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Clinical characteristics, management, and outcomes of thymic malignancies: a tertiary centre experience in India

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Abstract

Introduction: Thymic malignancies are uncommon, and very few studies are available, especially related to systemic combination therapy. Thus, there are unmet needs in standardising treatment approaches.

Materials and methods: This descriptive study retrospectively examined patients with thymic malignancies presented between January 2022 and May 2025. All patient, irrespective of stage or histotypes, were included in the study. Among 52 patients, data for analysis were available for 42 patients.

Results: Most patients had thymoma with B2 and B3 histology. 1/3rd of patients presented with Masoka stage IV. Stages III, II, and I were 23.8%, 21.4% and 23.8%. Patients with upfront resectable disease underwent surgery followed by adjuvant radiation therapy if high risk features were present. The commonly used regimens in potentially operable and inoperable tumours were combination adriamycin, cisplatin, vincristine, and cyclophosphamide (ADOC) and combination Cyclophosphamide, adriamycin and cisplatin (CAP) and paclitaxel-carboplatin. Disease control rate was 68.4 % with an overall response rate (ORR) of 52.6%. ORR were 55.5%, 50% and 40% with ADOC, CAP and paclitaxel-carboplatin, respectively. Neutropenia was seen in 42% the patients with grade ¾ in 15.7% of the patients. Two-year survival rates were 84%. Survival was shorter in patients with advanced disease thymic carcinoma. Stage-wise Survival rates for stages I, II, III, and IV were 100%, 89%, 79% and 71% (p value-0.04), respectively.

Conclusion: Modified Masoka staging is an important prognostic marker in Thymoma. Three or four drug combination chemotherapy can be considered in potentially operable or inoperable tumours with good response rates and manageable toxicity profile.

Keywords: Thymoma, Masoka staging, ADOC, CAP

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Introduction

Thymic malignancies are relatively slow-growing tumours with thymoma being potentially malignant and thymic carcinoma being malignant with origin being thymic epithelial cell (1,2). The histopathological classification and staging classification are based on World Health Organization (WHO) 2021 classification and the modified Masoka staging system (3,4).

Patients presenting with thymic malignancies are uncommon, even in a tertiary centre. There are very few studies with large cohorts, especially in the Indian setting, with most being retrospective studies with small numbers of cases and this explains the unmet needs in standardisation of treatment approaches. The data on exact incidence in Indian population is lacking due to scarce widespread epidemiological data.

Surgical resection remains the cornerstone of treatment for patients with resectable thymic malignancies. For those with unresectable tumors, neoadjuvant chemotherapy or definitive radiotherapy are commonly employed therapeutic strategies. In patients with advanced or metastatic disease, systemic palliative therapy is the standard approach, although data on available combination regimens are limited.

This retrospective study outlines our clinical experience in the management of thymic malignancies in patients treated between January 2022 and May 2025.

The purpose of this study is to share experience related to epidemiology, clinical presentation, management, and treatment outcomes, and prognostic relations to different clinical parameters, with special emphasis on the experience of systemic combination therapy in these patients. The objective of the study is to evaluate and report outcomes associated with combination chemotherapy in thymoma based on our clinical experience.

Materials and methods

A retrospective study of patients diagnosed between January 2022 to May 2025 with thymic malignancies was conducted from a regional cancer centre in the southern part of India. All the patients diagnosed with thymic malignancies, irrespective of stage or criteria were included in the study. Data were collected for epidemiological, clinical, histopathological, staging, and treatment outcome from patient files or electronic data. SPSS program version 23.0 for Windows was used for data analysis. To examine the relationship between ordinal variable, Chi-square test was used.

Most patients were evaluated with contrast-enhanced computed tomography scan (CECT) (Thorax/abdomen/pelvis), few with positron emission tomography-computed tomography (PET/CT) imaging. Patients were staged based on the modified Masoka staging system (6). Image-guided biopsy was done, and all specimens were reviewed by an oncopathologist and reported based on 2021 WHO classification of tumours of thymus (4). Patients with symptoms not related to primary or metastasis were evaluated for paraneoplastic syndrome.

