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Surgical Management and Clinical Outcomes of Mediastinal Mass Resections: A Single-center Retrospective Analysis

Hüseyin Çakmak, Mustafa Kalkan, Muhammet Ali Beyoğlu, Hakan Nomenoğlu, Göktürk Fındık

University of Health Sciences Türkiye, Dr. Abdurrahman Yurtaslan Ankara Oncology Training and Research Hospital, Clinic of Thoracic Surgery, Ankara, Türkiye

ABSTRACT

Aim: The surgical management of mediastinal masses is complex due to anatomical constraints and diverse pathologies. This study aims to provide a descriptive analysis of surgical outcomes, risk factors for complications, and survival trends in patients undergoing mediastinal mass resection.

Methods: We retrospectively reviewed the records of 36 patients who underwent surgical resection of mediastinal masses between 2019 and 2026. Postoperative complications were graded using the Clavien-Dindo classification. Demographic data, tumor characteristics, and pathological subtypes were analyzed. Long-term survival was estimated using the Kaplan-Meier method, and risk factors for major complications (Grade ≥III) were evaluated.

Results: The study cohort consisted of 26 females and 10 males with a mean age of 53.69±14.19 years. Major complications occurred in 13.9% (n=5) of patients. A significant association was found between major complications and smaller tumor diameters (31.14±14.0 mm vs. 53.55±23.8 mm, p=0.022) and a history of malignancy (p=0.028). The 30-day mortality rate was 2.8% (n=1). While major complications did not adversely affect 5-year overall survival (p=0.486), a strong trend toward prognostic divergence was observed across different pathological subtypes (log-rank p=0.056), with metastatic lesions showing poorer outcomes.

Conclusion: Mediastinal mass resection remains a clinical necessity and is inherently challenging. Given the vast pathological variety and technical demands of the mediastinum, continuous documentation of institutional experiences is essential for refining preoperative planning and complication management strategies. Successful outcomes depend on the integration of surgical precision with robust perioperative care.

Keywords: Mediastinal neoplasms, thoracic surgery, video-assisted thoracoscopic surgery, postoperative complications, survival analysis, tumor size

Introduction

The mediastinum is the central compartment of the thoracic cavity, bordered laterally by the pleural cavities, anteriorly by the sternum, and posteriorly by the vertebral column. This complex space is anatomically divided into superior, anterior, middle, and posterior compartments, each harboring distinct vital structures, including the heart, great vessels, trachea, esophagus, and major autonomic nerves [1-3]. Given this dense concentration of critical organs, any pathological mass arising within these boundaries poses a significant clinical challenge [4].

Mediastinal tumors are relatively uncommon, accounting for approximately 3% of all primary tumors in the thoracic cavity [5,6]. Despite their low incidence, they present a significant diagnostic and therapeutic challenge due to their proximity to vital thoracic structures [5,6]. The anatomical position and internal characteristics of a lesion are pivotal in refining the differential diagnosis [6].

Mediastinal masses are highly variable in size, location, and biological nature; therefore, surgical strategies must be carefully planned and adapted when dealing with these lesions [7,8]. The evolution of surgical techniques, from open sternotomy and thoracotomy to minimally invasive approaches, has allowed for more tailored interventions based on the specific characteristics of the mass and the patient's clinical status [8,9].

Address for Correspondence: Mustafa Kalkan MD, University of Health Sciences Türkiye, Dr. Abdurrahman Yurtaslan Ankara Oncology Training and Research Hospital, Clinic of Thoracic Surgery, Ankara, Türkiye

E-mail: postmustafakalkan@gmail.com **ORCID ID:** orcid.org/0009-0009-1420-397X

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The objective of this study was to analyze our institutional experience with mediastinal masses and evaluate our clinical findings in the context of existing literature. By documenting our surgical outcomes, complication profiles, and survival data, we aim to contribute to the collective understanding of these diverse clinical entities.

Methods

Study Design and Patient Selection

This retrospective study was conducted in the Department of Thoracic Surgery at a tertiary-care oncology hospital. Medical records of 36 patients who underwent surgical resection for mediastinal masses between 2019 and 2026 were retrospectively reviewed. The study protocol was approved by the Institutional Ethics Committee of University of Health Sciences Türkiye, Dr. Abdurrahman Yurtaslan Ankara Oncology Training and Research Hospital (approval no: 2026-02/16, date: 05.02.2026). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Inclusion and Exclusion Criteria

Patients who underwent surgical resection for a primary mediastinal mass in our thoracic surgery department between 2019 and 2026 were analyzed retrospectively. The inclusion criteria for this study were defined as follows: (1) the presence of a primary mediastinal tumor confirmed by preoperative imaging, including computed tomography (CT) or magnetic resonance imaging (MRI); (2) the availability of complete medical, surgical, and pathological records; and (3) the performance of surgical resection with curative intent (achieving either R0 or R1 resection). Exclusion criteria were: patients with incomplete follow-up data, and patients treated solely with biopsy without definitive resection.

