Diagnosis and Management of Mediastinal disease

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Contents

- Anatomy
- Non invasive and invasive Investigations
- Mediastinal infection
- Primary mediastinal tumors and syndromes associated with mediastinal lesions
- Other mediastinal lesions

Anatomy

- Traditional four-compartment subdivision
  - Sup / Ant / Middle / Post mediastinum

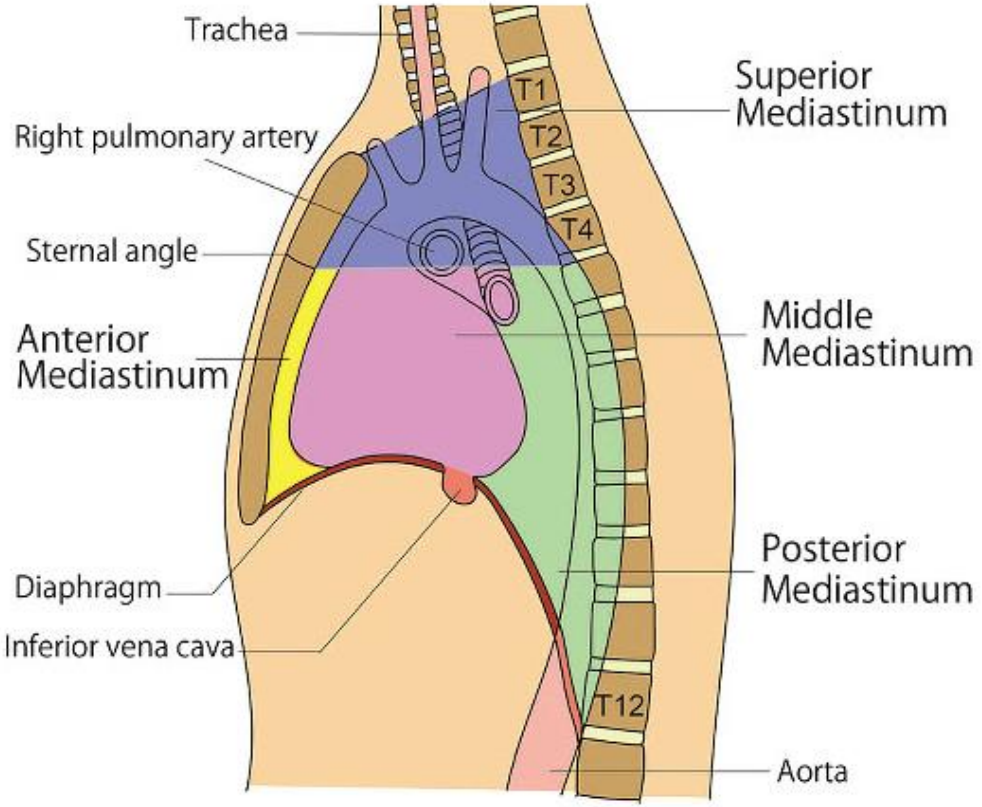


FIGURE 147.1 Schematic illustration of the traditional four-compartment subdivision of the mediastinum.

Anatomy

- Traditional three-compartment subdivision
  - Ant / Middle / Post mediastinum

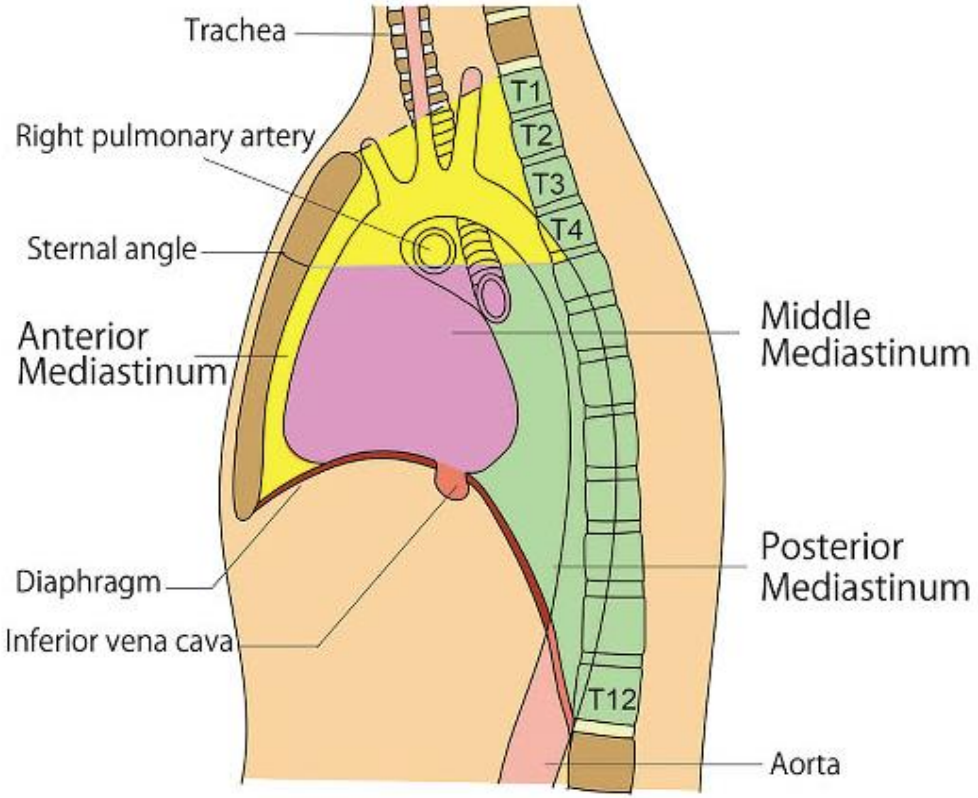


FIGURE 147.2 An example of the schematic illustration of the traditional three-compartment subdivision of the mediastinum.

Anatomy

- Felson's classification
  - Ant / Middle / Post mediastinum

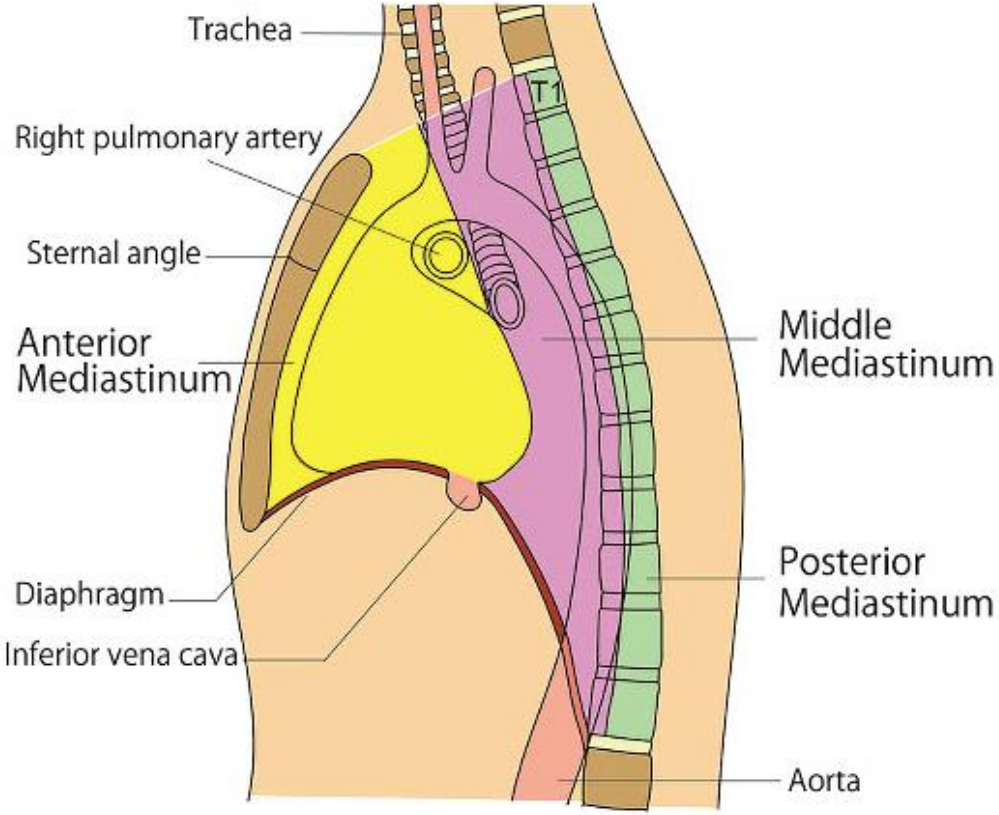


FIGURE 147.3 Schematic illustration of Felson's classification of the mediastinum compartment. Felson's classification is based on the chest roentgenology, therefore the boundary line could be vague.

Anatomy

- Shields' mediastinal subdivision.
  - Ant / Middle / Post mediastinum

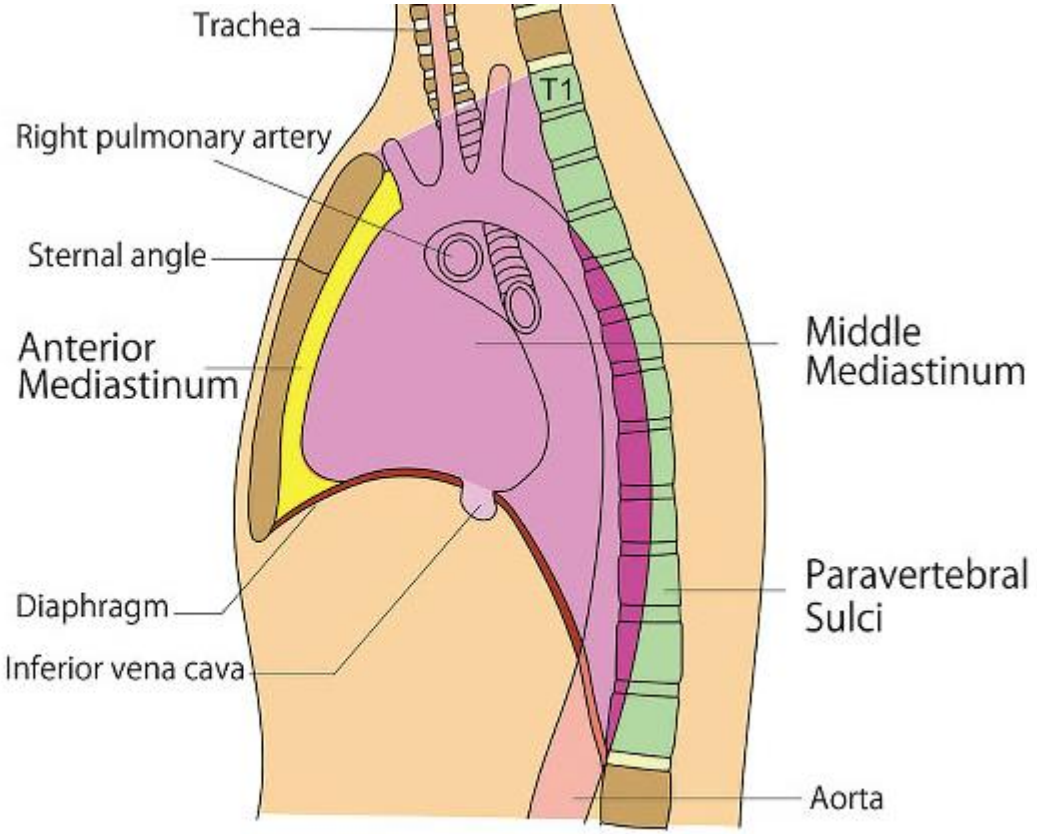
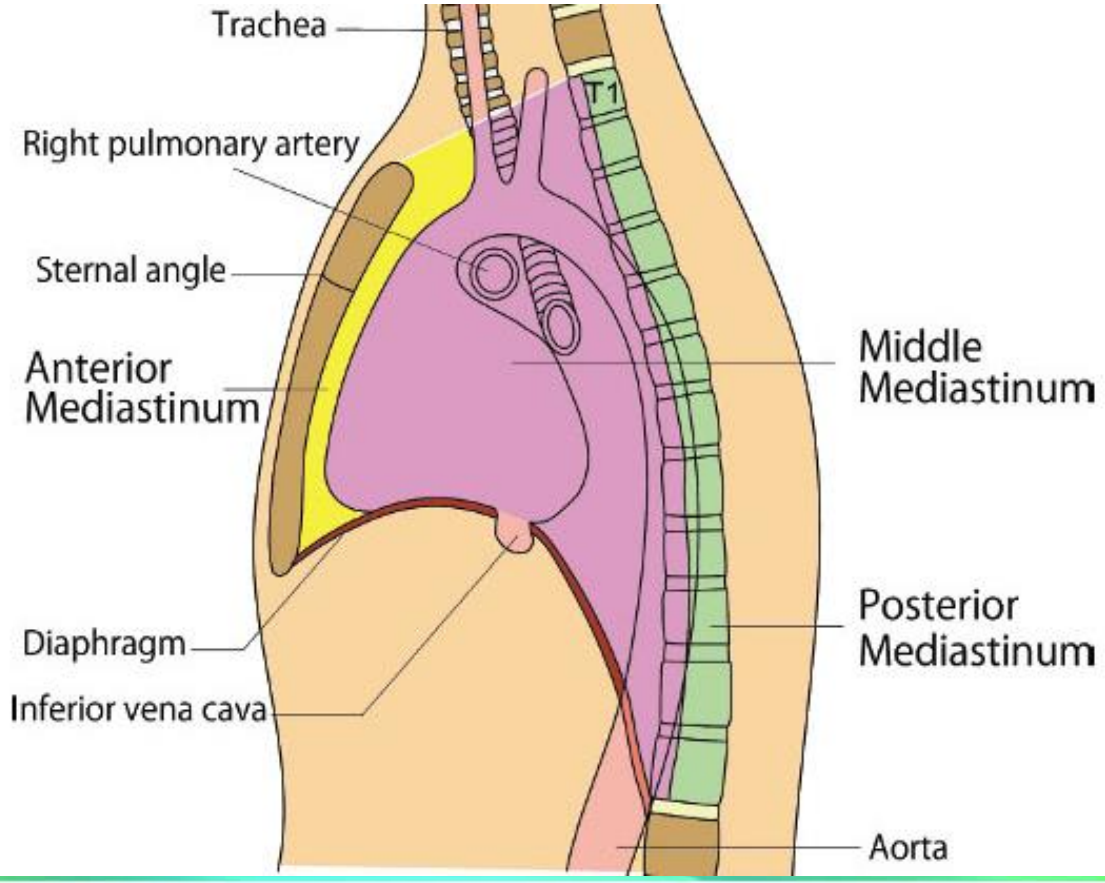


