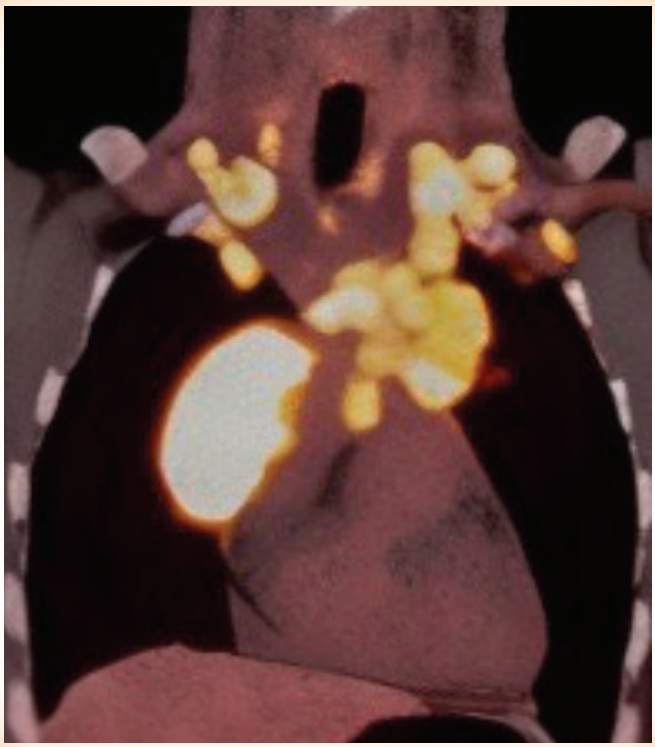
Volume 10 Number 1 April 2025

eISSN 2548-0316

CURRENT THORACIC SURGERY



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Volume 10 Number 1 April 2025 eISSN 2548-0316

Volume 10 Number 1 April 2025 eISSN 2548-0316

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Table of Contents

Volume 10 Number 1 April 2025 eISSN 2548-0316

To cite this article: Ağaoğlu Şanlı B, Karaçam V, Mutlu F, Kızıldağ Aktaş B, Karabay DÖ, Şanlı A. Clinical evaluation of intrapericardial pneumonectomies applied in non-small cell lung cancer. Curr Thorac Surg 2025; 10(1): 1-7.

Original Article

Clinical evaluation of intrapericardial pneumonectomies applied in non-small cell lung cancer

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ABSTRACT

Background: In non-small cell lung cancer (NSCLC), pulmonary artery, pulmonary vein, pericardium, or atrium involvement is not considered as an inoperability criterion, although it negatively affects the disease prognosis. In these patients accepted as local disease, intrapericardial pneumonectomy can be performed to leave a safe surgical margin. In this study, patients diagnosed with NSCLC who underwent intrapericardial pneumonectomy were subjected to clinical evaluation.

Materials and Methods: We retrospectively evaluated NSCLC patients who were diagnosed as T3-T4 and N0-N1 with preoperative invasive staging, who responded to neoadjuvant treatment for T4N2 disease, or who were considered persistent N2 and underwent intrapericardial pneumonectomy for intrapericardial pulmonary artery (PA) and pulmonary vein (PV) invasion.

Results: Thirteen patients underwent intrapericardial left pneumonectomy and 7 patients underwent intrapericardial right pneumonectomy. The median overall survival (OS) value of the patients included in the study was found to be 22.3 months, 95% CI (Confidence Interval) (5.6-39.0). The 1-month postoperative survival rate was 90%, the 6-month survival rate was 88%, the 1-year survival rate was 84%, and the 3-year survival rate was 35%. The assessment of the 5-year survival rate was conducted among 13 cases who successfully completed the 5-year follow-up period, revealing a median OS of 35,0 months and a 5-year survival rate of 23%. Patients who did not receive pre-op neoadjuvant therapy, patients who underwent right pneumonectomy and patients with squamous histopathology had a lower median OS and higher HRs for mortality.

Conclusions: In NSCLC patients who underwent intrapericardial pneumonectomy, right pneumonectomy, lymph node involvement, lymphovascular invasion, and lack of neoadjuvant treatment were evaluated as poor prognostic factors.

Keywords: intrapericardial pneumonectomy, non-small cell lung cancer, thoracic surgery

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Doi: 10.26663/cts.2025.001
Received 24.02.2025 accepted 26.03.2025

Introduction

Lung cancer is the primary cause of cancer-related deaths, 80% of which are non-small cell lung cancers (NSCLC). Treatment includes surgery, chemotherapy, radiotherapy, immunotherapy options, and a combination of these options. The most effective treatment option is surgery, and only 15-25% of NSCLC cases are operable at the time of diagnosis. The basis of surgical treatment is anatomical resection and lymph node dissection. 30% of the cases are seen as locally advanced disease at the time of diagnosis [1-3]. However, in patients with locally advanced disease, invasion of the pericardium, intrapericardial vascular structures and even atrium is not accepted as an inoperability-irresectability criterion, and systemic treatment without surgery is preferred by some centers. Due to the necessity of complete resection, intrapericardial pneumonectomy can be performed in these cases [4]. Intrapericardial involvement of pulmonary arteries and veins in thorax CT images is an indication for elective surgery. Conditions requiring intrapericardial pneumonectomy are; cases where the pulmonary artery and vein are involved intrapericardially, cases where pericardial involvement is present, after radiotherapy applications to central tumors, hilar lymph nodes are involved to a degree that does not allow dissection, adhesions that prevent dissection due to previous infections or surgeries.

The aim of this study is to clinically evaluate the surgical results in our series of 20 cases diagnosed with NSCLC and undergoing en-bloc resection. In addition, it is to show that cardiovascular surgical techniques are necessary in thoracic surgery and that resection can be easily performed with the help of these techniques.

Patients and Methods

In our study which was conducted in our clinic between 2016 and 2020, patients who were accepted as T3-T4 and N0-N1and operable according to the International Association Study of Lung Cancer (IASLC) 2017 classification with no mediastinal lymph node involvement and distant organ metastasis, or T4N2 patients that received a response to neoadjuvant treatment and were considered persistent N2, or patients who had intrapericardial pulmonary artery (PA), pulmonary vein (PV) invasion and underwent intrapericardial pneumonectomy due to the diagnosis of NSCLC were included. Main exclusion criteria are the presence of N2 disease in oncological principles, small cell carcinoma, and distant organ metastasis. The endpoint of the study is the absence of any other cardiovascular and intrathoracic T4 involvement except for the PA. All cases were operated on by the same thoracic surgeon and cardiovascular surgeon. Ethics committee approval was obtained from Dokuz Eylül University Non-invasive Research Ethics Committee with protocol number 2022-CREC-22-41.

All cases were evaluated preoperatively for cardiac and pulmonary reserve by physical examination, routine blood tests, chest radiography, fiber optic bronchoscopy (FOB), and pulmonary function test (PFT). Thoracic computed tomography (CT), magnetic resonance imaging (MRI) and positron emission tomography (PET) were used in clinical staging in cases with suspected diaphragmatic and atrium invasion. Patients with forced expiratory volume in 1 second (FEV1) value over 2 liters were found suitable for the operation. Patients with an FEV1 value of less than 2 liters (80%) were re-evaluated with carbon monoxide diffusion capacity measurement (DLCO), ventilation perfusion scintigraphy, and cardiopulmonary exercise tests. Endobronchial ultrasonography (EBUS) or mediastinoscopy and lymph node sampling were performed to exclude metastasis in cases with mediastinal lymph nodes with a short axis longer than 1 cm in the thorax CT performed for histopathological staging and/or mediastinal lymph nodes with suspicious FDG uptake on PET/CT.

Thoracotomy was performed in the 5th intercostal space in all cases under general anesthesia, with double lumen endobronchial intubation in the lateral position after appropriate sterilization measures. The lung was pushed posteriorly, and the pericardium was suspended with the help of a clamp, and the pericardium was opened by preserving the phrenic nerve at the level of the pulmonary vein. The pericardial incision was advanced to the pulmonary artery until the safe surgical margin was reached, and the pulmonary artery, superior and inferior pulmonary vein, and, when necessary, and lung anatomical resection and detailed mediastinal lymph node dissection were performed. In cases of uncertainty regarding surgical margins, an intraoperative frozen section was performed. In all cases, the adjacent viable tissues were sutured along the stapler line with 4-0 polyproplene sutures to protect the bronchial stump. Furthermore, to mitigate the risk of potential cardiac herniation, closure of the pericardial defect was accomplished utilizing polyproplene mesh.

Statistical Analysis

Statistical analyzes were performed using SPSS 19.0 software (SPSS Inc., Chicago, IL, USA). Continuous variables are expressed as mean ± SD, categorical variables are expressed as n (%). Kaplan-Meier method and log rank test were used for survival analyses. COX regression analysis was used to determine risk factors for mortality. The results are presented with 95% CI and the statistical significance level was determined as $p < 0.05$ in all tests.

Results

A total of 20 cases, 15 males and 5 females, were included in the study. The average age of the patients was determined as 59.1 ± 10.4 years (44-79, median 57.5 years) and the average tumor diameter was 50.3 ± 28.2 mm (12.0-140.0), median 47.5 mm). The histopathological diagnosis was detected as squamous cell carcinoma (60%) in 12 of the patients, adenocarcinoma in 5 (25%), large cell neuroendocrine carcinoma in 2 (10%), and adenoid cystic carcinoma (5%) in 1 of the patients (Table 1).

Table 1. Demographic data and clinical characteristics of the patients.

Age mean±SD (min-max)	59.1±10.4 (44.0-79.0)
Gender n (%)	
Male	15 (75%)
Female	5 (25%)
Tumor size (mm) mean±SD (min-max)	50.3±2.2 (12.0-140)
Pre-op CT/ RT n (%)	11 (55%)
Pathological diagnosis n (%)	
Squamous cell carcinoma	12 (60%)
Adenocarcinoma	5 (25%)
Large cell neuroendocrine carcinoma	2 (10%)
Adenoid cystic carcinoma	1 (5%)
Side n (%)	
Intrapericardial left pneumonectomy	13 (65%)
Intrapericardial right pneumonectomy	7 (35%)
Surgical margin n (%)	
Negative	16 (80%)
Positive	4 (20%)
Post-op CT/RT n (%)	15 (75%)
Post-op lymph node involvement n (%)	
N0	8 (40%)
N1	5 (25%)
N2	7 (35%)
N3	-
Follow-up period months mean±SD (min-max)	23.9±26.7 (1.0-117.7)

Abbrev.: Standard Deviation (SD), Chemotherapy (CT), Radiotherapy (RT)

Intrapericardial left pneumonectomy was performed in 13 patients, and intrapericardial right pneumonectomy was performed in 7 patients. Surgical margin positivity was observed in 20% of the patients (Table 1). Eleven of the patients with preoperative stages IIIA and IIIB received neoadjuvant CT, RT, or concurrent CRT. While 33% of patients who did not receive neoadjuvant treatment were still alive, 66% died. After pneumonectomy, 10 patients were evaluated as stage IIIA, 5 patients as stage IIIB, 2 patients as stage IIB, 2 patients as stage IB and 1 patient as stage IA. When evaluated according to postoperative lymph node involvement, 7 patients were N2, 5 patients were N1, and 8 patients were N0 (Table 1). Four of the patients evaluated as Stage IIB, IA, IB received neoadjuvant CT+RT or simultaneous CRT. Among these patients, two patients with stage IIIB at the time of diagnosis were evaluated as having regressed to IA and IB after treatment, and two patients with IIIA had regressed to IIB and IB.