All resectable patients after informed consent underwent upfront resection. Patient with potentially resectable tumour received neoadjuvant chemotherapy followed by surgical review. Patient with high risk factor (margin positive, prior neoadjuvant chemotherapy, masoka stage II or higher) received adjuvant radiation therapy. Patients believed to be unresectable despite neoadjuvant chemotherapy or with extensive disease received palliative chemotherapy. Post definitive management, patients were kept on surveillance with 6-monthly CECT thorax, while imaging was performed every 3 months in patients on palliative treatment.

Results

A total of 52 patients were diagnosed with thymic malignancy (thymoma/thymic carcinoma) during January 2022 to May 2025. Out of 52 patients, data for analysis were available for 42 patients. Male to female ratio was 1.2:1, with a median age of 49 years (18-67 years), with 26% of patients below the age of 40 years. 28.5% of the patients had co-morbidities (Table 1).

Most common presentations were ptosis, cough, breathing difficulty, chest pain, and hoarseness of voice. One patient presented incidentally. Either prior to referral to a tertiary centre or on evaluation, 31% of

patients had myasthenia gravis, many of them presented with ptosis and a few had breathing difficulties. For all patients with myasthenia, the neurologist's opinion was taken prior to starting oncological management. Most of the patients were treated with pyridostigmine. Three patients required plasmapheresis, while azathioprine and mycophenolate mofetil were each given to two patients. One patient received two doses of rituximab. None of the patients had pure red cell aplasia (Table 1).

Table 1. Demographic characteristics and clinical presentation.

Patients	Numbers	Percentage
Age	49 (18-61)	
Sex		
Male	23	54.7%
Female	19	45.2%
Comorbidities		
Diabetes	5	11.9%
Hypertension	9	21.4%
Ischemic Heart Disease	3	7.1%
Presentation		
Cough	10	23.8%
Ptosis	10	23.8%
Dyspnea	9	21.4%
Chest Pain	6	14.2%
Generalised Weakness	5	11.9%
Hoarseness	5	11.9%
Shoulder Pain	1	2.38%
Incidental	1	2.38%
Myasthenia Gravis	13	30.9%

On evaluation, 36 patients had thymoma, while 6 patients had thymic carcinoma (14.3%). Among patients with thymoma, B2 &B3 were common, making up of 33.3% and 21.4% of all 42 patients, respectively. Type A was 16.7% and type B1 was 11.9%. One patient was diagnosed with the spindle cell type of thymoma. Among these patients, 23.8%, 21.4%, 23.8%, and 31.0% had stage I, II, III, and IV, respectively (Table 2). Among patients with stage IV disease, 8 out of 13 had evidence of extra-thoracic metastasis. Five out of six thymic carcinoma cases had stage IV disease. The most common sites of metastasis were pleura and pleural effusion, lung, non-regional lymph node, adrenal, and liver. Patient with type A/B1 presented with stage I/II, while thymic carcinoma was more common in patients with stage IV (Figure 1).

Table 2. Clinical and pathological characteristics of the study population.

Disease status	No. Of patients	Percentage
Type of malignancy		
Thymectomy carcinoma	6	14.3%
Thymoma	36	85.7%
A	7	16.7%
B1	5	11.9%
B2	14	33.3%
B3	9	21.4%
Metaplastic	1	2.4%
Staging		
I	10	23.8%
II	9	21.4%
IIIa	4	9.5%
IIIb	6	14.3%
IVa	6	14.3%
IVb	7	16.7%
Sites of metastasis		
Pleura and pleural effusion	9	21.4%
Lung	4	9.5%
Non regional Lymph nodes	2	4.8%
adrenal	1	2.4%
Liver	1	2.4%

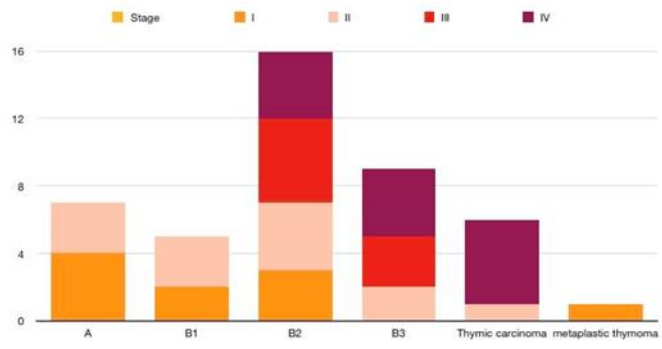

Figure 1. Stage-wise distribution of patients in different histotypes.

