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Thymic Neoplasms

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Background

Thymic neoplasms represent the most common tumours of the anterior mediastinum in adults and include both thymomas and thymic carcinomas. Thymomas account for approximately 20 percent of mediastinal tumours, with incidence rates of 0.18 per 100,000 for men and 0.10 per 100,000 for women.[1] Thymic carcinomas are rare tumours, accounting for less than one percent of mediastinal tumours; these tumours are more invasive than thymomas, and often have a higher rate of relapse and a poorer prognosis.[2-4] Given their low incidence, thymomas and thymic carcinomas have historically been grouped together in clinical studies. The existing literature on treatments for thymic neoplasms consists of relatively small studies of multimodality treatments, mostly in the form of retrospective case series reports. No randomized controlled study has been reported to date on any treatment modality in this disease. Total resection of the tumour has been repeatedly reported to be the most important factor affecting the rate of survival.[5] In partially resected or unresectable tumours, there is a growing body of literature suggesting that neoadjuvant and adjuvant radiotherapy and chemotherapy combinations provide varying degrees of benefit to patients with thymic neoplasms.

Guideline Questions

1. What are the recommended treatments for patients with a stage I or IIA thymic neoplasm?
2. What are the recommended treatments for patients with a resectable stage IIB or III thymic neoplasm?
3. What are the recommended treatments for patients with a stage IIB or III thymic neoplasm that is initially unresectable?
4. What are the recommended treatments for patients with an advanced-stage thymic neoplasm?

Search Strategy

The original systematic search strategy covered PubMed (2009–2012) and EMBASE (2009–2012) and was subsequently updated in two phases. The first update covered PubMed (2010–2022) and EMBASE (2010–2022), followed by a final search in MEDLINE (2020–2025) on September 4, 2025. Filters were applied to select clinical trials and cohort studies. Articles were excluded if they featured non-English abstracts, were not treatment-focused, or lacked reported response rates or survival data. Oncology-based health organizations and guideline developers were consulted, and additional searches were conducted in the Trip and GIN databases, as well as Google Scholar, to identify relevant guidelines. The complete search strategy, including search terms and the PRISMA flow diagram, is available upon request.

This updated literature review did not identify any new, practice-changing evidence warranting a major revision of the recommendations from the 2012 version.

Target Population

The recommendations in this guideline apply to adult patients over the age of 18 years diagnosed with thymoma or thymic carcinoma.

Recommendations

Diagnosis & Staging

1. The initial evaluation and workup of all patients with a suspected thymic neoplasm includes a chest CT scan, CBC with platelets, pulmonary function tests (PFT), and a standard cardiac workup. MRI or PET may be considered at the discretion of the treatment team. Serum α-fetoprotein and β-HCG should be measured when clinically appropriate to rule out germ cell neoplasms. Needle biopsy should be avoided unless recommended by a thoracic surgeon.[6]
2. All patients suspected of having thymoma should be evaluated for signs and symptoms of myasthenia gravis, pure red blood cell aplasia, hypogammaglobinaemia and other paraneoplastic syndromes. Where feasible paraneoplastic syndromes/symptoms should be treated prior to surgery.
3. Thymic neoplasms should be histopathologically described according to the World Health Organisation (WHO) classification system;[7] and clinical staging should be done using the Masaoka-Koga (MK) system (Appendix A).[8]
4. All cases of thymic neoplasms should be ideally reviewed at multidisciplinary rounds that include thoracic surgeons, radiation and medical oncologists.

Treatment

5. Whenever possible, patients should be considered for participation in ongoing clinical trials.

Early-Stage Disease (MK Stages I – IIA)

5. Complete surgical resection is the standard of care for patients with an early-stage thymic neoplasm.

Localized Disease (MK Stages IIB – III)

6. For patients with a resectable localized thymic neoplasm, complete surgical resection is the standard of care. Postoperative radiotherapy should be considered for patients with a resected localized thymic neoplasm.
7. For patients with an initially unresectable localized thymic neoplasm, induction chemotherapy or chemotherapy plus radiation, followed by reassessment and consideration for surgery, is recommended. If the response is sufficient to permit surgery, surgical resection followed by adjuvant radiotherapy, if not administered pre-operatively, is recommended.

8. For patients with an unresectable localized thymic neoplasm, or for those who are medically ineligible for surgery, chemotherapy alone or in combination with radiotherapy is recommended.