FIGURE 147.4 Schematic illustration of the Shields' mediastinal subdivision.

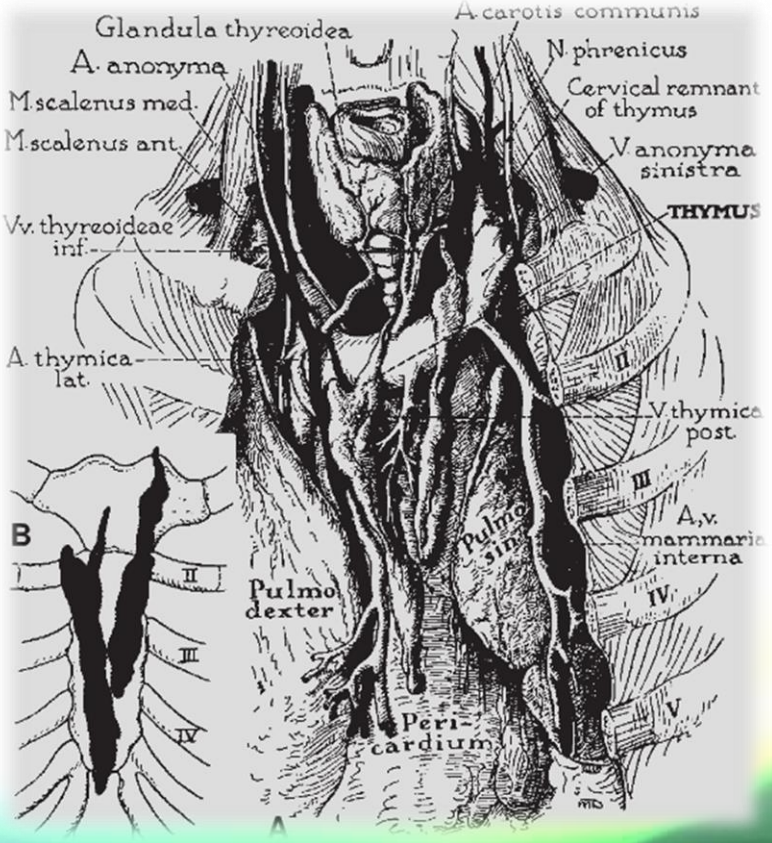
Anatomy

- International Thymic Malignancy Interest Group(ITMIG) Classification



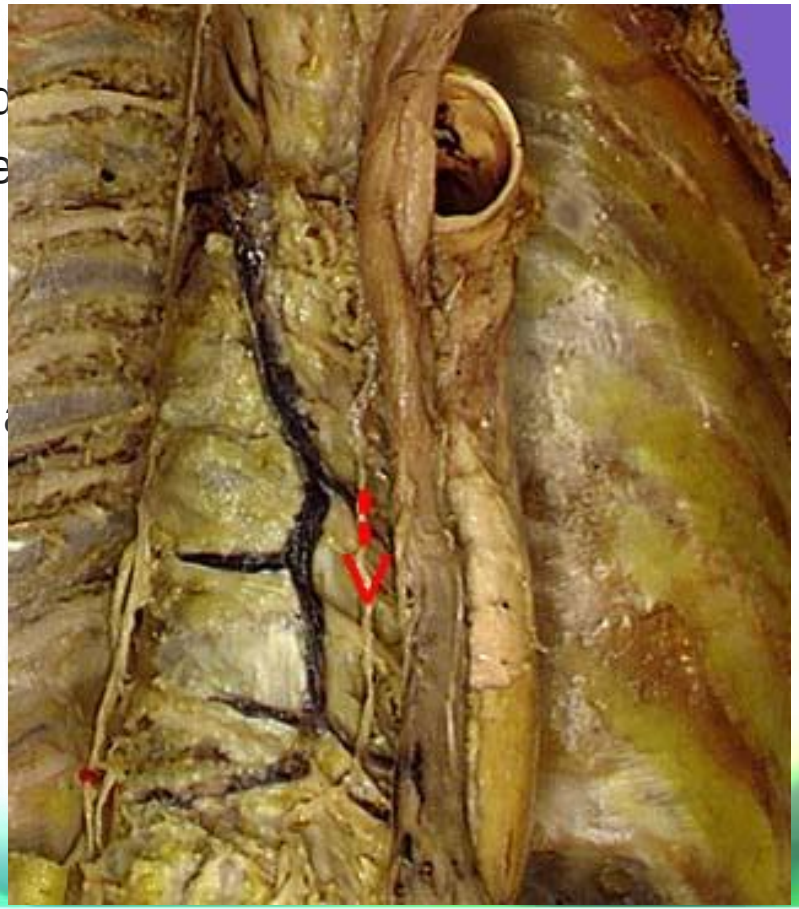
Anatomy(ITMIG)

- Ant mediastinum
  - **Thymus**
  - Connective tissue with fat
  - Left brachiocephalic vein



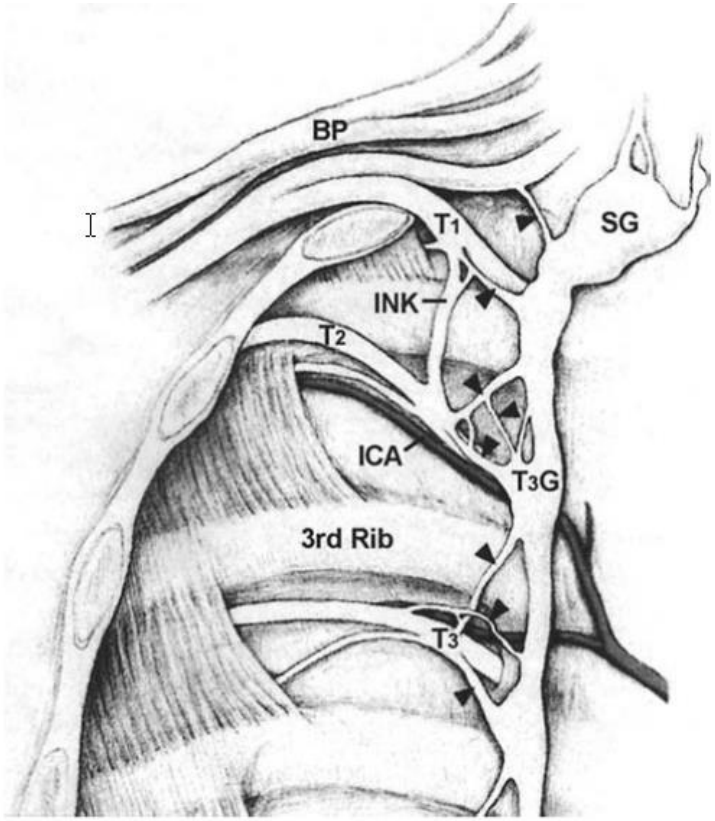
Anatomy(ITMIG)

- Middle compartment
  - Vascular category
    - heart, superior vena cava, ascend
      descending thoracic aorta, intrape
      thoracic ductof the azygos vein
  - The other category
    - trachea, carina, and esophagus,
      embryological origin



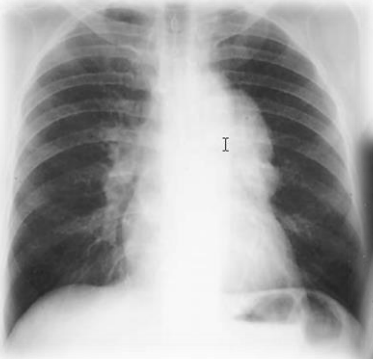
Anatomy(ITMIG)

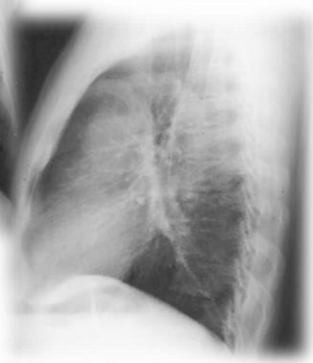
- Post compartment
  - thoracic spine and paravertebr

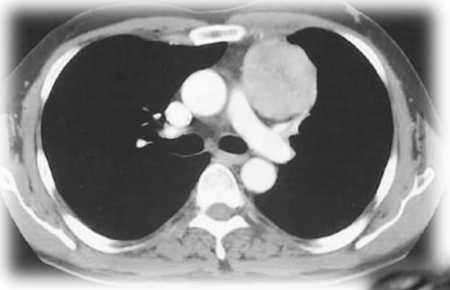


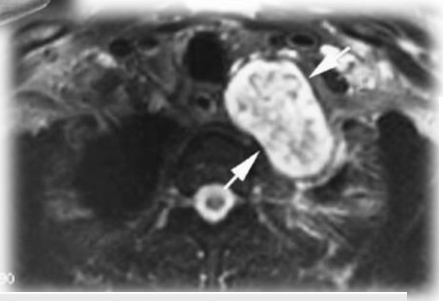
Non invasive Investigations

- Chest plain film including lateral view
- Chest CT
- Chest MRI
- Radionuclide studies
- Mediastinal tumor markers









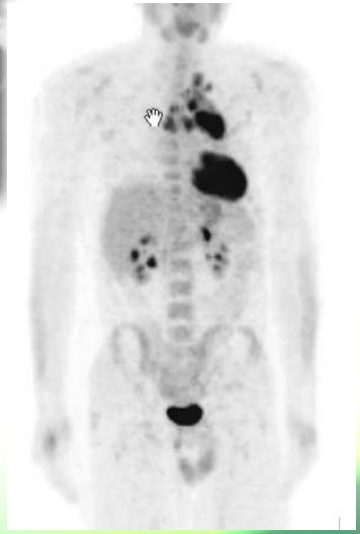


TABLE 168-2 Serum or Urine Markers of Mediastinal Tumors

Mediastinal location	*Tumor*	*Serum marker*
Anterior compartment	Yolk sac tumor[a]	AFP, LDH
	Embryonal carcinoma	LDH, TRA-1–60, CD30, β-HCG[b]
	Choriocarcinoma	β-HCG, LDH
	Seminoma	PLAP, LDH, NSE, β-HCG[b]
	Thymoma	None
	Thymic carcinoma	None
	Thymic carcinoid	ACTH, chromogranin, NSE
	Thymic small cell carcinoma	Bombesin, NCAM, NSE
	Parathyroid adenoma	PTH, chromogranin
Visceral and posterior compartments	Pheochromocytoma, neuroblastoma, and ganglioneuroblastoma	Urine[c] and plasma[d] catecholamines, and chromogranin, NSE

Invasive Investigations and surgical approaches

- Transcervical mediastinal LN sampling and Lymphadenectomy
  - Mediastinoscopy: extended, video-assisted
- Robotic or Video-assisted thoracic surgery
- Sternotomy and Thoracotomy
- Posterior Mediastinotomy