Follow-up Protocol

The standardized follow-up protocol involved clinical examination and radiological assessment. Following discharge, patients were evaluated at the outpatient clinic within the first postoperative month for early complications. Long-term follow-up consisted of physical examinations and thoracic CT scans every 6 months for the first 2 years and annually thereafter. Survival status and recurrence data were obtained from hospital records and national health databases.

Preoperative Evaluation and Surgical Procedure

All patients underwent comprehensive preoperative evaluation, including physical examination, routine laboratory tests, and pulmonary function tests. Contrast-enhanced CT was performed in all cases to assess tumor size, location, and relationship with adjacent vital structures. MRI was used in selected cases to better visualize neurovascular involvement.

Surgical approaches were tailored to the tumor's anatomical location and size. The primary goal in all cases was complete (R0) resection.

Due to the limited number of major complications (n=5), univariate analysis was primarily used to identify potential risk factors. A multivariate model was not constructed to avoid overfitting and maintain the validity of the statistical conclusions in this small-scale cohort.

Classification of Complications

Postoperative complications were recorded and graded according to the Clavien-Dindo classification [10].

Survival

Overall survival (OS) was defined as the time from the date of surgery to the date of death from any cause or to the date of last follow-up. The 30-day mortality rate was also documented.

Statistical Analysis

Statistical analysis was performed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation, and categorical variables were presented as frequencies and percentages. The independent samples t-test was used to compare continuous variables between groups. Categorical data were analyzed using Pearson's chi-square test or Fisher's exact test, as appropriate. Survival rates were estimated using the Kaplan-Meier method, and differences between groups (pathological subtypes and complication status) were compared using the log-rank (Mantel-Cox) test. A p value <0.05 was considered statistically significant.

Results

Patient Demographics and Clinical Characteristics

A total of 36 patients who underwent surgical resection for mediastinal masses were included in this study. The study population consisted of 26 (72.2%) females and 10 (27.8%) males, with a mean age of 53.69±14.19 years. The anatomical distribution of the masses revealed that the anterior mediastinum 25 (69.4%) was the most common site of involvement. The mean tumor diameter, as measured on preoperative CT, was 49.19±24.05 mm.

Surgical Outcomes and Pathological Diagnosis

Surgical interventions were performed via various approaches; sternotomy and thoracotomy were the most frequently used, with each accounting for 12 cases (33.3%). Other techniques included video-assisted thoracoscopic surgery, mediastinotomy, and collar incisions. The mean operative duration was 202.08±81.31 minutes, summarized in Table 1.

The most frequent diagnoses were schwannoma, thymic squamous cell carcinoma (SCC), Breast cancer metastasis, and thymoma, each identified in 4 patients (11.1%). Other pathological entities encountered in the study included ectopic thyroid tissue, reactive lymph node, synovial sarcoma, thymic cyst, ganglioneuroma, metastasis of teratoma, neuroendocrine carcinoma, mesothelial cyst, solitary fibrous tumour, cervical SCC metastasis, and bronchogenic cyst, which

are listed in Table 2. The presence of metastatic lesions and malignant primary tumors highlights the clinical complexity of the cases managed in our institution.

Analysis of Postoperative Complications

Postoperative complications were observed in 10 (27.7%) patients. According to the Clavien-Dindo classification:

- Minor complications (Grade I-II): Occurred in 5 (13.9%) patients.
- Major complications (Grade ≥III): Occurred in 5 (13.9%) patients.

Comparative analysis between patients with major complications (n=5) and those without (n=31) revealed several significant findings. A statistically significant correlation was found between smaller tumor size and a higher incidence of major complications (31.14±14.0 mm vs. 53.55±23.8 mm, p=0.022). Furthermore, a history of malignancy was significantly associated with increased major morbidity (p=0.028).

