pulmonary resection in the case of regression after neoadjuvant therapy in the presence of cN2. Nevertheless, patients with N2 disease form a heterogeneous group, including upper, aortic, and lower mediastinal lymph nodes. Moreover, it is clear that there is a difference regarding survival between the cN2 patients with bulky lymph nodes and pN2.
patients with microscopic lymph nodes detected after resection. This diversity has led to a variety of treatment recommendations and controversy. In some studies, patients with nodal involvement of lymph node station 5 or 6 have been reported to have a better survival than those with other pN2s but similar survival as patients with hilar and mediastinal lymph node involvement. Patterson et al. have suggested that lymph nodes in that region should not be considered as mediastinal lymph nodes and that pulmonary resection should be performed regardless of lymph node involvement. It may be considered acceptable not to perform invasive staging of APW because better survival is obtained by surgical resection in the presence of involvement of these stations. Compared with other studies, Cerfolio et al. reported a better survival rate in patients with lung cancer metastasized to APW lymph nodes, in which surgery was performed along with restaging after induction chemoradiotherapy. Also we consider biopsy-proven metastatic carcinoma of no. 5 and no. 6 lymph nodes as pN2 (multilevel and advanced disease) and thus unresectable. Thus, there is a conflict in identification or elimination of stations 5 and 6 according to presence of metastases before the resection. In this regard, the selection of the method to be performed in the staging of APW lymph nodes will be a second issue to resolve.

Although SCM, which is the most commonly used diagnostic method for mediastinal staging, is still considered the gold standard in sampling of superior mediastinal lymph nodes, it fails to evaluate APW. In the late 1980s, the evaluation of APW by ECM was proposed by Ginsberg et al. as an alternative method for SCM combined with left anterior mediastinotomy (Chamberlain procedure) and for thoracoscopy. Nevertheless, the studies investigating ECM are limited.

The NPV obtained in this study (89%) and in the previously published series has been considered adequate for ruling out the disease, as the importance of mediastinal staging is double: diagnosis and ruling out nodal disease (Table 3). In this study, the sensitivity of ECM was similar to those published previously. Nevertheless, sensitivity determined in the series of Lopez et al. and Freixinet et al. was slightly higher compared with those determined in our study. This may be attributed to the use of modified ECM method or CT examination of enlarged lymph nodes in their selected patient groups and thereby easy detection of lymph nodes by ECM. The presence of all false-negative metastases in subaortic (station 5) lymph nodes of which detection and biopsy are difficult may explain the low sensitivity determined in this study. Although the invasive methods evaluating the APW were considered valuable in combination with SCM, the overall sensitivity for the superior mediastinum and APW was lower in previously published series than those in this study (Table 3). This could be due to the determination of false negativity for the subcarinal region by other authors, whereas no subcarinal false negativity was determined in this study.

In left anterior mediastinotomy, after performing an anterior incision 5 to 8 cm in size, the costochondral junction should be excised. The aortopulmonary region can be accessed by retracting the pleura laterally; however, this may cause the opening of the pleura, and also the manipulation and exploration can be difficult as the majority of the patients have central or upper lobe tumors. Additionally, this method requires an anterior incision that results in poor esthetic appearance, and the possibility in the development of left internal mammary artery damage in patients with a high potential need for bypass. Video-assisted thoracic surgery (VATS) is not used as commonly as SCM and ECM in staging of bronchogenic carcinoma, and there is no specific analysis regarding its indications. Considering the need for single lung ventilation, the possible difficulties due to pleural adhesions and the potential difficulties in the subsequent thoracotomy due to disruption in the integrity of pleura and the need for postoperative follow-up with thoracic drainage for at least 1 day it is suggested that VATS is not superior to ECM in the evaluation of the APW. Most of the patients who underwent ECM were discharged home on the same day of operation with a mean hospitalization time of 8 hours as we previously describe. Freixinet et al. reported that ECM is superior both to VATS and left anterior mediastinotomy.

