Session I. Symposium

종격동 질환의 개요

Introduction of Mediastinal Disease

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A. Location of Mediastinum

Anatomic division of the thorax extending from the diaphragm to the thoracic inlet

(Boundary of mediastinum)

Superior - thoracic inlet
Inferior - diaphragm
Anterior - sternum
Posterior - thoracic vertebrae
Lateral - parietal pleura

Anatomical division of Mediastinum

1) Anterosuperior mediastinum
 - anterior part of pericardium and pericardial reflection
 - thymus, aortic arch & branch, great veins, lymphatic duct, fatty areolar tissue
2) Middle mediastinum
 - Between anterosuperior and posterior mediastinum
 - location of pericardial cavity
 - heart, pericardium, phrenic nerve, carina, main bronchus lymph node
3) Posterior mediastinum
 - posterior part of pericardium and pericardial reflection
 - esophagus, vagus nerve, sympathetic system, thoracic duct, descending aorta, azygous & hemiazygous vein, paravertebral lymph node, fatty areolar tissue

B. Mediastinal Diseases

1. Mediastinitis

acute fulminant infection and high mortality rate : characteristic

1) Causes
 a. wound infection after median sternotomy: most common and increase incidence (1~2% of OHS)
 b. esophageal perforation
  - spontaneous rupture(Boerhaave's syndrome)
  - esophagoscopy(decrease incidence after use of flexible esophagoscopy)
  - trauma(surgical, blunt, penetrating, foreign body)
 c. tracheobronchial perforation
 d. mediastinal extension from infection of lung, pleura, chest wall, vertebra, great vessel, or neck
 e. subphrenic infection
2) Symptom and signs
 a. high fever, chest pain, dyspnea, tachycardia, dysphagia: rapid progression
 b. delayed diagnosis cause death
 c. different symptoms due to cause and location
3) Diagnosis
 a. clinical symptom and signs
 b. leukocytosis
 c. chest X-ray, CT, Esophagogram
4) Treatment
 a. management of underlying disease
 b. I & D → irrigation

c. antibiotics administration and nutritional support

#. Sternal infection

? necrotic tissue debridement
? continuous irrigation
? antibiotics
? tissue flaps to obliterate dead space

#. Esophageal perforation

- Within Golden time; primary closure try
- After Golden time;
clear margin== primary closure & reinforcement try
severe infection == debridement & esophageal diversion
+ cervical esophagostomy
- closed chest tube insertion & mediastinal irrigation with drainage
high mortality (30~40%)

2. Mediastinal emphysema (Pneumomediastinum)

1) Source of air
   a. tracheobronchial tree(lung)
   b. esophagus :
   c. neck
   d. abdomen
2) Causes
   a. spontaneous or idiopathic
   b. traumatic - most common
   c. pathologic
3) Symptom and signs
   a. substernal pain and crepitus (chest wall and neck)
   b. SVC compressive syndromes
   c. Hamman's sign ; crunching sound, synchronous with systole at precordium
4) Diagnosis
   Chest X-ray & Chest CT : demonstration of mediastinal air
5) Pathogenesis
   Effect ; extrapericardial tamponade and reduction of alveolar ventilation
6) Treatment
   a. sedation
   b. chest tube insertion; combined with pneumothorax
   c. oxygen administration
   d. surgery
      surgical correction according to causes

3. Mediastinal Hemorrhage

1) Causes
   a. blunt or penetrating trauma
   b. thoracic aortic dissection
   c. rupture of aortic aneurysm
   d. surgical procedure within the thorax
2) Symptom and signs : varies with the underlying etiology
   a. retrosternal pain radiating to the back or neck : common
   b. symptoms related to compression of mediastinal structure;
      dyspnea, venous distention, cyanosis,
   c. cervical ecchymosis : blood dissecting into soft tissue
3) Diagnosis
   a. Radiologic findings; superior mediastinal widening, loss of normal aortic contour
      and soft tissue density in anterosuperior mediastinum
   b. Echocardiography & MRI ; better characterize mass and its relationship to vascular structure

