POLTAVA STATE MEDICAL UNIVERSITY
Department of Surgery #2 (cheif – prof. Sheyko V.D.)

# Diseases of mediastinum

## (achalasia, diaphragmatic hernias, mediastinitis)

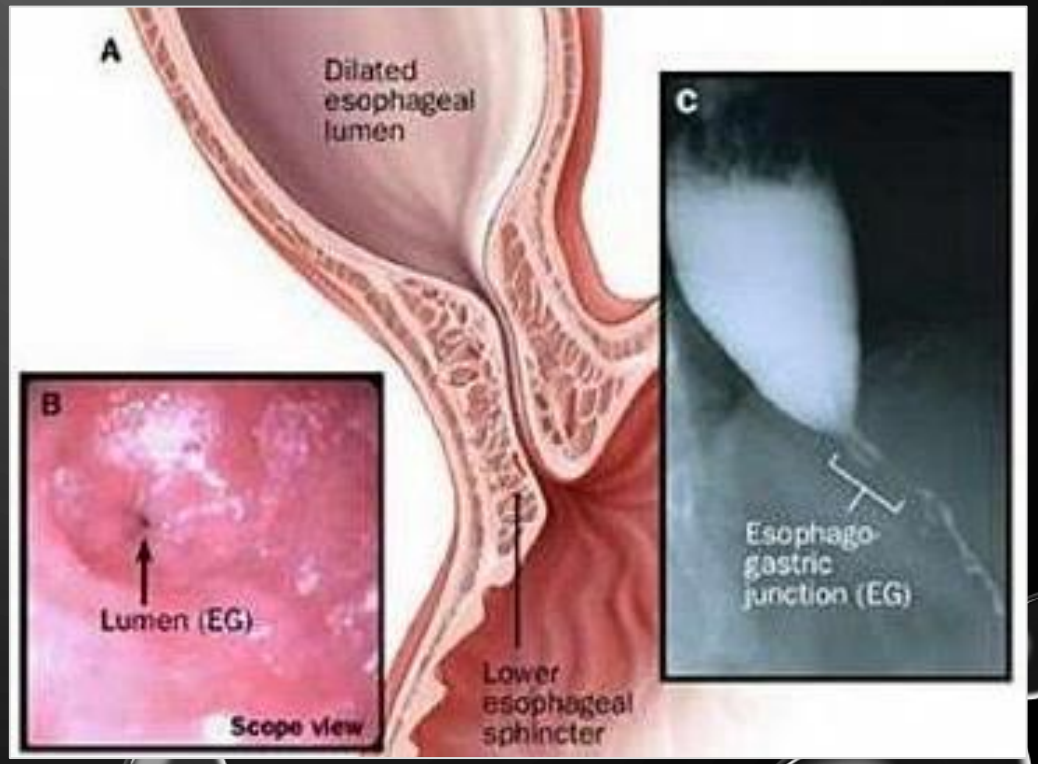
Poltava,
Ukraine, 2024

# ACHALASIA

**a primary esophageal motility disorder characterized by the absence of esophageal peristalsis and impaired relaxation of the lower esophageal sphincter (LES) in response to swallowing. Can occur in any age.**

Pathophysiology:

- LES pressure and relaxation are regulated by excitatory (eg, acetylcholine, substance P) and inhibitory (eg, nitric oxide, vasoactive intestinal peptide) neurotransmitters. Persons with achalasia lack nonadrenergic, noncholinergic, inhibitory ganglion cells, causing an imbalance in excitatory and inhibitory neurotransmission

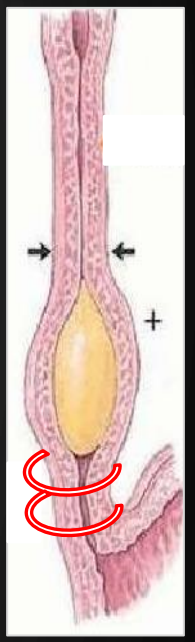


# Signs and symptoms

- Dysphagia (most common)
- Regurgitation
- Chest pain
- Heartburn
- Weight loss

Esophageal dysphagia:

- Inadequacy of food passage 2-4 sec after swallowing
- Food masses delay behind breastbone
- Choking and voice choking are not typical



Eckardt score, 1992

| | Symptom | | | |
|---|---|---|---|---|
| | **Weight loss (kg)** | **Dysphagia** | **Retrosternal pain** | **Regurgitation** |
| 0 | None | None | None | None |
| 1 | <5 | Occasional | Occasional | Occasional |
| 2 | 5-10 | Daily | Daily | Daily |
| 3 | >10 | Each meal | Each meal | Each meal |

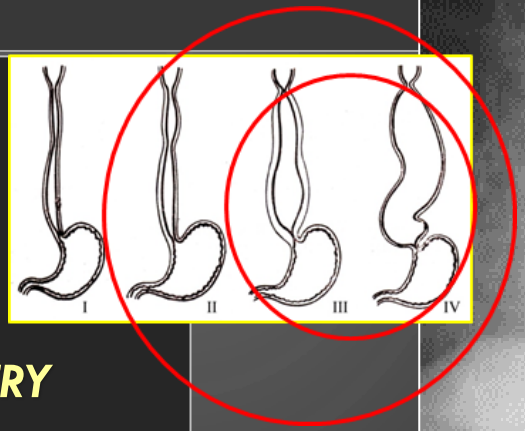
Treatment success evaulation

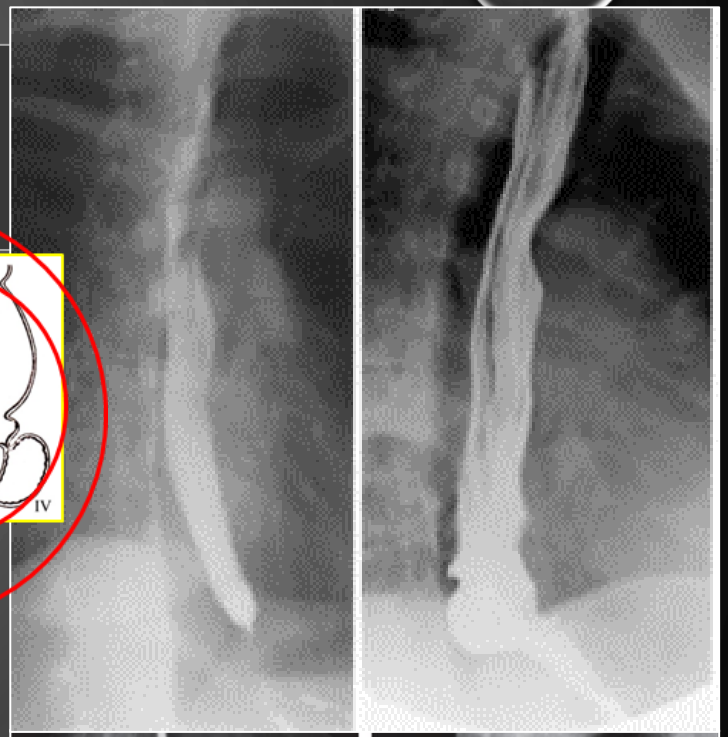
| | | |
|---|---|---|
| 0 | 0–1 | Remission |
| I | 2–3 | Remission |
| II | 4–6 | Treatment failure |
| III | >6 | Treatment failure |