Mediastinal infections

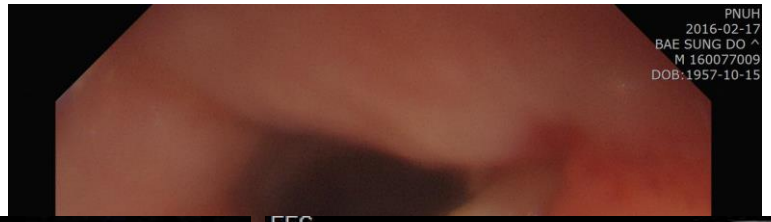
- **Acute and chronic mediastinitis**
  - **Perforation of the aero-digestive tract**
  - **Postoperative sternal infection and mediastinitis**
  - **Descending necrotizing mediastinitis**
  - **Sub-acute mediastinitis**
  - **Fibrosing mediastinitis**

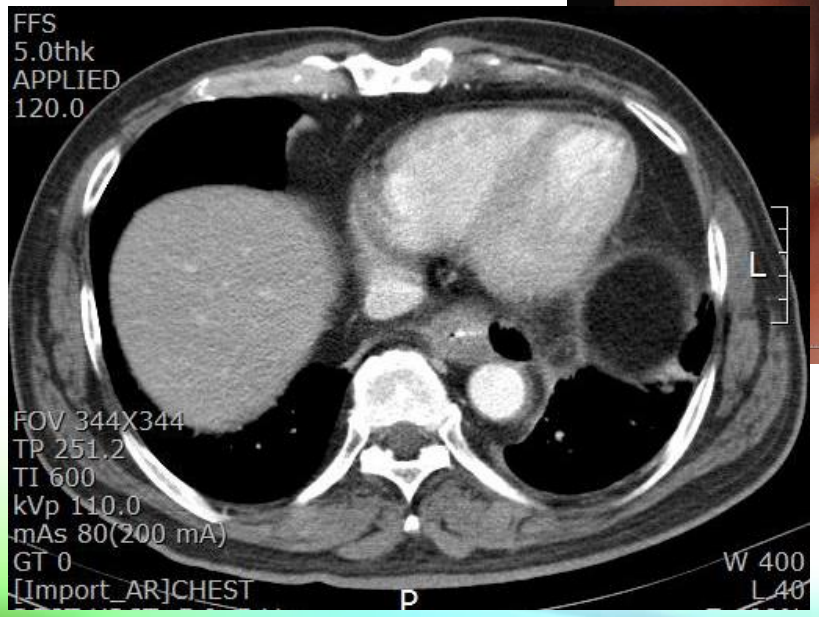
Perforation of the aero-digestive tract

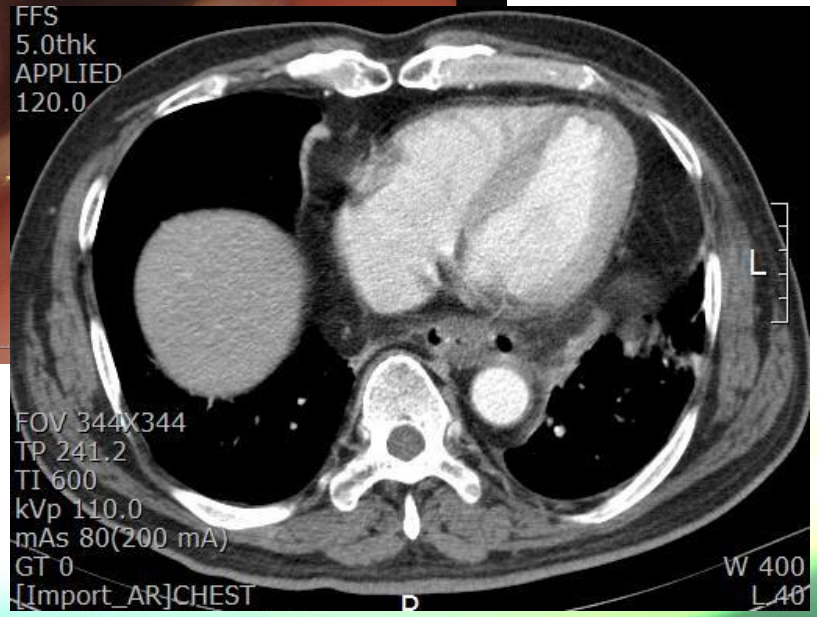
- ***Four principles*** of treatment
  1. **Eliminate source of soilage**
  2. **Provide thorough and wide mediastinal drainage**
  3. **Appropriate antibiotics**
  4. **Maintain adequate nutrition**.

Case

- 56/M
- 내원 수일전 매운탕 먹다가 목에 이물감 발생
- EGD
- Chest CT







Postoperative sternal infection and mediastinitis

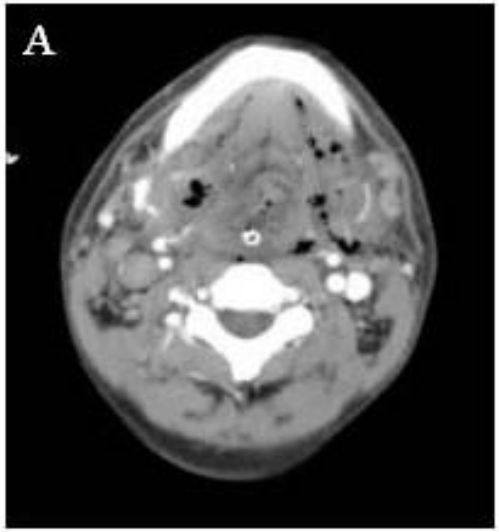
- Risk factor
  - Sternotomy: incomplete closure
  - Tracheostomy
  - CPB duration
  - Postoperative bleeding
  - Infection
  - Low cardiac output
  - Poor general condition
  - Steroid

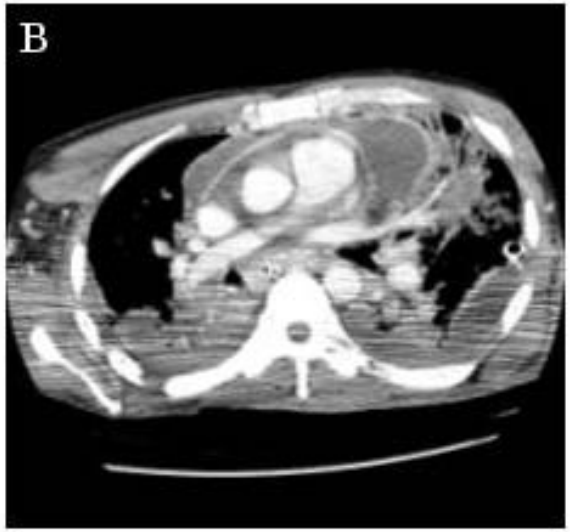
Descending necrotizing mediastinitis

- Acute purulent mediastinitis due to oropharyngeal infection
- uncommon but still lethal form of mediastinitis
- 60 ~ 70%, secondary to odontogenic infections
- Peritonsillar abscess, Retropharyngeal and parapharyngeal abscess, Epiglottitis
- Other less common causes
  - trauma to the neck, including neck or mediastinal surgery
  - cervical lymphadenitis, endotracheal intubation

Case

- 43세 여자 환자가 고열과 전신무력감 호소
- Present illness : 최근 치통으로 충치치료를 지속적으로 받고 있었으나 잘 조절되지 않아 발치를 하였으며 이후 고열과 전신무력감이 심해짐
- V/S : BP 80/50, PR 120/min, BT 38.9‘C
- P/Ex: 턱 아래쪽과 목 주위가 부어 있었으며 발적과 함께 열감과 동통
- Chest CT





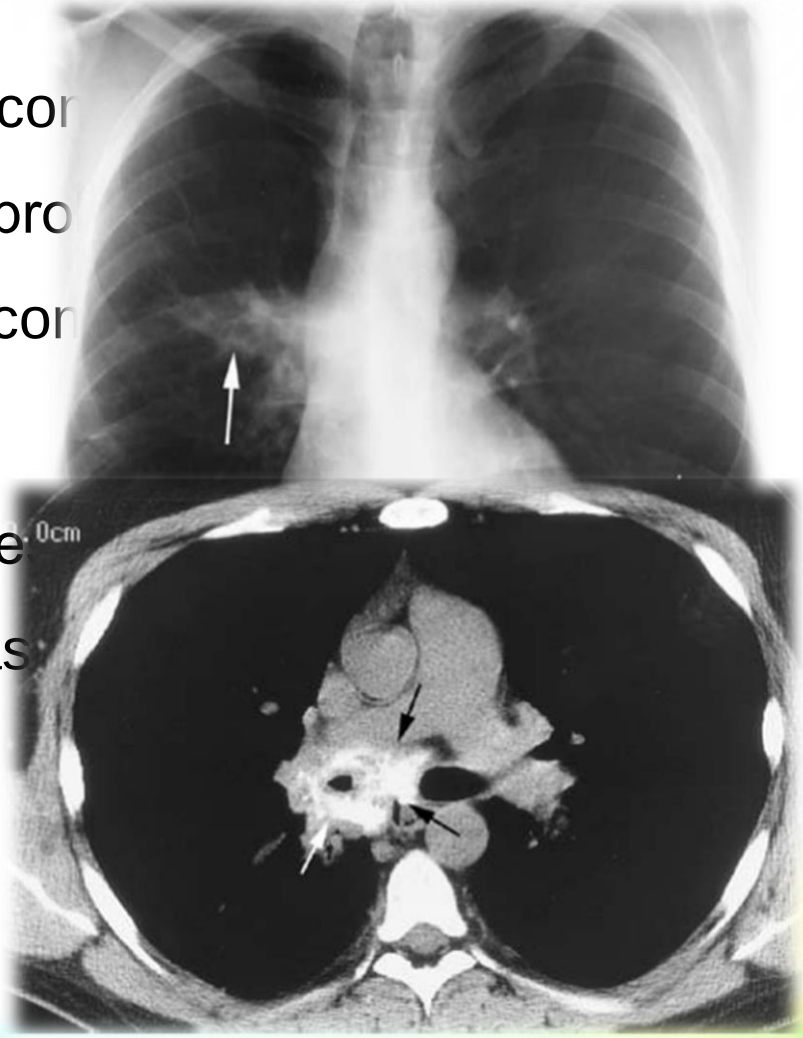
- 진단은?
- 치료는?
- 예후는?

Sub-acute mediastinitis

- The definition of subacute mediastinitis is unclear, but this term should embrace those inflammatory processes involving the mediastinum that produce minimal to mild and evanescent symptomatology (substernal pain, fever, night sweats) and an identifiable anterior or visceral mediastinal mass by radiographic or CT examination.
- These infections most often are the result of fungal, mycobacterial, or, rarely, actinomycotic organisms.
- Such subacute infections are observed only infrequently in previously normal, healthy persons but are becoming more common in immunocompromised patients, particularly those with AIDS.

Fibrosing mediastinitis

- Fibrosing mediastinitis is an uncor
  resulting in the deposition and pro
  tissue through out the visceral cor
  mediastinum.
- This chronic inflammatory proce
  and compression of vital medias



Primary mediastinal tumors and syndromes

- Thymic tumors
- Myasthenia Gravis
- Benign LN disease
- Germ cell tumor
- Neurogenic tumors

Thymic tumors

TABLE 166.1 WHO Histologic Subtypes of Thymic Epithelial Tumors		
Thymoma	Thymic Carcinoma	Thymic Neuroendocrine Tumor
A	Squamous	Carcinoid tumor Typical Atypical
AB	Basaloid	Large cell neuroendocrine
B1	Mucoepidermoid	Small cell carcinoma
B2	Lymphoepithelioma-like	
B3	Clear cell	
Micronodular tumor with lymphoid stroma	Sarcomatoid	
Metaplastic thymoma	Adenocarcinoma	
	Undifferentiated carcinoma	

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Thymic tumor

- Neoplasm of the thymus that originates in the gland's epithelial tissue.
- Incidence: thymoma(2.2 to 2.6/million/yr), thymic carcinomas (0.3 to 0.6/million/yr), thymic neuroendocrine tumors(even less common)
- Typically slow-growing tumors
- Spread by local extension
- Metastases are usually confined to the pleura, pericardium, or diaphragm, whereas extrathoracic metastases are uncommon.

