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Video-assisted cervical mediastinoscopy: our seven-year experience

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Abstract

Mediastinal exploration is a common procedure used for the diagnosis of the thoracic diseases and the staging of lung cancer. A retrospective review was performed to assess sensitivity, specificity, accuracy and morbidity of video-assisted cervical mediastinoscopy (VACM). From 1999 to 2006 a total of 139 VACMs were performed in 138 patients. Eighty-seven patients were evaluated for known or suspected lung cancer (CN2 or CT scan) – group 1. Fifty-one patients underwent VACM for the evaluation of adenopathies or masses having no indication of lung cancer – group 2. In group 1, the diagnosis of lymph node (LN) involvement was certified in 55 patients – sensitivity 80.8%. The remaining 27 patients (28.7%) were negative and underwent thoracotomy. In group 2, we obtained a definitive diagnosis in 57 patients – sensitivity 93.6%. In the negative patients the definitive histological diagnosis was obtained by means of thoracotomy or other procedure. The more frequent pathologies were lymphomas in 15 patients, sarcoidosis in 13 and reactive lymphadenitis in 14 patients. The mean operative time was 41.7 min. Mean number of sampled nodal stations was 1.9. There were two patients with complications (1.4%). The mortality rate was 0%.

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1. Introduction

Lymph node sampling is an important intervention for the diagnosis and management of the mediastinal nodal diseases, including benign and malignant etiologies. The cervical mediastinoscopy is the ‘gold standard’ for the assessment of mediastinal lymph nodes and it remains the clinical method with the highest sensitivity and specificity for exclusion of mediastinal lymph node involvement [1]. In essence the technical details of the mediastinoscopy did not change since they were first proposed by Carlens in 1959 [2]. The idea of using a video camera in mediastinoscopy by Lerut in 1989 [3] and the introduction of the video-assisted mediastinoscopy (VAM) in the clinical practice by Sortini [4], modified the operative technique of mediastinoscopy, allowing a better visualization of the mediastinum and the bimanual handling during the procedure. Through the video-assisted cervical mediastinoscopy (VACM) a more extended visualization, sampling and removal of pathologic lymph nodes was achieved.

This study is a review of the mediastinoscopies performed from 1999 to 2006 with the aid of the video camera system, in a thoracic surgical unit in the northwest region of Greece. We retrospectively evaluated the sensitivity, the specificity, the accuracy and the complications in 139 consecutive cases.

2. Materials and methods

2.1. Patients

From 1999 to 2006, 139 VACMs were performed. One hundred and thirty-eight patients were reviewed. There were 113 men (81.9%) and 25 women (18.1%), aged from 12 to 84 years (mean±S.D. 59.3±14.2 years). The study was approved by the Institutional Ethical Committee. All patients provided written, informed consent.

Mediastinal nodal enlargement (>1.0 cm in a short axis diameter) by computed tomography scan was the main absolute indication for VACM in lung cancer patients. Other indications were possible lymphomas, tumors and other lung diseases with mediastinal involvement.

Patients were divided into two groups according to the known or suspected etiology of the mediastinal lymphadenopathy.

In the first one (n=87) were patients with known or suspected lung cancer and with mediastinal nodal enlargement, as suggested by computed tomography. Thus, the procedure was done to either stage lung cancer and/or establish the diagnosis of malignancy in situations where other means had failed to do so, or were not appropriate.

In the second group (n=51) were patients with lesions in the mediastinum or undiagnosed mediastinal lymphadenopathy in whom all other investigation did not obtain diagnosis. In those patients only tissue histology was required. Also, if lung cancer was the final diagnosis in the second group the patient was finally grouped in the first one.
2.2. Procedure

Linder-Dahan and Lerut instruments are used alternatively to carry out videomediastinoscopy (Fig. 1).