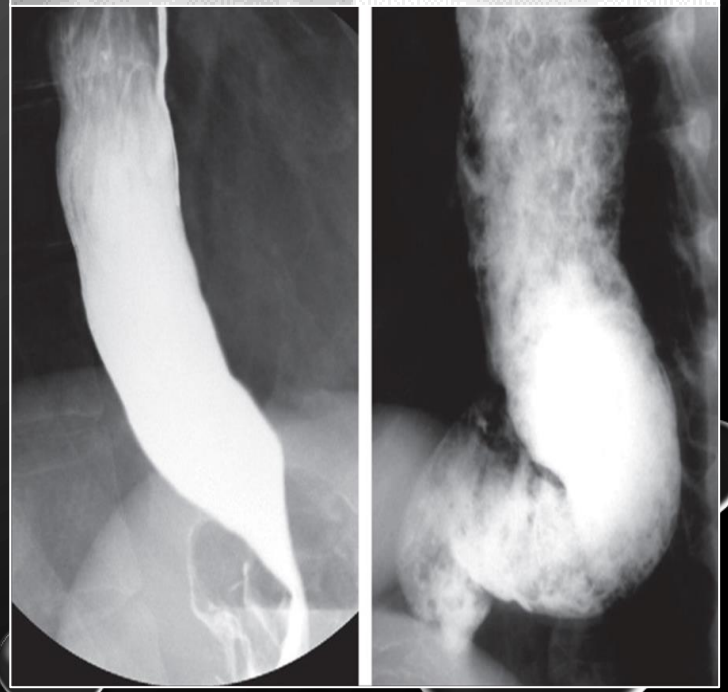
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5992017/

# WORKUP

- *CHEST X-RAY*
- *ENDOSCOPY*
- *CT*
- *HIGH RESOLUTION MANOMETRY*





St (Straight type)

Sg (Sigmoid type)

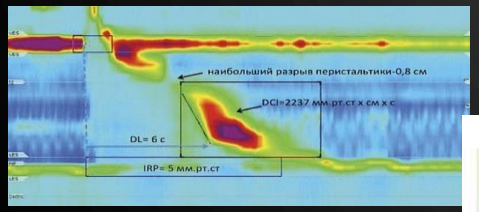
aSg (Advanced Sigmoid type)

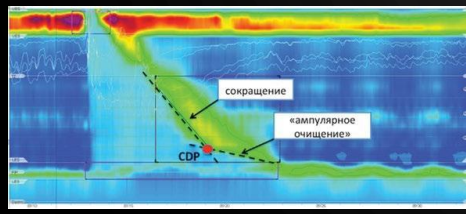
- Based on dilation of esophagus on esophagram
  - Grade 1: <4 cm
  - Grade 2: 4-6 cm
  - Grade 3: >6 cm

https://radiopaedia.org/articles/achalasia

# WORKUP

## *HIGH RESOLUTION MANOMETRY*

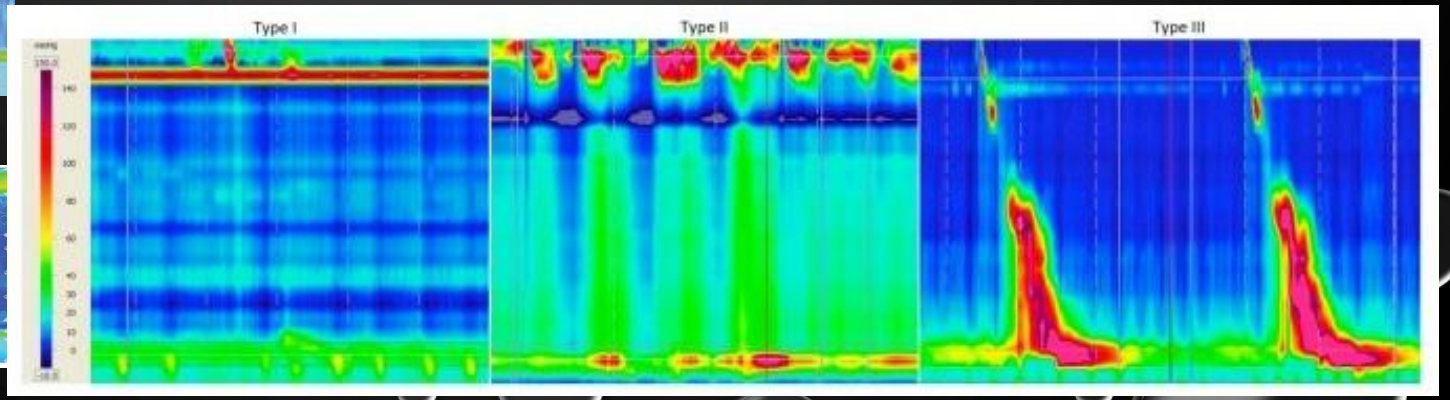



## Chicago Classification (v4.0):

- TYPE I: A conclusive diagnosis of type I achalasia is defined as an abnormal median IRP and absent contractility (100% failed peristalsis)
- TYPE II: A conclusive diagnosis of type II achalasia is defined as an abnormal median IRP and absent contractility (100% failed peristalsis) with panesophageal pressurization in 20% or more swallows
- 
- TYPE III: A conclusive diagnosis of type III achalasia is defined as an abnormal IRP and evidence of spasm (20% or more swallows with premature contraction) with no evidence of peristalsis

IRP integrated relaxation pressure at the level of LES/EGJ.



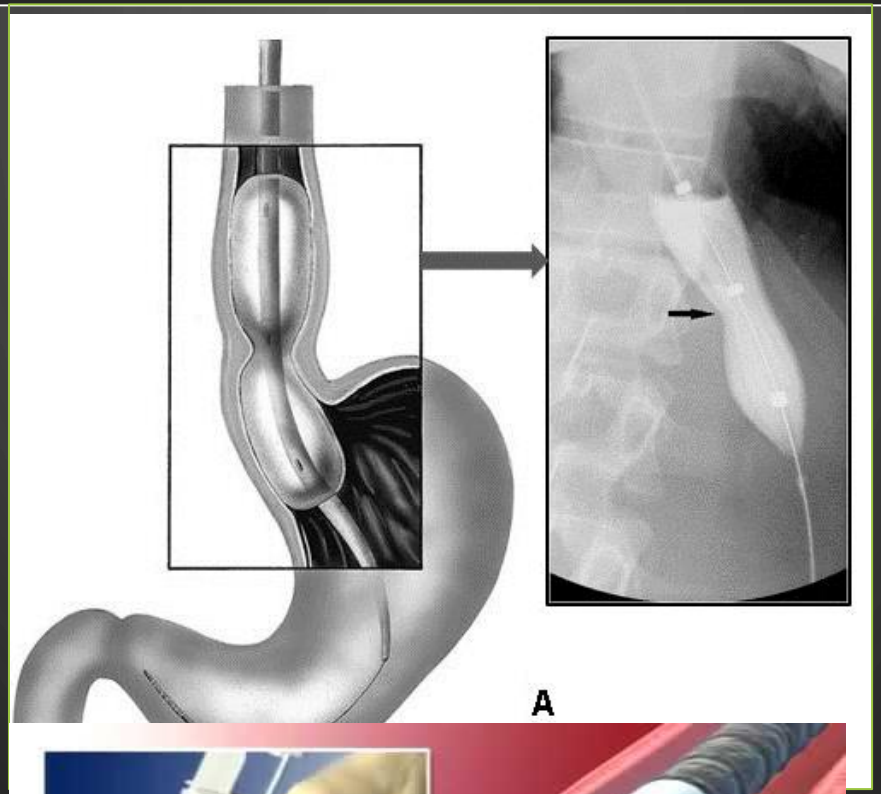

https://www.zora.uzh.ch/id/eprint/214927/1/nihms-1689425.pdf

# TREATMENT APPROACHES

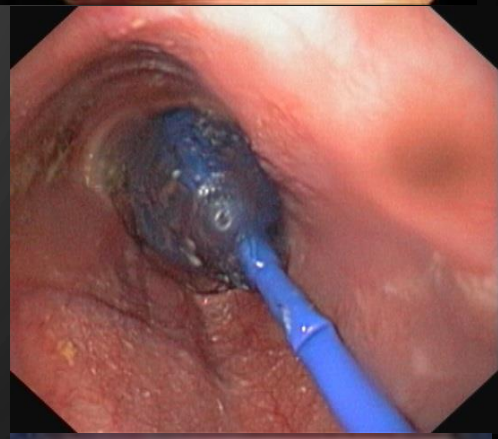

- Drugs
  - Atropin, ganglioblockers, calcium channel blockers, nitrates (low efficiency)
- Intrasphincteric injection of botulinum toxin