As to pathological stage, 40% of the patients had pathological stage of N0, 25% had N1, and 35% had N2 pathological stage. When the surviving patients were evaluated according to lymph node, 20% were N0 and 80% were N1 patients. Again, according to the postoperative lymph node involvement of the patients with left pneumonectomy, 4 were evaluated as N2, 4 as N1, 5 as N0, while in right pneumonectomy, 3 were evaluated as N2, 1 as N1, 3 as N0. Demographic and clinical characteristics of the patients are presented in Table 1.

During the retrospective evaluation, 6 (30%) of the patients were alive, while 14 patients (70%) had died (Table 1). During the retrospective evaluation, the 1-month postoperative survival rate was 90%, the 1-year survival rate was 84%, and the 3-year survival rate was 35%. The assessment of the 5-year survival rate was conducted among 13 cases who successfully completed the 5-year follow-up period, revealing a median OS of 35,0 months and a 5-year survival rate of 23%. All surviving patients were the ones who underwent left pneumonectomy. Of the patients who died, 7 were right pneumonectomy performed and 7 were left pneumonectomy performed patients. The mortality rate was 70% for all patients, 100.0% in patients with intrapericardial right pneumonectomy and 53.6% in patients with intrapericardial left pneumonectomy. The median OS value of the patients included in the study was found to be 22.3 months, 95% CI (5.6-39.0). There was no statistically significant difference between OS times in

male and female patients (p = 0.233). The median OS of patients who received pre-operative CT/RT was 16.7 months, and the median OS of patients who did not receive pre-operative CT/RT was 47.9 months, and a borderline statistical difference was found between the two groups (p = 0.080). When median OS was evaluated according to histopathological diagnoses, it was observed that patients diagnosed with squamous cell carcinoma had the shortest median OS with 7.2 months. The median OS of patients who underwent intrapericardial right pneumonectomy was found to be statistically significantly shorter than that of patients who underwent intrapericardial left pneumonectomy (OS = 7.2 months, 95% CI (0.4-14.1) vs OS = 25.5 months 95% CI (4.5-46.4) (p = 0.013) (Figure 1). Surgical margin status and post-operative RT/CT were found to have no effect on OS. In N2 cases, the median survival was 22.3 months 95 %CI (9.4-35.2), the 1-year survival rate was 71%, and the 3-year survival rate was 14%.

Surgical margin positivity was present in 4 cases. 3 of them were vascular surgical margin positivity, and one of these cases was accompanied by bronchial surgical margin positivity, one by mediastinal pleura, and one by pericardial surgical margin positivity. In one case, there was a positive bronchial surgical margin at the level of in situ carcinoma. All of them had microscopic surgical margin positivity and were accepted as R1. The median survival in these cases was calculated as 25.5 months.

All patients who died before 1 year had developed additional pathologies such as pneumonia, bronchopleural fistula, empyema, and pulmonary thromboembolism. Additionally, these complications were detected only in patients who underwent right pneumonectomy. In 2 cases with bronchopleural fistula, the fistula was closed by placing a stent using rigid bronchoscopy. When all cases were evaluated, empyema with bronchopleural fistula developed in 2 cases, isolated empyema in 1 case, pneumonia in 2 cases, and vocal cord paralysis in 1 case in the post-operative period. Phonation was achieved by applying medialization thyroplasty to the patient who developed vocal cord paralysis during the hospitalization period.

The mean OS was calculated as 16.8 months (1-48 months) in cases diagnosed with squamous cell carcinoma, 44 months (8-36 months) in cases diagnosed with adenocarcinoma, and 73 months (34-114 months) in cases with large cell neuroendocrine carcinomas. In the single case with adenoid cystic carcinoma, survival was achieved for 44 months (Figure 2).

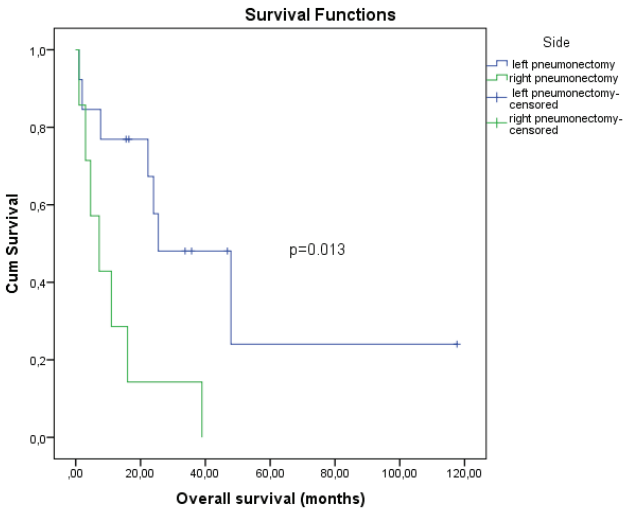

Figure 1. Overall survival according to pneumonectomy side (Kaplan Meier curves).

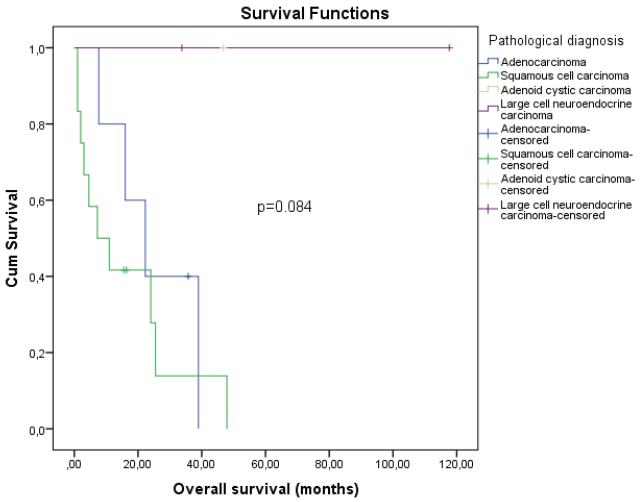

Figure 2. Overall survival according to pathological diagnosis (Kaplan Meier curves).

Metastases developed in 25% of the patients. While four of them died, one was alive. Metastases were in various organs such as brain, vertebra, liver, opposite lung, kidneys, adrenals, and uterus. No recurrence or metastasis was observed in 15 patients (75.0%). Of the five patients who developed metastasis, 4 had undergone left pneumonectomy and 1 had undergone right pneumonectomy. All patients who developed recurrence had received adjuvant treatment, and lymphovascular space invasion and perinodal spread were observed in all patients. The median OS was 31.5 months for patients who developed metastasis and 36.0 months for patients who did not. There was no statistically significant difference (p = 0.598). Evaluation of factors affecting OS is presented in Table 2.

Table 2. Evaluation of factors affecting overall survival time (Kaplan Meier analysis).

	Overall survival (month) median	%95 CI	P value (log rank test)
Gender			0.233
Male	22.3	(0.0-47.1)	
Female	38.9	(0.0-88.2)	
Pre-op CT/ RT			0.080
Yes	16.0	(0.0-33.3)	
No	47.9	(10.4-85.4)	
Pathological diagnosis n (%)			0.084
Squamous cell carcinoma	7.2	(0.0-18.2)	
Adenocarcinoma	22.3	(8.8-35.8)	
Large cell neuroendocrine carcinoma	46.8	(-)	
Adenoid cystic carcinoma	75.7	(-)	
Side			0.013
Intrapericardial left pneumonectomy	25.5	(4.5-46.4)	
Intrapericardial right pneumonectomy	7.2	(0.4-14.1)	
Surgical margin			0.373
Positive	16.0	(0.0-34.4)	
Negative	25.5	(0.0-59.6)	
Post-op CT/ RT			0.456
Yes	24.0	(10.2-37.8)	
No	4.6	(1.2-7.9)	
Post-op lymph node involvement			0.199
N0	4.6	(0.0-15.7)	
N1	95.6	(-)	
N2	22.3	(9.4-35.2)	
Recurrence			0.598
Yes	36.0	(9.0-62.9)	
No	31.5	(23.0-40.0)	

Abbrev.: *Chemotherapy (CT). Radiotherapy (RT)*

Table 3. Evaluation of risk factors affecting mortality (COX regression analysis)

	Univariate analysis			Multivariate analysis		
	HR	%95 CI	p value	HR	%95 CI	p value
Pre-op CT/ RT No vs yes	2.8	0.8-9.3	0.093	3.5	0.9-13.1	0.059
Intrapericardial pneumonectomy Left vs right	3.8	1.2-11.7	0.020	4.3	1.2-15.7	0.029
Pathological diagnosis others vs squamous cell carcinoma	3.3	1.1-10.7	0.045	7.1	1.6-31.8	0.010

Abbrev.: *Hazard Ratio (HR). Confidence Interval (CI). Chemotherapy (CT). Radiotherapy (RT)*

According to the results of univariate COX regression analysis; histopathological diagnosis of squamous cell cancer increased the risk of mortality 3.3 times compared to other pathologies (HR = 3.3, 95% CI 1.1-10.7) and p = 0.045). Intrapericardial pneumonectomy on the right side increased the risk of mortality 3.8 times (HR = 3.8, 95% CI (1.2-11.7) and p = 0.020). In addition, the risk of mortality was found to be higher in patients who received pre-operative CT than in those who did not, with borderline statistical significance (Table 3). In the multivariate COX regression analysis of the model created with these variables, the most important risk factors for mortality were right intrapericardial pneumonectomy (HR=4.3, 95% CI (1.2-15.7) and p = 0.029) and squamous cell cancer histopathology (HR= 7.1 95% CI (1.6-31.8) and p = 0.010) (Table 3).

Discussion

Surgery, chemotherapy, radiotherapy, immunotherapy, and the combination of these treatment options with a multidisciplinary approach are used in the treatment of NSCLC. In NSCLC cases with pulmonary artery and pulmonary vein invasion, the possibility of surgical intervention persists despite local infiltration. An intrapericardial approach is required in some cases since it is essential to maintain safe surgical margins. In 1946, Allison et al. also argued that intrapericardial vascular ligation provides the opportunity for more radical surgery due to safer surgical margins in patients diagnosed with bronchial carcinoma and in whom pericardial invasion is observed [5]. Additionally, as the pericardium serves as a natural barrier, it has been argued that intrapericardial resection provides the opportunity to work in a safer area in terms of surgical margins, since it is difficult for the tumor to pass into the intrapericardial area through lymphatic drainage [6]. We also decided to perform pneumonectomy due to NSCLC in our clinic and preferred intrapericardial pneumonectomy in 20 cases with pulmonary artery and pulmonary vein between 2016 and 2020. In four of our cases, R1 resection with microinvasion was executed. Remarkably, within the series of 20 cases, R0 resection was achieved in 16 instances, underscoring the significant accomplishment despite the extensive surgical intervention.

Although it is a good option for complete resection, pneumonectomy has a higher mortality and morbidity rate than other types of resections. The mortality rate after pneumonectomy varies between 3-20%, but it has been reported that right pneumonectomy has a higher mortality and morbidity rate than left pneumonectomy because the right lung is more hemodynamically effective than the left and is closer to fistula formation due to bronchial anatomy [2-6]. In addition, the anatomy of the right and left bronchial artery also shows various variations. However, the most common variation, with a rate of 60%, is the presence of one right bronchial artery and two left bronchial arteries [7]. This situation suggests that the blood supply of the right main bronchus may be weaker than the left and may be prone to fistula development.

In our cases, consistent with the literature, the mortality rate in patients who underwent right pneumonectomy was found to be higher and the average survival time to be shorter than in patients who underwent left pneumonectomy. It was revealed that patients who underwent right pneumonectomy had a higher HR for mortality. In addition, all our cases in which bronchopleural fistula, pulmonary thromboembolism, and empyema developed in the postoperative period consisted of patients with right intrapericardial pneumonectomy.