Advanced Disease (MK Stages IVA – IVB)

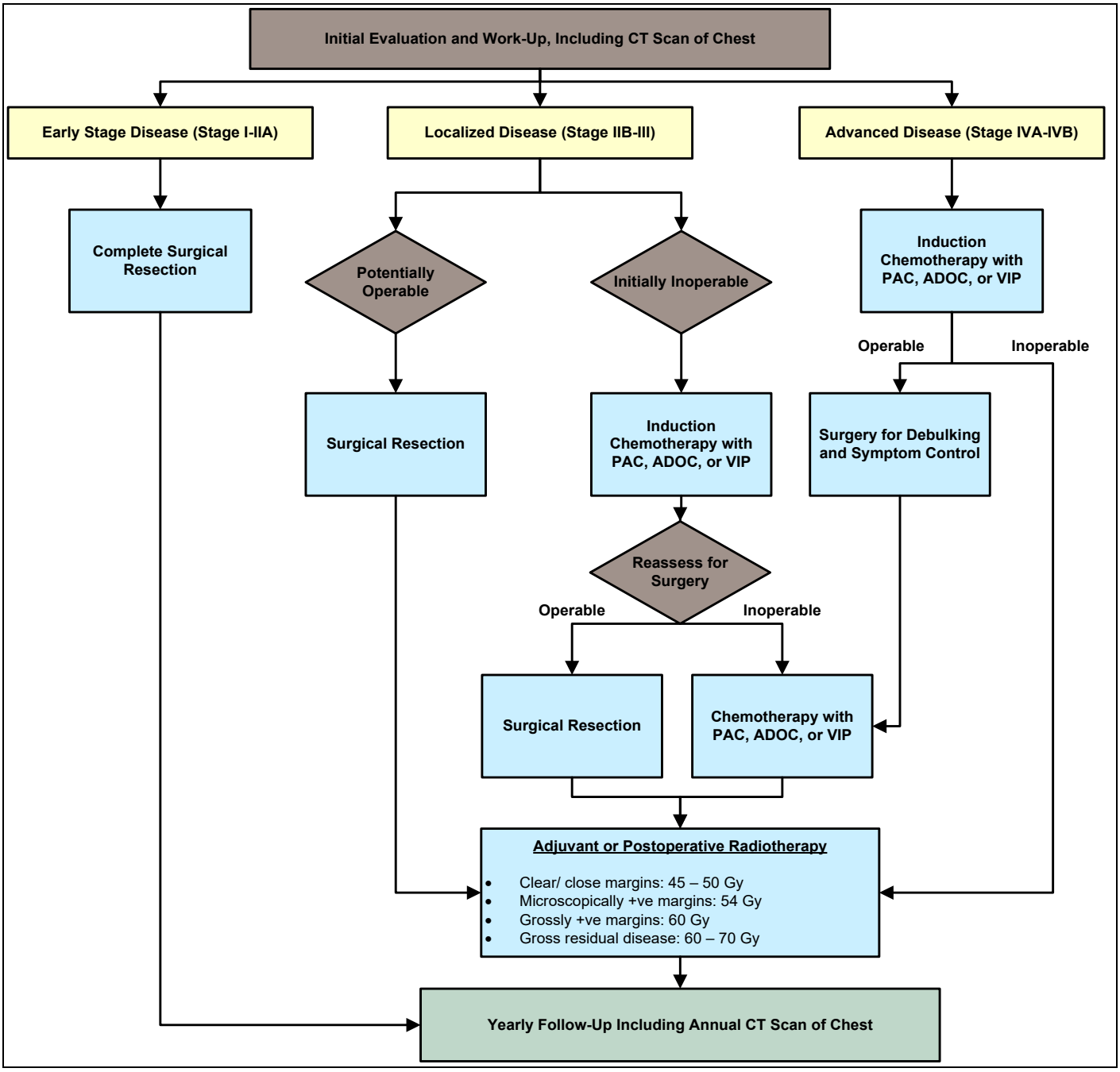
9. For patients with an advanced thymic neoplasm, multimodality therapy should consist of induction chemotherapy followed by surgery for debulking or symptom control, where appropriate. Postoperative management should include chemotherapy and/or radiotherapy for local control and palliation.

Follow Up

10. Due to the high risk of a secondary malignancy and/or a late recurrence, prolonged follow-up is recommended for patients who achieve a complete or partial response with either surgery or a multimodality approach. Surveillance should include at a minimum an annual chest CT scan. For thymic carcinoma specifically, follow-up should include a CT scan of the chest/abdomen every 3 months for the first year and then every 6 months in year two and then at least yearly after year two.

Treatment Algorithm

Figure 1. Treatment Options Patients with Thymic Neoplasms (Masaoka Staging System)



Appendix A. Staging and Classification Systems

Table 1. WHO Classification System for Thymomas, Version 2021[7]