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Clinical presentation

- Thoracic symptoms
  - Related to the size of the tumor and its effects on adjacent organs

    : chest pain, shortness of breath, cough, phrenic nerve palsy, superior vena cava obstruction
  - Systemic ("B") symptoms

    : fever, weight loss, and/or night sweats

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Paraneoplastic disorders

- Myasthenia gravis
- Pure red cell aplasia
- Immunodeficiency
- Thymoma-associated multiorgan autoimmunity

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Staging system

TABLE 166.2 Description of Masaoka-Koga Staging System

Stage	Description
I	Grossly and microscopically encapsulated tumor
IIA	Microscopic invasion through the capsule
IIB	Gross/macroscopic invasion through the capsule into the surrounding fat but no invasion of pleura or pericardium
III	Direct invasion into adjacent structures (pleura, pericardium, lung parenchyma, vascular structures)
IVA	Pleural or pericardial metastasis/implants
IVB	Lymph node metastasis (no level specified). Hematogenous metastasis

Adapted from Koga K, Matsuno Y, Noguchi M, et al. A review of 79 thymomas: modification of staging system and reappraisal of conventional division into invasive and non-invasive thymoma. *Pathol Int* 1994;44:359–367. Copyright © 1994 by John Wiley Sons, Inc. Reprinted by permission of John Wiley & Sons, Inc.

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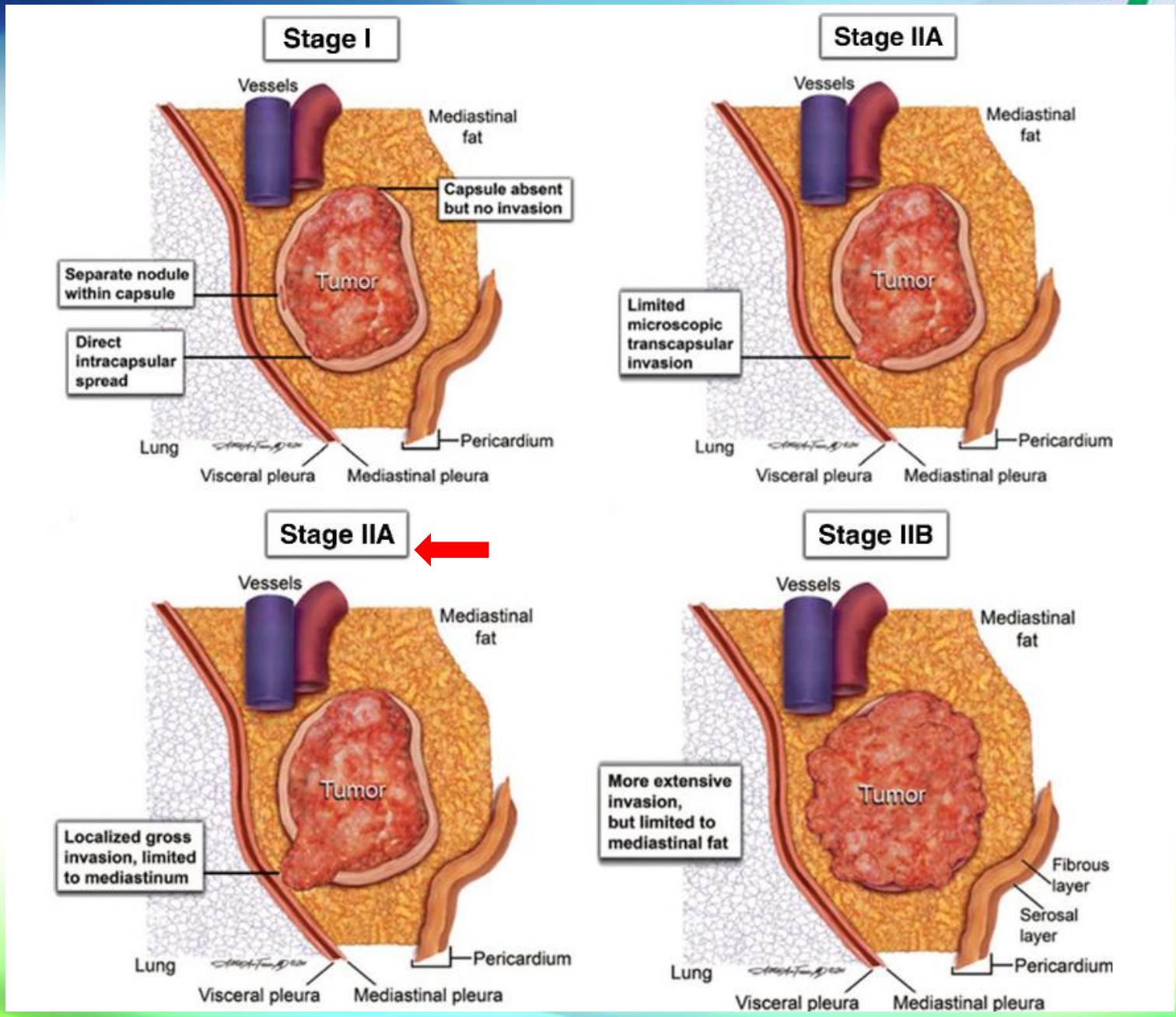

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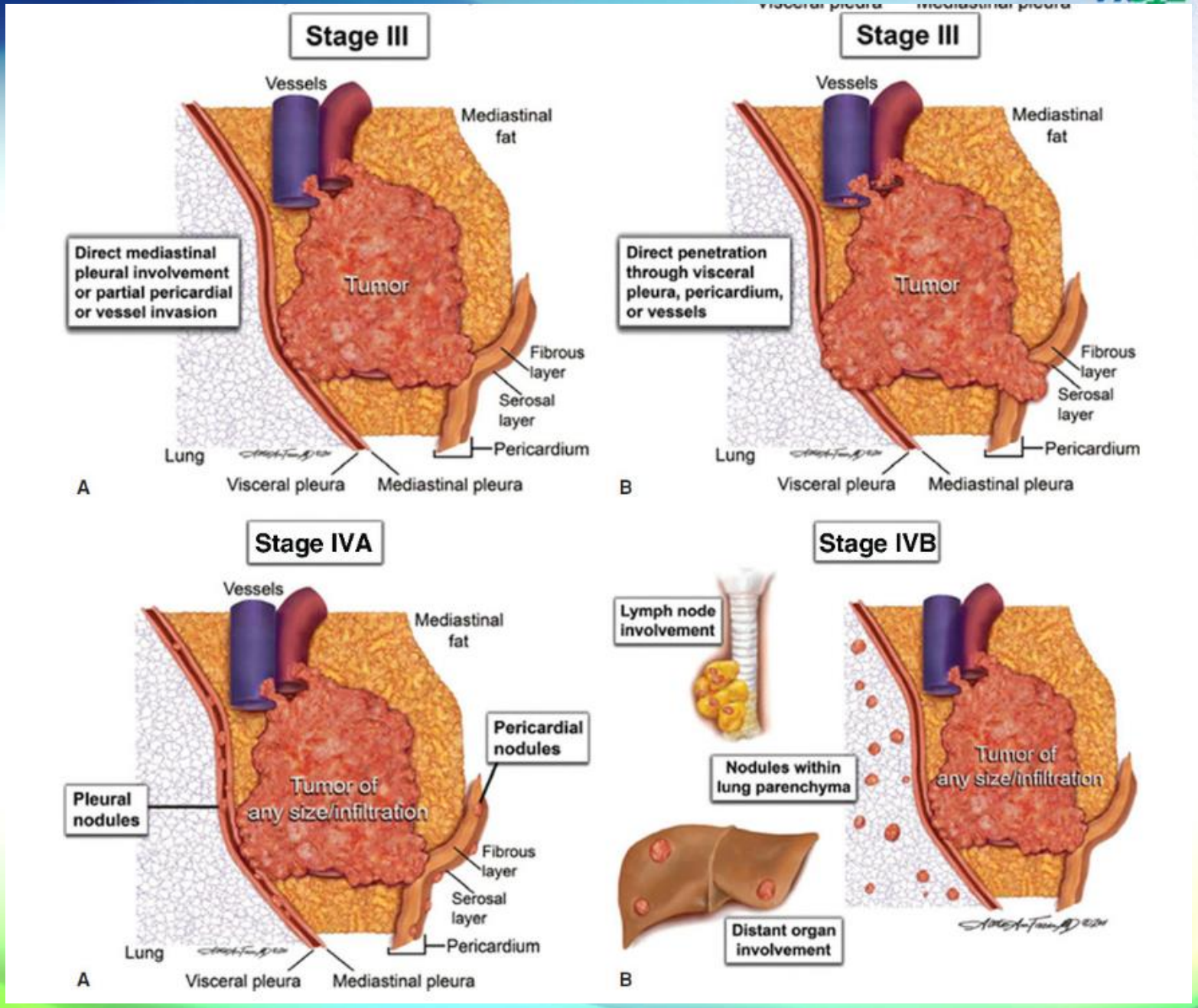
Stage III
Vessels
Mediastinal fat
Direct mediastinal pleural involvement or partial pericardial or vessel invasion
Tumor
Fibrous layer
Serosal layer
Pericardium
Lung
Visceral pleura
Mediastinal pleura
A
Stage III
Vessels
Mediastinal fat
Direct penetration through visceral pleura, pericardium, or vessels
Tumor
Fibrous layer
Serosal layer
Pericardium
Lung
Visceral pleura
Mediastinal pleura
B
Stage IVA
Vessels
Mediastinal fat
Pericardial nodules
Pleural nodules
Tumor of any size/infiltration
Fibrous layer
Serosal layer
Pericardium
Lung
Visceral pleura
Mediastinal pleura
A
Stage IVB
Lymph node involvement
Nodules within lung parenchyma
Tumor of any size/infiltration
Distant organ involvement
B

TABLE 166.3 The TNM Staging System Proposal by ITMIG/IASLC

	Description		
T1			
a	Tumor limited to capsule or mediastinal fat		
b	Extension into mediastinal pleura		
T2	Invasion of pericardium		
T3	Invasion of lung, chest wall, phrenic nerve, brachiocephalic vein, pulmonary vessels, hilum		
T4	Invasion of aorta, aortic arch vessels, main pulmonary artery, myocardium, trachea, esophagus		
N0	No nodal involvement		
N1	Anterior nodes (perithymic)		
N2	Deep intrathoracic or cervical nodes		
M0	No metastatic disease		
M1			
a	Pleural or pericardial nodules (separate from primary tumor)		
b	Pulmonary intraparenchymal metastasis, extrathoracic metastasis		
Stage	**T**	**N**	**M**
I	T1	N0	M0
II	T2	N0	M0
IIIA	T3	N0	M0
IIIB	T4	N0	M0
IVA	T any T any	N1 N0,1	M0 M1a
IVB	T any T any	N2 N any	M0, 1a M1b

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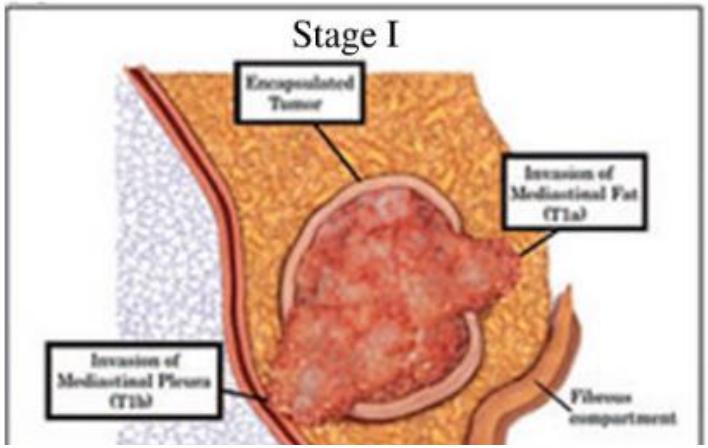