In addition to surgical treatment, discussing the necessity of neoadjuvant treatment with a multidisciplinary approach is imperative. While the mortality rate in patients receiving neoadjuvant treatment was found to be relatively lower, although not statistically significant, it has been shown that it is possible to survive for many years after pneumonectomy [8,9]. In our cases, mortality with a rate of 55% was observed among patients who did not undergo neoadjuvant treatment, while 44% of patients were alive, suggesting a potential beneficial impact of the implementation of neoadjuvant therapy on survival outcomes.

There are studies in the literature showing that squamous histopathological type is more aggressive than adeno cancers [10,11]. In our cases, the average overall survival time of patients with squamous histopathological type was found to be lower and their HR for mortality was higher.

N2 involvement should be carefully evaluated in cases demonstrating localized invasion significant enough to require intrapericardial pneumonectomy. It has been stated in the literature that survival is generally worse, distant organ metastases are more common, and the recurrence rate is higher in cases of NSCLC and N2 [10,11]. The standard treatment in N2 cases is definitive chemoradiotherapy or induction therapy followed by surgery [12,13]. In the literature, N2 cases that underwent pneumonectomy after neoadjuvant treatment were defined as persistent N2 and it was stated that surgery had a positive effect on survival, but no significant difference was observed in survival in patients over the age of 65. Furthermore, immunotherapy has been reported to emerge as a component of multimodal therapy, with notable impact on survival outcomes in N2 cases. [14,15]. Among our cases, four out of the five patients who remain alive were classified as N1, with one being categorized as N0. Following neoadjuvant therapy, invasive staging identified five of the postoperative N2 cases as N0-N1, while 2 of the N2 cases were evaluated as N0-N1 by invasive staging in the preoperative period. Following a retrospective analysis of all postoperative N2 cases, the 1-year survival rate was determined to be 71%, while the 3-year survival rate stood at 14%.

In a series of 126 cases in which intrapericardial and standard pneumonectomy cases were compared in the literature, the average survival was calculated as 32 months in standard pneumonectomy and 23 months in intrapericardial pneumonectomy, and a significant difference was determined [16]. However, the median survival in our intrapericardial pneumonectomy cases was calculated as 22.3 months, and very good survival results were obtained compared to the cases in the literature that underwent intrapericardial pneumonectomy. With this article, we wanted to show that such aggressive surgeries can be beneficial in terms of gaining time for immunotherapy and other new generation treatments.

Limitations of the study

This study is a retrospective and single-center study, the number of cases is limited even when the long-term survival consequences of resection type are taken into account. Studies with larger sample sizes will be more useful in detecting statistically significant differences. Third, we could not compare patients who underwent pneumonectomy with those who underwent sleeve resection and arteroplasty in terms of recurrence and survival.

In conclusion, although conditions such as pulmonary artery, pulmonary vein or pericardial involvement negatively affect the disease prognosis in NSCLC, they are not considered as inoperability criteria. In these cases, which are local diseases, intrapericardial pneumonectomy can be performed to leave safe surgical margins. Mortality and morbidity are higher in right pneumonectomy than in left pneumonectomy. N2 disease is considered to have a poor prognosis.

Declaration of conflicting interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The authors received no financial support for the research and/or authorship of this article.

Ethics approval

This study was approved by Dokuz Eylül University Non-invasive Research Ethics Committee with protocol number 2022-CREC-22-41.

Authors' contribution

BAS,AS; made substantial contributions to the design of the work, FM,BKA; made the analysis of data, VK,BAS; made the creation of new software used in the work, OK,BAS; have drafted the work, AS,BAS: revised it. All authors read and approved the final manuscript.

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Current Thoracic Surgery

To cite this article: Bıyıklı M, Kılıç M. Clinical and diagnostic significance of supraclavicular lymph node biopsy. Curr Thorac Surg 2025; 10(1): 8-14.

Original Article

Clinical and diagnostic significance of supraclavicular lymph node biopsy

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ABSTRACT

Background: Lymphadenopathy occurs due to the proliferation of inflammatory or neoplastic cells within the lymph node or the invasion of the lymph node. Surgical biopsy of supraclavicular lymph nodes in patients with suspected malignancy or lymphadenopathy serves as a valuable tool for determining the treatment plan and cell type. Today, supraclavicular lymph node excision holds an important place in tissue sampling as it is a minimally invasive procedure associated with low morbidity and acceptable diagnostic yield. Moreover, these minimally invasive procedures can be more advantageous as they provide more tissue compared to needle biopsy, with fewer complications.

Materials and Methods: In this study, we reviewed our experience with supraclavicular excisional lymph node biopsy in patients suspected of having supraclavicular lymph node metastasis. Detailed medical histories were obtained for all cases, and comprehensive general physical and systemic examinations were performed.

Results: The aim of the study is to evaluate the diagnostic utility, accuracy, and impact on survival of excisional lymph node biopsy in the diagnosis of suspected supraclavicular lymph node metastasis based on histopathological findings. We conclude that excisional biopsy is valuable for accurate diagnosis and appropriate treatment planning when supraclavicular lymph nodes are detected in radiological examinations, even if they are not palpable.

Conclusions: Excisional biopsy is a method that can be safely performed in palpable peripheral lymphadenopathies and does not carry a significant risk of morbidity. It is believed that excisional biopsy of the supraclavicular lymph node has the potential to shorten the time from presentation to diagnosis, thereby saving time and costs in the invasive staging process.

Keywords: supraclavicular, lymph node, excisional biopsy, metastasis

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Doi: 10.26663/cts.2025.002
Received 24.02.2025 accepted 16.04.2025

Introduction

Lymphadenopathy occurs due to the proliferation of inflammatory or neoplastic cells within the lymph node or invasion of the lymph node. Surgical biopsy of supraclavicular lymph nodes is a valuable tool for determining the treatment plan and cell type in patients with suspected malignancy or lymphadenopathy. Today, supraclavicular lymph node excision holds a significant place in tissue sampling as a minimally invasive procedure associated with low morbidity and acceptable diagnostic yield. Additionally, these minimally invasive methods are advantageous over needle biopsies as they provide more tissue with fewer complications.

The evaluation of supraclavicular lymph nodes plays a crucial role in both diagnosis and determining treatment options. Lymph node biopsies are particularly critical in the diagnosis and staging of metastatic cancer. The primary advantage of supraclavicular lymph node excision is its ability to accurately determine the N stage (regional lymph nodes) in staging. In the TNM staging system for lung cancer, supraclavicular lymph node metastasis is considered N3, and non-surgical approaches or palliative treatments are generally preferred in these cases [1]. The 5-year survival rate for patients with stage IIIB (T0–4N3M0) non-small cell lung cancer is 15% to 32%. [2].

In this study, we evaluated our clinical experiences with supraclavicular excisional lymph node biopsy in patients with suspected supraclavicular lymph node metastasis. The aim of the study is to assess the diagnostic utility, accuracy, and impact on survival of excisional lymph node biopsy in the diagnosis of suspected supraclavicular lymph node metastasis, in comparison with histopathological findings.

Materials and Methods

In our study, patients who underwent supraclavicular lymph node excision biopsy due to suspected supraclavicular lymph node metastasis between 2022 and 2024 were retrospectively evaluated. A total of 50 patients with suspected supraclavicular lymph node metastasis who underwent supraclavicular lymph node excision biopsy were included in the study. Detailed medical histories were obtained for all cases, and comprehensive general physical and systemic examinations were performed. The excised supraclavicular lymph nodes were histopathologically confirmed. In this study, the outcomes of excisional supraclavicular lymph node biopsies performed for diagnostic purposes in our department were analyzed. This study was approved by İnönü University Research Ethical Committee with protocol number 2024/6646.

Results

Patients who presented to our clinic with a preliminary diagnosis of malignancy and underwent excisional supraclavicular lymph node biopsy were included in the study. Supraclavicular lymph nodes were identified through palpation and/or imaging methods. Local anesthesia was applied to the skin prior to incision in all patients, and excisional biopsies were completed within an average of 30 minutes. The median interval between preoperative anesthesia preparation and surgery was 3 days (range: 2–5 days). Patients were discharged within an average of 1–3 days in the postoperative period. No complications were observed in any patient during the postoperative period.

A total of 50 patients were included in the study, of whom 22 (44%) were female and 28 (56%) were male, with a mean age of 57.8 ± 16.7 years. Among the lymph nodes, 60% were located on the right side, and 40% on the left. The diagnostic distribution was as follows: 28% lymphoma, 44% bronchogenic carcinoma, 24% benign conditions (tuberculosis, toxoplasmosis), and 4% other malignancies (breast cancer, mesothelioma). Of the masses, 50% were palpable and 50% were non-palpable. The mean follow-up period was 13.7 ± 10.2 months, during which 30% of the patients were deceased. Among the masses, 22% were bilateral, and 30% were mobile. Distant metastases were identified in 40% of patients.

According to the anesthesia risk classification, 6% of the patients were ASA I, 52% were ASA II, and 42% were ASA III. While 44% of the patients had no comorbidities, 34% had one comorbidity, and 22% had two comorbidities (Table 1).

The mortality rate among male patients (42.9%) was significantly higher than that of female patients (13.6%), a difference that was statistically significant ($p = 0.025$). The mortality rate in patients diagnosed with lymphoma was 35.7%, and for those with bronchogenic carcinoma, it was 45.5%. No mortality was observed in patients with benign or non-bronchogenic malignant conditions. A statistically significant difference in mortality was observed among lymph node pathologies ($p = 0.007$). The follow-up duration for patients who survived was significantly longer than for those who died ($p<0.001$). Patients with distant metastases had a significantly higher mortality rate (55%) compared to those without distant metastases (13.3%) ($p = 0.002$) (Table 2).

Table 1. Demographic and clinical characteristics of the patients			
Variable		n	%
Gender	Female	22	44.0
	Male	28	56.0
Age		57.8±16.7	
Localization	Right	30	60.0
	Left	20	40.0
Lymph node pathology	Lymphoma	14	28.0
	Bronchogenic carcinoma	22	44.0
	Benign	13	26.0
	Malignant	1	2.0
PET SUV Max		11.1±6.9	
Palpability	Palpable	25	50.0
	Non-palpable	25	50.0
Follow-up duration (months)		13.7±10.2	
Smoking	Yes	20	40.0
	No	30	60.0
Mortality	Yes	15	30.0
		35	70.0
Pack/year		38.9±19.5	
FEV1		2.3±.9	
Hospital stay duration (days)		2.1±1.5	
Time from outpatient clinic to surgery		4.4±3.9	
Primary tumor size (cm)		4.5±2.5	
Lymph node size (cm)		2.0±1.1	
Laterality	Unilateral	39	78.0
	Bilateral	11	22.0
Mobility	Fixed	35	70.0
	Mobile	15	30.0
Distant metastasis	Yes	20	40.0
	No	30	60.0
ASA classification	ASA I	3	6.0
	ASA II	26	52.0
	ASA III	21	42.0
Comorbidities	None	22	44.0
	One	17	34.0
	Two or more	11	22.0

Table 2. Comparison of mortality based on patient parameters.