In this study, the complication rate was 7.2%, and the most common complication was hoarseness. Considering the complications of ECM to be pneumothorax, mediastinitis, and surgical wound infection, the complications observed in this study may be attributed to the radical superior mediastinal lymph node sampling performed by SCM rather than ECM.

Recently, there has been an increasing interest in PET/CT staging, which is the most commonly used noninvasive method for mediastinal staging. Early studies revealed...
that accuracy of PET/CT was higher than CT and PET in the noninvasive mediastinal staging.\textsuperscript{20} Nevertheless, the efficacy of PET/CT in the intrathoracic lymph node staging is still contradictory due to presence of various results concerning its efficacy in determining mediastinal lymph node metastasis.\textsuperscript{6–9,21} For instance, based on a study including 51 patients, it has been reported that patients with negative PET/CT for mediastinal lymph nodes can be operated without invasive mediastinal staging.\textsuperscript{6} Despite the fewer false-negative results with improvements in PET technology, Lee et al.\textsuperscript{21} established a significant increase in false-positive results, and thus, they indicated that PET/CT should be used as an adjunct to clinical staging and that surgical staging was still the gold standard in NSCLC. Furthermore, another study demonstrated that the NPV of PET/CT was low in patients who had pathological lymph nodes on CT and negative PET/CT results.\textsuperscript{22} Although there are numerous publications comparing SCM with PET or PET/CT, a comparison between ECM with PET/CT has not been investigated. The sensitivity of ECM has been reported to be increased only in the series of Call et al.\textsuperscript{17} whose cases were selected by means of PET or PET/CT (routine ECM, 45%; selective ECM, 75%).

In this study, the sensitivity (53%), specificity (91%), NPV (83%), PPV (70%), and accuracy (80%) of PET/CT for the evaluation of APW lymph nodes were lower than those of ECM. The PPV of PET/CT found in this study was consistent with the literature.\textsuperscript{7,23} In this study, complete thoracic lymphadenectomy was performed both for APW and other mediastinal/hilar lymph nodes, and the histopathological examination was performed by the same and specific pathologist in all patients. Thus, pN2 patients with microscopic lymph nodes, which can easily be missed by PET/CT, could be identified. Bille et al.\textsuperscript{7} reported that station 5 was the second mediastinal lymph node station with the highest rate of PET/CT inaccuracy and that the sensitivity and NPV of PET/CT for APW lymph nodes were to be similar to those of this study. Cerfolio et al.\textsuperscript{23} reported that the most common locations for N2 disease that was undetected by PET/CT were the subcarinal and APW stations. They suggested that mediastinal staging should be performed in patients who were clinically classified as stage IB and stage II NSCLC, even if the nodes were negative on PET/CT scanning. Also in a recent study, NPV for APW lymph nodes was calculated 76% with patients with early-stage-cN0 lung cancer.\textsuperscript{24} Therefore, although PET/CT can indicate an appropriate area for biopsy and be used as a guide for APW region, it cannot replace a tissue biopsy. Thus, we consider that surgical staging is the gold standard, and PET/CT is a supplementary method in staging.

In conclusion, ECM is a useful technique that has an adequate NPV and accuracy in determining metastasis to APW lymph nodes in patients with NSCLC and can be easily applied by an experienced team. Even though PET/CT reveals negative results, ECM is recommended in patients with upper lobe or central NSCLC with APW lymph nodes larger than 1 cm (in the smallest diameter) due to the high rate of APW lymph node metastasis. As PET/CT did not provide an adequate NPV and sensitivity in determining APW metastasis, PET/CT failed to reduce the need for invasive procedures for the APW lymph nodes.

ACKNOWLEDGMENTS

The authors thank Songül Büyükakale, MD, and Okan Falay, MD, from Medica Imaging and Diagnosis Center, Istanbul, for their assistance in the PET/CT revision of this article.

REFERENCES


