

Research Article / Araştırma Makalesi

Pulmonary Metastasectomy; Analyse and Clinical Overview of 20 Patients  
Pulmoner Metastazektomi; 20 Hastanın Analizi ve Klinik Değerlendirmesi

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**Abstract:** It has been revealed that metastasectomy surgery performed on patients whose primary tumor is under control and who have only lung metastases can show better survival after complete surgical resection compared to cases with multiple organ metastases. In our study, we retrospectively shared our experience with metastasectomies and their impact on survival. In our clinic, 20 patients (12 men, 8 women; average age 49 years) who were operated on due to metastasis detected in the lung between 2010 and 2020 were retrospectively examined. Patients were determined according to age, gender, primary tumor pathology, disease-free time, radiologically and surgically. It was evaluated according to the number of metastatic lesions detected, the type of operation and the follow-up period. Respiratory function tests were performed on all patients. Patients with isolated pulmonary lesions whose primary tumors were under control underwent resection if their cardiopulmonary status was suitable for resection. Three of the twenty patients underwent video-assisted thoracoscopic surgery (VATS), and the other 17 patients underwent open thoracotomy, for a total of 28 metastasectomy operations. While the number of nodules detected before the operation was 39, a total of 51 nodules were excised during the operation. No major complications were observed. While 9 of our patients died due to widespread metastases within the 5-year postoperative period, 11 patients are being followed up disease-free without pulmonary metastases. It is known that metastasectomy positively affects survival in cases with isolated pulmonary metastases whose primary tumor is under control. The possibility of missing radiological findings when evaluating the number of nodules still makes the importance of open surgical treatment and digital palpation current in metastasectomy.

**Keywords:** Pulmonary, Metastasectomy, Thoracotomy

**Özet:** Primer tümörü kontrol altında olan ve sadece akciğer metastazı bulunan hastalarda yapılan metastazektomi ameliyatının birden fazla organ metastazı olan olgularla karşılaştırıldığında komplet cerrahi rezeksiyon sonrasında daha iyi sağkalım gösterebildikleri ortaya konulmuştur. Çalışmamızda, retrospektif olarak metastazektomileri ve sağkalıma etkisi ile ilgili deneyimimizi paylaştık. Kliniğimizde, 2010 ile 2020 yılları arasında akciğerde saptanan metastaz nedeni ile opere edilmiş 20 hasta (12 erkek, 8 kadın ;ortalama yaş 49) ,retrospektif olarak incelendi.Hastalar yaş, cinsiyet, primer tümör patolojisi,hastaliksız geçen süre,radyolojik ve cerrahi olarak tespit edilen metastatik lezyon sayısı, operasyon şekli ve takip süreci ile değerlendirildi.. Tüm hastalara solunum fonksiyon testleri incelemesi yapıldı. Primer tümörleri kontrol altında olan izole pulmoner lezyonları mevcut hastaların kardiyopulmoner durumu yapılacak rezeksiyona uygun ise rezeksiyon uygulandı. Yirmi hastanın 3 ' üne video yardımcı torakoskopik cerrahi(VATS) ile, diğer 17 hastaya açık torakotomi ile toplamda 28 metastazektomi operasyonu uygulandı. Operasyon öncesi saptanan nodül sayısı 39 iken, operasyonla toplamda 51 adet nodül eksize edildi. Majör komplikasyon görülmedi. 9 hastamız postoperatif 5 yıllık süreçleri içinde yaygın metastazlar ile kaybedilirken, 11 hasta pulmoner metastaz olmaksızın hastaliksız takip edilmektedirler. Primer tümörü kontrol altında olan izole pulmoner metastazlı olgularda metastazektominin sağkalımı olumlu yönde etkilediği bilinmektedir. Nodüllerin sayı olarak değerlendirilmesinde radyolojik bulgu olarak da atlanma olasılığı, yapılacak metastazektomide açık cerrahi tedavi ve dijital palpasyonun önemini halen güncel kılmaktadır.