Parameter	Mortal		Non-Mortal		p-value
	n	%	n	%	
Gender					
Female	3	13.6	19	86.4	0.025
Male	12	42.9	16	57.1	
Age (Mean ± SD)	62.1±14.3		56.0±17.5		0.244
Localization					
Right	9	30.0	21	70.0	1.000
Left	6	30.0	14	70.0	
Lymph node pathology					
Lymphoma	5	35.7	9	64.3	0.007
Bronchogenic carcinoma	10	45.5	12	54.5	
Benign+ malignant	0	0	14	100.0	
PET SUV Max	12.7±3.6		10.3±8.0		0.200
Palpability					
Palpable	8	32.0	17	68.0	0.758
Non-palpable	7	28.0	18	72.0	
Follow-up duration (months)	4.2±5.6		17.7±9.0		<0.001
Smoking status					
Yes	9	45.0	11	55.0	0.059
No	6	20.0	24	80.0	
Pack/year	37.9±19.1		40.0±21.4		0.847
FEV1	1.7±.5		2.4±.9		0.144
Hospital stay duration (days)	2.2±1.7		2.1±1.5		0.812
Time from outpatient clinic to surgery	5.3±5.1		4.0±3.3		0.371
Primary tumor Size (cm)	5.0±1.6		4.1±3.0		0.411
Lymph node size (cm)	1.9±.8		2.0±1.2		0.608
Laterality					
Unilateral	13	33.3	26	66.7	0.468
Bilateral	2	18.2	9	81.8	
Mobility					
Fixed	13	37.1	22	62.9	0.176
Mobile	2	13.3	13	86.7	
Distant metastasis					
Yes	11	55.0	9	45.0	0.002
No	4	13.3	26	86.7	
ASA classification					
ASA I	1	33.3	2	66.7	0.887
ASA II	7	26.9	19	73.1	
ASA III	7	33.3	14	66.7	
Comorbidities					
None	5	22.7	17	77.3	0.405
One	5	29.4	12	70.6	
Two or more	5	45.5	6	54.5	

Of the 50 patients included in the study, 15 had died, yielding an overall survival rate of 70%. The mean survival duration for all patients was calculated as 23.8 months. The 3-month, 6-month, 12-month, and 24-month survival rates were 84%, 73.6%, 71.1%, and 65.6%, respectively (Figure 1).

In our study, four patients who underwent surgery with a preliminary diagnosis of malignancy based on positive uptake in PET-CT (positron emission tomography-computed tomography) were diagnosed with tuberculosis. PET-CT of a supraclavicular lymph node (SUVmax 28.7) showing necrotizing granulomatous inflammation, initially misdiagnosed as malignant (Figure 2). In one patient with an anterior mediastinal mass and PET-CT findings showing multiple mediastinal and supraclavicular lymph node involvement, a minimally invasive supraclavicular lymph node excision was performed, and the diagnosis was Diffuse Large B-Cell Lymphoma. The patient was discharged on postoperative day 2 (Figure 3).

Another patient with a right central mass and pathological-sized supraclavicular lymph node detected on physical examination underwent surgery on the same day of their outpatient clinic visit. The lymph node was excised, and the diagnosis was squamous cell carcinoma (Figure 4).

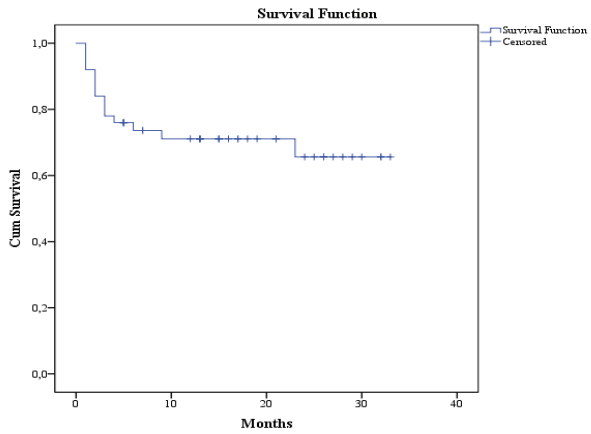

Figure 1. Overall survival curve.

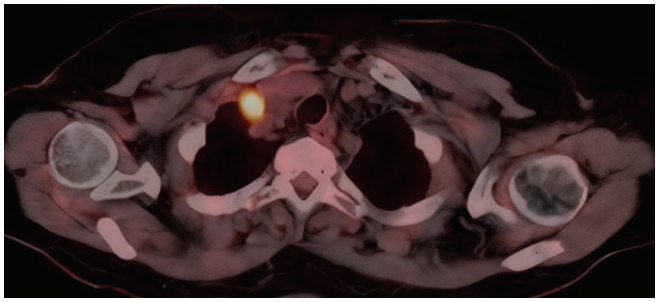

Figure 2. PET-CT of a supraclavicular lymph node (SUVmax 28.7) showing necrotizing granulomatous inflammation, initially misdiagnosed as malignant.

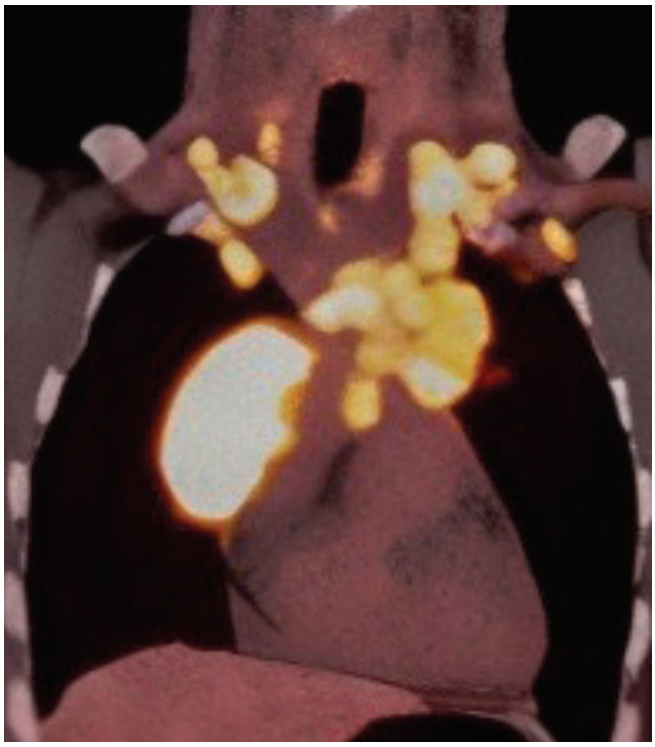

Figure 3. PET-CT image of a patient with an anterior mediastinal mass and multiple mediastinal lymph node involvement, who underwent left supraclavicular lymph node excision (SUVmax: 19.2) and was diagnosed with Diffuse Large B-Cell Lymphoma.

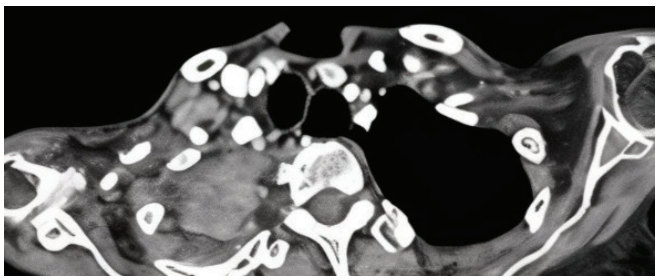

Figure 4. Chest CT image of a patient with a mass in the right lung, who presented to the clinic on the same day for excision of a palpable supraclavicular lymph node, with a diagnosis confirmed after excision.

In the majority of cases, the supraclavicular lymph node was completely excised, while in cases with invasion, diagnostic punch biopsies were performed. No complications or mortality were observed in any patient during the postoperative period.

Discussion

Spraclavicular excisional lymph node biopsy significantly contributes to the processes of diagnosis, staging, and determining cell type. Moreover, this method aids in planning advanced investigations, such as molecular-targeted therapy. Additionally, it allows for the avoidance of unnecessary surgical interventions, more

invasive procedures, and potential complications. Although fine-needle aspiration biopsy (FNAB) is a valuable diagnostic tool for distinguishing between benign and malignant lesions, its major disadvantage lies in the inability to obtain sufficient tissue material for diagnosis [3]. Particularly in malignant tumors such as lymphoma, excisional biopsy stands out as a more effective method for accurate identification of subtypes and planning appropriate oncological treatment.

Excisional lymph node biopsies should be performed in easily palpable superficial regions such as the axilla, inguinal, or cervical areas. In cases where superficial palpable lymph nodes are not present, biopsies can also be performed from deep lymphadenopathy sites. Lymph nodes larger than 2 cm in diameter typically indicate malignancy or granulomatous diseases [4].

Biopsy is recommended when there is a rapid increase in lymph node size within two weeks, no reduction in size within four to six weeks, or continued growth. During excisional biopsy, it is advised to target the most abnormal-appearing lymph node among those available, even if it is not the most easily accessible [5].

In a study conducted by Darnal et al malignancy was detected in 47% of 273 adult patients who underwent surgical lymph node biopsy. The malignancy rate observed in our study is consistent with the rates reported in this study. On the other hand, in another study by Dorfman et al lymphoma was diagnosed in 40.7% of 118 patients who underwent surgical biopsy. In contrast, Sheresta et al reported that lymphoma was detected in only 7 (5.3%) of 132 patients who underwent excisional lymph node biopsy. These differences are thought to be due to the higher prevalence of tuberculosis lymphadenopathy in endemic regions.

Our clinical experience demonstrates that minimally invasive supraclavicular lymph node biopsies improve diagnostic accuracy while reducing morbidity, particularly for radiologically-detected non-palpable nodes. In our series, we obtained definitive diagnoses in all 25 patients with lymphadenopathy detected solely through imaging, challenging the conventional approach that prioritizes only palpable nodes. The absence of complications confirms the safety of this approach.

PET-CT effectively identifies nodes with increased FDG uptake, aiding biopsy site selection. However, we observed false-positive results in four patients initially misdiagnosed with malignancy but later confirmed to have tuberculosis, reinforcing Werner et al's emphasis on histopathological confirmation [6].

Our malignancy detection rate (74%) exceeds Darnal's reported 47% [7], possibly due to our specialized patient selection criteria. Our lymphoma detection rate (28%) aligns with Metser's findings of 25-30% in scalene node biopsies [8], though lower than Dorfman's 40.7% [9]. Cerfolio demonstrated that these biopsies provide definitive diagnosis in over 90% of cases [10], consistent with our 100% diagnostic accuracy. Our results showed significant survival differences between patients with metastatic disease (55% mortality) versus those without (13.3%), highlighting the prognostic value of accurate assessment.

We recommend excisional biopsy for radiologically-detected supraclavicular nodes even when non-palpable, supported by Patel's finding that such biopsies yielded sufficient tissue for molecular studies in 94% of cases. While we prefer complete excision of pathological nodes, partial excision may be necessary when nodes are exceptionally large or adherent to critical structures.

In conclusion, supraclavicular lymph node excisional biopsy is safe with minimal morbidity, crucial for definitive diagnosis, and offers a cost-effective solution that shortens time from presentation to diagnosis in the staging process.

Declaration of conflicting interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The authors received no financial support for the research and/or authorship of this article.

Ethics approval

This study was approved by İnönü University Research Ethical Committee with protocol number 2024/6646.

Authors' contribution

MB,MK; made substantial contributions to the design of the work, made the analysis of data, have drafted the work, co-wrote and revised it. Both authors read and approved the final manuscript.

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To cite this article: Karapolat S, Topaloglu O, Buran A. A rare esophageal foreign body found in a patient with mental retardation: safety needle. Curr Thorac Surg 2025;10(1):15-18.

Case Report

A rare esophageal foreign body found in a patient with mental retardation: safety needle

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ABSTRACT

Esophageal foreign bodies are emergency cases mostly involving intellectually disabled individuals. An 18-year-old intellectually disabled female patient presented to our clinic complaining about irritability, dysphagia and hypersalivation. Her posteroanterior chest x-ray showed an opacity caused by a safety needle. In her rigid esophagoscopy, a safety needle with an open point was seen, which was localized in the first constriction of her oesophagus. The open sharp point of the safety needle was pulled towards the lumen, held with forceps, bent from its tip towards the clasp, and the pin was removed without any complications. The patient was allowed oral intake of food next day and was discharged without any problems. Esophageal foreign bodies seen in patients with mental retardation may be atypical non-food foreign bodies. Careful endoscopic removal of particularly sharp-pointed objects such as safety needle will prevent complications.