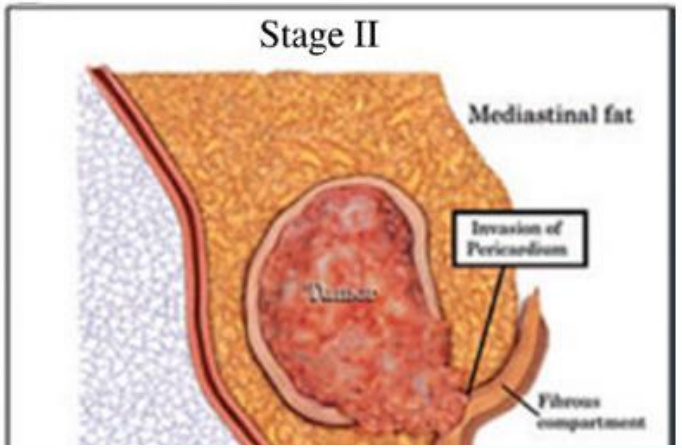

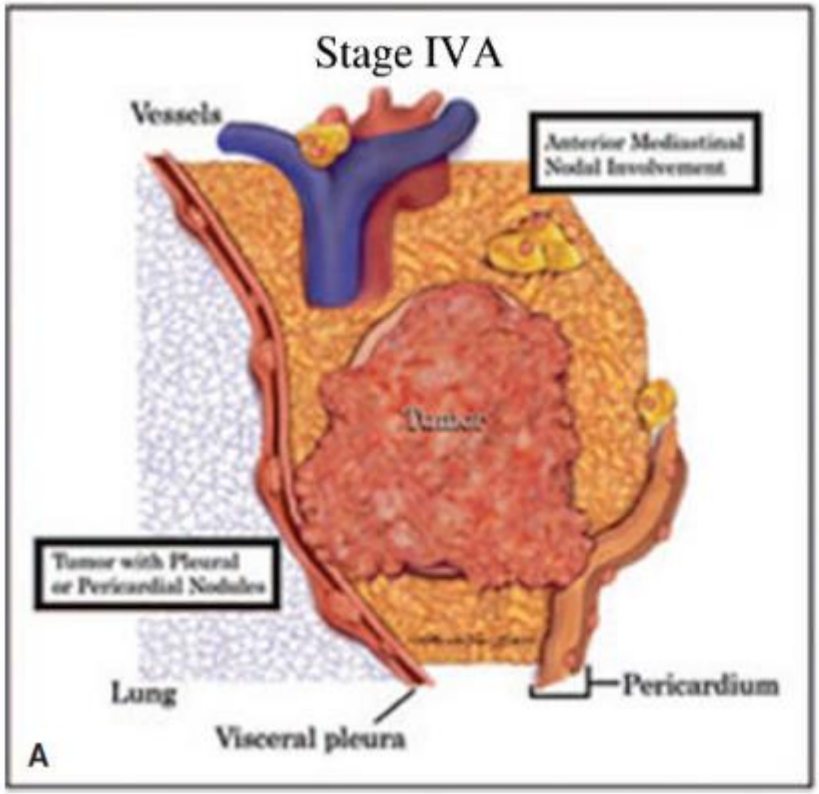

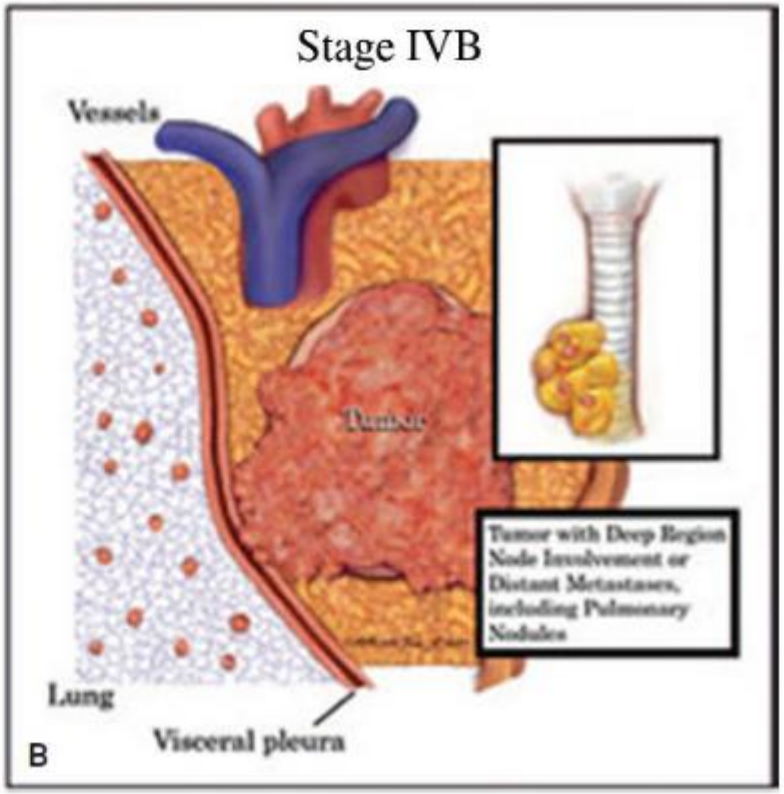

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Treatment

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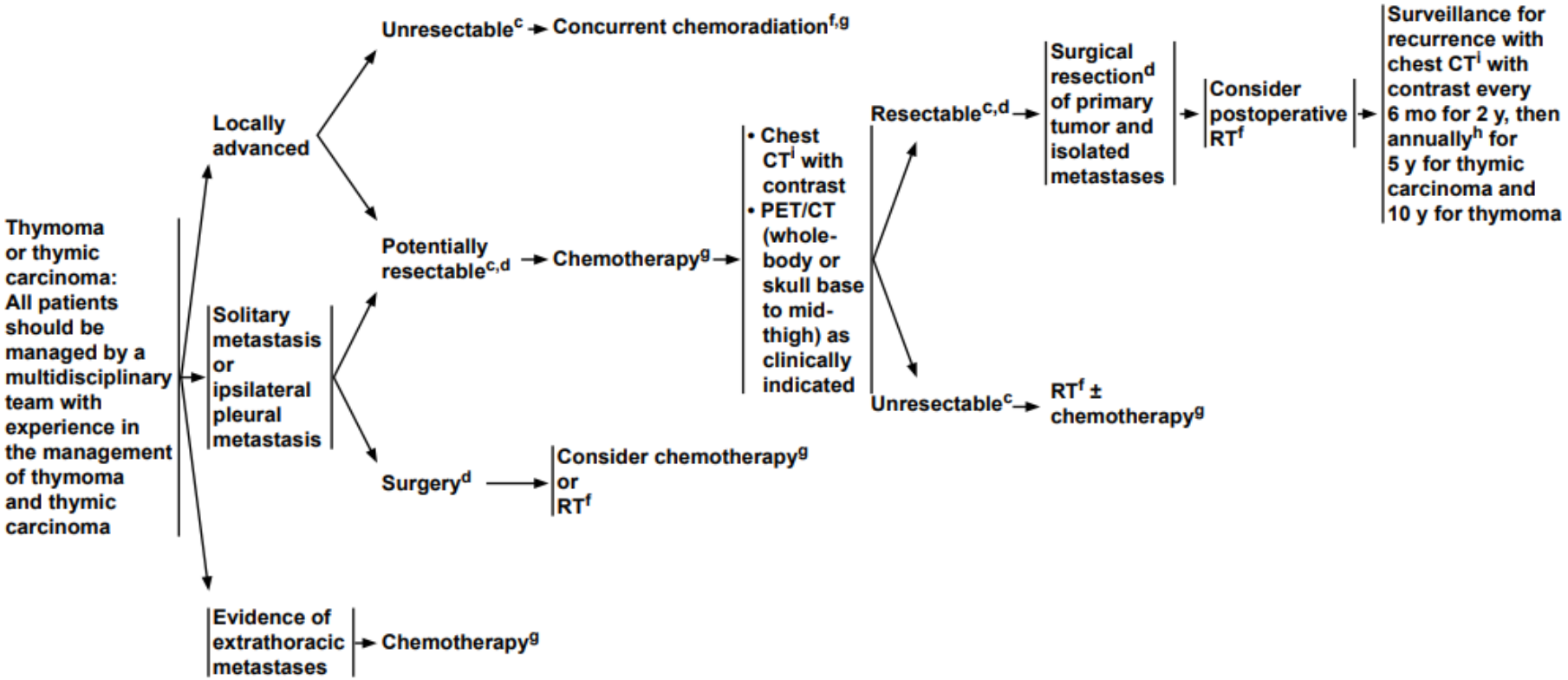
NCCN Guidelines Version 2.2019
Thymomas and Thymic Carcinomas

NCCN Guidelines Index
Table of Contents
Discussion

LOCALLY ADVANCED, ADVANCED, OR RECURRENT DISEASE

TREATMENT



Early Stage Tumors

- **R0 resection** is the goal of treatment with care to avoid violating the tumor capsule.
  - **total thymectomy** with en-bloc resection of the tumor with the entire thymus gland and surrounding fat.
  - thymomectomy alone : not good
  - approaches
    - transsternal
    - thoracotomy or hemiclamshell,
    - minimally invasive thoracoscopic or robotic approach,
    - transcervical approach.

Locally Advanced Tumors

- Except for stage IVB tumors (LN or extrathoracic metastases) thymic tumors are generally considered a surgical disease, and **complete resection (R0) is the primary goal of treatment**.
- *Thymomas are typically chemosensitive and the goal of neoadjuvant chemotherapy is to improve the rate of R0 resection.*
- For advanced tumors with local invasion, especially if resection margins are close or positive, postoperative radiation treatment (PORT) is favored.

Locally Advanced Tumors

- Although thymic carcinomas are much less responsive to chemotherapy, recent evidence suggests that thymic carcinomas may benefit from PORT.
- Patients with thymic tumors are generally younger and healthier than those with lung or esophageal cancers and, thus, are able to tolerate **extended resections** quite well.
- It is recommended that surgical resection be performed within 6 to 8 weeks of completion of chemotherapy.

NEOADJUVANT TREATMENT FOR THYMIC TUMORS

- **Induction Chemotherapy**
  - Thymomas are considered to be chemosensitive tumors and a variety of combinations of chemotherapy regimens have been reported with varying response rates
  - There are no randomized trials examining different regimens
- **Induction Chemoradiation**
- **Induction Radiation Therapy**

ADJUVANT TREATMENT FOR THYMIC TUMORS

- **Adjuvant Chemotherapy**

- **Adjuvant Radiation Therapy**
  - ***Port in Thymoma***
  - ***Port in Thymic Carcinoma***

Prognosis

- Thymomas are indolent tumors that usually do **not shorten life expectancy**
- **They can recur and therefore, long-term follow-up is still required after resection.**
- **The majority of the recurrences are intrathoracic** and **re-resection** has been described and associated with long-term survival.
- Most authors have described treatment with **neoadjuvant chemotherapy or chemoradiation followed by local resection**, if there is no progression of disease. There are, however, **significant biases** in these studies and the decision to re-resect should be made on a case-by-case basis with multidisciplinary tumor board consensus.

