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Cervical mediastinoscopy in diagnosis and lung cancer treatment

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Abstract— **Objective:** This study aims to evaluate the value of using mediastinoscopy in the diagnosis and treating of mediastinal lesions in lung cancer. Lung cancer is known to be the leading cause of cancer mortality globally, and it is also ranked first on the prevalence of cancer against the planet's population. **Materials and methods:** the study was performed by mediastinoscopy on 106 patients to diagnose lung cancer. We have used general clinical, laboratory, endoscopic (EBUS-TBNA, CMM), radiographical (CT, PET-CT), morphological, immunohistochemical, and statistical methods of study. For applied mathematics analysis results, we used Statistica for Windows Version 10.0 (Stat Soft INC., USA). Parameters are given within the form M±m, where M is the mean, m is the standard deviation. In the case of $p<0.05$, variations were set as statistically vital. **Results:** The number of patients in the study (who performed mediastinoscopy 106, 65 were represented by lung cancer). **Conclusion:** Mediastinoscopy remains the most effective diagnostic investigation of choice for paratracheal and retrovascular mediastinal pathology, especially in lung cancer.

Keywords— Cervical, mediastinoscopy, lung cancer, mediastinal lesions

1. Introduction

Cervical mediastinoscopy can be described as an invasive method that can be used to examine the superior and middle mediastinum for staging of cancer of the lung and establish the histological diagnosis of any mediastinal masses of unknown etiology [1]. It was first described by, A Jackson laryngoscope was inserted into the mediastinum through an incision in supraclavicular, and lymph node biopsies were then taken [2]. Mediastinoscopy was first represented by Carlen's in 1959 and is employed to assess mediastinal nodal enlargement seen on CT and carcinoma staging [3]. Conjointly cervical mediastinoscopy will appraise mediastinal lymphatic tissue groups, proximal hilar lymph nodes and therefore the most superior/anterior parts of subcarinal pathology and high and low paratracheal nodes will be envisioned and biopsied; however, different groups cannot be evaluated by mediastinoscopy [4]. The procedure carries a low incidence of significant complications, estimated at around 0.5% within the most effective series. The most common complication rumored is an iatrogenic injury to the most important vessels, which may need repair under a cardiorespiratory bypass circuit. Alternative reported difficulties include pneumothorax, left recurrent cartilaginous structure nerve paralysis, tracheal or esophageal rupture, wound infection and significant hemorrhage, and even injury to the trachea-bronchial tree.5Thoracic CT usually shows enlarged body fluid nodes. It's the foremost commonly used non-invasive staging technique of the mediastinum. Imaging techniques like CT cannot perpetually differentiate dependably between benign and malignant lesions, as enlarged nodes could additionally be inflammatory, whereas normal-sized body fluid nodes might contain malignancy [6]. The performance of CT, alongside the necessity for a definitive tissue identification, mediastinoscopy (by getting biopsy) and endoscopic ultrasonography (EUS)-guided fine needle aspiration (FNA) biopsy, transbronchial needle aspiration (TBNA) diagnostic assay, and CT guided transthoracic FNA diagnostic assay became commonplace strategies for tissue confirmation, with variable

yields and complications [7]. Mediastinoscopy offers visualization also as tissue identification from associate accessible body fluid station, however it's considered invasive procedure with a considerable value and a tiny low definitive morbidity.8According to the published data by the European Association of Oncology, there are about 1.6 million new lung cancer cases annually worldwide.9The most likely suffered cases are men over women - 33.8 per 100,000 men cases versus 13.5 per 100,000 women cases of population.10Early diagnosis is essential to overcome this pathology, allowing an early and personalized treatment to begin [11]. The main task of carcinoma medicine is to see the situation, size, propagation, and morphological verification of the tumor [15]. Non-invasive and invasive diagnostic strategies area unit accustomed diagnose of carcinoma (LC). The most non-invasive strategies include: laboratory examinations, chest radiography, magnetic resonance imaging (MRI), computerized tomography (CT), antilepton emission CAT (PET/CT), osteoscintigraphy, which may be set the presence, unfold and localization of oncological growth. These strategies are applied as a primary stage of diagnostic search and permit determining the invasive technique administered for the target morphological verification [12, 13, 14]. For invasive diagnosis of lung cancer, we use transthoracic puncture biopsy, fibro bronchoscopy with biopsy, transbronchial biopsy (EBUS TBNA), transesophageal biopsy (EUS-FNA), video thoracoscopy with biopsy, cervical mediastinoscopy(CM), an open biopsy [16, 17].