Keywords: foreign body, esophagus, rigid esophagoscopy

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Doi: 10.26663/cts.2025.003
Received 09.01.2025 accepted 26.03.2025

Introduction

An esophageal foreign body (EFB) is a clinical entity caused by food or an object swallowed accidentally or intentionally being trapped in the esophagus, which may lead to symptoms such as dysphagia, odynophagia, a prickly sensation and increased secretion. It may result in serious and even life-threatening complications including obstruction in the esophagus, perforation, mediastinitis and sepsis [1]. EFB is more common in adults. Patients with mental retardation (MR) have a special place in the population affected by EFB. These patients tend to swallow non-food objects of various forms.

This paper intends to present, also referring to the literature, the diagnosis and treatment stages of a rare esophageal foreign body case involving a patient diagnosed with MR.

Case Report

An 18-year-old female patient presented to our clinic with the complaints of irritability, dysphagia and hypersalivation that started a day ago. It was learned that the patient was diagnosed with MR based on the anamnesis taken from her relatives. In her physical examination, her mouth was observed to be full of secretions. Her laboratory tests were normal. In her posteroanterior chest x-ray, a radiopaque appearance of an open safety needle was seen at her superior mediastinum (Figure 1). EFB was considered as an initial diagnosis, and she urgently underwent a rigid esophagoscopy. The esophageal lumen was found normal. An open safety needle with the head part looking down and body part looking up was found in the first constriction of the esophagus. The open sharp point of the safety needle was pulled towards the lumen, held with forceps and bent from its tip. Holding it from its body part with forceps, the safety needle approximately 2.5 cm in length was removed without any complications (Figure 2). The patient was allowed oral intake of food next day and was discharged without any problems. Written informed consent was obtained from the patient or the next of kin for publication.

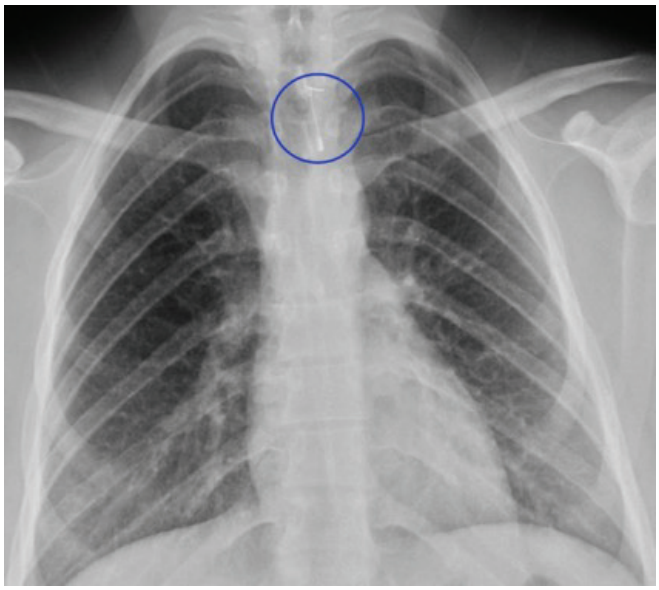

Figure 1. Posteroanterior chest radiography showing a foreign body in the upper mediastinum (blue circle).

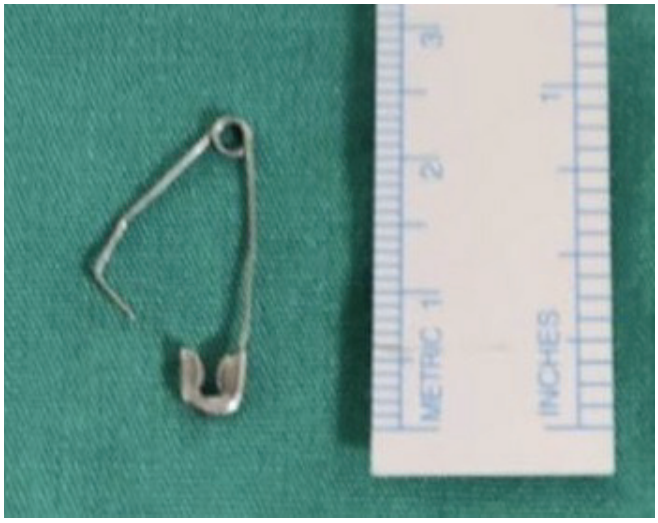

Figure 2. 2.5 cm long safety needle removed by rigid esophagoscopy.

Discussion

Cases of EFB commonly occur in the adult population and may lead to significant morbidity and mortality. Patients with special conditions such as MR, psychiatric disorders and those who are demented or edentulous are at higher risk of developing complications associated with an EFB [1]. Due to accompanying eating disorders such as pica and often putting non-food objects into the mouth, atypical foreign bodies in forms different from those seen in normal population can be encountered in patients with MR, such as very lightly chewed foods ingested as a whole, walnuts or hazelnuts with their shells on, soil, stones, wood, paper, metal objects and vinyl gloves [2,3]. In our case, the foreign body was a safety needle, which is actually seen in children most of the time.

Individuals with MR are usually unable to express their complaints clearly. To be able to make a correct diagnosis in time and perform early and appropriate treatment, we should consider EFB in the presence of acute symptoms such as swallowing difficulty and hypersalivation in patients with MR and try to discuss the issue with their caregivers in detail to obtain a comprehensive anamnesis. In the present case, we learned from the patient' mother that the patient has been trying for a long time now to put metal objects into her mouth, they tried to teach her not to do this but have been unable to prevent it. We think that it is important in terms of preventive medicine to inform the relatives of patients with MR about the significance of EFB and its possible complications to prevent recurrent EFBs.

The main purpose of EFB is to remove the foreign body as soon as possible without damaging the surrounding tissues. Otherwise, delayed intervention or late diagnosis complicates treatment and can lead to serious and life-threatening complications [4]. Today, two methods are applied: Flexible and rigid esophagoscopy. While gastroenterologists advocate flexible, surgeons prefer rigid esophagoscopy [5]. Both techniques have advantages and disadvantages, and a common consensus has not emerged for either method [6]. Flexible esophagoscopy also has the advantages of better visualization of the distal esophagus, better overall patient comfort, shorter procedure time, less post-procedural dysphagia, and the ability to perform the procedure with sedation. In rigid esophagoscopy, the advantages include easier access to the proximal esophagus, a larger lumen that allows the use of larger grasping forceps to remove large, irregular and sharp-edged foreign bodies, the ability to remove sharp-edged foreign bodies by taking them into the lumen and causing less trauma to the esophagus and also providing safer airway protection [7]. The complication rate of rigid endoscopy for airway or esophageal FB is low (0.2%-5%) and mortality is rare (<0.1%) [8]. A rigid esophagoscopy under general anaesthesia should be preferred in MR cases for its ease and not requiring patient cooperation [5]. In our patient with mental retardation, we preferred rigid esophagoscopy under general anesthesia because of the possibility of inability to establish effective cooperation during the foreign body removal procedure, the potential for complications due to sudden movements of the patient and to ensure airway safety. An endoscopic removal of a sharp-pointed object such as a safety needle as we encountered in our case requires caution to avoid injury in the mucosa and muscle tissues of the esophagus. Otherwise, potentially mortal complications such as esophageal perforation, abscess, mediastinitis, empyema, fistula formation and sepsis may occur. In our patient, the safety needle was open, and its body part was facing up. Demiroren has already explained in detail in the literature how safety needle in this position can be removed safely [9]. However, in our case, the open piercing tip of the safety needle was stuck in the esophageal mucosa. For this reason, the tip was first pulled to the inner part of the lumen and then bent towards the clasp; the object was held with forceps from its body part and removed safely.

In conclusion, unusual EFBs such as a safety needle may be encountered in patients with MR. The care to be taken during the removal of such sharp-pointed objects by way of rigid esophagoscopy will prevent complications.

Declaration of conflicting interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The authors received no financial support.

Authors' contribution

SK,OT,AB: have given substantial contributions to the literature search, data collection, study design, analysis of data, manuscript preparation and review of manuscript, OT, AB: analysis interpretation of the data and review of manuscript. All authors have participated to drafting the manuscript, SK,OT: revised it critically. All authors read and approved the final version of the manuscript. All authors read and approved the final version of the manuscript.

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To cite this article: Gurz S, Temel NG, Sengul A Endobronchial management of a rare complication associated with pleural catheter. Curr Thorac Surg 2025;10(1):19-21.

Case Report

Endobronchial management of a rare complication associated with pleural catheter

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ABSTRACT

Catheter thoracostomy is a common method of pleural effusion; however, complications can occur. This case study describes a rare complication where the catheter extended from the bronchial system into the trachea, with management performed through an endobronchial approach. During catheter thoracostomy, insertion of the catheter under ultrasound guidance at the site of the highest pleural fluid accumulation minimized complications. With hemoptysis, selective bronchial block application with a balloon catheter is a reliable method for treatment.

Keywords: catheter, complication, pleural effusion

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Doi: 10.26663/cts.2025.004
Received 27.12.2024 accepted 25.03.2025

Introduction

Pleural effusion is a common pleural pathology, characterized by symptoms such as shortness of breath and cough. There are more than 50 causes of pleural and systemic diseases [1]. When evaluated based on etiology (e.g., pneumonia, lung cancer, heart failure), pleural effusion may regress following treatment of underlying disease. Where the amount of effusion is excessive, drainage with a pleural drainage catheter or chest tube may be required, depending on the patient's general condition [2]. Here, we present a case study and the treatment method in which the catheter progressed into the endobronchial system - a very rare complication of catheter thoracostomy.

Case Report

A 66-year-old female patient, who was under oncology follow-up with a diagnosis of endometrial carcinoma, was referred to our Thoracic Surgery Clinic with respiratory distress. Both chest radiography and thoracic computed tomography (CT) detected loculated pleural effusion in the right hemithorax. With the patient in a sitting position, a third-year thoracic surgery resident - under the supervision of a specialist - performed thoracentesis on the patient, who was orthopneic and dyspneic. Thoracentesis was carried out from the right anterior axillary line at the level of the 4th intercostal space. In the presence of serous fluid drainage, catheter thoracostomy was performed using pleuracan® (B. Braun, Melsungen, Germany) from the same area. Hemoptysis developed after the procedure, and air was aspirated through the catheter. Thoracic CT revealed that the catheter extended from the right lung middle lobe lateral segment bronchus to the trachea (Figures 1a,b).

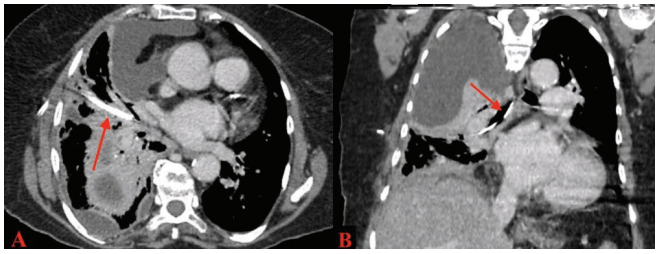

Figure 1. CT of the thorax before the procedure shows the catheter opacity advancing in the middle lobe lateral segment bronchus on the axial axis **(a)**, and its location in the right main bronchus in the coronal axis **(b)**.