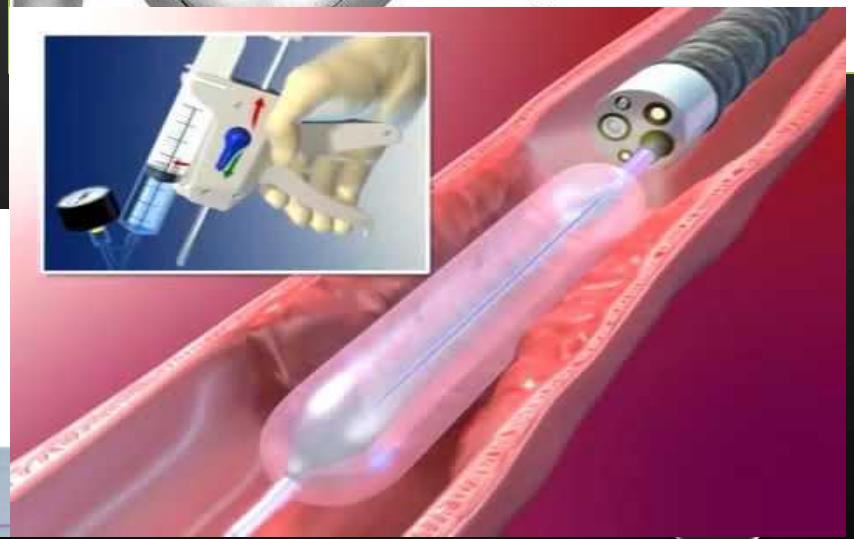
- Pneumatic dilatation
- Surgery:
  - ***Heller Procedure***,
    - Laparoscopy/laparotomy
  - ***POEM***: Peroral endoscopic myotomy,
  - Esophagus extirpation with plastics.

# PNEUMATIC DILATATION

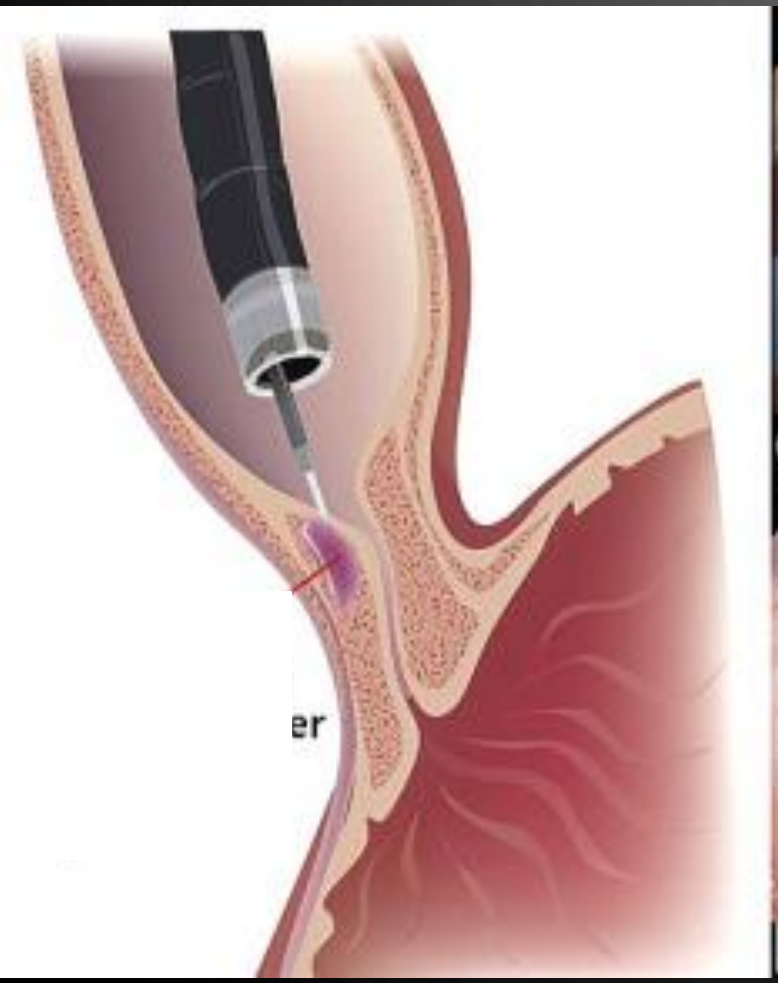


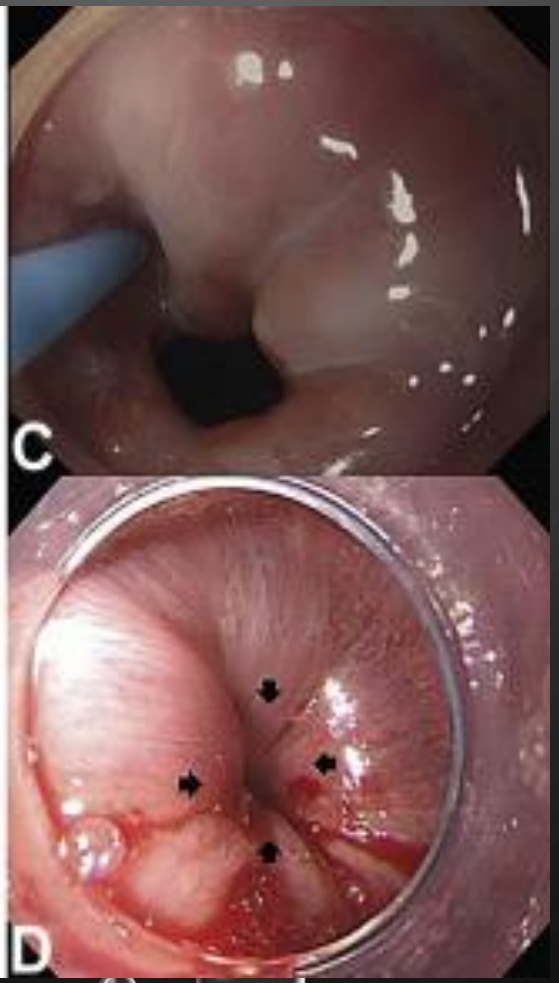






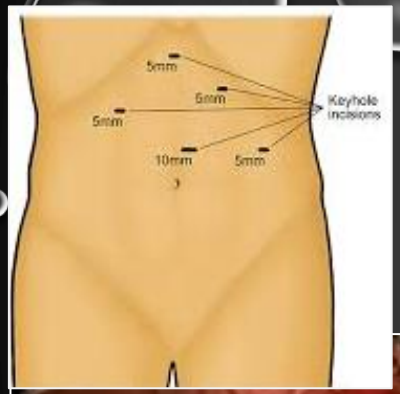
# INTRASPHINCTERIC INJECTION OF BOTULINUM TOXIN