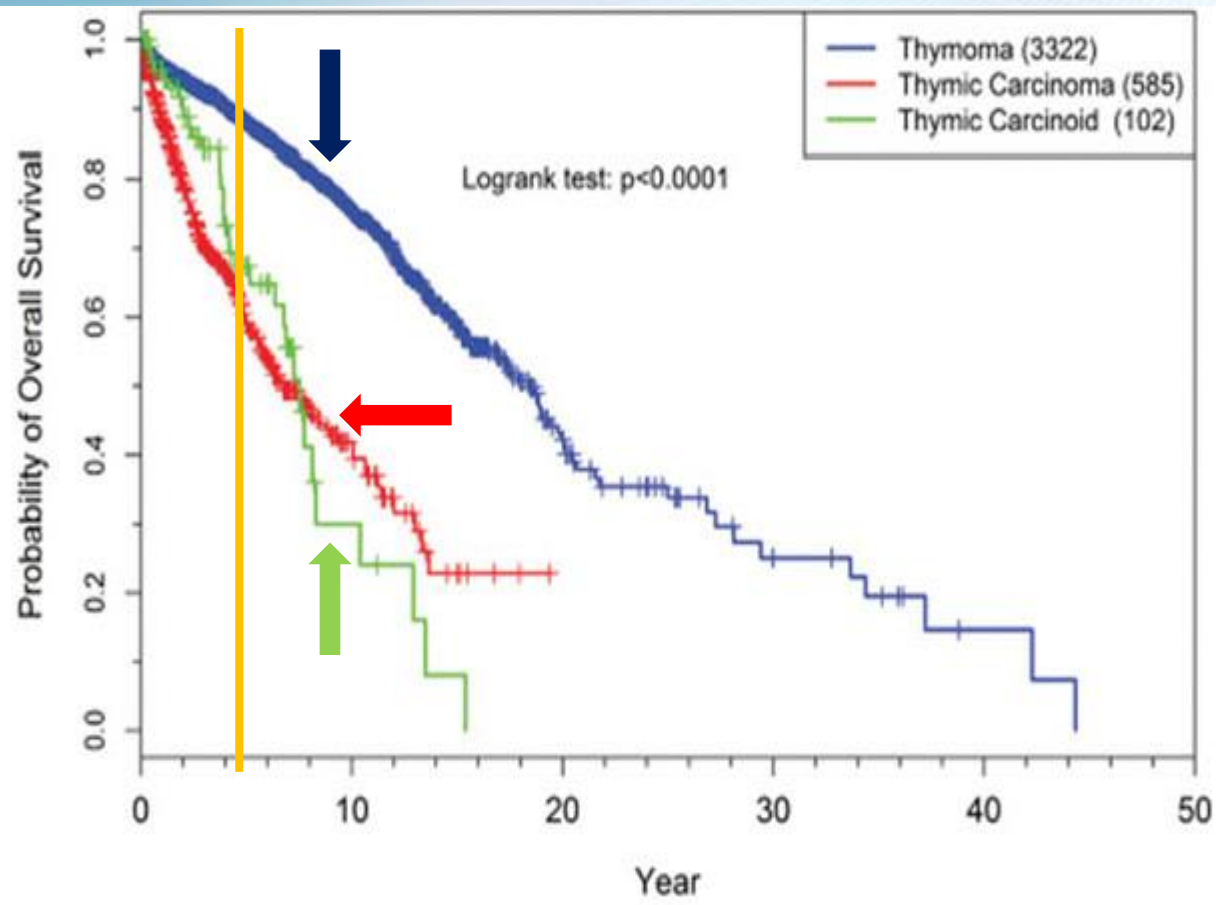


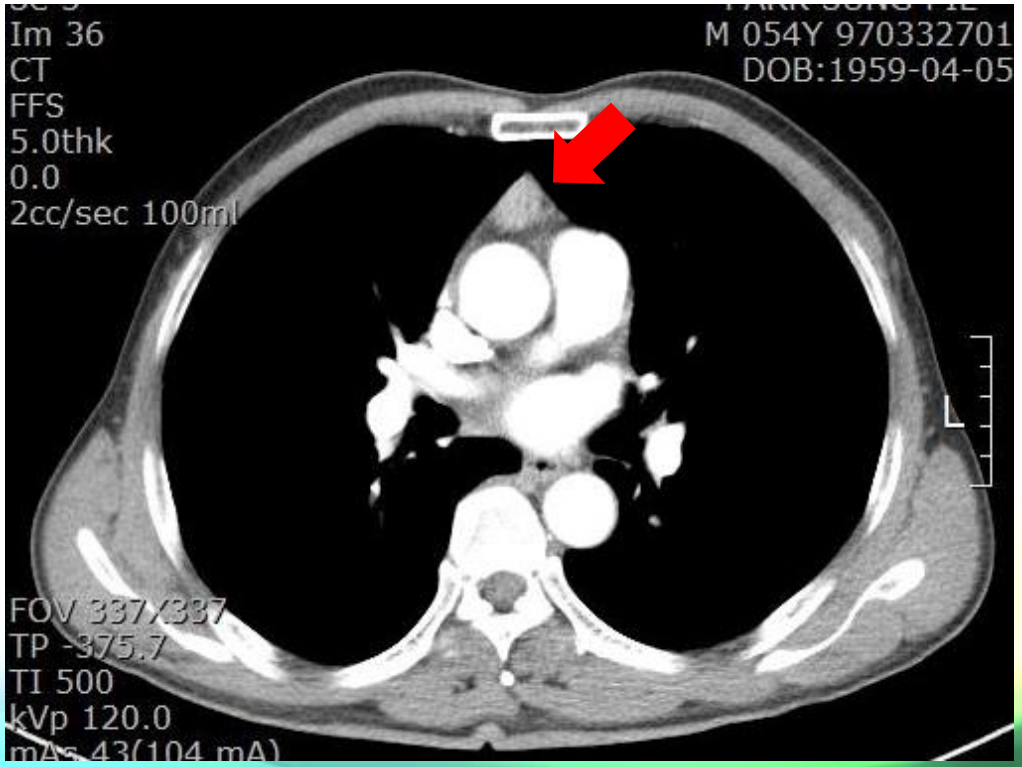
FIGURE 166.4 Overall survival of thymoma, thymic carcinoma, and neuroendocrine tumors in the ITMIG database. (Reprinted from Huang J, Ahmad U, Antonicelli A, et al. Development of the international thymic malignancy interest group international database: an unprecedented resource for the study of a rare group of tumors. *J Thorac Oncol* 2014;9(10):1573–1578. Copyright © 2014 International Association for the Study of Lung Cancer. With permission.)

Myasthenia Gravis

- Neuromuscular junction disorder
- caused by the autoimmune destruction of the acetylcholine receptors of voluntary muscle
- Sx: diplopia, ptosis, dysphagia, weakness, fatigue
- approximately 30% of patients with thymomas have myasthenia gravis
- rare in thymic carcinoma

Case

- 57세 남자 환자가 복시 현상 및 저녁이 되면 무기력함을 호소하여 응급실을 방문하였다. 시행한 흉부전산화단층촬영에서 아래와 같은 병변이 관찰되었다.



- 진단을 위한 검사는?
- 진단은?
- 적절한 그 다음 조치는?

DIAGNOSIS

- **Clinical Aspects**
- **Radiographic and Electrophysiologic Evaluation**
- **Antibodies to Acetycholine Receptor**

TABLE 164.1 Osserman and Genkins Classification of Myasthenia Gravis, Modified by the MGFA Task Force[a]

Class	Clinical Form(s)	Symptoms
I[b]/MGFA I	Ocular form	Ptosis, diplopia
IIa[b]/MGFA II	Mild generalized form	Mild generalized weakness
IIb[b]/MGFA IIb	Faciopharyngeal form	IIa + bulbar weakness
III[b]	Severe acute generalized form	Acute severe general weakness + bulbar symptoms + respiratory insufficiency
MGFA III	Medium severity generalized form	Medium severity generalized weakness with:
MGFA IIIa		Involvement of the extremities/trunk musculature > faciopharyngeal musculature
MGFA IIIb		Faciopharyngeal/respiratory musculature > extremities/trunk musculature
IV[b]	Severe chronic generalized form	Severe, often progressive generalized weakness
MGFA IV	Severe generalized form	
MGFA IVa		Extremities/trunk musculature > faciopharyngeal musculature
MGFA IVb		Faciopharyngeal/respiratory musculature > extremities/trunk musculature
V[b]	Myasthenia with severe residual deficits	Severe chronic form with muscle atrophy
MGFA V	Severe MG requiring intubation	

[a]MGFA, Myasthenia Gravis Foundation Association; the entries marked.

[b]Refer to the Osserman and Genkins classification.

Adapted from Toyka KV, Gold R. Treatment of Myasthenia Gravis. *Schweiz Arch Neurol Psychiatr* 2007;158:309. With permission from EMH Swiss Medical Publishers Ltd.

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Treatment

- Medication
  - ACETYLCHOLINESTERASE INHIBITORS
  - CORTICOSTEROIDS
  - AZATHIOPRINE, CYCLOSPORINE
  - MYCOPHENOLATE MOFETIL
  - RITUXIMAB
- PLASMA EXCHANGE AND INTRAVENOUS IMMUNOGLOBULIN
- ***THYMECTOMY***

Thymectomy Classification

TABLE 165.1 Thymectomy Classification
T-1 Transcervical Thymectomy
(a)-Basic
(b)-Extended
T-2 Videoscopic Thymectomy
(a)-"Classic"
(b)-"VATET"
T-3 Transsternal Thymectomy
(a)-Standard
(b)-Extended
T-4 Transcervical & Transsternal Thymectomy

Regardless of the technique employed,
Complete removal of all thymic tissue is the goal

Minimally invasive maximal thymectomy.

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MYASTHENIC CRISIS

- Approximately 16% of all patients experience a crisis, a figure that has not appreciably changed over time.
- Progressive weakness, oropharyngeal symptoms, refractoriness to anticholinesterase medication, and infection precede crisis in most of these patients.
- Crisis is a temporary exacerbation, regardless of the proximate cause.
- The goal is to keep the patient alive **until** **the transient morbidity of viral or bacterial infection, aspiration pneumonitis, surgery, or other complications subsides** and **responsiveness to anticholinesterase medication returns.**

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Benign LN disease

TABLE 167.1 Benign Mediastinal Lymphadenopathies

I. Mediastinal granulomatous disease
- Tuberculosis
- Fungal infection
- Sarcoidosis
- Silicosis
- Wegener granulomatosis

II. Castleman disease

III. Others
- Systemic lupus erythematosus
- Infectious mononucleosis
- Reactive lymph node hyperplasia
- Amyloidosis
- HIV–associated *Pneumocystis carinii*

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Germ cell tumor

TABLE 169.1 Classification of Mediastinal Germ Cell Tumors

I. Teratomatous lesions
   1. Mature teratoma (composed of well-differentiated, mature elements)
   2. Immature teratoma (with the presence of immature mesenchymal or neuroepithelial tissue)
   3. Teratoma with additional malignant component:
      Type I: with an associated malignant GCT tumor (seminoma, embryonal carcinoma, yolk sac tumor, etc.)
      Type II: with a non–germ cell epithelial component (squamous, adenocarcinoma, etc.)
      Type III: with a malignant mesenchymal component (rhabdomyosarcoma, chondrosarcoma, etc.)
      Type IV: a teratoma with any combination of the above

II. Nonteratomatous tumors
   1. Seminoma
   2. Yolk sac tumor, or endodermal sinus tumor
   3. Embryonal carcinoma
   4. Choriocarcinoma
   5. Combined nonteratomatous tumors (a combination of any of the above)

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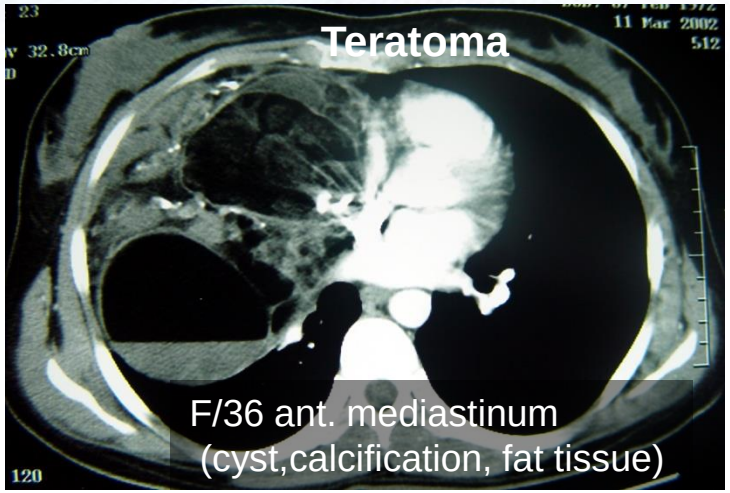
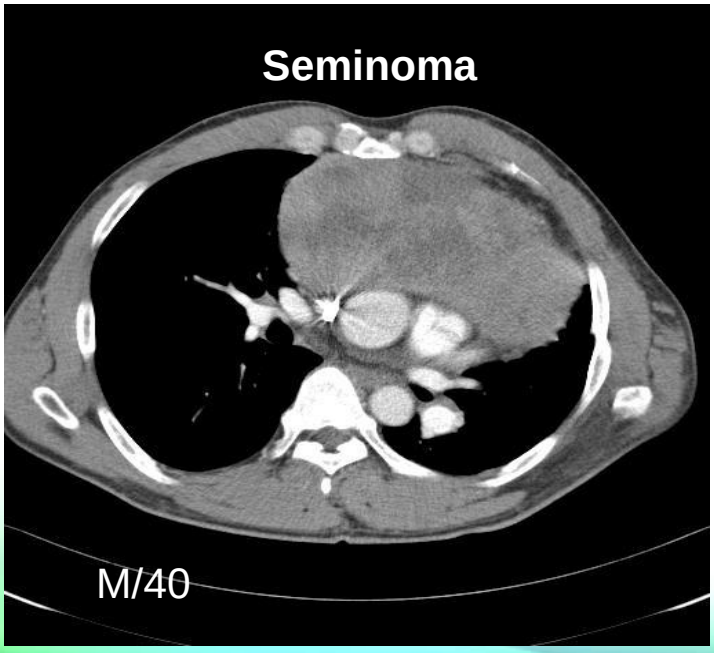
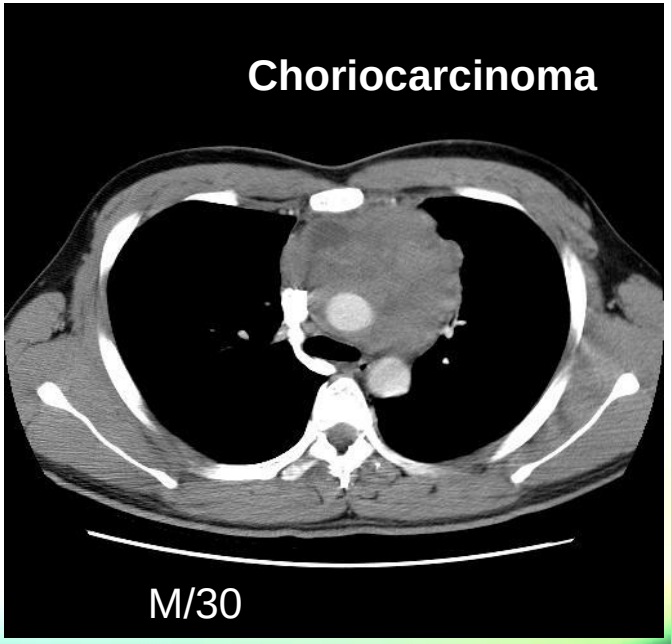
Mediastinal Tumor

- Anterior mediastinum
- Thymoma? Lymphoma? Teratoma? or other
- Biopsy?
- Operation?
    - When?
    - (VATS or sternotomy? thoracotomy?)
- Postop. ?