4) Treatment
Evacuation of existing clot and repair of the underlying process

4. Superior Vena Cava Syndrome

1) Causes
(1) malignancy (70~80%)
a. RUL lung cancer(3/4) → direct invasion, secondary lymph node &mediastinal involvement
b. thymoma;
c. malignant germ cell tumor
d. lymphoma
e. metastatic cancer
(2) benign condition (25%)
a. mediastinal granulomatous disease : histoplasmosis, tuberculosis
b. idiopathic mediastinal fibrosis
c. mediastinal goiter, bronchogenic cyst, teratoma, pleural calcification
d. thoracic aortic aneurysm
e. indwelling catheter or trauma to vessel

2) Symptom and Signs
a. Edema of upper extremity, face, neck, upper chest
b. venous engorgement of upper extremity
c. headache, dizziness, cyanosis, tinnitus;aggrevated after neck flexion
d. usually slow obstruction = not fetal condition.
(collateral ; azygous vein)
e. acute obstruction- cerebral edema, cranial thrombosis, coma & death

3) Diagnosis
a. Chest PA & lateral view
b. Chest CT & MRI
c. Venous angiography

4) Treatment
(1) medical treatment
a. diuretics and salt restriction, head up position
b. steroid therapy
(2) radiation therapy ; emergency RT in malignant condition
(3) Surgery according to causes :
(4) SVC bypass surgery, percutaneous stent insertion
(5) multiagent chemotherapy
(6) anticoagulant or fibrolytic therapy

5. Mediastinal Tumor

Metastatic tumor in usually old age(Especially lung cancer)
More common primary tumor in young age

#. Primary tumor

1) Incidence
- neurogenic tumor(20%)>> thymoma(19%)> primary cyst(18%)> lymphoma(13%)>germ cell tumor(10%)
- location
anterosuperior(56%), Posterior(25%), Middle(19%)
- Malignancy in 25~42%,
malignant lymphoma, thymoma, germ cell tumor, primary carcinoma, neurogenic tumor
- Incidence of malignancy according to location:
anterosuperior(59%), middle(29%), posterior(16%)
- Incidence according to age: high malignancy in 2nd ~4th decade
Mostly benign below 10 year(73%)

2) Symptoms
- Usually asymptomatic
high possibility of malignancy in symptomatic cases.

asymptomatic in 54% of benign, 15% of malignancy

a. nonspecific symptoms ; common (chest pain, dyspnea, cough, URI symptom, general weakness, weight loss)
b. compressive symptoms : Tracheobronchial compression
c. invasive symptoms : SVC syndrome, hoarseness, Horner syndrome
d. endocrine symptoms
; hypertension, hypercalcemia, Cushing, thyrotoxicosis
* Cushing syndrome : carcinoid, thymoma
* gynecomastia : germ cell tumor
* diarrhea, flushing : ganglioneuroma

3) Location and characteristic of primary tumor

(1) Anterior mediastinum
(thymoma > lymphoma > germ cell tumor)

a. Thymoma

peak incidence in 3rd to 5th decades
- combined diseases
① Myasthenia gravis (10-50 %)
② pure red cell aplasia, pure white cell aplasia
③ aplastic anemia
④ hypogammaglobulinemia
⑤ Cushing's syndrome
⑥ SLE
⑦ rheumatoid arthritis
⑧ megaesophagus
⑨ dermatomyositis
⑩ granulomatous myocarditis

Histological classification :
by predominance of epithelial or lymphocytic cells
(lymphocytic, epithelial, mixed and spindle)
by morphologic resemblance to cortical or medullary epithelium

DDx between benign and malignant disease
determined by the presence of gross invasion of adjacentstructures,
metastasis or microscopic evidence of capsular invasion

Staging of thymoma
Stage I : tumor is well encapsulated without evidence of gross or microscopic capsular invasion
Stage II : tumor exhibits pericapsular growth into adjacent fat of mediastinal pleura or microscopic invasion of the thymic capsule
Stage III : tumor invades adjacent organs
Stage IVa : intrathoracic metastatic spread occurs
Stage IVb : extrathoracic metastatic spread occurs(uncommon)