Due to the patient's hemoptysis, urgent removal of the catheter with bronchoscopy was planned to control the bleeding. Endotracheal intubation was performed under general anesthesia, and during flexible bronchoscopy through the intubation tube, a catheter was inserted into the trachea (Figure 2a). The catheter extended from the trachea toward the middle lobe lateral segment bronchus (Figure 2b). Active bleeding was not observed. However, with the possibility of bleeding after removal of the catheter, closure of the middle lobe entrance was planned with a bronchial blocker. As bronchial blockers could not be obtained under emergency conditions, a 3F Fogarty® balloon (Edwards Lifesciences, CA, USA) was used instead.

Using a flexible bronchoscope (Karl Storz® 11009BC1, CA, US), the Fogarty® catheter was extended to the lateral segment of the middle lobe, while the catheter was aspirated and retracted in a controlled manner (Figure 3a). The Fogarty® balloon, placed at the entrance of the middle lobe, was inflated (Figure 3b). During the procedure, the patient remained hemodynamically stable, and the Fogarty® balloon was secured within the endotracheal intubation tube. The patient was sedated in the intensive care unit.

One day later, under operating room conditions, the middle lobe entrance was visualized through the endotracheal tube using a flexible bronchoscope. The Fogarty® balloon was then removed carefully. There was no blood drainage from the middle lobe lateral segment or other parts of the bronchial system. Therefore, the patient was extubated. The patient did not develop any complications, so a catheter thoracostomy was performed on the right hemithorax under ultrasound guidance two days later. Following pleural fluid drainage and improvement in the patient's general condition, she was transferred to the oncology department. Written informed consent was obtained from the patient or the next of kin for publication.

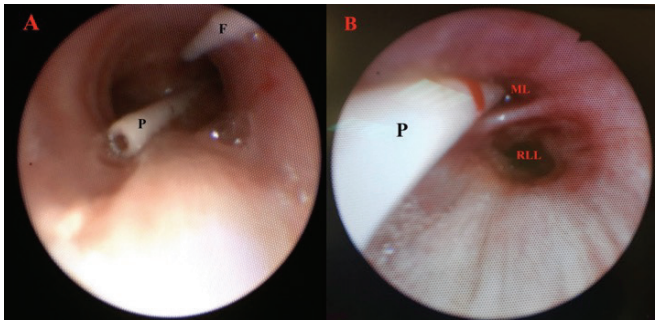

Figure 2. The pleural catheter seen in the trachea on flexible bronchoscopy **(a)**, was seen to advance from the middle lobe entrance **(b),** (Abbrev.; F: Fogarty® balloon, ML: middle lobe, P: pleural catheter, and RLL: right lower lobe).

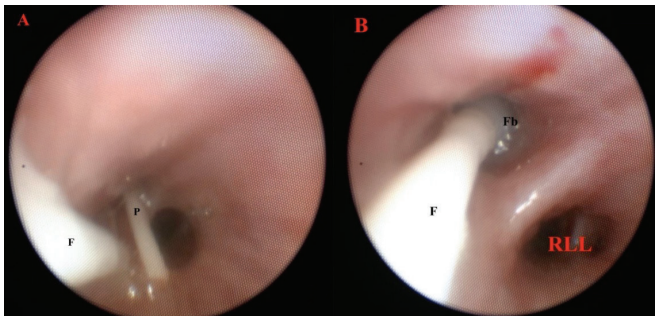

Figure 3. While the pleural catheter was withdrawn, the Fogarty® balloon was directed to the middle lobe using a bronchoscope **(a)**, and inflated at the entrance to the middle lobe **(b)**, (Abbrev.; F: Fogarty® catheter, Fb: Fogarty® balloon, P: pleural catheter, and RLL: right lower lobe).

Discussion

Catheter thoracostomy can be easily performed under local anesthesia in high amounts of pleural fluid [2]. A pleural drainage catheter is used for this procedure. Pleural drainage catheters are thinner than chest tubes and are placed in the pleural space under the guidance of a trocar. There is a 30% risk of major complications during chest tube and catheter thoracostomy [3]. Therefore, the use of ultrasound guidance is recommended for catheter application [4].

This practice, which is integral to residency training in both academic and clinical settings, may result in complications owing to limited opportunities for experience. A study by Kong et al found a significantly higher rate of complications with younger doctors compared with senior doctors [5]. In this study, pleural fluid was accessed during thoracentesis performed by the physician through the appropriate intercostal space. However, advancing the catheter from the locule, where a small amount of fluid was collected, caused it to pass from the lung parenchyma into the bronchial system.

It is very rare for a catheter to reach the bronchial system through the lung parenchyma. A similar complication reported by Kirschbaum et al is the only documented case in the literature [6]. In contrast, the presence of hemoptysis in this patient increased the risk of significant bleeding after pleural catheter removal, so a selective bronchial block was planned to prevent bleeding. Davidson et al recommend the use of a routine bronchial blocker or Fogarty® balloon to isolate bleeding in intubated patients due to the increased risk of major bleeding [7]. Isolation of the injured area with selective bronchial block is important for two reasons. First, it prevents asphyxia by preventing the spread of bleeding to other bronchial systems, and second, it prevents pneumothorax in the pleural space due to parenchymal injury.

This case study demonstrates that placing a pleural catheter at the site of maximum pleural fluid accumulation minimizes the risk of complications. Selective bronchial block with a Fogarty® balloon is a reliable method in cases where hemoptysis develops due to major complications. Furthermore, residency education should prioritize structured training on major complications.

Declaration of Conflicting Interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The authors received no financial support.

Authors' Contributions

SG; organized the article and wrote the paper, NGT,AS contributed to the data collection, SG,NGT,AS; revised the article. All authors revised the manuscript. The authors read and approved the final manuscript.

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Current Thoracic Surgery

To cite this article: Yazkan R, Akin SE, Yildirim HE, Karakas B, Camas HE. Branchial cleft cyst with subcarinal and posteroinferior mediastinal localization: what would be your most likely interpretation based on preoperative images? Curr Thorac Surg 2025;10(1):22-24.

Case Report

Branchial cleft cyst with subcarinal and posteroinferior mediastinal localization: what would be your most likely interpretation based on preoperative images?

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ABSTRACT

Branchial cleft cysts are common head and neck lesions in children; however, their occurrence in the mediastinum, particularly at lower levels, is extremely rare. When located in the posterior mediastinum, these cysts may cause symptoms such as dysphagia and dyspnea due to compressive effects. Therefore, although uncommon, mediastinal localization should be considered in the differential diagnosis of cystic mediastinal masses.

Keywords: mediastinal cyst, branchial cleft cyst, images

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Doi: 10.26663/cts.2025.005
Received 28.01.2025 accepted 11.04.2025

Introduction

Branchial arch anomalies are among the most common congenital lesions of the head and neck region in children [1]. Branchial cleft cysts (BCC) are heterogeneous congenital malformations resulting from incomplete development of the branchial apparatus, which arises from the first four pairs of pharyngeal arches during embryogenesis [2]. While the majority of BCCs are located in the head and neck, mediastinal localization is exceedingly rare. BCCs typically present as cystic lesions or infected cysts; however, in rare instances, they may lead to compressive symptoms such as respiratory distress, chest pain, and dysphagia, particularly when situated in the posterior mediastinum [3]. Herein, we report the case of a 71-year-old patient with a giant BCC located in the subcarinal and postero-inferior mediastinum, presenting with dyspnea, dysphagia, and chest pain. The case is notable for the unusual localization of the cyst and its clinical management.

Case Report

A 71-year-old woman with no comorbidities presented with dysphagia, right-sided chest pain, and shortness of breath for 2 years. The patient was followed up with analgesics and inhaler therapy in another center and no surgical treatment was recommended. It was learned that the lesion was 5 cm when first detected 10 years before she presented to us. Respiratory sounds and vital signs were within normal limits and laboratory tests revealed no abnormality. On direct chest radiography, there was a well-circumscribed opacity in the mediastinum which could be distinguished from the contour of the heart. Thoracic computed tomography (CT) revealed a smoothly circumscribed cystic lesion of approximately 8.5 cm in diameter with a density of 60 Hounsfield units, starting from the subcarinal area and extending inferiorly, adjacent to both main bronchus, esophagus, right pulmonary artery, and vena cava superior (Figures 1a-c). Because of the high density and size of the lesion, positron emission tomography-CT (PET-CT) was performed. No increase in metabolic activity was observed (Figure 1d). Endoscopy was performed because of dysphagia to clarify the relationship with the esophagus and seen as normal. The right hemithorax was opened by a posterolateral thoracotomy. In the posterior mediastinum, a cystic structure consisting of vena azygos at the upper border, right inferior pulmonary vein at the lower border, and esophagus, vertebrae, left atrium, right main pulmonary artery, and right main bronchus at the base were detected. The cyst was aspirated with a needle, but couldn't be drained because of the dense content. Cystotomy was performed and the contents, which were thought to be brown hematoma compatible with pending blood, were drained. The cyst was completely excised. No postoperative complications were observed. Pathologic examination revealed ciliated cylindrical respiratory tract epithelium and lymphoid tissue lining the cyst and the result was interpreted as a BCC (Figure 2). The patient is being followed up smoothly in the postoperative period. The patient was informed in detail about the use of the patient's medical data in academic studies and written consent was obtained from the patient.

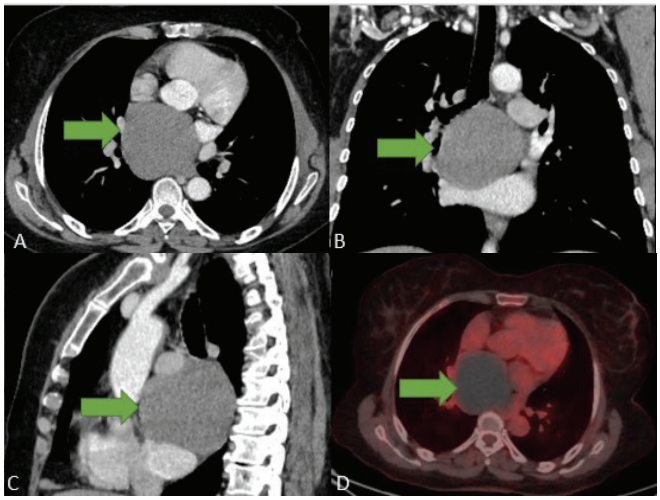

Figure 1. The cyst on CT and PET-CT images. Axial mediastinum window **(a)**, sagittal mediastinum window **(b)**, coronal mediastinum window **(c)**, PET-CT fusion on axial image **(d)** (green arrow shows cyst).

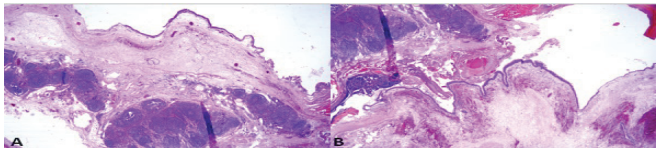

Figure 2. Histopathological image. Ciliated cylindrical airway epithelium on the cyst surface (a) and lymphoid tissue in the cyst wall (b) (H&E, x40).

Discussion

The most accepted theory today is that BCC originates from persistent degenerative abnormal branchial arches on the lateral side of the neck [3]. Those located in the

mediastinum push the esophagus and trachea and cause difficulty in breathing and swallowing. Thorax CT and a detailed anamnesis are effective in the diagnosis. On thorax CT, it is seen as oval or round masses separated from the surrounding tissues with a smooth border. Endoscopy, barium esophageal radiography, and laryngoscopy should be additionally preferred for BCC [4]. In this case, in addition to the above-mentioned diagnostic methods, we used PET because of the possible risk of malignancy due to advanced age and the high density of the contents.