The shaft of the current Linder-Dahan mediastinoscope (Wolf type – Richard Wolf, Knittlingen, Germany) has two spreadable blades which help to give a much better vision inside the mediastinum providing a wide operative field. The Lerut (Karl Storz mediastinoscope, Tuttingen, Germany) mediastinoscope is similar to a conventional instrument but with the camera incorporated on its handle.

General anesthesia using a single-lumen tube was applied. The patient was positioned supine with a roll under the shoulders to provide a greater extension of the cervical area. The mediastinoscope was fitted to the video camera allowing the view to the whole surgical team. With a small incision above the suprasternal notch and dissection in the middle line between the strap muscles, the pretracheal fascia was opened with the scissors and separated from the anterior aspect of the trachea by digital dissection. Additional entry into the pretracheal fascia was also done by the index finger inferiorly to innominate artery facilitating the dissection of the anteriorly situated lymph nodes (Video 1).

The instrument was introduced and the dissection continued using the tip of the metal suction catheter to reveal the paratracheal lymph nodes bilaterally. To dissect the subcarinal nodes, the thin fascia in front of the tracheal bifurcation needed to be entered, with the tip of the mediastinoscope below the right pulmonary artery. Biopsies (Video 2) were taken from all accessible nodal stations, with the use of an aspirating needle if the operator was in doubt about the nature of the structure. Specimens were sent to the laboratory for frozen sections, allowing the surgeon to proceed immediately to thoracotomy if required. Coagulation was used as necessary via the metal tip of the suction catheter. After the completion of the procedure, the platysma only was approximated with absorbable sutures and the skin was closed.

2.3. Statistical analysis

Data demonstrating the operative time, the levels of sampled lymph nodes, the intraoperative complications and the results of the histologic examination were collected from our database. Sensitivity, specificity, accuracy and predictive values of the operative method were calculated and analyzed with SPSS 12.0 (Chicago, IL) statistical software.

3. Results

A total of 139 VACMs were performed. From them there was one re-mediastinoscopy for drainage of suppuration after manipulations in purulent lymph nodes during the initial VACM. Mean operative time was 41.7 min. Mean number of stations biopsied was 1.9 ± 0.8 with range 1–4 (2.2 ± 0.8 in group 1 and 1.6 ± 0.6 in group 2). The group 2R was biopsied in 70 patients (50.7%), group 2L in 3 (2%), group 3 in 49 (35.5%), group 4R in 110 (79.7%), group 4L in 4 (3%) and group 7 was biopsied in 23 patients (16.6%).

In the first group (n = 87), 60 patients had already a known diagnosis of lung cancer by bronchoscopy or other means and the mediastinoscopy was for staging. In the remaining 27 patients, VACM was performed for both diagnosis and staging. Nine patients had already an established vena cava obstruction syndrome. Histopathology certified the diagnosis of lymph node involvement in 55 patients (metastatic N2 disease). Thus, sensitivity of the procedure was 80.9%, specificity was 100% and accuracy was 85%. Positive predictive value was calculated 100% and negative predictive value was 59.3%. The diagnosis of small cell lung cancer (SCLC) was established in 10 patients – 11.5%. Forty-two patients had non-small cell lung cancer (NSCLC) according to the histological report of VACM – 48.3%. Thirty-two VACMs were negative in this group of patients – 36.8%. The procedure provided definitive operable lung cancer diagnosis in 29 patients (negative for lymph node involvement). Post-thoracotomy staging agreed with VACM staging in 25 of 29 cases (86.2%). Restaging mediastinoscopy for downstaging of lung cancer was performed in eight patients two weeks after induction chemotherapy. Downstaging was diagnosed in five patients. In three patients residual disease...
was confirmed. No re-mediastinoscopy was performed for restaging.