Prognosis

	5Yr Survival rate	10Yr Survival Rate
Stage I	90.0~96.2%	66.7~86.0%
Stage II	70.0~96.0%	55.0~75.0%
Stage III	50.0~69.6%	21.0~58.3%
Stage IV	50.0~100%	0.0~40.0%

b. Germ-cell Tumor

(classification)

Benign
Mature teratoma
Dermoid cyst

Malignant
Seminomas

Nonseminomatous germ cell tumors
Immature teratoma
Teratoma with malignant components
Choriocarcinomas
Embryonal cell carcinomas
Endodermal cell(yolk sac) tumors
Mixed germ cell tumors

#. teratoma : most common mediastinal germ cell tumor
3 germ cell layer tissue
- ▸ ectoderm : skin, hair, sweat glands, sebaceous material, tooth-like structure)
- ▸ mesoderm : fat, cartilage, bone
- ▸ endoderm : respiratory or intestinal epithelium

mixed density in CT scan (fat, cartilage, bone density)

teratodermoid(dermoid) cyst: simplest form, predominantly epidermal
including dermal & epidermal glands,hair and sebaceous material

#. malignant germ cell tumor
seminoma : 50% of malignant germ cell tumor
common in anterosuperior mediastinum
remain intrathoracic with local extension to mediastinal & pulmonary structure
- ▸ β-HCG(+) (less than 7%)
- ▸ α-FP(-)

therapy is determined by the stage
sensitive to radiation and chemotherapy
nonseminoma : choriosarcoma, embryonal cell carcinoma,
malignant teratoma, endodermal(yolk-sac) tumor
(difference from seminoma)
① more aggressive tumor, frequently disseminated at the time of diagnosis
② rarely radiosensitive
③ β-HCG & α-FP production : more than 90%

c. Lymphoma
frequently involve mediastinum during course of disease(40~70%)
infrequent sole site of disease at the time of presentation
chest pain, cough, dyspnea, hoarseness, SVC syndrome: most common clinical manifestation
CT & MRI : useful in delineating the extent of disease, determing invasiveness,
differentiating from cardiovascularabnormality, aiding the selection of radiation portals
following the response to therapy, and diagnosing relapse, difference from thymoma
and germ cell tumor

(2) Middle mediastinum
- rare

a. lymphoma
b. pericardial cyst
c. bronchogenic cyst ;

(3) Posterior mediastinum
a. neurogenic tumor : most common mediastinal tumor
20% of all primary tumor and cyst

(origin)
sympathetic ganglia: ganglioma, ganglioneuroblastoma, neuroblastoma
intercostal nerve: neurofibroma, neurilemoma, neurosarcoma
paraganglia cell: paraganglioma

most neurogenic tumor in adult : benign
greater percentage of neurogenic tumor in children : malignant
10% of neurogenic tumor: extension into the spinal column *(Dumbbell tumor)*