**Anahtar Kelimeler:** Pulmoner, Metastazektomi, Torakotomi

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## 1. Introduction

Tumor cells originating from body tissue of malignant character can be able to make metastasis despite treatment. In autopsy studies, one-third of deaths were observed due to cancer. One of them was shown to have lung metastasis and in some of them, only lung metastases were detected (1). Distant organ metastases detected in the lung are less than 5% of lung cancers. Isolated lung metastases, as opposed to systemic metastases does not mean that the primary disease is always systemic and out of control. Patients with isolated lung metastases organ respond significantly better to local and systemic treatment when compared cases with metastases to more than one. Five-year follow-up after pulmonary metastasectomy in patients, survival rate is between 20-40% (2,3). However, studies have reported that metastasectomy has a positive effect on survival and various prognostic factors have been examined. In this study, when the primary tumor is under control, the positive effect on survival of pulmonary metastasectomy is achieved in our clinical experience.

## 2. Materials and Methods

A total of 20 patients were diagnosed in our clinic between 2010 and 2020 retrospectively. Patients' age, gender, primary malignancy, disease-free period, number of lung metastasis detected in preoperative thorax CT, if re-metastasectomy was performed, when and whether patients received chemotherapy (CT) before and after the operation is investigated. If the primary malignancies of all patients have been surgically resected before, in addition to whether the tumor is under control or not; necessary scans were performed to show that there was no metastasis in other organs. The number of detectable metastases was recorded. Pulmonary function test and echocardiography are performed on all patients to determine whether their cardiopulmonary reserves are sufficient, and relevant tests are performed on those with additional diseases. Related departments were consulted. Metastatic lesions that have been surgically excised and their number and location were also noted. Video-assisted

thoracoscopic surgery for lesions (VATS) was performed by thoracotomy except 3 patients. Detected metastases are removed by cautery and/or was resected appropriately with the help of linear stapler, with at least 1 cm of safe benign margin at the time of resection. Parenchymal damage in patients causes air leaks were repaired with 3/0 Vicryl sutures in order to prevent it. In conjunction with Medical Oncology in the postoperative period Median follow-up period of patients were followed up. And new metastases and survival was recorded.

## 3. Results

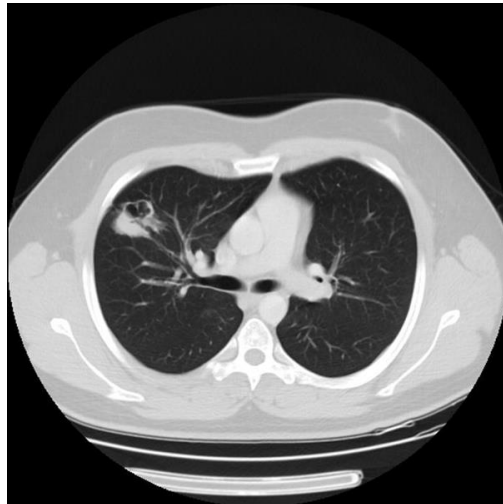
12 of 20 patients who underwent a total of 28 operations were male (60%), 8 female (40%), median age was found to be 49 (23-67 years).

Primary pathologies; colon carcinoma in 9 cases (45%), germ cell tumor in 4 cases (20%), larynx ca in 2 cases (10%), sarcoma in 5 patients (25%) are detected. The cases were examined 3 weeks after primary malignancy resection for periods ranging from 1 month to 120 months (median 50 months). were taken into operation for detected metastases. Single surgical intervention was performed in 12 (60%) of the cases, and two-stage surgical intervention was performed in 8 (40%) of the cases. Seventeen of the patients (85%) were performed posterolateral thoracotomy. Three of the patients (15%) were performed Video Assisted Thoracic Surgery (VATS) due to the detected single nodule peripherally. The exact number of metastases reported by CT before the operation was 39, a total of 51 nodules were excised with the operations.

