Video-Assisted Mediastinoscopic Lymphadenectomy for Staging Non–Small Cell Lung Cancer

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Background. **The aim of this study was to evaluate the results of video-assisted mediastinoscopic lymphadenectomy (VAMLA) for staging of non–small cell lung cancer (NSCLC).**

Methods. **This was a prospective observational study of all consecutive VAMLAs performed from January 2010 to April 2015 for staging NSCLC. For left lung cancers, extended cervical videomediastinoscopy was added to explore the subaortic and paraaortic nodes. Patients with negative VAMLA results underwent tumor resection and lymphadenectomy of the remaining nodes. Those with N2–3 disease underwent chemoradiation. The rate of unsuspected pathologic (p)N2–3 was analyzed in the global series and in the subgroups of patients according to their nodal status diagnosed by imaging and metabolic techniques.**

Results. **One hundred sixty VAMLAs were performed for staging NSCLC (138 tumors were clinical (c)N0-1 based on imaging techniques). The rate of unsuspected N2–3 disease was 18% for the whole series: 40.7% for cN1, 22.2% for cN0 and tumor size greater than or equal to 3 cm, and 6.4% for cN0 and tumor size less than 3 cm. Staging values were sensitivity, 0.96 (95% confidence interval [CI], 0.81–99.3); specificity, 1 (95% CI, 0.97–1); positive predictive value, 1 (95% CI, 0.87–1); negative predictive value, 0.99 (95% CI, 0.95–0.99); and diagnostic accuracy, 0.99 (95% CI, 0.96–0.99). The complication rate was 5.9%.**

Conclusions. **VAMLA is a feasible and highly accurate technique. The high rate of unsuspected mediastinal node disease diagnosed by VAMLA in patients with cN1 or cN0 disease and tumor size larger than 3 cm suggests that preresection lymphadenectomies should be included in the current staging algorithms.**

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Preoperative mediastinal node assessment is essential to define prognosis and guide treatment for patients with lung cancer (LC). The current North American and European guidelines for preoperative mediastinal node staging for non–small cell lung cancer (NSCLC) [1, 2] recommend tissue confirmation with endoscopic techniques or with surgical staging when computed tomography (CT) shows enlarged mediastinal nodes, when positron emission tomography (PET) shows an increased uptake in the mediastinum or the hilum, and in central tumors. Moreover, for tumors larger than 3 cm, preoperative mediastinal staging is advised, mainly in adenocarcinomas with a high standardized uptake value [2]. Recently, we reported on 621 patients with NSCLC staged and operated on according to the European Society of Thoracic Surgeons (ESTS) guidelines [3]. Following this preoperative staging protocol, using exclusively mediastinoscopy as an invasive method when indicated, we found a negative predictive value of 0.91, and the rate of unsuspected pathologic (p)N2 disease was 5.5%. The survival of this subgroup of patients with unsuspected pN2 disease was higher (5-year survival rate of 40%) than the survival of the surgical series with pN2 disease from the International Association for the Study of Lung Cancer (IASLC) database (5-year survival rate of 22%) used to inform the seventh edition of the *TNM Classification of Malignant Tumours* for LC [4]. We hypothesized that this better survival could be explained by the selection provided by an accurate staging and the high rate of

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Abbreviations and Acronyms

c	= clinical
CI	= confidence interval
CT	= computed tomography
DLCO	= diffusing capacity of the lung for carbon monoxide
ESTS	= European Society of Thoracic Surgeons
EBUS-FNA	= endobronchial ultrasonographic fine-needle aspiration
EUS-FNA	= esophageal ultrasonographic fine-needle aspiration
FEV_1	= forced expiratory volume in the first second of expiration
IASLC	= International Association for the Study of Lung Cancer
LC	= lung cancer
NSCLC	= non–small cell lung cancer
p	= pathologic
PET	= positron emission tomography
SCLC	= small cell lung cancer
TEMLA	= transcervical extended mediastinal lymphadenectomy
TNM classification	= tumor, node, and metastasis classification
VAMLA	= video-assisted mediastinoscopic lymphadenectomy

complete resection (90%) according to the definition proposed by the IASLC [5].