Complete excision with a clean margin after emptying the cyst content is the most preferred method. Open thoracotomy gives surgeons better visibility of cysts and surrounding tissues and a broad region to act in case of complications. On the other hand, VATS is also preferred [2]. We planned surgical treatment without delay because of the absence of an infective clinic and prominent compression symptoms. Due to the size of the cyst and its proximity to the mediastinal main structures, we preferred an open surgical approach, which we thought would be safer in this particular case.

BCC typically consists of ciliated cylindrical epithelium or stratified squamous epithelium with lymphoid tissue and contains lymphoid aggregates. Bronchogenic cysts and esophageal duplication cysts are the most common masses in the posterior mediastinum that require differential diagnosis, but these cysts do not contain lymphoid tissue [5]. BCC generally do not invade the surrounding tissues, are well-circumscribed, and are easy to dissect as in our case. In the literature review, mediastinal localization is rare, while posterior mediastinal localization is even rarer. In terms of size, these cysts usually do not reach extremely large sizes, but in our case, it was much larger than in other cases. We attribute this to the fact that the patient was followed up for a while her treatment was delayed and she was older than the other cases in the literature.

BCC is very rare in the posterior mediastinum and should be differentially diagnosed with other masses. As in our case, surgery is the effective treatment method and the definitive diagnosis is made histopathologically after the use of radiologic imaging methods. As we mentioned, although it is mostly seen in the head-neck region, localization at the subcarinal level and in the postero-inferior mediastinum should be kept in mind.

Declaration of Conflicting Interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The authors received no financial support.

Authors' Contributions

RY,SEA: data curation, investigation, methodology, validation, writing, review and editing, HEY: conceptualization, data curation, resources, supervision, writing, review and editing, BK: data curation, investigation.

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To cite this article: Yazkan R, Ozdemir MS, Akın SE, Camas HE, Afacan O. Advanced age chest wall hamartoma and typical carcinoid tumor: a very rare coexistence. Curr Thorac Surg 2025;10(1):25-28.

Case Report

Advanced age chest wall hamartoma and typical carcinoid tumor: a very rare coexistence

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ABSTRACT

Chest wall hamartoma is a rare pathology in adults, usually presenting at birth or in early infancy. They may present with compression symptoms depending on their localization. Although it is rare to be recognized with late-onset symptoms in adults, it requires differential diagnosis with other malignant and benign tumors of the chest wall. Histologically, carcinoid tumors are classified into two subgroups as typical and atypical. Atypical carcinoids have an aggressive course and have the potential for metastasis and recurrence. Typical carcinoids are low grade malignancies. Although the prognosis of carcinoid tumors after surgical resection is reported to be good, a variable prognosis has been reported. The size of the tumor, histological type, nodal involvement, and distant metastasis are thought to affect the prognosis. Herein we present an elderly patient with chest wall hamartoma and typical carcinoid, in the light of literature.

Keywords: chest wall, carcinoid tumor, hamartoma

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Doi: 10.26663/cts.2025.006
Received 07.02.2025 accepted 15.04.2025

Introduction

The term "hamartoma" originates from the Greek word "hamartanein," meaning "to go wrong," and was first defined by Albrecht in 1904 as the mislocalization of tissues normally found in an organ. Hart reported hamartoma localized in the lungs for the first time in 1906. Hamartoma is the most common benign tumor of the lung [1,2]. Although it can occur in any organ, such as the lung, kidney, liver, and hypothalamus, domestic and foreign literature reports on chest wall hamartoma mainly focus on infants, but hamartoma on the adult chest wall is extremely rare, and the number of reported cases is limited [3]. The incidence of typical carcinoid tumor has decreased in recent years. In this case report, we aimed to present an elderly patient with chest wall hamartoma and typical carcinoid coexistence.

Case Report

An 84-year-old female patient with no known diseases other than hypertension and diabetes mellitus. She presented with swelling and pain on the anterior chest wall at the right edge of the sternum. Physical examination revealed a swelling in the right parasternal area that was painful to touch. Magnetic Resonance Imaging (MRI) was examined (Figure 1). Positron Emission Tomography (PET-CT) was planned for the patient upon the interpretation that there was an anteriorly subcutaneous expansile multilobulated mass lesion approximately 50×38×57 mm in size, destructing the 3rd costa in the right parasternal area. The PET-CT report was interpreted as an irregular, limited lesion (SUVMax = 2.22) on the right hemithorax anterior chest wall in the lateral neighborhood of the sternum and a spicular lesion (SUVMax = 2.37) in the posterior upper lobe of the right lung, and an operation plan was made for the patient (Figures 2,3). A video-assisted right thoracotomy was performed due to the patient's pulmonary function test showed FEV1 best: 0.96, low respiratory capacity, and one of the lesions was located in the chest wall and the other in the parenchyma. A wedge resection was performed on the lesion located in the upper lobe of the right lung, and the frozen section was sent for examination. The frozen section result was reported as malignant. Anatomic resection could not be performed because the patient had limited respiratory reserve. The lesion adjacent to the inferior mamamarian artery and sternum was identified. (Figure 4). The mass on the chest wall was removed by blunt and sharp dissections and sent to pathology. No early complications were observed. In pathological examination, the wedge resection material from the upper lobe was reported as a 1.8×7.5 cm typical carcinoid tumor, and the material removed from the chest wall was reported as 4.5×3.5×1 cm compatible with hamartoma (Figure 5). The patient is being followed up by oncology due to the typical carcinoid diagnosis. Consent was obtained from the patient for the use of her medical data in academic studies.

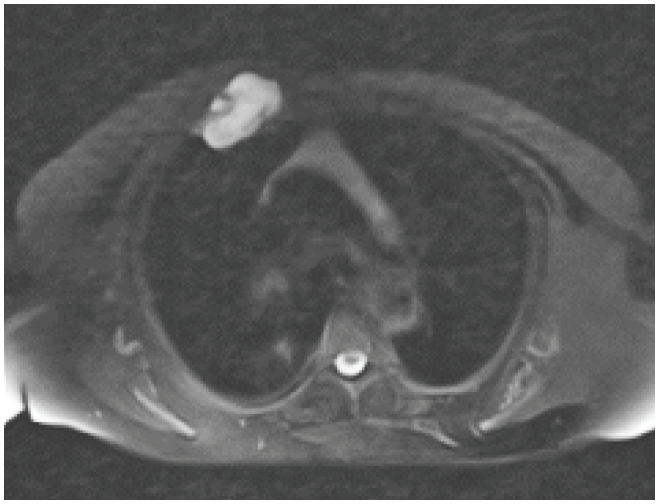

Figure 1. Magnetic resonance imaging showing the localization of the hamartoma.

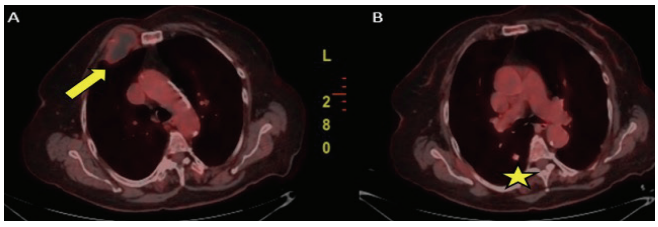

Figure 2. PET-CT images of chest wall hamartoma **(a)** (arrow) and typical carcinoid tumor **(b)**(star).

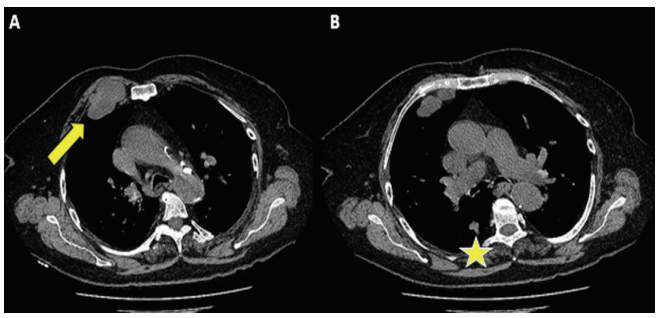

Figure 3. CT images of chest wall hamartoma **(a)** (arrow) and typical carcinoid tumor **(b)** (star).

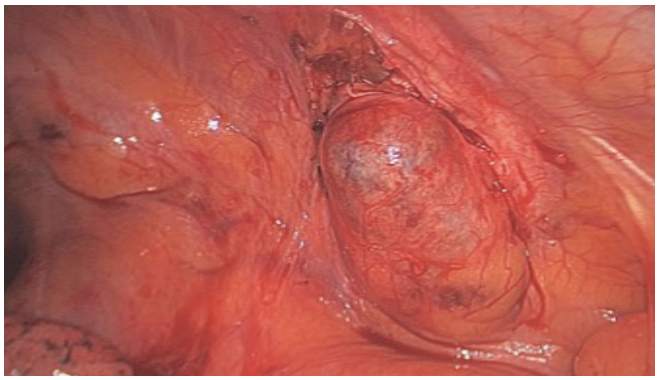

Figure 4. Intraoperative image of a chest wall hamartoma

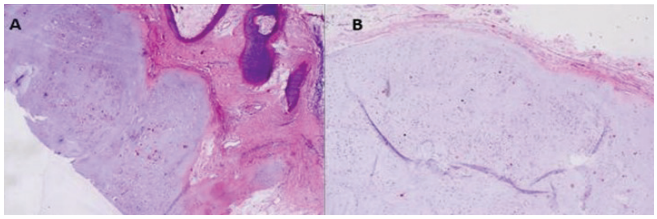

Figure 5. Osseous and cartilaginous tissue fragments in a smoothly circumscribed lobulated lesion (A: H&E, x40 B: H&E, x100).

Discussion

Hamartoma means an abnormal combination of normal tissue elements or an abnormal ratio of a single element in an organ, and is the most common benign tumor of the lung. However, hamartomas arising from the chest wall are quite rare and present with deformity of the thoracic wall and respiratory symptoms in varying degrees at birth or early infancy [4]. In this case, in contrast to the literature, the patient was advanced aged and had coexistence with typical carcinoid tumor. Neuroendocrine tumors (NETs) are a subtype of neoplasms that can arise in most organs and share several common biochemical and pathological features. Pulmonary NETs account for 20-30% of all NETs, and NETs in the lung can be divided into four subtypes according to their degree of malignancy: Typical carcinoids (TC), atypical carcinoids (AC), large cell neuroendocrine carcinomas (LCNEC), and small cell lung cancers (SCLC). Among these subtypes, typical and atypical carcinoids are generally referred to as pulmonary carcinoids and constitute 1-2% of all pulmonary malignancies; however, their incidence has increased markedly in recent years [5]. Since pulmonary carcinoid is a tumor with a low malignancy rate, resection is usually an effective treatment option for early disease. However, in this case, anatomical resection could not be performed because of insufficient respiratory reserve. Approximately 80% of pulmonary carcinoids are located in the central airways [6], whereas the number of reported cases of chest wall hamartomas in adults is very low [3]. To the best of our knowledge, no case of coexistence of chest wall hamartoma and typical carcinoma has been reported in the literature. During the treatment period, MRI and PET-CT imaging techniques were used to examine the detailed localization of the lesions, their metabolic activity, and their relationship with soft tissue and parenchyma. Since our preoperative FEV 1 best: 0.96, our operation plan was made in such a way that both lesions could be reached through a single incision line and video-assisted, although both lesions were distant from each other and in different localizations. Although frozen section examination was reported as a typical carcinoid tumor, anatomical resection could not be performed due to the insufficient respiratory reserve.

In conclusion, hamartomas of the chest wall at an advanced age are very rarely reported pathologies and require detailed preoperative examination and differential diagnosis. They may coexist with other pathologies, such as the typical carcinoid that we found in our patient, and surgery is the most effective treatment method.