2. Methods

The work was performed during 2016-2020. It was based on the oncology clinic of the Department of Oncology of the O. O. Bogomolets National Medical University (Kiev, Ukraine) and the Kiev Clinical Railway Transport Hospital No. 3. The number of patients in the study who performed mediastinoscopy was 106-110 to diagnose lung cancer. We have used general clinical, laboratory, endoscopic (EBUS-TBNA, CMM), radiographical (CT, PET-CT), morphological, immunohistochemical, and statistical methods of study. An indication for mediastinoscopy was the enlargement of the lymph nodes of the mediastinum discovered by computed tomography of the thoracic organs. Mediastinoscopy was performed under general anesthesia. Used a classic mediastinoscopy consistent with Carlen in the patient's position on his back with a roller beneath his shoulders. The first anatomical landmark was a jugular notch; directly on top of that, a skin incision was created within the lower third of the neck in the transversal direction. Besides the sternal and organ muscles, the musculus platysma stirred on the white line of the neck. The second anatomical landmark was the trachea. Once dissection of the pre-tracheal fascia, the trachea was exposed, and the forefinger was inserted into the wound canal, the paratracheal tissue was stratified, and a course was inserted for the insertion of a mediastinoscopy. His blade was captive on the trachea, specializing in its rings. The third anatomical landmark is tracheal bifurcation. Paratracheal areas, the place of the tracheal bifurcation, and the main bronchi's initial areas were examined. Enlarged lymph nodes were taken for biopsy test (excision biopsy) from entirely different sites, right and left. The basis of the foundation of the left respiratory organ, the blade of the mediastinoscopy was mounted on the anterior semicircle of the left main bronchial tube, the dissector was stratified by peribranchial tissue, and anterior from the bronchial tube was separated by the posterior two-dimensional figure of the left pulmonic artery; The mediastinoscopy was advanced into the formed canal to the area of the arterial blood vessel and also the starting of the maxillary bronchial tube. Patients were discharged from the hospital the day of surgery or the following day. The study was conducted according to the necessities of the Helsinki Declaration of Human Rights, and every informed participant gave their written consent. For applied mathematics analysis results, we used Statistica for Windows Version 10.0 (Stat Soft INC., USA). Parameters are given within the form M±m, where M is the mean, m is the standard deviation. In the case of $p<0.05$, variations were set as statistically vital.

3. Results

The study was done on 106 patients for diagnosing lung cancer, all had performed mediastinoscopy, and after getting the results, it was discovered that 65 were represented by lung cancer. The rest of the cases were presented by other pathologies. Colorectal and stomach cancers were most common. In one case, the patient had a comorbidity, a combination of lung cancer and colorectal cancer.

Table 1. The ratio of different combinations in affected lymph nodes at the patients with lung cancer.

Parameter	%
2R, 4R	16.38
4R, 4L	21.1
4L	9.72
2R, 4R	7.73
4R, 4L	6.2
4R	9.02
10L, 4L	2.72
2R	1.83
2R, 2L, 4R, 4L	4.9
2L, 4L, 10L, 4R	1.16
2R, 4R	7.55
2R, 4R, 4L	5.34
4R,10R	1.55

The variety of mixtures is because of the very fact that, 1st of all, the enlarged lymph nodes were investigated. Most often, the samples of three teams of lymph nodes were taken. The primary purpose of cervical mediastinoscopy among patients with carcinoma was to work out the standing of. In 42 patients, the study of lymph nodes of the mediastinum allowed to verify the identification of carcinoma and determine the standing of N. That is, the sensitivity of the strategy, compared with computerized tomography, was 97.6 CI%95. Additionally, a reliable Specificity indicator was established at 46.5 CI%95 - [32.3-61.2] and a low probability of False-negative rate - 0.05 CI%95 - [0.01-0.26] Table2.

Table 2. Parameters of Diagnostic Value Neck Mediastinoscopy versus Computed Tomography at the Patients with Lung Cancer.