b. enteric cyst
c. bronchogenic cyst

4) Primary Cysts
18% of mediastinal mass,
bronchogenic, pericardial, enteric, thymic and unspecified cyst
more than 75%: asymptomatic
(brochogenic cyst)
most common primary cyst, originate as sequestrations from the ventral foregut,
the antecedent of the tracheobronchial tree
usually located proximal to the trachea or bronchi and may be justposterior to the carina
2/3 of cyst : asymptomatic
in infant, can cause respiratory distress by compression the tracheaor the bronchus
Surgical excision recommand to provide definite histologic diagnosis,
alleviate symptoms, and prevent complication
Malignant degeneration reported
(pericardial cyst)
second most common cyst, occur in the pericardiophrenic angles
Rt side: 70%, Lt side: 22%, remainer: other sites
(enteric cyst)
arise from the posterior division of the primitive gut
most frequently located in posterior mediastinum, usually adjacent to the esophagus
associated with vertebral column anomaly: *neuroenteric cyst*
(nonspecific cyst)
lesion which a specific epithelial or mesothelial lining cannot be identified
5) Primary Carcinoma
3~11% of primary mediastinal masses
origin of tumor is unknown
large cell, undifferentiated morphology
occur with equal frequency in either sex,
have symptoms from the local mass effects of the tumor
surgical excision is rarely possible
routine radiation therapy and chemotherapy: unsuccessful
mean survival is less than 1 year
6) Endocrine Tumors
(Thyroid Tumors)
intrathoracic thyroid tumor is rare and only 1% of all mediastinal mass
arise from heterotopic thyroid tissue
peak incidence: 6th to 7th decade, Female> Male
symptom related to location of tumor
anterosuperior or middle mediastinum = tracheal compression symptoms[dyspnea, cough
wheezing, and stridor]
posterior mediastinum = esophageal compression symptoms[dysphagia]
mostly adenoma, carcinoma also reported
(Parathyroid Tumors)
found anterosuperior(80%) and posterior(20%)
adenoma and carcinoma : hormonally active
parathyroid cyst : usually not hormonally active
(Neuroendocrine Tumors)
known as carcinoid tumors, arise from cells of Kulchisky located in the thymus
predilection in Male in 40s and 50s
located in the anterosuperior mediastinum
metastatic spread to mediastinal and cervical LN, liver, bone, skin and lung
: 20% at presentation
50% of tumor : hormonally active, associated with Cushing's syndrome

7) Mesenchymal tumors

originate from the connective tissue, muscle, fat, lymphatic tissue, and blood vessels
7% of primary mass in the collected series
lipoma, liposarcoma, fibrosarcoma, fibroma, xanthogranuloma, leiomyoma, leiomyosarcoma, benign and malignant mesenchymoma, rhabdomyosarcoma, mesothelioma
50% of tumor are malignant and surgical resection remains primary therapy

8) Giant Lymph Node Hyperplasia(Castleman's Disease)

initial and most report site, can be developed wherever lymph nodes in the body
usually located in anterosuperior
twodistinct histological entity
hyaline vascular type : 90% of Castleman's tumor, asymptomatic
plasma cell type : systemic symptoms[fever, night sweats, anemia, hypergammaglobulinemia]
Multicentric Castleman's disease: generalized lymphadenopathy with symptoms[fever, chills weight loss, hepatosplenomegaly, immunity and autoimmune phenomena], associated with HIV infection and human herpes virus 8, more malignant disease

9) Chordoma

rare malignant tumor in posterior mediastinum and originate from the primitive notochord
Male>Female, peak incidence in 5th to 7th decades
Chest pain, cough and dyspnea : common Sx
spinal cord compression follow extension into the spinal canal
Radical surgical excision : only effective therapy
Tend to recur at the surgical site
70% died of their disease

10) Extramedullary Hematopoiesis

all ages, as result of altered hematopoiesis,
typically a result of massive hemolysis, myelofibrosis, spherocytic anemia, or thalassemia
bilateral, asymmetrical paravertebral massess
Tx) No surgical resection unless invasion and compression of mediastinal structures
Radiation therapy: rapid shrinkage of mass

11) Diagnosis of mediastinal tumor

a. Medical History and Physical Examination
b. Chest PA, lateral & CT : usually incidental finding in routine check tumor nature(solid/cystic), size, location, density, calcification& type confirmed by chest film & CT(95%)
c. MRI
d. Esophagogram : DDx with esophageal disease
e. PCNA & PCNB - suspect secondary mass
f. Mediastinoscopy & Mediastinotomy
g. RI scan
h. Explothoracotomy

12) Treatment

Surgical Resection

- Low mortality and morbidity
- pathologically benign, clinically malignant
- possibility of malignant transformation
- Good prognosis in early diagnosis and surgery

Chemotherapy
Radiation

■ References

1. Townsend : Sabiston Textbook of Surgery, 17th ed. Elsevier, 2004
2. Sabiston DC, Spencer FC : Surgery of the chest, 5th ed. Philadelphia : WB Saunders,1994
3. Bennet and Plum : Cecil Textbook of Medicine, 22th ed
4. Crapo JD et al : Baum's Textbook of Pulmonary Disease, 7th ed, Philadelphia : LWW, 2004