



2025

KARNATAKA RADIOLOGY EDUCATION PROGRAM



- 31-year-old female; progressive breathlessness × 1 week.

KREP ONCOIMAGING



Findings:

- ***Location:*** A lobulated soft-tissue mass centered in the prevascular space, abutting the anterior pericardium.
- ***Morphology / density:*** Heterogeneous contrast enhancement with internal punctate and coarse calcific foci. No gross intratumoural fat identified.
- ***Local invasion:*** The inferior margin demonstrates loss of fat plane with the pericardium and areas of soft-tissue continuity suggesting direct invasion of the pericardium. Associated moderate pericardial effusion is present. No obvious myocardial invasion was noted.
- ***Vascular involvement:*** No definite encasement of the great vessels identified on the current series. No intraluminal extension visualized.
- ***Thorax:*** No discrete pleural nodules or gross pulmonary metastases were identified on lung windows. No significant mediastinal or hilar lymphadenopathy.
- ***Other:*** Lungs clear of acute consolidation. No osseous destructive lesion were identified.

Imaging features and location consistent with a thymic epithelial neoplasm with imaging evidence of invasiveness — Differentials include Invasive thymoma and thymic carcinoma.

Pericardial invasion with associated pericardial effusion — on TNM staging this corresponds to T2 (invasion of pericardium) in current TNM proposals and is Masaoka-Koga stage III equivalent in classical systems; this has implications for resectability and need for multimodality therapy.

Recommendations:

- Discuss at MDT / thoracic oncology multidisciplinary meeting.
- Image-guided core (Tru-cut) biopsy from the mediastinal mass for histologic subtype and immunohistochemistry (required to distinguish thymoma vs thymic carcinoma).
- Avoid blind pericardial tap as first diagnostic step unless hemodynamically necessary.
- Cardiac MRI (with cine sequences and tissue characterization) to evaluate for myocardial or intracavitary extension if surgery is contemplated.
- FDG-PET/CT may help if thymic carcinoma suspected or to stage for extrathoracic disease.
- If biopsy confirms thymoma, stage using Masaoka-Koga and TNM systems; plan for surgery if resectable, possibly preceded or followed by chemo/radiotherapy depending on stage and histology.

MEDIASTINAL THYMOMA

Epidemiology & clinical context

Thymomas are the commonest primary neoplasm of the prevascular (anterior) mediastinum in adults, with peak incidence in middle-age; they are uncommon overall (incidence \approx 1–3 per million).

They have important clinicopathologic associations (especially myasthenia gravis and other paraneoplastic autoimmune syndromes) that influence management and perioperative risk.

Imaging modality strategy — role of CT, MRI and PET

- CT is the first-line modality: it defines lesion location (ITMIG compartments), morphology, calcification, cystic/necrotic change, fat and relationship to mediastinal structures - essential for operative planning.
- MRI adds value when CT is equivocal for local invasion (pericardium/myocardium/phrenic nerve) because cine and tissue-contrast sequences better define soft-tissue planes and functional relationships.
- FDG-PET/CT is not routinely required for all thymomas but may help suggest more aggressive histology (higher SUV), detect nodal/distant disease if carcinoma suspected, or in restaging.
- Use of modalities should be individualized via MDT.

**CT phenotype & imaging features that predict higher risk /
invasiveness**

On CT, predictors of invasive/high-risk behaviour include: heterogeneous enhancement, necrosis/cystic change, lobulated/irregular margins, larger size, loss of fat planes or frank invasion into adjacent structures, vascular contact/encasement and presence of scattered calcification.

However, CT is imperfect - microscopic capsular invasion can be occult and imaging may both overcall and undercall invasion.

Imaging features should be interpreted together with clinical and histologic information.

Calcification — significance and correlation

Calcification may be seen in thymomas (punctate or coarse). Multiple studies show scattered calcification correlates with larger size and higher likelihood of invasiveness in some cohorts;

However, calcification is not pathognomonic and must be correlated with other CT features (fat suggesting teratoma, complex calcification/fat for germ-cell tumours).

In short - calcification is a helpful imaging clue but not definitive for histotype.

Pathology: WHO types, how imaging correlates (and limitations)

Thymic epithelial tumours are classified by WHO into types A, AB, B1, B2, B3 and thymic carcinoma (and NETT separately).

Imaging correlates imperfectly: low-risk types (A/AB/B1) more often appear well-circumscribed and homogeneous, while B2–B3 and thymic carcinoma more frequently show irregular contours, necrosis, heterogeneous enhancement, and local/distant spread.

Imaging cannot reliably substitute for tissue diagnosis — histologic subtype and grading require adequate core biopsy or surgical specimen.

Staging: Practical use of Masaoka-Koga vs TNM (ITMIG/IASLC → AJCC)

Historically Masaoka-Koga staging (capsular invasion, adjacent organ invasion, pleural/pericardial dissemination, distant metastasis) guided prognosis/therapy.

Contemporary practice increasingly uses the TNM system developed by ITMIG/IASLC and adopted in AJCC (8th/9th ed. evolution): e.g., pericardial invasion = T2; lung/great vessel/myocardial invasion = higher T categories; pleural implants = M1a, distant metastases = M1b.

Both frameworks are used clinically; when presenting cases explicitly map imaging findings (e.g., pericardial invasion → Masaoka stage III ≈ TNM T2/T3 depending on extent).

Staging directly influences resectability, need for neoadjuvant therapy and adjuvant recommendations.

Biopsy, resectability assessment & surgical implications

Percutaneous CT-guided core biopsy is the usual tissue route for anterior mediastinal masses when histologic confirmation will change management (avoid blind cytology alone).

Choose biopsy tract carefully to permit en bloc resection if resectable.

On imaging, Document: extent of pericardial invasion, phrenic nerve proximity, degree of vessel encasement or luminal involvement, pleural/diaphragmatic implants and relationship to lungs/airways.

Pericardial invasion often necessitates partial pericardiectomy at resection; great-vessel or myocardial involvement may convert a planned resection to complex cardiothoracic operation or deem tumour unresectable - MDT and cardiothoracic surgical input early are essential.

Oncologic management implications & prognosis

Resectability remains the single most important prognostic factor: complete R0 resection for thymoma offers the best survival outcomes.

For borderline or locally advanced disease (e.g., pericardial or pleural/mediastinal invasion), neoadjuvant chemotherapy may be used to downstage to allow R0 resection.

Adjuvant radiotherapy is considered for incompletely resected tumours or higher stage (many guidelines/ESMO/NCCN recommend adjuvant RT for stage II–III or close/positive margins).

Thymic carcinoma carries a worse prognosis and more frequently requires multimodality therapy including systemic chemotherapy and radiotherapy.

Surveillance strategy post-therapy commonly includes chest CT at intervals guided by stage and institutional protocols.

Early MDT coordination (thoracic surgery, medical/radiation oncology, radiology, pathology) is mandatory for optimal outcomes.

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