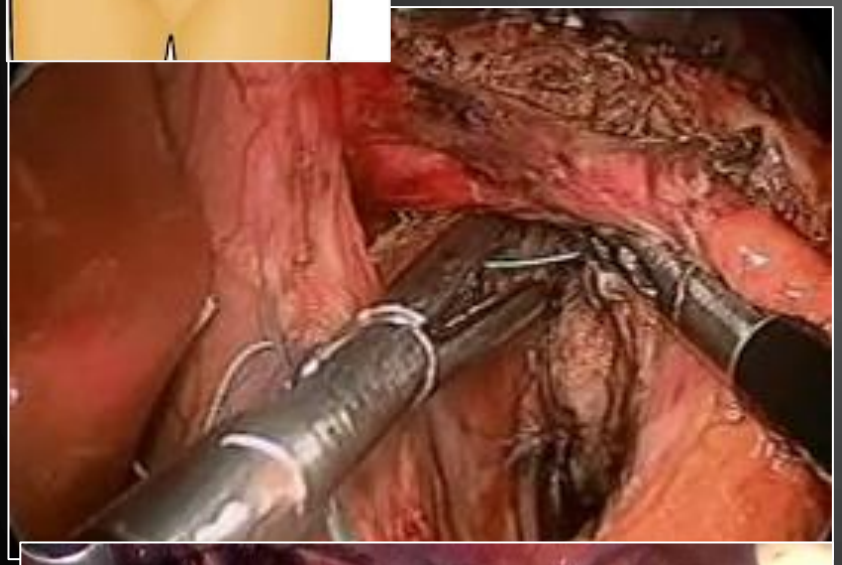


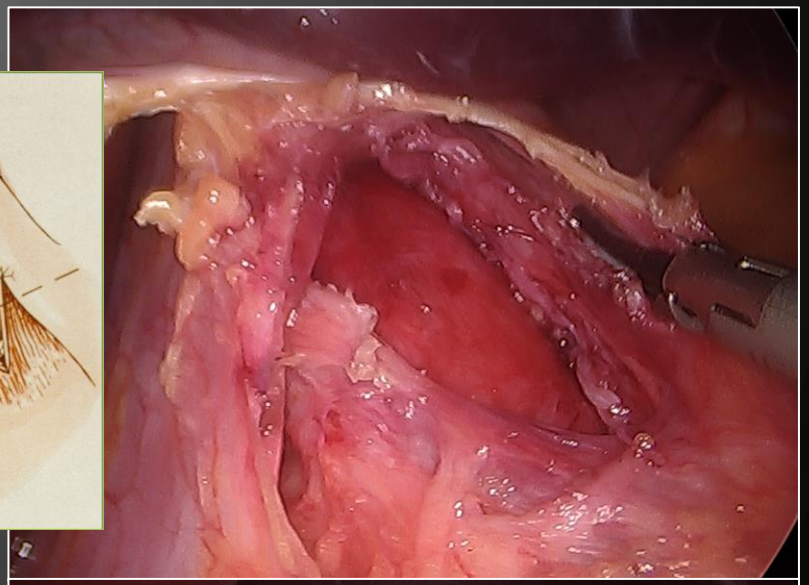



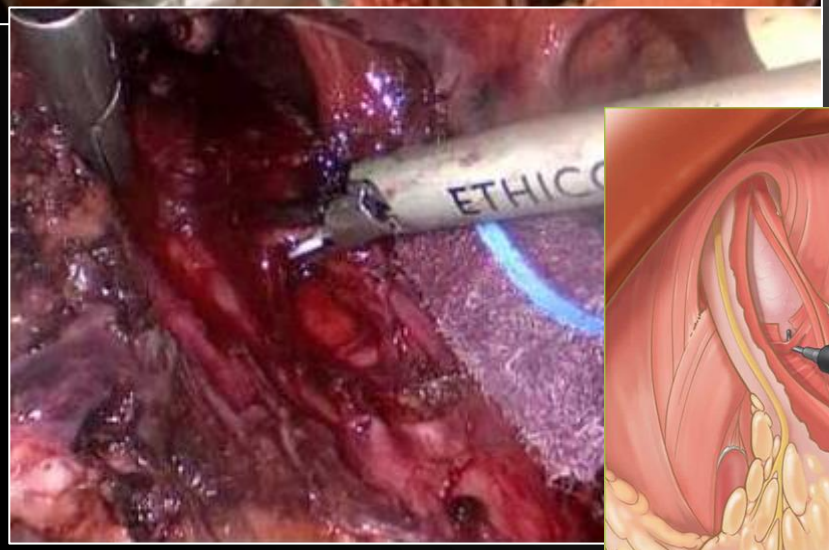


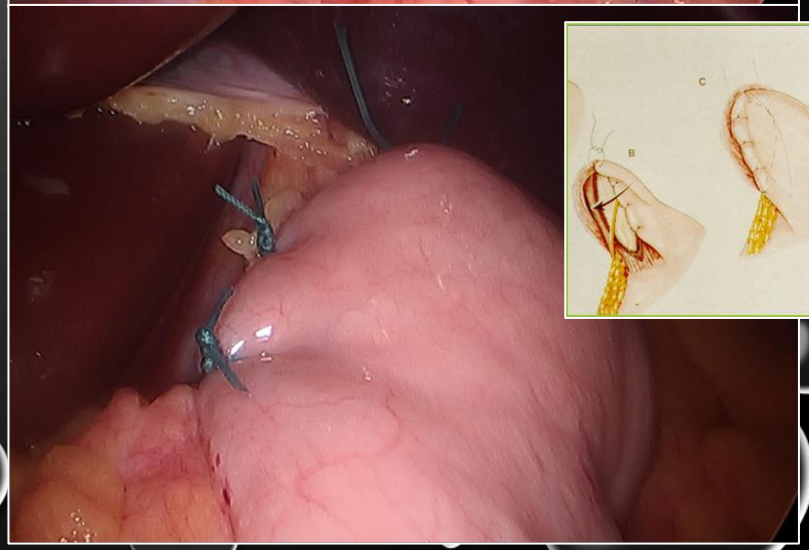
# Heller Procedure

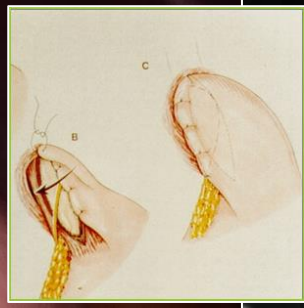


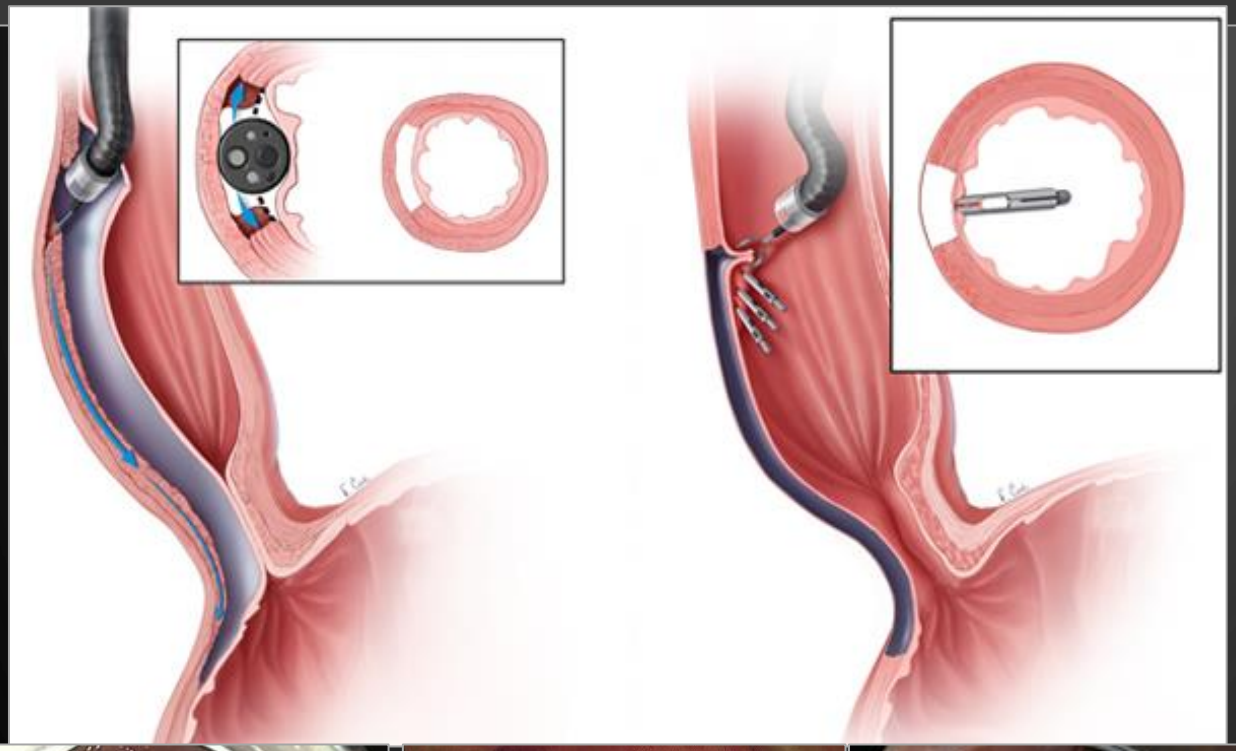



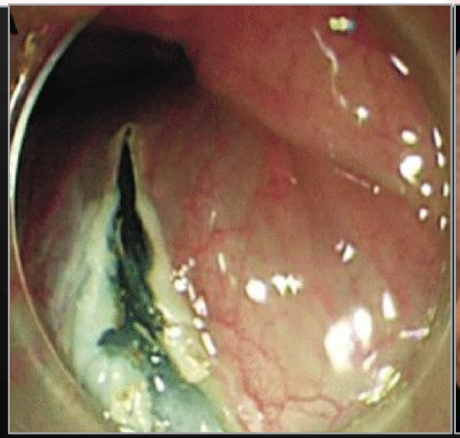




# POEM: Peroral endoscopic myotomy





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SAGES guidelines for the surgical treatment of esophageal achalasia

Authors | Authors and affiliations

Dimitrios Stefanidis, William Richardson, Timothy M. Farrell, Geoffrey P. Kohn, Vedra Augenstein, Robert D. Fanelli

CLINICAL GUIDELINES 1393

ACG Clinical Guidelines: Diagnosis and Management of Achalasia

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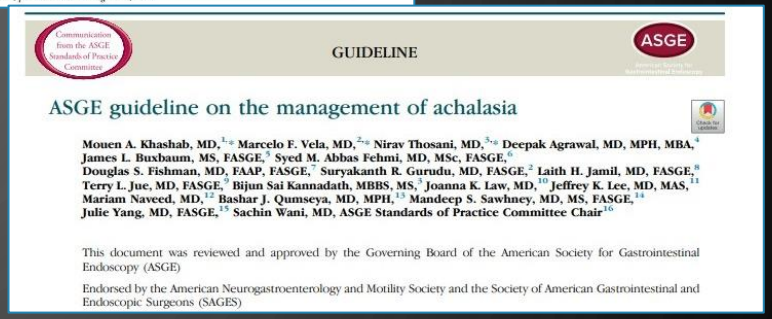
**Achalasia is an esophageal motility disorder characterized by aberrant peristalsis and insufficient relaxation of the lower esophageal sphincter. Patients most commonly present with dysphagia to solids and liquids, regurgitation, and occasional chest pain with or without weight loss. High-resolution manometry has identified 3 subtypes of achalasia distinguished by pressurization and contraction patterns. Endoscopic findings of retained saliva with puckering of the gastroesophageal junction or esophagram findings of a dilated esophagus with bird beaking are important diagnostic clues. In this American College of Gastroenterology guideline, we used the Grading of Recommendations Assessment, Development and Evaluation process to provide clinical guidance on how best to diagnose and treat patients with achalasia.**

*Am J Gastroenterol 2020;115:1393–1411. https://doi.org/10.14309/ajg.0000000000000731; published online August 10, 2020*

Communication from the ASGE Standards of Practice Committee

GUIDELINE