Declaration of Conflicting Interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The authors received no financial support.

Authors' Contributions

RY,MSO: data curation, investigation, methodology, validation, writing, review and editing, SEA,HEC: conceptualization, data curation, resources, supervision, writing, review and editing, OA: data curation, investigation.

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To cite this article: Aydın S, Keçeci Özgür G, Tekneci AK. A supplementary technique for localized pneumothorax requiring tube thoracostomy: scopy. Curr Thorac Surg 2025;10(1):29-30.

Letter to the Editor

A supplementary technique for localized pneumothorax requiring tube thoracostomy: scopy

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Keywords: chest tube, localized pneumothorax, secondary spontaneous pneumothorax, scopy

Dear Editor,

Pneumothorax is a condition characterized by the presence of air between the visceral and parietal pleura, resulting in lung collapse. Collapse may be either partial or complete [1]. The pneumothorax not resulting from trauma or an iatrogenic etiology is known as spontaneous pneumothorax and is categorized as primary and secondary. Secondary spontaneous pneumothorax develops from an underlying pulmonary disease. The etiological factors of secondary spontaneous pneumothorax include diseases such as chronic obstructive pulmonary disease, asthma, interstitial pneumonia, cystic fibrosis, lung cancer, and tuberculosis [2]. The collapse of already impaired lung tissue is a more serious condition for the patient than primary spontaneous pneumothorax. Consequently, secondary spontaneous pneumothorax has been documented in the literature as a more severe and lethal condition [3]. Cases of secondary spontaneous pneumothorax need lung capacity that remains non-functional in respiration due to minimal collapse. Despite the challenges and risks associated with chest tube insertion in these areas, inserting tube thoracostomy with supplementary radiological techniques for localized pneumothorax enhances lung volume contributing respiration, and protects patients from potential outcomes of conservative management, including intubation, critical care, and related complications.

Tube thoracostomy has evolved over time in response to current requirements, both physically and procedurally. Ultrasonography may assist in selecting the intervention site, particularly in the tube thoracostomy performed for fluid drainage [4]. Due to the limited efficacy of ultrasonography in partial pneumothorax, scopy may be utilized in specific patient populations at institutions equipped for such procedures. With the use of a single-plane C-arm fluoroscopy device and real-time imaging support, a dynamic radiographic view can be obtained, closely resembling a moving X-ray. Respiratory-dependent lung movements, the line of an expansion defect, and the real-time visualization of an inserted chest tube can all be observed as if in a video format. This facilitates precise monitoring during the procedure.

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Doi: 10.26663/cts.2025.007
Received 06.03.2025 accepted 15.04.2025

When ultrasonography is used, the fact that the probe must be operated by the surgeon limits the ability to perform the intervention bimanually. Alternatively, when handled by another physician, the presence of the ultrasound probe can restrict access to the procedural field, presenting a disadvantage. Furthermore, ultrasound has known limitations in imaging air-containing structures, which may compromise the reliability of the procedure. In computed tomography guided procedures, real-time imaging is not feasible, and stepwise progression using static cross-sectional images interrupts the continuity of the procedure and may reduce its safety. Additionally, the cumulative radiation exposure from each imaging step represents another drawback.

Considering all these limitations, fluoroscopy offers a dynamic version of conventional radiography - a modality frequently utilized and well understood in daily clinical practice. Its ability to provide real-time images significantly enhances procedural safety and precision. Nevertheless, due to the radiation risk, the need for complicated organization, and the potential for time loss, careful selection of cases is necessary. The well-selected patient criteria we recommend should simultaneously include the following: pneumothorax merged from different areas but with separate volumes that are too small for a safe tube thoracostomy, pneumothorax with a total volume causing a decrease in saturation, and secondary spontaneous pneumothorax cases that tube thoracostomy is expected to be beneficial. We have two instances for this procedure which were performed bilateral tube thoracostomy under scopy for bilateral localized secondary spontaneous pneumothorax. The underlying diseases were pneumocystis jiroveci pneumonia related to HIV and chronic obstructive lung disease in these cases. Radiologic images of patients were provided to explain the indications clearly (Figures 1a,b). Subsequent to the procedures, the oxygen requirements decreased in both patients and their follow-ups were conducted in the ward.

In cases of secondary spontaneous pneumothorax, scopy may serve as a supplementary technique to tube thoracostomy in well-selected cases that are expected to benefit from tube thoracostomy.

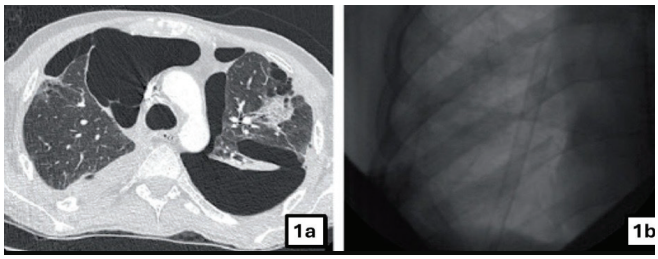

Figure 1. Bilateral partial pneumothorax resulting from chronic obstructive pulmonary disease **(a)**, image of collapsed lung and chest tube under scopy **(b)**.

Acknowledgements

We express our gratitude to Associate Professor Ali Özdil and Professor Ufuk Çağırıcı for their supervision of the interventions performed in the cases.

Declaration of conflicting interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The authors received no financial support for the research and/or authorship of this article.

Authors' contributions

All authors contributed to the study conception and design. SA, GKÖ, and AKT performed the procedure. SA wrote the manuscript. GKÖ and AKT collected data. All authors commented on previous versions of the manuscript. All authors reviewed and approved the final version of the manuscript.

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To cite this article: Yilmaz Y. Appendix A. Editorial comment. Cur Thorac Surg 2025; 10(1): 31

Appendix A. Editorial comment

A Supplementary Technique for Localized Pneumothorax Requiring Tube Thoracostomy: Scopy

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I would like to congratulate the authors for their highly informative and clinically relevant contribution to the management of secondary spontaneous pneumothorax; a condition that continues to pose significant therapeutic challenges. This manuscript presents a thoughtful and well-articulated rationale for the use of fluoroscopy-assisted tube thoracostomy in cases of localized pneumothorax, especially where conventional imaging techniques fall short in safety or efficiency.

The authors provide a nuanced understanding of the pathophysiological distinctions between primary and secondary pneumothorax, emphasizing the increased morbidity associated with the latter due to compromised pulmonary reserve. Their practical insight into the limitations of ultrasonography and computed tomography in selected cases is particularly valuable, as is their argument for dynamic real-time imaging to ensure procedural accuracy.

By presenting two illustrative cases supported by radiological imaging, the authors convincingly demonstrate how scopy-assisted tube thoracostomy can optimize lung re-expansion, reduce oxygen requirements, and potentially obviate the need for more invasive interventions such as mechanical ventilation. Their proposed patient selection criteria are well reasoned and align with a precision medicine approach that prioritizes individualized care.

This innovative yet pragmatic perspective is a welcome addition to the thoracic surgery literature and may inspire further exploration of image-guided techniques in managing complex pleural conditions. I hope that this letter to the editor will serve to enrich the perspectives of both the readers and authors of Current Thoracic Surgery.

Keywords: localized pneumothorax, tube thoracostomy, image-guided intervention, scopy

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Doi: 10.26663/cts.2025.008

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Explain clearly but concisely your clinical, technical, or experimental procedures. Previously published papers related to the methods should be cited with appropriate references. Brand names and company locations should be supplied for all mentioned equipment, instruments, chemicals, etc.

Results

Findings must be described without comment. The same data or information given in a Table must not be repeated in a Figure and vice versa. It is not acceptable to repeat extensively the numbers from Tables in the text or to give lengthy explanations of Tables or Figures.

Discussion

Statements from the Introduction and Results sections should not be repeated here. The final paragraph should highlight the main conclusions of the study. Names of funding organizations should be written in full.

References

In the text, references should be identified using numbers in square brackets in which they appear consecutively. The titles of journals should be abbreviated according to the style used in Index Medicus. Ageneral guide limit the number of references to 25 for original articles, to 6 for case reports and to 85 for reviews. For articles with 1 to 6 authors, list all authors. For articles more than 6 authors, list the first 6 authors followed by "et al.". Do not use individual sets of parentheses for citation numbers that appear together, e.g., [2,3,5-9], not [2],[3],[5]–[9]. For other styles of publication or Internet articles, see http:// www. nlm.nih.gov/ bsd/ uniform_requirements.html References should be formatted as follows (please note the punctuation and capitalization)

Journal titles should be abbreviated according to ISI Web of Science abbreviations. Authors are solely responsible for the accuracy and completeness of references.

Articles in Journals

Özpolat B, Gürpınar ÖA, Ayva EŞ, Gazyağcı S, Niyaz M. The effect of Basic Fibroblast Growth Factor and adipose tissue derived mesenchymal stem cells on wound healing, epithelization and angiogenesis in a tracheal resection and end to end anastomosis rat model. Turk Gogus Kalp Dama 2013; 21: 1010-9.

For other styles of publication or Internet articles, see http:// www.nlm.nih.gov/bsd/uniform_requirements.html

Tables and Figures

All illustrations (photographs, drawings, graphs, etc.), not including tables, must be labeled "Figure." Figures must be submitted both in the manuscript and as separate files.

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Figures that are charts, diagrams, or drawings must be submitted in a modifiable format, i.e. our graphics personnel should be able to modify them. Therefore, if the program with which the figure is drawn has a "save as" option, it must be saved as *.ai or *.pdf. If the "save as" option does not include these extensions, the figure must be copied and pasted into a blank Microsoft Word document as an editable object. It must not be pasted as an image file (tiff, jpeg, or eps) unless it is a photograph.

Tables and figures, including caption, title, column heads, and footnotes, must not exceed 16×20 cm and should be no smaller than 8 cm in width. For all tables, please use Word's "Create Table" feature, with no tabbed text or tables created with spaces and drawn lines. Please do not duplicate information that is already presented in the figures.

Tables must be clearly typed, each on a separate sheet, and double-spaced. Tables may be continued on another sheet if necessary, but the dimensions stated above still apply.

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The Current Thoracic Surgery is a current periodical, peer-reviewed and open access official e- journal of the Turkish Society of Thoracic Surgery which its funded and published three times annually. In April, August and December.

The language of the journal is English.

The Current Thoracic Surgery is dedicated to publishing clinical research, clinical analysis, laboratory and experimental studies, editorials, invited current reviews, case reports, interesting images and "How to Do It" papers.

The journal is based on independent and unbiased double-blinded peer-reviewed principles. Only unpublished papers that are not under review for publication elsewhere can be submitted. Current Thoracic Surgery does not accept multiple submission and duplicate submission even though the previous one was published in a different language. The authors are responsible for the scientific content of the material to be published. The Current Thoracic Surgery reserves the right to request any research materials on which the paper is based.

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The Editorial Board of the Current Thoracic Surgery and the Publisher adheres to the principles of the International Council of Medical Journal Editors (ICMJE), the World Association of Medical Editors (WAME), the Council of Science Editors (CSE), the Committee on Publication Ethics (COPE), the US National Library of Medicine (NLM), the World Medical Association (WMA), the US Office of Research Integrity (ORI), the European Association of Science Editors (EASE), and the International Society of Managing and Technical Editors (ISMTE).

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All articles submitted for publication are strictly reviewed for their

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Manuscripts that comply with the main rules of the journal are sent to at least two external reviewers, and the reviewers are asked for their opinion about the suitability of the paper for publication. The reviewed manuscripts are then re-reviewed by the Editor in Chief and the Editorial Board and a decision of rejection or acceptance is shaped.

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