Despite the progressive introduction of endobronchial ultrasonographic fine-needle aspiration (EBUS-FNA) and esophageal ultrasonographic FNA (EUS-FNA) in clinical practice, mediastinoscopy remains the gold standard for preresection mediastinal assessment. Mediastinoscopy, described by Carlens [6] in 1959, did not undergo any significant modifications until Lerut [7] designed the videomediastinoscope in 1989 and Linder-Dahan designed the spreadable videomediastinoscope in 1992 [8]. These technological advances were fundamental for the development of mediastinal lymphadenectomies through the cervical incision used for mediastinoscopy, ie, the video-assisted mediastinoscopic lymphadenectomy (VAMLA) and the transcervical extended mediastinal lymphadenectomy (TEMLA). The main difference between these procedures is that VAMLA is an endoscopic technique performed through a videomediastinoscope [8], and TEMLA is an open procedure assisted by a videomediastinoscope or a videothoracoscope, depending on the nodal station dissected [9]. Their range of exploration also differs, with TEMLA exploring all mediastinal node stations from supraclavicular to paraesophageal, whereas VAMLA explores the right and left paratracheal and subcarinal nodes.

After performing more than 3,000 mediastinoscopies in our department in the past 20 years, in 2010, VAMLA was introduced into our staging protocol. The objective of this study was to describe our preliminary results in the staging of LC.

Patients and Methods

Study Design

This is a prospective observational single-center study from a dedicated thoracic surgery department conducted from January 2010 to April 2015. The Ethics and Clinical Research Committee of Hospital Universitari Mutua Terrassa approved this study and waived individual patient consent.

Patients

One hundred eighty-five consecutive patients (152 men; median age, 65 years; range, 39–83 years) with histologically proven NSCLC who underwent VAMLA were analyzed. The exclusion criteria and the excluded patients are shown in Figure 1.

Preoperative Workup

Chest roentgenograms, routine blood tests, bronchoscopy, CT of the chest and upper abdomen, and PET were performed routinely. Depending on the symptoms or findings of these initial tests, other tests were performed such as CT or magnetic resonance imaging of the brain (or both), abdominal ultrasonography, and bone scans.

Operability was assessed by medical history and physical examination, electrocardiography, spirometry, and diffusing capacity of the lung for carbon monoxide (DLCO). In patients with either forced expiratory volume in the first second of expiration (FEV_1) or DLCO, or both, less than 80% underwent the shuttle walk test or stair climbing. Those showing suboptimal performance on these tests underwent ergometric assessment. Quantitative perfusion lung scanning was performed in patients who had a predicted postoperative FEV_1 or DLCO less than 35%.

Operable patients with negative VAMLA results underwent tumor resection and lymphadenectomy of the remaining lymph nodes. Patients with N2–3 tumors diagnosed at VAMLA were treated with chemoradiotherapy.

Indications and Contraindications for VAMLA

The staging protocol was based on the ESTS guidelines [10], but VAMLA was indicated instead of EBUS-FNA/EUS-FNA or mediastinoscopy to explore the mediastinum in the situations shown in Table 1. VAMLA was contraindicated in patients with extensive mediastinal disease, for whom EBUS-FNA/EUS-FNA or mediastinoscopy may be enough to confirm nodal disease.

Instrumentation and Technique

VAMLA requires the same anesthetic considerations and patient positioning used for standard mediastinoscopy: general anesthesia and hyperextension of the neck with the patient in the supine decubitus position. The Linder-Dahan spreadable videomediastinoscope (Richard Wolf, Knittlingen, Germany) was used because it enlarges the operative field, allowing optimal exposure of the mediastinum and bimanual dissection. Regarding instrumentation, the same standard mediastinoscopy instruments can