Out of the total patients, 23 patients (stage I and II and few stage III were believed resectable upfront and underwent surgery. Most of the patients underwent video-assisted thoracic surgery (VATS). Twelve patients (stage III and IVa) were started on neoadjuvant chemotherapy. Following neoadjuvant chemotherapy, 4 patients achieved a partial response, 3 patients had stable disease, and 5 patients showed disease progression. Out of 12 patients, 5 patients underwent

surgery, but 1 patient had residual disease post-surgery and was treated with definitive RT. Patient with high-risk factors received adjuvant RT. A total of 19 patients received chemotherapy either as neoadjuvant or a palliative setting (Table 3).

Table 3. Summary of treatment history.

Treatment	No of patients	Percentage
Upfront surgery	23	54.7%
Neoadjuvant systemic therapy	12	28.5%
Post neoadjuvant R0 Resection	4	9.5%
Adjuvant radiation	7	16.7%
Unresectable patients	15	35.7%
Definitive RT (residual post surgery)	1	2.4%
Chemotherapy	19	45.2%
Type of chemotherapy		
ADOC	9	21.4%
CAP	6	14.3%
paclitaxel-carboplatin	4	9.5%

The most used chemotherapy regimen in thymoma was combination adriamycin, cisplatin, vincristine, and cyclophosphamide (ADOC) in 9 patients and combination cyclophosphamide, adriamycin and cisplatin (CAP) in 6 patients. Paclitaxel-carboplatin was used in patients with thymic carcinoma (5 patients). Disease control rate was seen in 68.4 % of the patients with an overall response rate (ORR) of 52.6%. Two of the patients achieved a complete response. Response rates with ADOC, CAP and Palitaxel-carboplatin were 55.5%, 50% and 40% (p value-0.31), respectively. Out of 9 patients who progressed, 5 received second line systemic therapy – single agent pemetrexed (3) and two received combination etoposide, ifosfamide, and cisplatin (VIP). All patients who received ADOC and CAP received growth factors. Neutropenia was seen in 42.1% of the patients, with Grade ¾ seen in 15.7% of the patients (3 out of 19). However, it did not lead to discontinuation of systemic therapy. Adriamycin dose was reduced in 2 patients. Six patients had peripheral neuropathy (31.5%), with grade 3 peripheral neuropathy seen in one patient (5.2%). Grade 2 Diarrhoea was seen in 3 patients (15.7%). Nausea/vomiting was seen in 6 patients (31.5%). One patient developed grade 2 hyponatremia. There was no treatment-related death seen with systemic therapy (Table 4).

Table 4. Toxicity profile.

Toxicity	All grade	Grade 3/4
Overall toxicity	68.4%	26.3%
Hematological toxicity		
Neutropenia	42.1%	15.7%
Febrile neutropenia	10.5%	0%
Anemia	52.6%	10.5%
Thrombocytopenia	15.7%	0%
Non hematological toxicity		
Nausea /vomiting	31.5%	0%
Diarrhoea	15.7%	5.26%
Peripheral neuropathy	31.5%	5.2%
Hyponatremia	5.26%	0%
Mucositis	21.0%	5.26%
Increased creatinine	10.5%	0%

After a median follow of 22 months (2-39 months), in patients who underwent surgery, recurrences were very less (15.7%). Patient with unresectable disease (15) progression was seen in 9 patients with a 2-year progression-free survival (PFS) rate of 58%. 2-yr PFS in patients with stage III was 72% while in stage IV it was 50%. After a median follow up 22 months (2-39 months), 6 patients died with a 2-year survival rate of 84%. 2-year survival rates in stage I, II, III and IV were 100%, 89%, 79% and 71% respectively (p value 0.03). Overall Survival (OS) rates were lower in thymic carcinoma and patients with Extra-thoracic disease (2-year OS 50% and 50% respectively) (Figures 2 and 3).