The overall 30-day postoperative mortality rate was 2.8% (n=1). One death occurred in the major complication group (1/5, 20%), whereas no deaths were observed among patients without major complications (0/31, 0%). The difference did not reach statistical significance due to the limited number of events (Fisher's exact test, p=0.139).

Patients in the major complication group tended to be younger (44.57±15.2 vs. 55.89±13.0 years) and had longer operative durations (248.5±95.6 vs. 190.8±75.0 minutes); however, these differences did not reach statistical significance as seen in Table 3 (p=0.056 and p=0.094, respectively). Other factors, including gender, surgical approach, and anatomical compartment, showed no significant correlation with major complications (p>0.05).

Table 1. Comparative analysis of surgical approaches

Surgical approach	n (%)	Mean operation time (minute)	Complication rate (%)	Mean hospital stay (days)
Sternotomy	12 (33.3%)	215±45	16.6%	7.2±2.1
Thoracotomy	12 (33.3%)	190±60	16.6%	6.8±1.8
VATS (minimally invasive)	8 (22.2%)	160±35	12.5%	3.5±1.2
Other (Mediastinotomy, etc.)	4 (11.1%)	145±25	0%	2.1±0.9

VATS: Video-assisted thoracoscopic surgery, min: Minimum

Table 2. Distribution of pathological diagnoses and survival outcomes

Pathological groups	n (%)	5 year survival rate (%)	Clinical behavior
Neurogenic tumors (schwannoma, ganglioneuroma)	5 (13.9%)	100%	Benign/indolent
Thymic epithelial tumors (thymoma, thymic SCC/CA)	9 (25.0%)	77.8%	Low-intermediate malignancy
Metastatic lesions (breast, cervix, teratoma)	6 (16.7%)	33.3%	Aggressive/poor prognosis
Cystic lesions (bronchogenic, thymic, mesothelial)	4 (11.1%)	100%	Benign
Miscellaneous (thyroid, SFT, synovial sarcoma, etc.)	12 (33.3%)	83.3%	Variable
Total	**36 (100%)**	**83.3% (overall)**	--

SCC: Squamous cell carcinoma, CA: Carcinoma, SFT: Solitary fibrous tumor

Table 3. Association between demographic/clinical characteristics and major complications (Clavien-Dindo Grade ≥III)

Variable	Total (n=36)	Major comp. (+) (n=5)	Major comp. (-) (n=31)	p value
Age (years), mean ± SD	53.69±14.19	44.57±15.2	55.89±13.0	**0.056**
Tumor size (mm), mean ± SD	49.19±24.05	31.14±14.0	53.55±23.8	**0.022***
Operative duration (min), mean ± SD	202.08±81.31	248.5±95.6	190.8±75.0	**0.094**
Gender, n (%)				**0.061**
- Male	10 (27.8%)	3 (30.0%)	7 (70.0%)	
- Female	26 (72.2%)	2 (7.7%)	24 (92.3%)	
History of malignancy, n (%)				**0.028***
- Present	7 (19.4%)	3 (42.8%)	4 (57.2%)	
- Absent	29 (80.6%)	2 (6.9%)	27 (93.1%)	

*: p<0.05 indicates statistical significance based on Fisher's exact test

SD: Standard deviation

Survival Analysis

The impact of postoperative morbidity on long-term prognosis was evaluated using the Kaplan-Meier method. The median follow-up period was 25.8 (0-108) months. There were 6 (16.7%) events (deaths) recorded during the follow-up period. There was no statistically significant difference in 5-year OS between patients with major complications and those without (p=0.486, log-rank test; see Figure 1). The lack of a statistically significant association between major complications and long-term survival may be attributed to the relatively small sample size of our cohort, which limits the statistical power to detect such a difference.

The relationship between pathological subtypes and OS was analyzed using the Kaplan-Meier method. A notable trend toward statistical significance was observed among the different pathological groups (log-rank p=0.056). Patients with metastatic breast cancer demonstrated a poorer survival profile compared with patients with benign pathologies, such as Schwannomas, who maintained a 100% survival rate during the follow-up period (see Figure 2). Although the difference did not reach the conventional threshold of p<0.05, the observed trend (p=0.056) suggests a prognostic difference that may achieve statistical significance in a larger patient cohort with greater statistical power.

