

## EVALUATION OF THE SURGICAL TREATMENT OF LUNG CANCER

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### **Abstract**

Lung cancer is the most common malignancy in men and in the entire human population. It is considered that 2,200,000 new patients are detected annually in the world (Globcan 2020), 475,000 in Europe (Globcan 2020), i.e. 1,135 in the Republic of North Macedonia (Globcan 2020). The treatment is multimodal, and several factors influence its choice.

Surgical treatment is one of the modalities of treatment and its application depends on numerous factors - histological structure of the tumor, stage of the disease, satisfactory respiratory reserves, satisfactory cardiac reserves, general condition of the patient, etc. At the clinic for thoracic and vascular surgery in 2022, only 59 patients were surgically treated, which is 85% of the total surgically treated in the Republic of North Macedonia. Out of the 59 patients, 44 (74.6%) were men. The average age of the operated patients was 64.22 years, and 37 (62.7%) underwent neoadjuvant chemotherapy preoperatively to reduce the tumor and stage of the disease.

Patients who were operated on were mostly in IIIA stage 16 (27.12%). The small percentage of operated patients, 7.7%, and the particularly high percentage of operated patients at an advanced stage indicates that patients are detected at an advanced stage of the disease, which is a contraindication for surgery. Introduction of screening for lung cancer using computed tomography in risk groups will significantly change the therapeutic approach to this group of patients, as well as the outcome of their treatment.

**Key Words:** *lung cancer, screening, surgery,..*

### **Introduction**

Lung cancer is the most common malignancy in men and in the entire human population, but also is on the first place according to the mortality rate. It is considered that 2,200,000 new patients are detected annually in the world (Globcan 2020), i.e. 1,135 in the Republic of North Macedonia (Globcan 2020), out of which only 59 patients were surgically treated at the thoracic and vascular surgery clinic in 2022, which is 85% of the total surgically treated in the Republic of North Macedonia (1).

Lung resection is one of the procedures in the treatment of lung cancer (2-4).

The extensiveness of the disease (clinically advanced stage), histological structure (small cell carcinoma), limited respiratory reserves, limited cardiac reserves, deterioration of the general

condition, make lung resection impossible. That is why only 10% of newly diagnosed patients with lung malignancy undergo surgical intervention with lung resection (4).

The use of neoadjuvant oncology therapy in a certain percentage increases the chance of lung resection.<sup>4</sup> Of course, perhaps the introduction of a screening program with computed tomography enables the detection of lung cancer in the earliest stage of the disease, which significantly increases the percentage of lung resections (5,6).

The aim of this paper is to determine the characteristics of patients with lung cancer, type of tumor, type of lung resection through the analysis of operative material of patients operated at the University Clinic for Thoracic and Vascular Surgery in 2022. At the same time, measures should be proposed to increase the percentage of operated patients from lung malignancy.

### **Material and Methods**

In 2022, 59 patients with proven lung malignancy were surgically treated at the Thoracic and Vascular Surgery Clinic. The study did not include patients in whom lung malignancy was not proven, as well as patients in whom the surgical intervention was for the purpose of diagnosing changes, exploration and so on.

Descriptive parameters (gender, age), tumor localization, pathohistological finding, TNM descriptors, preoperative application of neoadjuvant therapy, stage of disease resulting from TNM descriptors, surgical approach, type of lung resection and removed part of lung were analyzed.

The parameters are entered into a database in the Excel program. Standard computer programs Statistics 10 were used for statistical analysis.

### **Results**

At the Clinic for Thoracic and Vascular Surgery in 2022, 59 patients were operated for lung cancer. Out of them, 44 (74.6%) were men, and 15 (25.4%) were women. The age of the patients was from 40 to 79 years, with an average age of 64.22 years.

All patients were operated under general anesthesia, using a double-lumen tube.

Among the pathohistological findings, squamous cell carcinoma was most common - in 32 (54,2%), followed by adenocarcinoma - in 19 (32.2%). The results of the distribution of patients by gender and pathohistological findings are shown in Table 1.

**Table 1.** Distribution of type of lung cancer according to gender of patients.

| Pathohistology        | Male       | Female    | Total             |
|-----------------------|------------|-----------|-------------------|
| <b>Squamos cell</b>   | 27 (45.8%) | 5 (8.5%)  | <b>32 (54.2%)</b> |
| <b>Adenocarcinoma</b> | 11 (18.6%) | 8 (13.6%) | <b>19 (32.2%)</b> |

|                |                   |                   |                  |
|----------------|-------------------|-------------------|------------------|
| <b>SCLC</b>    | 0                 | 1 (1.7%)          | <b>1 (1.7%)</b>  |
| <b>Another</b> | 6 (10.2%)         | 1 (1.7%)          | <b>7 (11.9%)</b> |
|                | <b>44 (74.6%)</b> | <b>15 (25.4%)</b> | <b>59 (100%)</b> |

The following table shows the results of distribution of disease stage descriptors T (tumor size), N (involvement of lymph nodes with metastases) and M (presence of systemic metastases).