Type	Obligatory Criteria	Optional Criteria
Type A	Occurrence of bland, spindle shaped epithelial cells; paucity or absence of immature T cells	Polygonal epithelial cells CD20+ Epithelial cells
Atypical type A variant	Criteria of type A, in addition comedo-type tumor necrosis; increased mitotic count, nuclear crowding	Polygonal epithelial cells CD20+ Epithelial cells
Type AB	Occurrence of bland, spindle shaped epithelial cells; abundance of immature T cells	Polygonal epithelial cells CD20+ Epithelial cells
Type B1	Thymus-like architecture and cytology; abundance of immature T cells, areas of medullary differentiation; paucity of polygonal or dendritic epithelia cells without clustering	Hassall's corpuscles; perivascular spaces
Type B2	Increased numbers of single or clustered polygonal or dendritic epithelial cells intermingled with abundant immature T cells	Medullary islands; Hassall's corpuscles; perivascular spaces
Type B3	Sheets of polygonal slightly to moderately atypical epithelial cells; absent or rare intercellular bridges; paucity or absence of intermingled T cells	Hassall's corpuscles; perivascular spaces
Micronodular thymoma with lymphoid stroma	Nodules of bland spindle or oval epithelial cells surrounded by an epithelial cell-free lymphoid strome	Lymphoid follicles; monoclonal B cells and/or plasma cells
Metaplastic thymoma	Biphasic tumor composed of solid areas of epithelial cells in a background of bland-looking spindle cells; absence of immature T cells	Pleomorphism of epithelial cells; actin, keratin, or EMA-positive spindle cells
Rare others[i]		

[i] *Includes thymic carcinomas, previously classified as Type C Thymoma*

Table 2. Modified Masaoka-Koga staging system for thymic neoplasms[8, 9]

Stage	Diagnostic Criteria
Stage I	Grossly and microscopically completely encapsulated tumor
Stage IIA	Microscopic transcapsular invasion
Stage IIB	Macroscopic invasion into thymic or surrounding fatty tissue, or grossly adherent to but not breaking through mediastinal pleura or pericardium
Stage IIIA	Macroscopic invasion into neighboring organ (i.e., pericardium, great vessel, or lung) without invasion of great vessels
Stage IIIB	Macroscopic invasion into neighboring organ (i.e., pericardium, great vessel, or lung) with invasion of great vessels
Stage IVA	Pleural or pericardial metastases
Stage IVB	Lymphogenous or hematogenous metastasis

Table 3. TNM 8th Edition Staging System for Thymic Tumours[10]

Stage	Diagnostic Criteria		
T1a	Encapsulated or unencapsulated, with or without extension into mediastinal fat		
T1b	Extension into mediastinal pleura		
T2	Pericardium		
T3	Lung, brachiocephalic vein, superior vena cava, chest wall, phrenic nerve, hilar (extrapericardial) pulmonary vessels		
T4	Aorta, arch vessels, main pulmonary artery, myocardium, trachea, or esophagus		
N0	No nodal involvement		
N1	Anterior (perithymic) nodes		
N2	Deep intrathoracic or cervical nodes		
M0	No metastatic pleural, pericardial, or distant sites		
M1a	Separate pleural or pericardial nodule(s)		
M1b	Pulmonary intraparenchymal nodule or distant organ metastasis		
Prognostic Group			
Stage	**When T is…**	**And N is…**	**And M is…**
I	T1a	N0	M0
I	T1b	N0	M0
II	T2	N0	M0
IIIa	T3	N0	M0
IIIb	T4	N0	M0
IVa	Any T	N1	M0
IVa	Any T	N0-1	M1a
IVb	Any T	N2	M0-1a
IVb	Any T	Any N	M1b

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Development and Revision History

This guideline was reviewed and endorsed by the Alberta Provincial Lung Tumour Team. Members include surgical oncologists, radiation oncologists, medical oncologists, nurses, pathologists, and pharmacists. Evidence was selected and reviewed by a working group comprised of members from the Alberta Provincial Lung Tumour Team, external participants identified by the Working Group Lead, and a methodologist from the Guideline Resource Unit. A detailed description of the methodology followed during the guideline development process can be found in the Guideline Resource Unit Handbook.

This guideline was originally developed in 2010 and updated in 2012. In 2026, available evidence was reviewed and no major changes made.

Maintenance

A formal review of the guideline will be conducted in 2030. If critical new evidence is brought forward before that time, however, the guideline working group members will revise and update the document accordingly.

Abbreviations

ADOC, cisplatin + doxorubicin + vincristine + cyclophosphamide; CBC, complete blood count; CT, computed tomography; GIN, Guidelines International Network; Gy, Gray; HCG, human chorionic gonadotropin; MK, Masaoka-Koga; MRI, magnetic resonance imaging; PAC, cisplatin + doxorubicin + cyclophosphamide; PET, positron emission tomography; PFT, pulmonary function test; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses; TNM, tumour node metastasis; VIP, etoposide + ifosfamide + cisplatin; WHO, World Health Organization

Disclaimer

The recommendations contained in this guideline are a consensus of the Alberta Provincial Lung Tumour Team and are a synthesis of currently accepted approaches to management, derived from a review of relevant scientific literature. Clinicians applying these guidelines should, in consultation with the patient, use independent medical judgment in the context of individual clinical circumstances to direct care.

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Conflict of Interest Statements

Dr. Doreen Ezeife, medical oncologist, reports receiving honoraria from Pfizer, Bristol Myers Squibb, Novartis, AstraZeneca, and Roche; an educational grant from Pfizer; and is a member of the advisory board for Pfizer, Bristol Myers Squibb, Novartis, AstraZeneca, and Roche
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