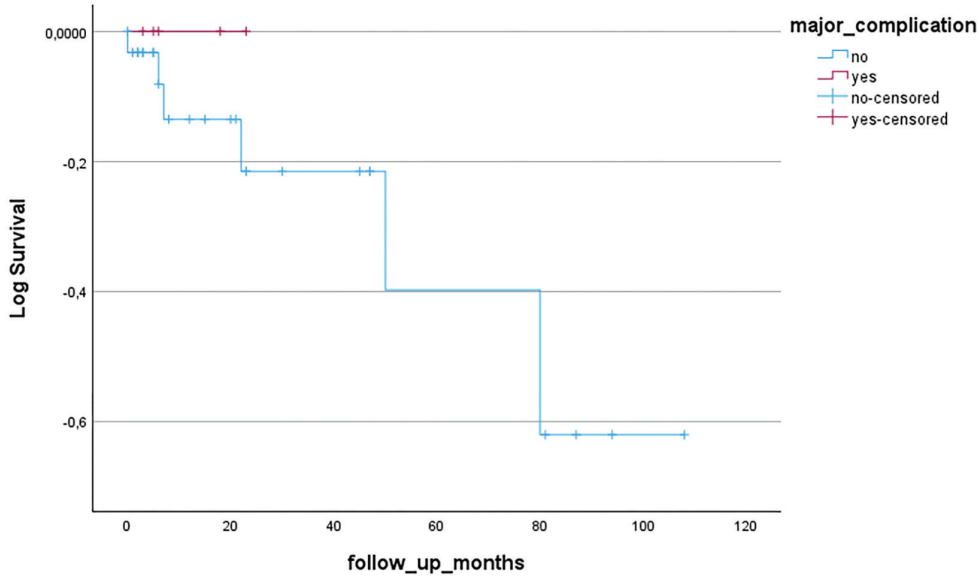

Figure 1. Kaplan-Meier analysis of overall survival stratified by major complications

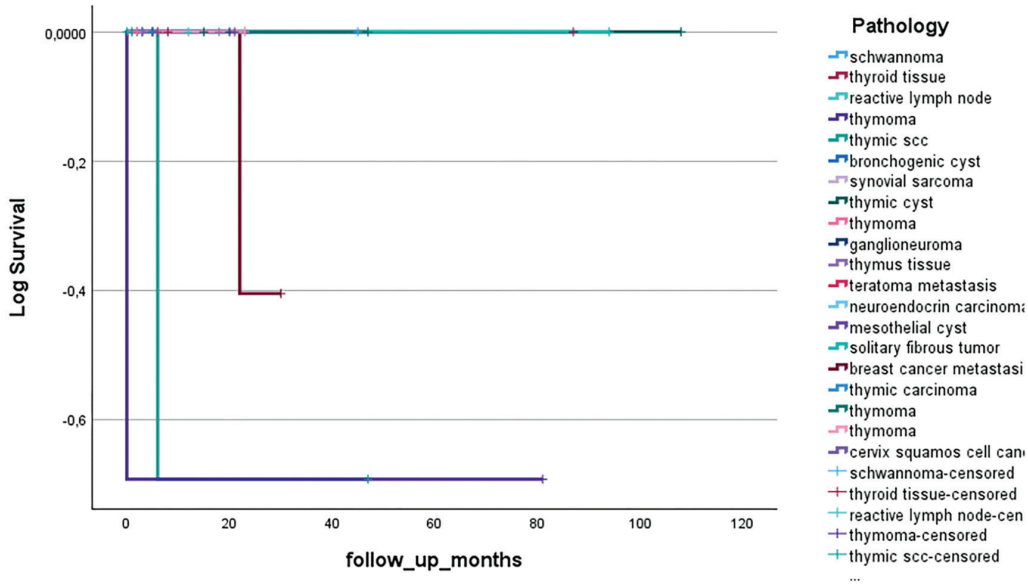

Figure 2. Long-term survival outcomes based on histopathological diagnoses

Discussion

The surgical management of mediastinal masses remains a challenge due to the complex anatomical landscape and the proximity of vital neurovascular structures. In this study, we evaluated the perioperative outcomes and long-term survival of 36 patients, focusing on the impact of postoperative complications.

We also identified a significant correlation between a history of malignancy and major postoperative complications (p=0.028). Patients with previous oncological treatments, such as chemotherapy or radiotherapy, often present with tissue fibrosis and increased vascular fragility. These factors significantly complicate surgical planes and increase the risk of perioperative bleeding or organ injury. Our results underscore the need for heightened vigilance and potentially more conservative surgical planning in patients with a history of malignancy.