**Table 2.** Distribution of patients according T stage, N stage, M stage and TNM stage.

|              | <b>T</b>         | <b>N</b>         | <b>M</b>         |  | <b>stage</b> | <b>TNM</b>       |
|--------------|------------------|------------------|------------------|--|--------------|------------------|
| <b>0</b>     | 1 (1.7%)         | 37 (62.7%)       | 57(96.6%)        |  | <b>I</b>     | 11 (18.6%)       |
| <b>1</b>     | 11 (18.6%)       | 17 (28.8%)       | 2 (3.4%)         |  | <b>IIA</b>   | 13 (22.0%)       |
| <b>2</b>     | 24 (40.7%)       | 5 (8.4%)         |                  |  | <b>IIB</b>   | 9 (15.2%)        |
| <b>3</b>     | 14 (23.7%)       |                  |                  |  | <b>IIIA</b>  | 19(32.2%)        |
| <b>4</b>     | 9 (15.2%)        |                  |                  |  | <b>IIIB</b>  | 5 (8.4%)         |
|              |                  |                  |                  |  | <b>IV</b>    | <b>2 (3.4%)</b>  |
| <b>Total</b> | <b>59 (100%)</b> | <b>59 (100%)</b> | <b>59 (100%)</b> |  |              | <b>59 (100%)</b> |

The tumor size in the lung ranged from 0 to 90mm, mean value 45.12mm.

The tumor was mostly located in the upper lobe, in 23 (39%) and in the right lung, in 31 (52.5%).

Oot of the operated patients, preoperative neoadjuvant chemotherapy was applied in 37 patients (62.7%), in order to reduce the stage of the disease, so that lung resection could be performed.

Open anterolateral thoracotomy was the most often applied, in 49 (83%) of the patients.

Of the lung resections, lobectomy was the most often used, in 45 cases (76.27%). The surgical approach and type of lung resection are attached to Table 3.

**Table 3.** Distribution of patients presented by type of surgical approach and type of lung resection according to TNM stage.

| <b>TYPE</b>        |           |            |            |             |             |           |                   |
|--------------------|-----------|------------|------------|-------------|-------------|-----------|-------------------|
| <b>↓ STAGE →</b>   | <b>I</b>  | <b>IIA</b> | <b>IIB</b> | <b>IIIA</b> | <b>IIIB</b> | <b>IV</b> | <b>Total</b>      |
| <b>Thoracotomy</b> | 9         | 10         | 8          | 16          | 4           | 2         | <b>49 (83%)</b>   |
| <b>VATS</b>        | 2         | 3          | 1          | 3           | 1           | 0         | <b>10 (17%)</b>   |
|                    | <b>11</b> | <b>13</b>  | <b>9</b>   | <b>19</b>   | <b>5</b>    | <b>2</b>  | <b>59</b>         |
| <b>Wedge</b>       | 1         | 1          | 0          | 0           | 1           | 0         | <b>3 (5.1%)</b>   |
| <b>Lobectomy</b>   | 9         | 11         | 7          | 14          | 2           | 2         | <b>45 (76.3%)</b> |
| <b>Bilobectomy</b> | 0         | 1          | 0          | 2           | 0           | 0         | <b>3 (5.1%)</b>   |

|                   |                             |                           |                            |                             |                           |                           |                            |
|-------------------|-----------------------------|---------------------------|----------------------------|-----------------------------|---------------------------|---------------------------|----------------------------|
| <b>Pulmectomy</b> | 0                           | 0                         | 2                          | 2                           | 2                         | 0                         | <b>6</b><br><b>(10.2%)</b> |
| <b>other</b>      | 1                           | 0                         | 0                          | 1                           | 0                         | 0                         | <b>2 (3.4%)</b>            |
|                   | <b>11</b><br><b>(18.6%)</b> | <b>13</b><br><b>(22%)</b> | <b>9</b><br><b>(15.3%)</b> | <b>19</b><br><b>(32.2%)</b> | <b>5</b><br><b>(8.5%)</b> | <b>2</b><br><b>(3.4%)</b> | <b>59</b><br><b>(100%)</b> |

Complications of the type: prolonged air leak in 10, incomplete re-expansion in 9, bronchopneumonia with atelectasis in 8, encapsulated effusion in 4, which were resolved with conservative treatment, were detected in the patients.

No death outcome was detected in any patient in-hospital.

## **Discussion**

Resection is the primary mode of treatment for stage I and II NSCLC and an important component of the multimodality approach to stage IIIA disease (2-4,7).

Standard resections include removal of the lobe involved with tumor and systematic evaluation of ipsilateral hilar and mediastinal lymph nodes (2-4,8).

According to Globcan, in 2020, 1,135 patients with lung malignancy were detected in the Republic of North Macedonia, unfortunately only 59 (5.2%) cases were treated surgically, which is 85% of the total surgically treated patients with lung malignancy (1).