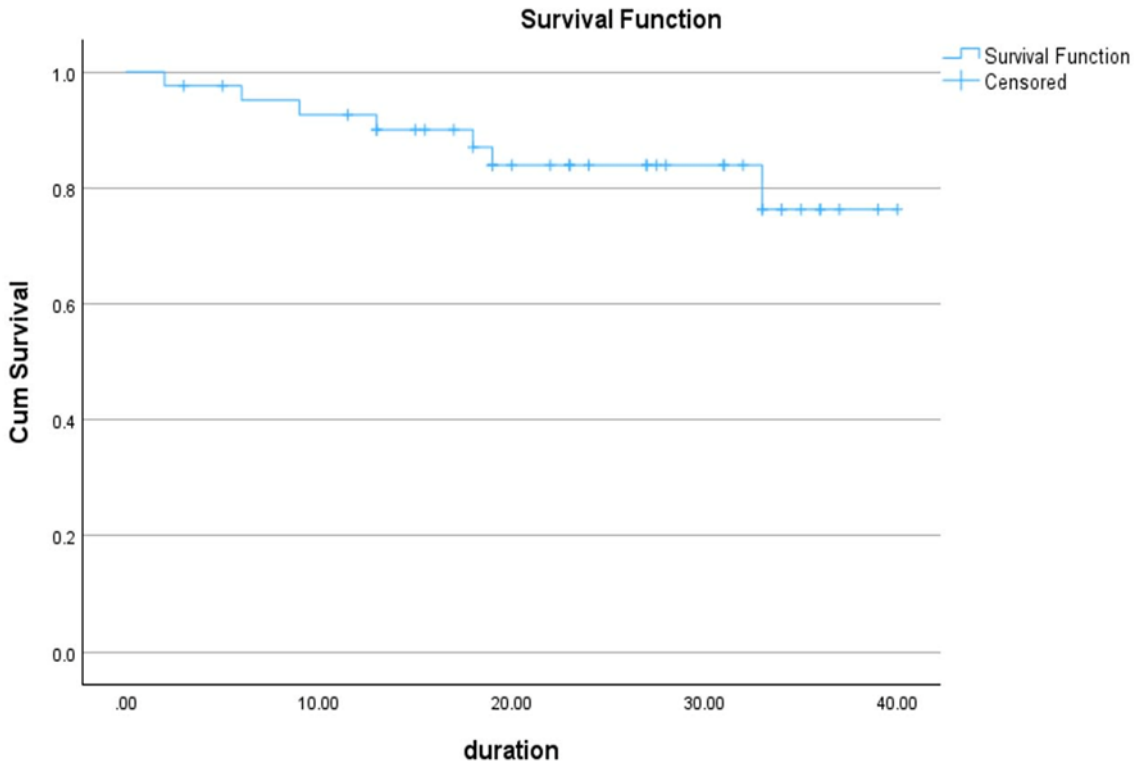

Figure 2. Survival curve showing overall survival (x-axis – duration in months).