ASGE

ASGE guideline on the management of achalasia

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This document was reviewed and approved by the Governing Board of the American Society for Gastrointestinal Endoscopy (ASGE)

Endorsed by the American Neurogastroenterology and Motility Society and the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES)

- ***Surgical treatment-*** laparoscopic myotomy, POEM and pneumatic dilatation are effective;
  - **laparoscopic myotomy with partial fundoplication** is the most **favorable** procedure
    - ***Optimal fundoplication types– partial anterior or posterior fundoplication is superior to circular fundoplication;***
    - ***length of the esophageal myotomy should be at least 4 cm on the esophagus and 1-2 cm on the stomach.***
- ***Botulinum toxin injection can be administered safely, but its effectiveness is limited especially in the long term. It should be reserved for patients who are poor candidates for other more effective treatment options such as surgery or dilation.***
- **Endoscopic dilation** is the most effective for dysphagia relief in patients with achalasia but is also associated with the highest risk of complications. It should be considered in selected patients who refuse surgery or are poor operative candidates (++++, strong).
- ***Esophageal stents cannot be recommended for the treatment of achalasia.***

# HIATAL HERNIA

NCBI Resources How To

PubMed.gov US National Library of Medicine National Institutes of Health

PubMed

Advanced

Format: Abstract

Surg Endosc. 2013 Dec;27(12):4409-28. doi: 10.1007/s00464-013-3173-3. Epub 2013 Sep 10.

**Guidelines for the management of hiatal hernia.**

Kohn GP[1], Price RR, DeMeester SR, Zehetner J, Muensterer OJ, Awad Z, Mittal SK, Richardson WS, Stefanidis D, Fanelli RD; SAGES Guidelines Committee.