The primary objective in the management of mediastinal masses is achieving a definitive pathological diagnosis and, where possible, a complete surgical resection. Our study highlights the intrinsic complexity of mediastinal surgery, dictated by the narrow confines of the thoracic compartments. Regardless of the pathological subtype—ranging from benign schwannomas to aggressive thymic SCC—surgical intervention remains the cornerstone of treatment to prevent local invasion and provide long-term symptom relief. However, the surgeon must navigate an "anatomical minefiel" in which even minor deviations can lead to injury to great vessels or the tracheobronchial tree. The diverse pathological etiologies observed in our cohort (spanning 11 different diagnoses) underscore that mediastinal surgery is not a monolithic practice but requires a tailored approach for each histopathological entity.

In our series, major complications occurred in 13.9% of patients, which serves as a reminder of the inherent risks of these procedures. The management of these complications is as crucial as the surgery itself. In this descriptive study, our data reflect that a high level of perioperative vigilance is mandatory, particularly for patients with the risk factors we identified, such as prior malignancy and smaller, deep-seated lesions.

In our analysis, smaller tumor size was significantly associated with major complications (p=0.022). Although this finding appears paradoxical, it is most likely attributable to the limited sample size of our cohort. In small-scale clinical studies, the presence of a few high-risk cases with smaller tumor diameters can skew univariate results, leading to potentially misleading statistical significance. Therefore, this correlation should be interpreted with caution and viewed as an exploratory finding rather than a definitive clinical rule. Future research involving larger patient populations is essential to determine whether tumor size is a genuine independent predictor of surgical morbidity in mediastinal resections.

Our surgical outcomes and clinical findings are consistent with several significant studies. Kilic et al. [11] reported in their 118-case series that anterior mediastinal location was predominant and that postoperative complications significantly prolonged hospital stay (p=0.018), a finding that mirrors our own clinical observations. Furthermore, the 20-year long-term experience presented by Harrison et al. [12] confirms that achieving complete (R0) resection remains the most critical prognostic factor for OS. Consistently, in the landmark study by Caronia et al. [4,13], the importance of surgical radicality was emphasized, with morbidity rates (around 15-20%) comparable to our cohort. Our high R0 resection rate and favorable survival trends are consistent with established national and international benchmarks, confirming the reliability of our single-center surgical approach.

The successful management of the diverse pathologies encountered in our series—ranging from benign nerve sheath tumors to metastatic lesions—reflects the evolution of surgical strategies in a tertiary care cancer center. Our data suggest that the diversity of mediastinal etiologies necessitates a versatile surgical repertoire, from minimally invasive approaches to complex open resections. As surgical teams navigate the learning curve associated with these high-stakes procedures, the continuous documentation and sharing of institutional outcomes become paramount. This descriptive process is not merely a statistical exercise but a vital tool for the transfer of experience, helping to refine preoperative risk stratification and intraoperative decision-making, thereby further minimizing perioperative morbidity.

Study Limitations

This study has several limitations that should be considered when interpreting the results. The primary limitations are its retrospective design and the relatively small sample size, which precluded performing a multivariate analysis. Although our univariate analyses identified small tumor size and a history of malignancy as significant risk factors for major morbidity, we were unable to adjust for potential confounding variables. Furthermore, the heterogeneity of pathological entities within the cohort and the limited number of primary events may reduce statistical power to detect subtle differences in survival or to draw definitive conclusions for specific tumor types. Despite these constraints, our findings provide valuable clinical insights into the risk factors for major morbidity in mediastinal surgery and serve as a foundation for future larger-scale studies.

Conclusion

This study provides a descriptive analysis of the surgical management of mediastinal masses, highlighting that while resection is a clinical necessity, it remains inherently challenging. Given the anatomical complexity and the potential for major morbidity, continuous updates of institutional experiences in the literature are essential.

Ethics

Ethics Committee Approval: The study protocol was approved by the Institutional Ethics Committee of University of Health Sciences Türkiye, Dr. Abdurrahman Yurtaslan Ankara Oncology

Training and Research Hospital (approval no: 2026-02/16, date: 05.02.2026).

Informed Consent: Retrospective study.

Footnotes

Authorship Contributions

Surgical and Medical Practices: H.Ç., M.K., H.N., Concept: H.Ç., M.K., M.A.B., Design: H.Ç., M.K., M.A.B., Data Collection or Processing: H.Ç., M.K., H.N., G.F., Analysis or Interpretation: H.Ç., M.K., G.F., Literature Search: H.Ç., M.K., H.N., Writing: H.Ç., M.K., M.A.B., G.F.

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