Incidence

5-10% (extra-gonadal, mediastinum)	of Germ cell tumor
15% (85% benign) 25% (children, 대부분 benign)	of Anterior mediastinal tumors *Mullen & Richardson (1986)*
42 (10%) (50% benign)	400 mediastinal mass *Duke Univ. medical center (1930-1982)*

Benign GCT (Teratoma) *Shirodkar (1997)*

97-98% anterior mediastinum

3-8% posterior mediastinum)

Malignant GCT

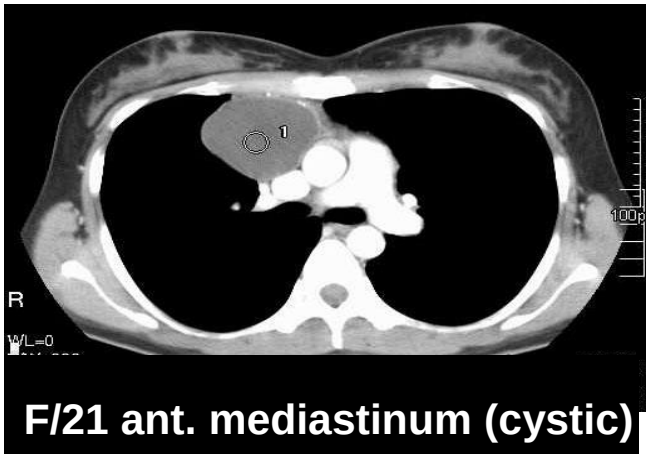
1-5% of all germ cell neoplasm

3-5% of mediastinal tumors

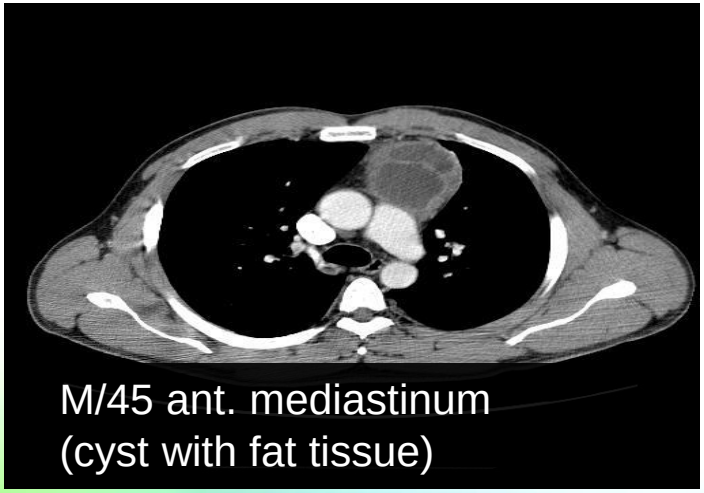
Seminoma 50% / Non-seminomatous GCT 50%

Benign Germ Cell Tumors

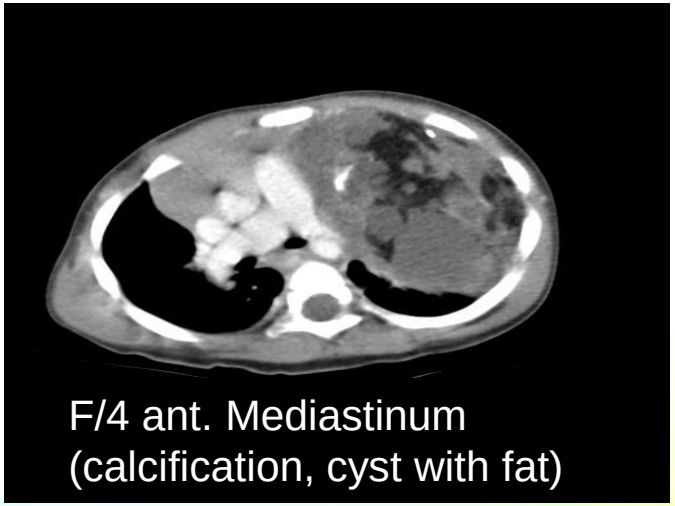
F/36 ant. mediastinum
(cyst, calcification, fat tissue)



F/21 ant. mediastinum (cystic)



M/45 ant. mediastinum
(cyst with fat tissue)



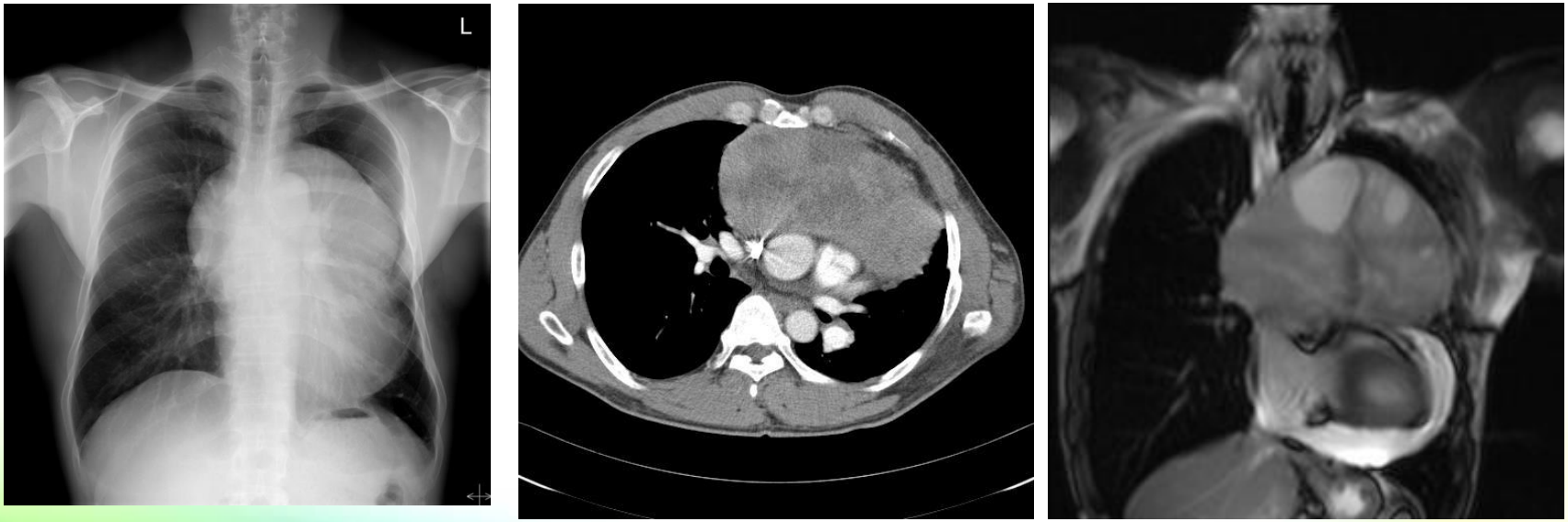
F/4 ant. Mediastinum
(calcification, cyst with fat)

- **Three primodial layers**
  - Ectoderm; skin, hair
  - Mesoderm; bone, fat, muscle
  - Endoderm; respiratory epithelium, GIT

- Mature cells or tissues – **Mature teratoma**
- Less well-differentiated tissues – **Immature**
  - Infant; behave similarly to mature teratoma
  - Older patient; more aggressive (malignant teratoma)

Seminoma

- Second common mediastinal GCT / TMC malignant mediastinal GCT
- 3 rd ~ 5 th decade men, white men predominant
- Slow-growing tumors with lobular appearance including necrosis, hemorrhage
  - encapsulation – half of time, calcification – infrequently



40/M Seminoma

Seminoma

Young man with anterior mediastinal tumor

Serum Tumor markers
hCG AFP LDH

(+) hCG * (-) AFP

Seminoma (pure)

(++) hCG (+) AFP

Mixed tumor or NSGCT → *NSGCT*

Testicular exam. : bimanual exam. & U/S
Abdominal CT/ Bone scan/ Brain CT or MR

Biopsy Mediastinoscpy or Sternotomy
VATS

Seminoma

Radiotherapy or adjuvant radiotherapy

Surgery

Chemotherapy

Poor Prognostic factor

Heitmiller & Marasco(1995)

Age greater than 35 years
Bulky mediastinal disease
SVC obstruction
Lymphadenopathy

Platinum-based
complete remission 88 ~ 100 %
5 YSR 70 ~ 85 %

Courtesy by prof. Kim

International Germ Cell Cancer Collaboration Group
J Clin Oncol 1977

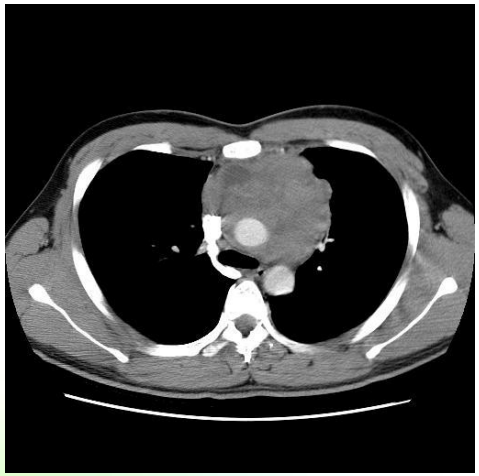
Good Prognosis		
	Any Primary site	**90% of seminomas**
	No NPVM	**5 year PFS 82 %**
	Normal AFP, hCG, LDH	**5 YSR 86 %**
Intermediate Prognosis		
	Any Primary site	**10% of seminomas**
	NPVM (liver, bone, brain)	**5 year PFS 67 %**
	Normal AFP, hCG, LDH	**5 YSR 72 %**

NPVM non-pulmonary visceral metastasis

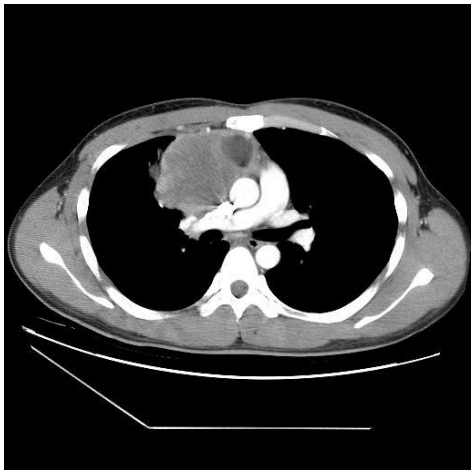
PFS progression free survival

Non-seminomatous GCT

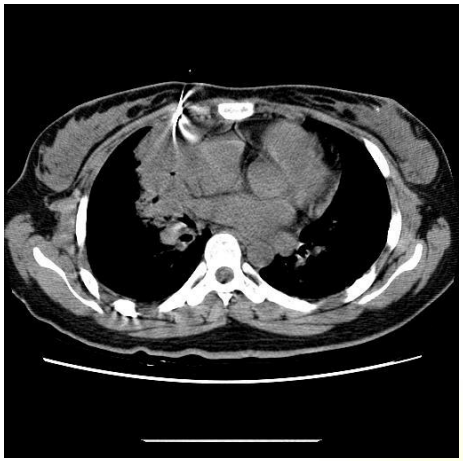
- Potentially curable with surgery
- Exclusively in young adult, men (fewer than 30 cases reported in women)
- Rapid local growing tumors with early metastasis (85-90% at diagnosis)
- In-homogenous mass with multiple areas of necrosis & hemorrhage



30/ M
Choriocarcinoma



24/ M
Endodermal sinus tumor



Incidence	*Moran & Suster (1997)* *229 cases*	*강창현 (2008)* *29cases*
Teratocarcinoma	41 %	9.5 %
58% non-germ cell component (sarcoma, epithelial carcinoma)		
Endodermal sinus (Yolk sac) tumor	35 %	42.9 %
Choriocarcinama	7 %	4.8 %
Embryonal carcinoma	6 %	9.5 %
Mixed	11 %	9.5 %
Unknown		23.8 %

Differ from testis origin

Pure endodermal sinus tumor, extremely rare in testis
Embryonal carcinoma, much higher in testis
Non-germ call histologies is more common in mediastinum

Tumor markers

hCG or AFP	90%
AFP with/without hCG	80%
hCG	30-35%
LDH	80-90%

APF 이 증가된 경우는 조직검사상 pure seminoma로 보인다고 해도 NSGCT와 같이 치료

hCG가 100 ng/ml 이상은 pure seminoma에서 uncommon

Differ from testis origin

Testicular NSGCT AFP & hCG equal frequency

Associated syndromes

Hematologic malignancies

Acute non-lymphocytic leukemia	**Acute lymphocytic leukemia**
Erythroleukemia	**Acute megakaryocytic leukemia**
Myelodysplastic syndrome	**Malignant histiocytosis**
Hartmann(2000) 2%	***Median survival 5 months***
(287 mediastinal NSGCT)	***No patient more than 2 years***