Collaborators (44)

Author information

**Comment in**

SAGES guidelines for the management of hiatal hernia. [Surg Endosc. 2013]

PMID: 24018762 DOI: 10.1007/s00464-013-3173-3

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## MANAGEMENT OF SYMPTOMATIC, ASYMPTOMATIC, AND RECURRENT HIATAL HERNIA: A SYSTEMATIC REVIEW AND META-ANALYSIS

Print PDF

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**Authors**

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## GUIDELINES FOR THE SURGICAL TREATMENT OF HIATAL HERNIAS

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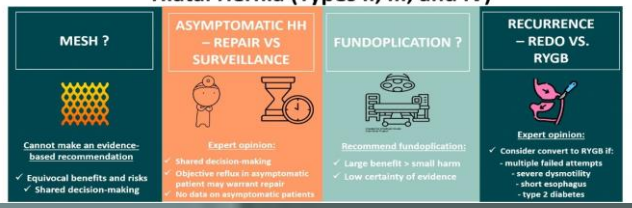
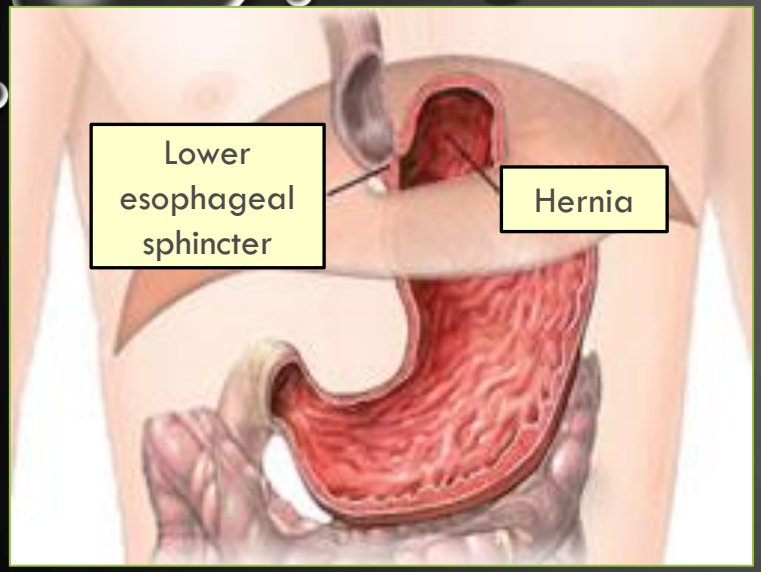
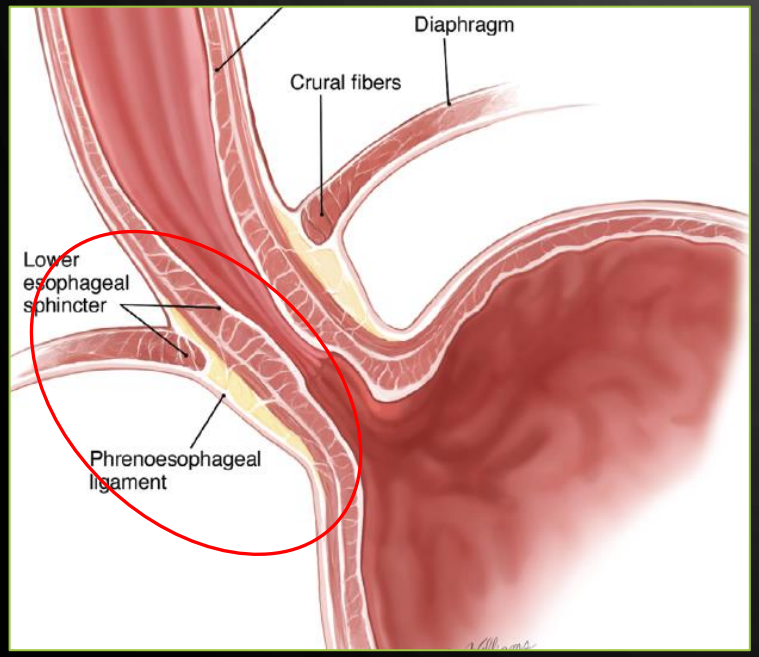
**SAGES Guideline for the Surgical Treatment of Hiatal Hernia (Types II, III, and IV)**






**Hiatal hernia (HH) is** a protrusion of any abdominal structure other than the esophagus into the thoracic cavity through a widening of the hiatus of the diaphragm.

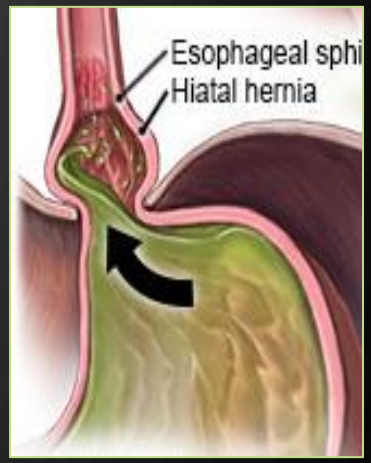
First described by surgeon A.Pare (France, 1579) and anatomist Morgani (Italy, 1768).




Cephalad migration of the gastroesophageal junction may result from **weakening of the phrenoesophageal ligament**. Depletion of elastin fibers leads to stretching of the ligament and proximal displacement of the gastroesophageal junction. Most cases of hiatal hernia are acquired rather than congenital, though familial clustering has been reported and in a very small number of cases, multifactorial inheritance may play a part.

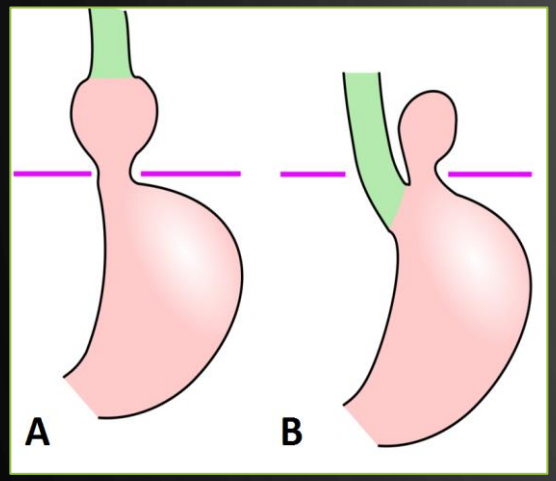
# BACKGROUND

- Hiatal hernias are more common in Western countries. The frequency of hiatus hernia increases with age, from 10% in patients younger than 40 years to 70% in patients older than 70 years. About 5% of population have HH. In EU and USA HH hold circa 30% of all digestive tract morbidity.
  - 50% - asymptomatic;
  - 25% - need PPI
  - 15% - need surgery.
- GERD – typical complication
  - **"Acid pocket" paradigm with reflux (heartburn, dysphagia, pain, regurgitation)**
  - USA, EU – 10-20% have GERD, 80% of them have decreased life quality
- Laparoscopy – a method of choice for treatment.




- Main surgical aspects:
  - Big and giant HH:
    - Best type of procedure is not established,
    - High frequency of unsatisfactory results.
  - Severe complications need urgent surgery:
    - *Cameron lesion with bleeding or stricture*,
      - severe iron deficiency anemia, which is refractory to treatment.
    - Gastric volvulus and incarceration lead to stomach outlet obstruction and/or wall necrosis.

# CLASSIFICATION




*ANATOMIC AND X-RAY CLASSIFIACATION*

*1. SLIDING HH – EGJ AND CARDIA (SELDOM STOMACH FUNDUS) DISLOCATES THOUGH DILATES HIATUS TO MEDIASTINUM (NO HERNIA SAC)*

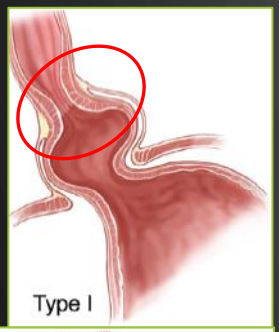
*2. PARAESOPHAGEAL HH - GASTRIC FUNDUS PROTRUDES SUPERIOR TO THE HIATUS WITH THE GEJ IN NORMAL POSITION (HAS PARAESOPHAGEAL HERNIAL SAC)*