Distribution of metastases are found as: 20% upper left, 30% leftlower, 10% right upper lobe, 10% right middle lobe, 30% right lower lobe. Number of resected metastases 1-5 (median: 3) in all cases. All primary malignancies had previous surgery. Metastasectomy was performed with intact surgical margins in all cases. One patient underwent left lower lobectomy with Ewing sarcom because of inferior pulmonary vein and superior segmental pulmonary artery involvement. One patient with colon carcinoma metastases was performed right

lower segmentectomy due to the nodule was not palpable in the lung parenchyma; therefore to perform complete excision of the metastases, we performed right lower segmentectomy to the detected hypermetabolic ground glass area. Pneumonectomy was not performed. Prolonged air leakage is developed in 2 cases (10%). Median length of stay of patients is 6

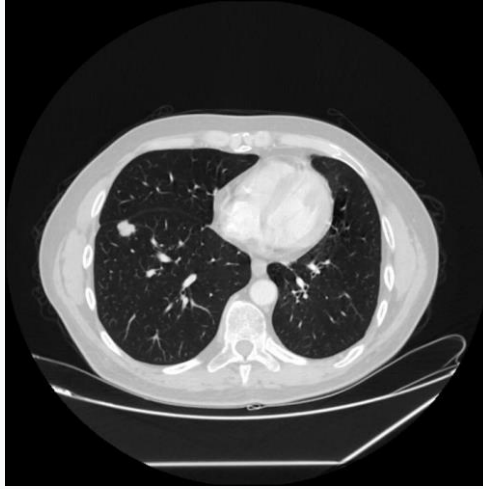
days and no mortality detected in postoperative period. 9 of our patients died due to widespread metastases within the 5-year postoperative period, 11 patients are being followed up disease-free without pulmonary metastases.



**Figure 1.** Computed tomography image of germ cell tumor metastasis



**Figure 2.** Computed tomography image of sarcoma metastasis



**Figure 3.** Computed tomography image of colon carcinoma metastasis



**Figure 4.** Computed tomography image of larynx carcinoma metastasis

#### 4. Discussion

Malignant tumors arising in any system tend to spread according to the degree of differentiation. Primary foci can be removed locally by surgery or radiotherapy. Can be controlled, but systemic metastasis may occur. In this case, treatment is much more difficult. Systemic metastases are usually treated with chemotherapy or, in some cases, radiotherapy (RT). Lung is the most common metastasis of many malignant tumors. Especially urogenital malignancies, colorectal carcinomas and Sarcomas most commonly metastasize to the lung(4,5). The most important factor

determining survival after metastasectomy criteria, as well as the histology of the primary tumor, localization and number of metastases, disease-free duration, whether complete resection can be performed or not, tumor doubling time, patient's immune status, age, gender and other treatments received. These factors, complete resection, disease-free long period of time and the number of metastases are single or low blood pressure has a positive effect on prognosis reported. Mortality of the surgical intervention performed is below 2% and can be applied safely and potential cure

with surgical treatment in selected patient groups. To achieve the best survival rates the primary focus should be kept under control in the selection of patients(6). The patient's postoperative pulmonary reserve should be sufficient and complete. All metastatic lesions presented on CT examination can be detected to is very important for planning the surgery type.. But with CT detection of lesions, their location or size can be found different during the surgery.. Most researcher in lung metastasectomy surgery, comprehensive manual examination of the lung intraoperatively detects sometimes more lesions than that detected radiologically in the preoperative period. They reported as they resected a higher number of metastatic lesions reports (7, 8). Mineo et al. (9) reported 22% more than what was detected in the preoperative CT examination. In our study, preoperative evaluation of 20 patients with pulmonary metastases were reported as 39 (76%) metastatic lesions on CT examination but 51 metastatic lesions were excised. It indicates that some lesions may be missed during the scanning examination. Approaching patients with thoracotomy has been recommended by many authors in order to palpate the number and the border of the lesions. We approached 17 cases except 3 cases through thoracotomy. VATS was used in 3 patients with a peripheral lesion of 1 cm in diameter and limited pulmonary functions.

Applying surgical treatment and post-treatment in order to obtain the best survival rates, some criteria should be taken into account in the selection of patients.

It is reported (10,11,12) and according to these criteria;

- Primary focus is under control
- Absence of extrathoracic tumor spread
- The patient's postoperative pulmonary reserve is sufficient
- All metastatic foci are resectable
- The appropriate pulmonary reserve for the postoperative period must be known in advance.

- Other indications and purpose for partial or complete resection;
- Diagnostic requirement
- Removal of all residual nodules after chemotherapy
- Providing the necessary tissue for tumor markers or immunohistochemical study
- Tumor burden was not reduced

Different types of resection for metastasectomy is recommended and used. Metastatic nodüle wedge resection with surrounding healthy tissue removal with cautery, laser or stapler is most preferred. The metastatic mass is completely and from the lung parenchyma in the least possible amount should be removed by taking into account the appropriate surgical margins.