Parameter	Value [CI%95]
Sensitivity	97.6 [89.3-100.0]
Specificity	46.5 [32.3-61.2]
False positive rate	53.5 [38.9-67.7]
False negative rate	2.33 [0.37-10.7]
Likelihood ratio for positive test	1.83 [1.44-2.31]
Likelihood ratio for negative test	0.05 [0.01-0.26]
Youden's index	0.44 [0.31-0.57]
Area under ROC curve	72.1 [65.6-78.6]
Diagnostic odds ratio	36.5 [6.4-97.8]

According to chest CT in patients with carcinoma, a rise within the Mediastinal tumor's nodes from 10 to

14.9mm was discovered in twenty-three (54,76%) and 15 millimeters in 19 (45,24%). The presence of carcinoma metastases within the mediastinal nodes was detected in 33 (78,57%) patients. In 9 (21,43%) subjects, mediastinal pathology according to CT data) wasn't caused by metastasis. The histologic distribution once playing cervical mediastinoscopy was as follows: epithelial cell malignant neoplastic disease - 10 (23,8%) cases, glandular carcinoma - 24 (57.1%), small cell carcinoma - 8 (19,04%). Consistent with the classification, TNM - T4N3M0 – 3, T4N2M0 - 4, T4N2M1 - 2, T3N3M1 - 3, T3N2M0 - 3, T3N0M0 - 3, T2N3M1 - 2, T2N3M0 - 6, T2N2M1 - 4, T2N2M0 - 5, T2N0M1 - 1, T2N0M0 - 5, T1N2M0 - 2. The results of surgical histologic examination of mediastinal body fluid nodes coincided with the histologic results of operative cervical mediastinoscopy in 100% of cases (100.0 [97.1-100.0]). False-negative rate zero.01 [0.25-2.89] was unreliable. Acting cervical mediastinoscopy influenced the selection of treatment techniques.

4. Discussions

Cervical mediastinoscopy could be a safe, correct, and cost-effective procedure minimizing hospital keep and permitting adequate treatment to be like a shot commenced upon diagnosing. The main advantage of this technique is its high diagnostic worth - sensitivity is about 81.8%, and specificity 100%. This technique permits the sampling of morphological material sufficient to perform a histologic immunohistochemical and molecular investigation that makes it doable to diagnose and fairly prescribe treatment objectively. Histological analysis of mediastinal tumors nodes is feasible once using invasive diagnostic strategies like VATS, EBUS-TBNA, and cervical mediastinoscopy. The disadvantages of VATS are often thought of as the invasiveness of the technique, the power to perform a solely unilateral diagnostic test of humor nodes, long admission in hospital. The disadvantages of EBUS-TBNA are high-ticket instrumentation and the ability to perform diagnostic tests of a restricted quantity of material. Staging of carcinoma could be a significant indication for mediastinoscopy. The most significant advantage of mediastinoscopy over other investigations is that this technique provides morphological confirmation of tumor propagation. Thus, in a retrospective analysis of 72 patients in whom a lesion of the intra-thoracic humor nodes was disclosed by mediastinoscopy, chest radiography was uninformative. Chest CT has enlarged its diagnostic capabilities. However, research suggests that chest CT cannot and may not be used as a complete technique for carcinoma staging. The method faithfully detects mediastinal tumor nodes solely in 52-58% of cases. A CT scan will sight any affected tumor nodes larger than one cm in size. However, the frequency of false positives is more or less half-hour. On average, the sensitivity and specificity of chest CT once police work intrathoraciclymphomatous metastases of carcinoma is adequate 56-63% and 52,75% severally, whereas, with mediastinoscopy, these indicators reach 98-100% and 95-97%, severally. In terms of sensitivity and specificity (80% and 96-98%, respectively), positron emission imaging approaches mediastinoscopy. Mediastinoscopy remains the most effective diagnostic investigation of choice for par tracheal and retro vascular mediastinal pathology, especially in lung cancer.

5. Conclusion

Thus, cervical mediastinoscopy in patients with primary lung cancer allowed:

- Accurately establish the explanation for the rise in mediastinal tumor nodes and verify the frequency of various combos of the studied teams.
- In patients with primary carcinoma, verify the designation in 100% of cases and verify the N status in 100%of cases.
- The sensitivity of the strategy of cervical mediastinoscopy, compared with CT, was97.6% CI[89.3-100.0]; a reliable Specificity of 46.5%CI [32.3-61.2] and a coffee likelihood of false-negative rate of the take a look at - 0.05%CI [0.01-0.26].

- The results of operative microscopic anatomy examination of the mediastinal tumor nodes coincided with the histological results of surgical cervical mediastinoscopy in 100% of cases (100.0 [97.1-100.0]). False-negative rate 0.01 [0.25-2.89] was unreliable.
- Cervical mediastinoscopy created it doable to gather enough tissue samples for immune-histochemical study to accurately establish the designation and substantiate the treatment of patients with primary lung cancer.

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