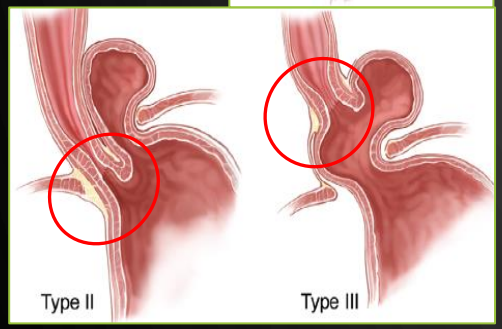
- *CARDIOFUNDUL, SUBTOTAL AND TOTAL*

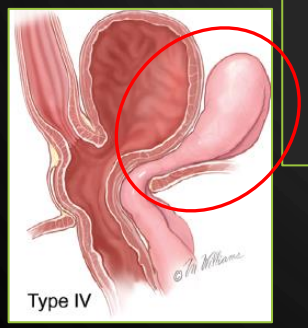
*3. MIXED HH - COMBINATION OF SLIDING AND PARAESOPHAGEAL HH*

- *IDC – 10:*
  - *K44.0 DIAPHRAGMATIC HERNIA WITH OBSTRUCTION, WITHOUT GANGRENE*
  - *K44.1 DIAPHRAGMATIC HERNIA WITH GANGRENE*
  - *K44.9 DIAPHRAGMATIC HERNIA WITHOUT OBSTRUCTION OR GANGRENE*

# SAGES CLASSIFICATION

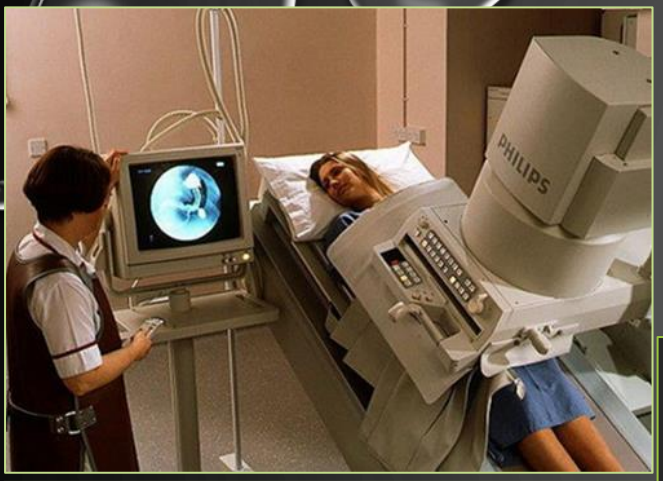



- Type I hernias (95%) are sliding hiatal hernias, where the gastroesophageal junction migrates above the diaphragm. The stomach remains in its usual longitudinal alignment and the fundus remains below the gastroesophageal junction.
  - GERD (and Barrett's esophagus) is common
- Type II hernias are pure paraesophageal hernias (PEH); the gastroesophageal junction remains in its normal anatomic position but a portion of the fundus herniates through the diaphragmatic hiatus adjacent to the esophagus.
- Type III hernias are a combination of Types I and II, with both the gastroesophageal junction and the fundus herniating through the hiatus. The fundus lies above the gastroesophageal junction.
- Type IV hiatal hernias are characterized by the presence of a structure other than stomach, such as the omentum, colon or small bowel within the hernia sac.

- **Types II-IV- paraesophageal hernias** (III - 90%, II - uncommon),
  - Have hernia sac;
  - Phrenoesophageal ligament is relatively intact.
- Giant HH (III and IV types) - ½ of stomach or more protrudes to mediastinum.

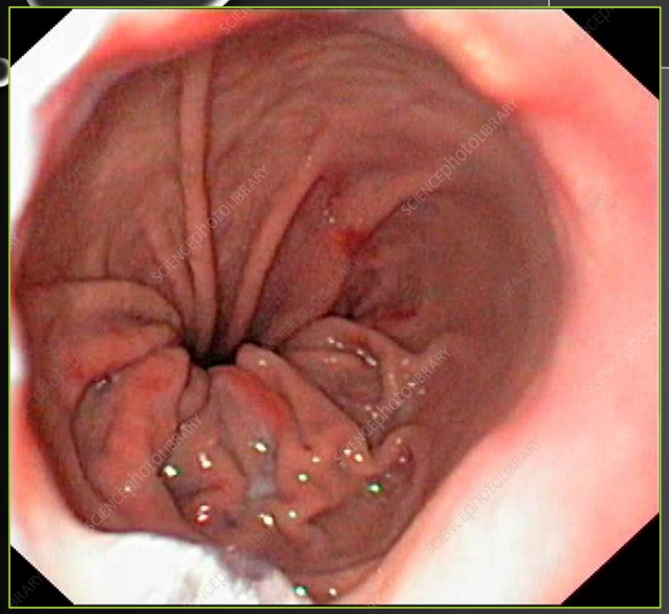



# DIAGNOSIS

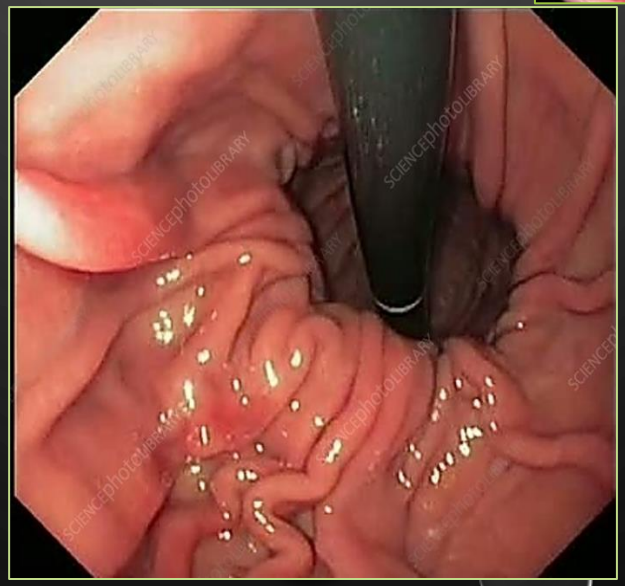
- Basic for surgery:
  - Chest X-ray,
  - EGDS
  - X-ray scopy with $BaSo_4$ + Trendelenburg position (superior to EGDS for size evaluation)
- CT – if deeper investigation needed only (eg. Gastric volvulus; Type IV hernia).

- **GL SAGES:** Hiatal hernia can be diagnosed by various modalities. Only investigations which will alter the clinical management of the patient should be performed (**+++, strong**).