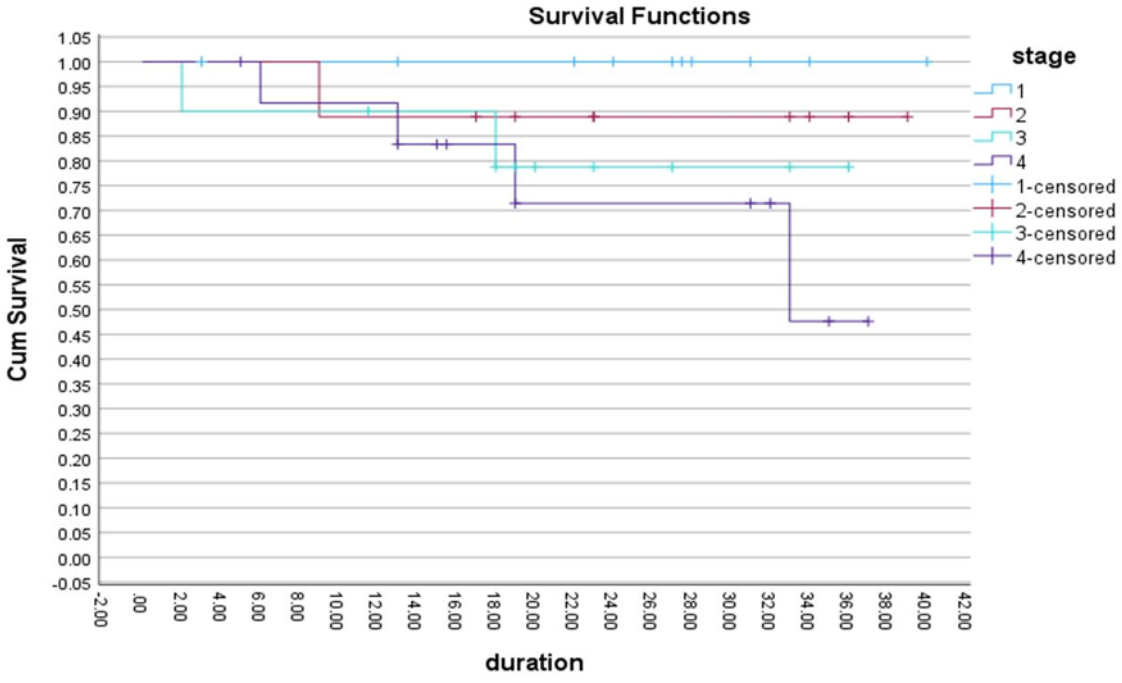

Figure 3. Survival curve showing stage-wise overall survival (x-axis- duration in months).

Discussion

Thymic malignancies have been classified based on histomorphological and immunohistochemical features into A, B1, B2, B3, metaplastic, micro-nodular thymoma with lymphoid storms (2). Thymic carcinomas have been subcategorised into squamous cell carcinoma, adenocarcinoma, adenosquamous carcinoma and not otherwise specified (NOS) type (3). Thymoma does better as compared to thymic carcinomas, also many studies have shown a prognostic hierarchy in thymoma with type A, B1 had favourable outcomes as compared to type B2, B3 (7-9). Based on worldwide database, type B2 was the most common histotype, with A subtype more frequent in the older age group and lower staged patients (10). Studies have shown that most of the thymic malignancy patients present with Masoka stage I and II, however, a substantial proportion of patients may present with advanced disease due to slow and late presentation, however many studies concluded the opposite (11,12) .

In our study, type B2 and stage IV disease was slightly higher compared to other histotypes and stages. None of the patients in stage III and stage IV were either A or B1 subtype, while most of the thymic carcinomas were stage IV. However, age-wise subtype distribution was more homogeneous. Prognosis seemed better in patients with earlier stages as compared to advanced stages. Also, patients with subtype A\B1 did better as compared to B2\B3 and thymic carcinoma. This may be due to the presentation of type A/B1 in earlier stages.

Paraneoplastic syndrome (PNS) and autoimmune disease (AID) are known entities in thymoma. Nearly one-third of patients may have PNS, most commonly myasthenia gravis (13). PNS is seen more commonly with thymoma as compared to thymic carcinoma. The prognostic value of PNS is controversial, with studies suggesting positive prognostic value in univariate but not in multivariate analysis (13,14). Whereas other studies suggest no role or only if total resolution of PNS after treatment (15). In our study, myasthenia gravis was present in 30.9% of the patients. None of the patients had pure red cell aplasia or autoimmune disease. However, no prognostic correlation was seen with the presence of PNS.