In the second group of patients (n=51), the diagnosis of lymph node involvement was confirmed in 44 patients by VACM. In seven patients no involvement of lymph node was found. The diagnosis of benign disease was established in 28 cases (54.9%) including sarcoidosis (n=13), tuberculosis (n=1) and reactive lymphadenitis (n=14). This diagnosis was confirmed by other diagnostic investigations or by the follow-up of the patients. A non-lung malignancy was demonstrated in 16 cases (31.4%) including non-Hodgkin’s lymphoma (n=3), Hodgkin’s lymphoma (n=12) and hepato-cellular cancer (n=1). Sensitivity of the procedure in this group of patients was 93.6%, specificity was 100% and accuracy 94.1%. Positive predictive value was calculated 100% and negative predictive value at 57.1%.

Overall sensitivity was 86.1%, specificity 100% and accuracy 88.4%. Overall positive predictive value was calculated 100% and overall negative predictive value was 59%. There was no mortality. The morbidity and postoperative complications were only minimal (2 patients – 1.4%). These included one bleeding because of trauma to the azygos vein in a patient with superior vena cava obstruction due to inadvertent biopsy. An infective complication took place as a result of biopsying suppurative mediastinal nodes requiring drainage through the same suprasternal incision-reme-diastinoscopy.

4. Discussion

During the last few years, the technique of video-mediastinoscopy has been further refined and extended [5] giving the opportunity of a more extending and probably accurate lymph node sampling. Even if the field of indications [1, 6–8] and contraindications [9] has been adequately covered in the literature, the number of lymph node stations that should be examined at cervical mediastinoscopy remains under discussion. The current recommendations by ESTS working group [1] according to the latest LN map of Mountain-Dressler (1997) suggest that ideally, the following nodal stations should be explored and their LNs biopsied: right and left superior paratracheal (level 2R and level 2L), right and left inferior paratracheal (level 4R and level 4L) and subcarinal nodes (level 7). But a lesser standard could also be accepted for “routine” clinical practice: level 4R, level 4L and level 7. Complete LN dissection is probably more accurate for the diagnosis of LN metastasis than LN sampling is, but the current studies suggest no survival benefit in the extended or entire dissection groups [5, 8]. In contrary, performing LN sampling may offer greater benefits than complete dissection through the preservation of the immune system response against cancer.

Obvious advantages of the video systems to perform the mediastinoscopy are the better visualization and exposure of the mediastinal structures [7], safer and more ergonomic handling preserving the major neurovascular structures [10] and the rapid learning with short learning curve [11]. The possibility of excising whole nodes is particularly advantageous especially in the case of suspected lymphomas or SCLC because of the improved tissue diagnosis [12]. The profound disadvantage of the VACM is the slight increase in the cost of this procedure.

From our experience the initial digital dissection to prepare the space for the introduction of the mediastinoscope, does not reach the carina level in the conventional mediastinoscopy. This is easily confirmed after the passage of the instrument. There is still some distance left to dissect with the tip of the sucker, in order to break the precarinal fascia and to reveal the number seven nodes.

Another comment is that we avoid the VACM prior to the induction of neoadjuvant treatment when the diagnosis of lung cancer is secure. We prefer to perform accurately the VACM two weeks after the end of chemotherapy [13].

Redo mediastinoscopy is the best way to assess the mediastinum, although it is not the gold standard for histologic verification of mediastinal re-staging [8]. Although more difficult, one should not defer it, but instead insist on it. In our opinion some of the difficulties may be lessened if one – at the time of the first mediastinoscopy – confirming positive nodes by frozen section at higher stations (positions 2 or 3) – does not dissect further down, so minimizing the production of dense adhesions and reserving the dissection for the nodes four and seven for the redo mediastinoscopy. This however is not applicable to all cases.

In this review, video-mediastinoscopy was primarily used for staging lung cancer, but it can also be of great value in sampling mediastinal masses and lymph nodes by offering a safe diagnosis to the patient with or without lung cancer. The video-procedure is safe with zero mortality and only minimal morbidity, and it is currently the recommended procedure in patients with apparently resectable non-small cell lung carcinoma [10, 12, 14].

References