First of all, the reason for such a small number of operated patients is the detection of lung cancer in an advanced stage. Namely, the indication for surgery are patients of I, II and part of IIIA stage from the group of non-small cell cancer type. Contraindicated for surgery are also patients with detected small cell cancer, which are represented by 20%, except for the earliest stage (4,7).

The large respiratory reserves of the lungs, clinical symptoms that are not characteristic of lung cancer at the beginning, are the reason for detection of lung cancer in an advanced stage, which are inoperable at the time of diagnosis.

Preoperative evaluation of pulmonary reserves (gas analyses, ventilation tests), as well as evaluation of cardiac reserves (echocardiography and, if necessary, coronary angiography), further exclude from operative treatment the patients with a high risk of surgery.

According to the pathohistological diagnosis of the tumor, squamous cell carcinoma is the most common, especially in operated male patients where it is represented by 61,4%. Contrary to this, in women operated for lung cancer, adenocarcinoma dominates, which is represented by 53,3% .

According to the stage of the disease in the operated patients, the most often they were operated in IIIA stage - 19 (32.2%), which indicates that they were operated in an advanced stage, even

more knowing that 37 patients (62.7%) were preoperatively treated with neoadjuvant chemotherapy in order to downsize the tumor and the stage.

Lobectomy remains the preferred operation and it is associated with better survival and lower locoregional recurrence, but there is increased interest in the role of sublobar resections (2,3,7-9)

In our study, 45 (76.3%) of the patients were treated with lobectomy and lymphadenectomy, 3 with bilobectomy and 6 with pulmectomy due to disease progression in more than one lobe.

Results after anatomical lobectomy for early stage, NSCLC were good. In the large ACOSOG Z0030 trial, disease-free survival at 5 years was 68% for resected early-stage patients. The operative mortality following lobectomy is reported to be 1 to 3% with pneumonia and respiratory failure as the overwhelming causative factors (2,3,7-9).

For early-stage disease, the evolving surgical treatment goals were aimed at decreasing of morbidity and mortality through less invasive approaches including video-assisted thoracoscopic surgery (2,3,7-9).

The most large series of lobectomy by VATS describe a similar pattern of perioperative complications as the open approach, but at reduced rates of complications, especially at early stage (2,7,9).

VATS has been established as a safe and less morbid alternative to open resection, but skepticism remains about its oncologic effectiveness (8).

From what has been presented so far, it clearly follows that the main problem is late-diagnosed patients with lung cancer. Accordingly, consideration should be given to introducing lung computed tomography screening in at-risk populations. With the introduction of screening, it is expected that the percentage of patients with early-stage disease who will undergo surgery will rise to 25 to 40% (5,6).

## **Conclusions**

The small percentage of patients with lung cancer that were operated, as well as those operated in an advanced stage of the disease, should encourage the introduction of screening of the risk population.

## **References**

1. <https://gco.iarc.fr/today/data/factsheets/cancers/15-Lung-fact-sheet.pdf>. (assessed January 2024)

2. Francesco Petrella, Stefania Rizzo, Monica Casiraghi, Claudia Bardoni, Shehab Mohamed, Valeria Musso, Emanuele Simonini, and Lorenzo Spaggiari State of the art and new perspectives in surgical treatment of lung cancer: a narrative review -*Transl Cancer Res.* 2022 Oct; 11(10): 3869–3875. doi: 10.21037/tcr-22-1491.
3. Hongfei Cai , Yonghui Wang , Da Qin , Youbin Cui , Hongbo Zhang - Advanced surgical technologies for lung cancer treatment: Current status and perspectives. *Engineered Regeneration* Volume 4, Issue 1, March 2023, Pages 55-67.
4. Adam Lackey, MD1 Jessica S. Donington, MD - Surgical Management of Lung Cancer-*Semin Intervent Radiol* 2013;30:133–140.
5. Aberle D.R., Adams A.M., Berg C.D., et al. Reduced lung-cancer mortality with low-dose computed tomographic screening. *N Engl J Med.* 2011;365:395–409.
6. de Koning H.J., van der Aalst C.M., de Jong P.A., et al. Reduced lung-cancer mortality with volume CT screening in a randomized trial. *N Engl J Med* 02. 2020;382:503–513.
7. Vignesh Raman, Chi-Fu Jeffrey Yang, John Z. Deng, Thomas A. D’Amico- Surgical treatment for early stage non-small cell lung cancer/ *J Thorac Dis* 2018;10(Suppl 7): S898-S904. dx.doi.org/ 10.21037/ jtd.2018.01.172.
8. Ginsberg RJ, Rubinstein LV; Lung Cancer Study Group. Randomized trial of lobectomy versus limited resection for T1 N0 non-small cell lung cancer. *Ann Thorac Surg* 1995;60(3):615–622; discussion 622–623.
9. Roviato G, Varoli F, Vergani C, Maciocco M. Video-assisted thoracoscopic surgery (VATS) major pulmonary resections: the Italian experience. *Semin Thorac Cardiovasc Surg* 1998;10(4): 313–320.