Surgical management is the main modality of treatment in resectable patients (5). In patients with unresectable disease, neoadjuvant chemotherapy or definitive chemoradiotherapy are the primary treatment options (16). In contrast, for those with extensive disease, palliative chemotherapy remains the mainstay of treatment. Immunotherapy in thymoma is concerning due to the risk of immune-related events in patients who are already prone for PNS and AID, while in thymic carcinomas, immunotherapy has been studied in few phase II trial (17,18). Other drugs with promising benefits are anti-VEGF and mTOR inhibitors (19-23). In our study, 54.7% patients presented with upfront resectable disease, while one fourth of the patients had potentially resectable disease and received neoadjuvant chemotherapy. Chemotherapy was administered to 45% of patients, primarily in the neoadjuvant setting. Combination chemotherapy regimens were used, however there was no statistically significant difference noted in overall response rates between regimens. In this study three or four drug regimens were used in thymoma while 2 drug regimen was used in thymic carcinoma. Pemetrexate and VIP were used in the second line. None of the patient received immunotherapy or targeted therapy.

The Masaoka staging system has been identified as one of the most important prognostic indicators in thymic malignancies. Five-year survival rates were found to be 80% for stage I/II, 63% for stage III 42% for stage IVa, and 30% for stage IVb, respectively (24). In our study, 2-yr overall survival rate was 84%, with survival rates of 100%, 89%, 79% and 71% in stages I, II, III and IV, respectively. Survival differences between stages were statistically significant. An earlier retrospective study from this same institute resulted in 2-year OS of 82.5% in stage III and 60% in stage IV (25).

Toxicity related to systemic therapy was seen in 68.4% of the patients, with grade ¾ toxicity in 26.3%. The most common toxicity is anemia, neutropenia and gastrointestinal. Febrile neutropenia was seen in 15.7% of patients; however, no cases required discontinuation of treatment. Importantly, there were no systemic therapy-related deaths reported in the study.

Despite its strength, several limitations affect the interpretation of this study's findings. An important

limitation is single-centric retrospective study with short-duration follow-up. A prospective study with a comparison of two drug combinations to three drug or four combinations, like ADOC and CAP, might help in better choosing the chemotherapy.

Conclusion

This study shows the importance of modified Masoka staging and WHO classification through retrospective analysis. Given its manageable toxicity profile and favourable response rates, three-drug combination chemotherapy may be considered for patients with potentially resectable or unresectable thymoma.

Author contribution

LKN and **SB** conceptualization and project administrator. **YP** and **LKN** methodology and supervision. **YP** data curation and investigation, resources and software. **YP**, **RAH**, **LKR**, **SCS** and **GVG** formal analysis. **LKN**, **YP**, **GS**, **DRS**, **KA** manuscript writing and figures.

Ethics approval

This study was conducted under the Declaration of Helsinki as a retrospective observational study conducted for clinical purposes and to share real-world experience.

Conflicts of interest

There are no conflicts of interest.

Funding

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References

1. Le Péchoux C, Mahé M, Bretel JJ, Roberti E, Ruffié P. Tumeurs épithéliales thymiques. Cancer Radiother. 2005;9(6-7):351-357.

2. Soomro IN. Pathology of thymoma—where are we today? J Thorac Dis. 2020;12(12):7545-7552.

3. Marx A, Chan JKC, Chalabreysse L, et al. The 2021 WHO classification of tumors of the thymus and mediastinum: What is new in thymic epithelial, germ cell, and mesenchymal tumors? J Thorac Oncol. 2022;17(2):200-213.

4. Marx A, Detterbeck F, Marom EM. Tumors of the thymus. In: WHO Classification of Tumours Editorial Board. WHO Classification of Tumours. Thoracic Tumours. 5th ed. Vol. 7. Geneva: World Health Organization; 2021.

5. Yuan HZ, Zhao L, Tao YL, Ding JY, Chen G. Prognostic correlation between tumor volume and complete resection of thymoma at different Masaoka-Koga stages. Discov Med. 2023;35(175):178-184.

6. Roden AC, Yi ES, Jenkins SM, et al. Modified Masaoka stage and size are independent prognostic predictors in thymoma, and modified Masaoka stage is superior to histopathologic classifications. J Thorac Oncol. 2015;10(4):691-700.

7. Alothaimeen HS, Memon MA. Treatment outcome and prognostic factors of malignant thymoma—a single institution experience. Asian Pac J Cancer Prev. 2020;21(3):653-661.