Preventive resection should be attempted as much as possible, the most frequently used method in our series is lineer stapler wedge resection with intact margins of the lesion. To make the complete resection of the lesions, we performed lobectomy in 1 case and segmentectomy in 1 case in our series.

## **5. Conclusion**

As a result primary tumor under control of elsewhere no metastases detected, and respiratory functions are adequate, the chance of metastasectomy considering positive effect on survival should be given. Although Thorax CT is a sensitive method for detecting sensitivity is limited and we should keep in mind that a large number of metastases can be detected. Surgery should be well planned and the possibility of missing radiological findings when evaluating the number of nodules still makes the importance of open surgical treatment and digital palpation current in metastasectomy.

We evaluated in our clinic and performed pulmonary metastasectomy included in the study patient with appropriate surgical indications due to the small number of patients and the primary heterogeneous structure of pathologies. Although it gives a

positive signal in showing the results, to make an objective assessment in all aspects large

metastasectomy series with large numbers of cases will be appropriate for the evaluation.

## REFERENCES

1. Shields TW. Pathology of carcinoma of the lung. In: Shields TW, LoCicero J, Ponn RB, editors. General thoracic surgery. Philadelphia: Lippincott Williams & Wilkins, 2000; 1235-68.
2. Ripley RT, Downey RJ. Pulmonary Metastasectomy. J Surg Oncol 2014; 109: 42-6.
3. Fiorentino F, Treasure T. Pulmonary metastasectomy: Are observational studies sufficient evidence for effectiveness? Ann Thorac Surg 2013; 96: 1129-31.
4. Pastorino U, Buyse M, Friedel G, et al. Long-term results of lung metastasectomy: prognostic analyses based on 5206 cases. J Thorac Cardiovasc Surg 1997; 113: 37-49.
5. Putnam JB, Roth JA. Secondary Tumors in The Lung. In: Shields TW (ed). General Thoracic Surgery 4th ed. Philadelphia: Williams&Wilkins, 1994; 1334-52.
6. Yüksel M, Kalaycı G. Metastatik akciğer tümörleri. In: Yüksel M, Kalaycı G (ed). Göğüs Cerrahisi. İstanbul: Bilmedya Grup, 2001; 307-28.
7. Margaritora S, Porziella V, D'Andrilli A, et al. Pulmonary metastases: can accurate radiological evaluation avoid thoracotomy approach? Eur J Cardiothorac Surg 2002; 21: 1111-4.
8. Parsons AM, Detterbeck FC, Parker LA. Accuracy of helical CT in the detection of pulmonary metastases: is intraoperative palpation still necessary? Ann Thorac Surg 2004; 78: 1910-8.
9. Mineo TC, Ambrogi V, Paci M, et al. Transxiphoid bilateral palpation in video-assisted thoracoscopic lung metastasectomy. Arch Surg 2001; 136: 783-8
10. Hendriks JM, Romijn S, Van Putte B, Eyskens E, Vermorken JB, Van Marck E, et al. Long-term results of surgical resection of lung metastases. Acta Chir Belg 2001; 101:267-72.
11. Putnam JB. Pulmonary metastases. In: Franco KL, Putnam JB, editors. Advanced therapy in thoracic surgery. Ontario: BC Decker; 1998. p. 117-26.
12. Kondo H, Okumura T, Ohde Y, et al. Surgical treatment for metastatic malignancies. Pulmonary metastasis:

indications and outcomes. Int J Clin Oncol 2005;10:81-85.

### Ethic

**Ethics Committee Approval:** Informed consent was obtained each patient.

**Informed Consent:** Written informed consent was obtained from each participants.

**Authorship Contributions:** Concept- ED; Design- ED.; Supervision- ED.; Materials-ED, Data Collection or Processing-S.H., ED.; Analysis or Interpretation- ED.; Literature Review- ED.; Writing- ED Critical Review- ED.

**Copyright Transfer Form:** Copyright Transfer Form was signed by all authors.

**Peer-review:** Internally peer-reviewed.

**Conflict of Interest:** No conflict of interest was declared by the authors.

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