Idiopathic thrombocytopenia

Hemophagocytic syndrome ***single case of endodermal sinus tumor***

Klinefelter's syndrome ***not associated with testicular GCT***
common underlying germ cell defect

NSGCT

Young man with anterior mediastinal tumor

Serum Tumor markers
hCG AFP LDH

(+) hCG * **(-) AFP**

Seminoma (pure)

(++) hCG **(+) AFP**

Mixed tumor or NSGCT

Biopsy, least invasive approach
Excess 500 ng/ml of hCG or AFP not delay chemotherapy due to biopsy

Chemotherapy

Platinum-based
Long-term survival 41 %

Surgery ? or not

Poor Prognostic factor

강창현 (2008)

Bulky mediastinal disease – incomplete surgical resection
Histology – pure endodermal sinus tumor
Pre-chemotherapy hCG concentration

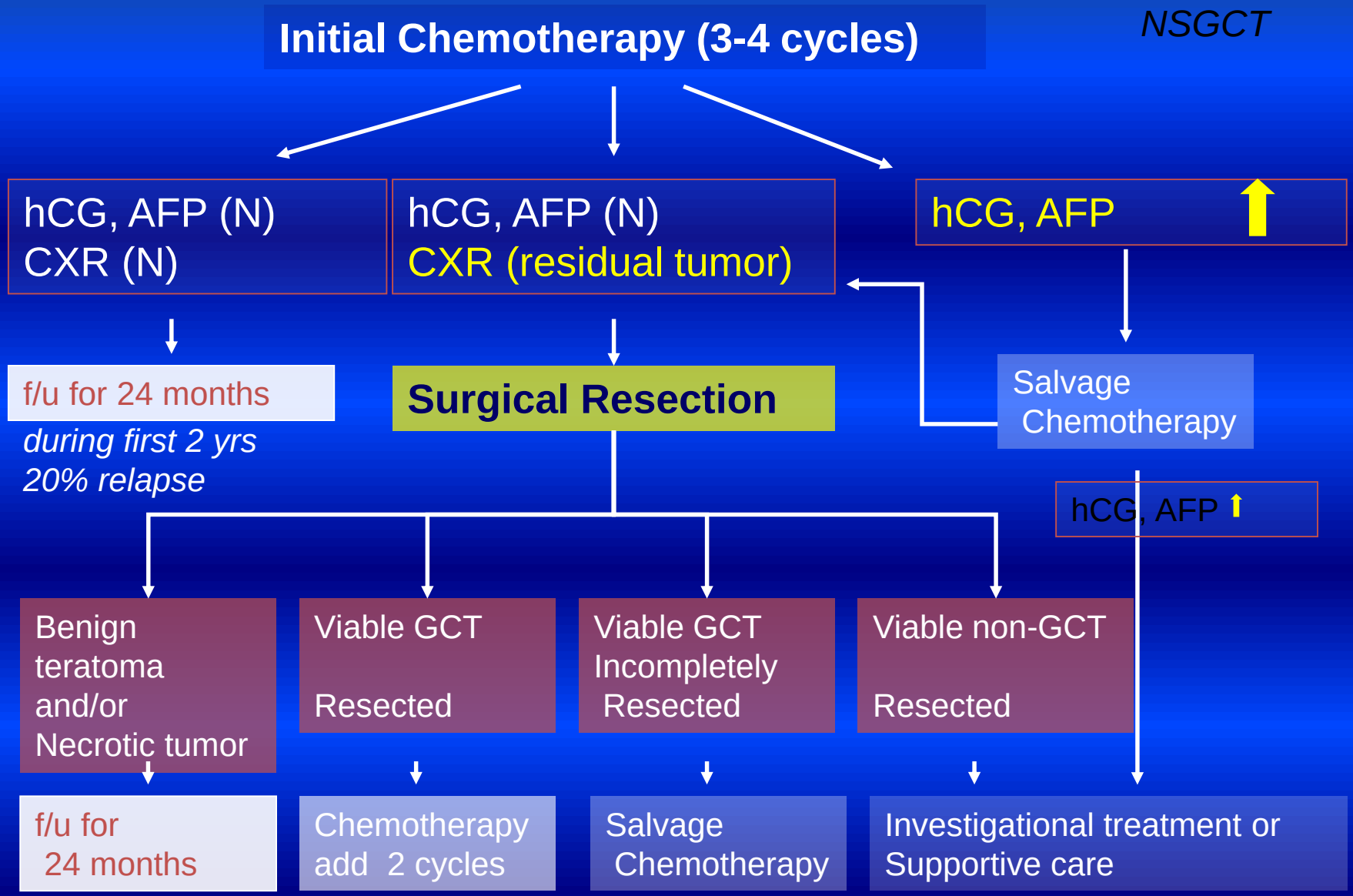


Fig 187-7 Shield, General Thoracic Surgery

TABLE 169.2 Definitions of the Germ Cell Consensus Classification for Metastatic GCT

I. Good prognosis
   A. Nonseminoma. Testis/retroperitoneal primary and no nonpulmonary visceral metastases and good markers, including all of α-fetoprotein (α-FP) <1,000 ng/mL, and β-human chorionic gonadotropin (β-HCG) <5,000 IU/L (1,000 ng/mL) and serum lactate dehydrogenase (LDH) <1.5 times the upper limit of normal); 56% of nonseminomas show a progression-free survival (PFS) rate of 89% and a 5-year survival rate of 92%.
   B. Seminoma. At any primary site and no nonpulmonary visceral metastases and normal α-FP, any β-CG, any LDH; 90% seminomas, 5-year PFS rate of 82% and 5-year survival rate of 86%.

II. Intermediate prognosis
   A. Nonseminoma. Testis/retroperitoneal primary and no nonpulmonary visceral metastases and any of α-FP ≥1,000 ng/mL and ≤10,000 ng/mL or β-HCG ≥5,000 IU or ≤50,000 IU/L or LDH ≥1.5 times normal or ≤10 times normal; 28% of nonseminomas show a 5-year PFS rate of 75% and a 5-year survival rate of 80%.
   B. Seminoma. At any primary site and nonpulmonary visceral metastases and normal α-FP, any β-HCG, and any LDH; 10% of seminomas, 5-year PFS of 67% and 5-year survival of 72%.

III. Poor prognosis
   A. Nonseminoma. All patients with mediastinal primary, or nonpulmonary visceral metastases, or poor markers: α-FP >10,000 ng/ml or β-HCG >50,000 IU/L (1,000 ng/mL) or LDH >10 times × upper limit of normal; 16% of nonseminomas show a PFS of 41% and 5-year survival of 48%.
   B. Seminoma. No patients are classified as poor prognosis.

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NSGCT

International Germ Cell Cancer Collaboration Group ***J Clin Oncol 1977***

	AFP	*hCG*	*LDH*	non-semonomas	
Good Prognosis					
Testis/retroperitoneal				56%	
No NPVM				5 year PFS	82 %
Good markers	< 1000	< 1000	< 1.5 x N	5 YSR	86 %
Intermediate Prognosis					
Testis/retroperitoneal				28%	
No NPVM				5 year PFS	75 %
Intermediate markers	1,000~ 10,000	1,000~ 10,000	1.5 x~ 10 x N	5 YSR	80 %
Poor Prognosis					
Mediastinal primary				16%	
NPVM (liver bone, brain)				5 year PFS	41 %
Poor markers	> 10,000	> 10,000	> 10 x N	5 YSR	48 %

NPVM non-pulmonary visceral metastasis
PFS progression free survival

Neurogenic tumors

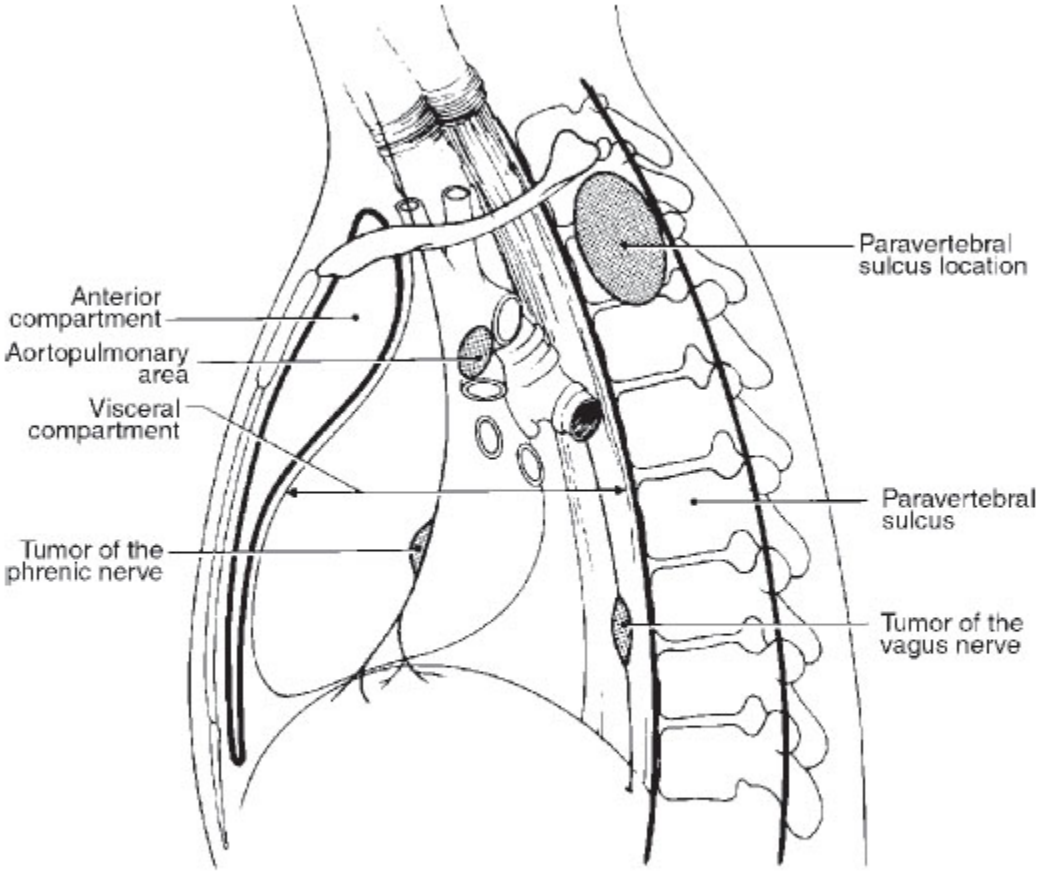

FIGURE 170.1 Mediastinal compartments and usual locations of neurogenic tumors: (1) paravertebral sulcus location; (2) aortopulmonary area of the visceral compartment; (3) tumor of the phrenic nerve in the visceral compartment; and (4) tumor of the vagus nerve in the visceral compartment. (Reprinted from Shields TW, Reynolds M. Neurogenic tumors of the thorax. *Surg Clin North Am* 1988;68:645. Copyright © 1988 Elsevier. With permission.)

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TABLE 170.1 Neurogenic Tumors of the Thorax

Benign	Malignant	Age Group
Nerve sheath origin Neurilemoma Neurofibroma Melanotic schwannoma	Malignant schwannoma; neurogenic sarcoma Neurogenic sarcoma	 Adults Adults Adults
Granular cell tumor		Adults
Autonomic ganglia Ganglioneuroma	Ganglioneuroblastoma Neuroblastoma Primary malignant melanotic tumor of the sympathetic ganglia	Children and young adults Children, rarely in adults Adults
Peripheral neuroectodermal tumor	Malignant small-cell tumor; Askin tumor	Children

TABLE 170.2 Mediastinal Neurogenic Tumors

Tumors of Autonomic Ganglia	Neuroblastoma	Ganglioneuroblastoma	Ganglioneuroma
Tumors of Nerve Sheath Origin	Schwannoma (Neurilemoma)	Neurofibroma	Malignant schwannoma (Neurogenic sarcoma)
Tumors of Neuroectodermal Origin	MNTI	Askin tumor	
Tumors of Paraganglia Origin	Paraganglioma		

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Mesenchymal Tumors of the Mediastinum

TABLE 172.1 Primary Mesenchymal Tumors

Tissue	Benign	Malignant
Adipose	Lipoma	Liposarcoma
	Lipoblastoma	
	Hibernoma	
Lymphatic	Lymphangioma	
	Lymphangioleiomyomatosis	
Blood Vessels	Hemangioma	Hemangioendothelioma
	Hemangiopericytoma	Angiosarcoma
Fibroblasts	Fibromatosis	Fibrosarcoma
		Malignant Fibrous Histiocytoma
		Inflammatory Fibrosarcoma
Skeletal	Chondroma	Osteosarcoma
		Chondrosarcoma
Muscular		
Striated	Leiomyoma	Leiomyosarcoma
Smooth	Rhabdomyoma	Rhabdomyosarcoma

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