8. Zhao M, Yin J, Yang X, et al. Nomogram to predict thymoma prognosis: a population-based study of 1312 cases. Thorac Cancer. 2019;10(5):1167-1175.

9. Jiang YG, Ma MY, Wu JJ, et al. Prognostic factors in patients with thymoma who underwent surgery. World J Surg Oncol. 2023;21(1):203.

10. Huang J, Ahmad U, Antonicelli A, et al. Development of the International Thymic Malignancy Interest Group international database: an unprecedented resource for the study of a rare group of tumors. J Thorac Oncol. 2014;9(10):1573-1578.

11. Dharanikota A, Arjunan R, Chowdappa R, Althaf S. Survival outcomes in patients with thymoma after thymectomy in an Indian scenario. Indian J Surg Oncol. 2020;11(4):785-790.

12. Litvak AM, Woo K, Hayes S, et al. Clinical characteristics, and outcomes for patients with thymic carcinoma: evaluation of Masaoka staging. J Thorac Oncol. 2014;9(12):1810-1815.

13. Padda SK, Yao X, Antonicelli A, et al. Paraneoplastic syndromes and thymic malignancies: an examination of the International Thymic Malignancy Interest Group retrospective database. J Thorac Oncol. 2018;13(3):436-446.

14. Zhao J, Bhatnagar V, Ding L, et al. A systematic review of paraneoplastic syndromes associated with thymoma: treatment modalities, recurrence, and outcomes in resected cases. J Thorac Cardiovasc Surg. 2020;160(1):306-314.e14.

15. Ruffini E, Detterbeck F, Van Raemdonck D, et al. Tumours of the thymus: a cohort study of prognostic factors from the European Society of Thoracic Surgeons database. Eur J Cardiothorac Surg. 2014;46(3):361-368.

16. Hamaji M, Ali SO, Burt BM. A meta-analysis of induction therapy for advanced thymic epithelial tumors. Ann Thorac Surg. 2015;99(5):1848-1856.

17. Giaccone G, Kim C, Thompson J, et al. Pembrolizumab in patients with thymic carcinoma: a single-arm, single-centre, phase 2 study. Lancet Oncol. 2018;19(3):347-355.

18. Conforti F, Zucali PA, Pala L, et al. Avelumab plus axitinib in unresectable or metastatic type B3 thymomas and thymic carcinomas (CAVEATT): a single-arm, multicentre, phase 2 trial. Lancet Oncol. 2022;23(9):1287-1296.

19. Tsao AS, Hsieh MH, Koczywas M, et al. S1701, a randomized phase 2 trial of carboplatin-paclitaxel with and without ramucirumab in patients with locally advanced, recurrent, or metastatic thymic carcinoma. JTO Clin Res Rep. 2024;5:100738.

20. Sato J, Satouchi M, Itoh S, et al. Lenvatinib in patients with advanced or metastatic thymic carcinoma (REMORA): a multicentre, phase 2 trial. Lancet Oncol. 2020;21(6):843-850.

21. Thomas A, Rajan A, Berman A, et al. Sunitinib in patients with chemotherapy-refractory thymoma and thymic carcinoma: an open-label phase 2 trial. Lancet Oncol. 2015;16(2):177-186.

22. Proto C, Manglaviti S, Lo Russo G, et al. STYLE (NCT03449173): a phase 2 trial of sunitinib in patients with type B3 thymoma or thymic carcinoma in second and further lines. J Thorac Oncol. 2023;18(9):1070-1081.

23. Hellyer JA, Ouseph MM, Padda SK, Wakelee HA. Everolimus in the treatment of metastatic thymic epithelial tumors. Lung Cancer. 2020;149:97-102.

24. Ahmad U, Yao X, Detterbeck F, et al. Thymic carcinoma outcomes and prognosis: results of an international analysis. J Thorac Cardiovasc Surg. 2015;149(1):95-101.e12.

25. Tirumala V, Babu S, Govind BK, Lokanatha D, Babu KG, Jacob LA. Treatment experience of thymoma and thymic carcinoma in a tertiary cancer institute in India. Ann Oncol. 2018;29(suppl_9):ix164.