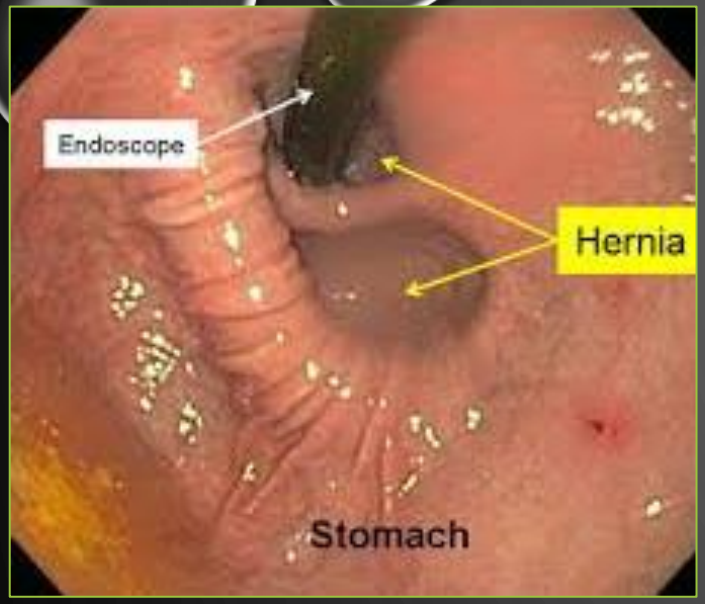
# TYPE I HH



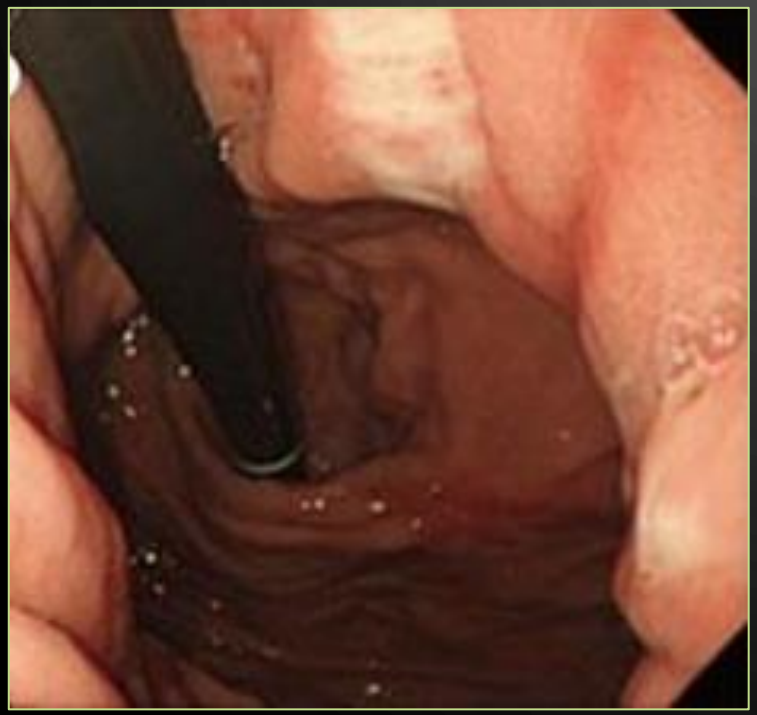
- Evaluation of esophageal and gastric mucosa
  - Esophagitis, Barrett's esophagus;
- Size and type of hernia (X-ray is better)
  - May be difficult in case of volvulus

# TYPE II-IV HH

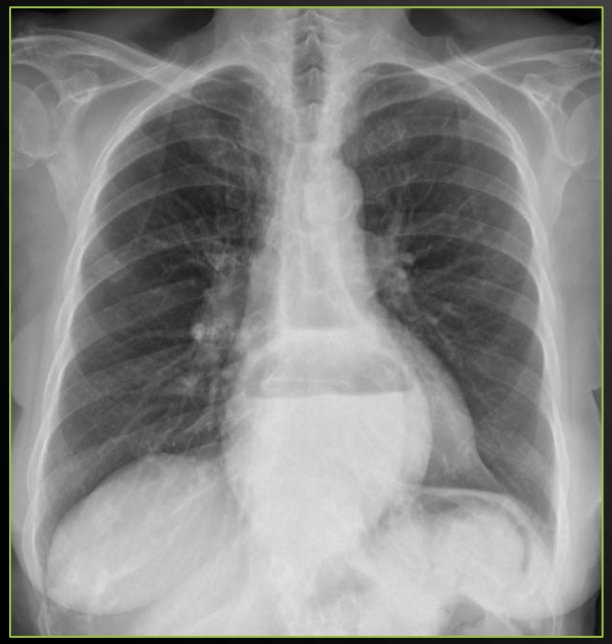


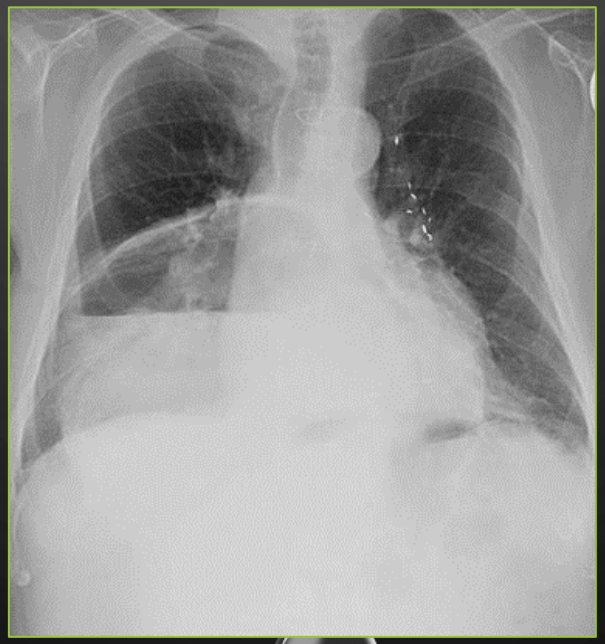

- Evaluation of esophageal and gastric mucosa
  - Esophagitis, Barrett's esophagus;
- Size and type of hernia (X-ray is better)
  - May be difficult in case of volvulus

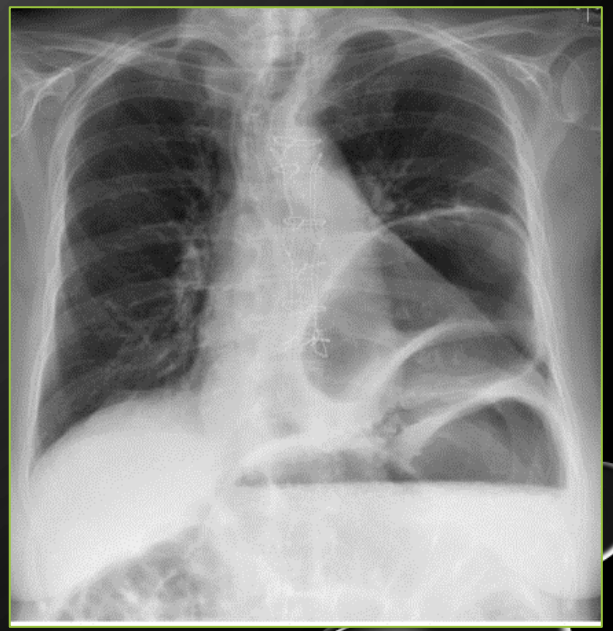


# CHEST X-RAY

*Plain chest radiographs may identify soft tissue opacity with or without an air fluid level within the chest. A retrocardiac air-fluid level on chest x-ray is pathognomonic for paraesophageal hiatal herniaand posttraumatic hernia. Visceral gas may be seen in cases of intestinal herniation.*



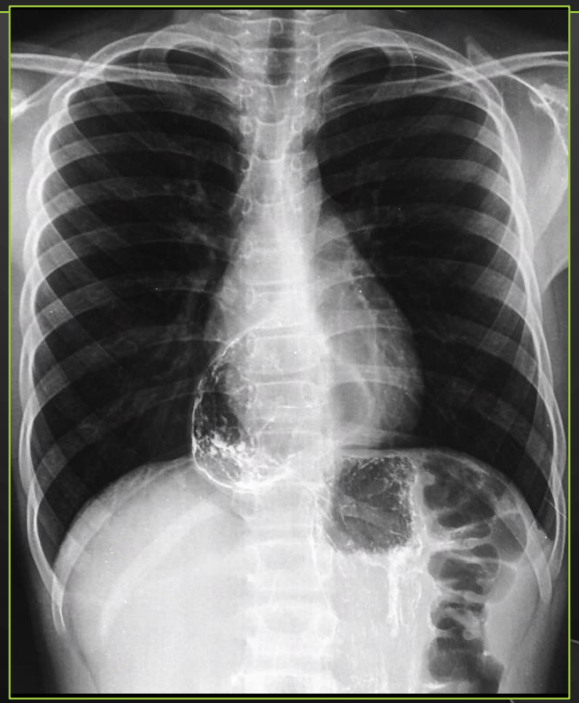


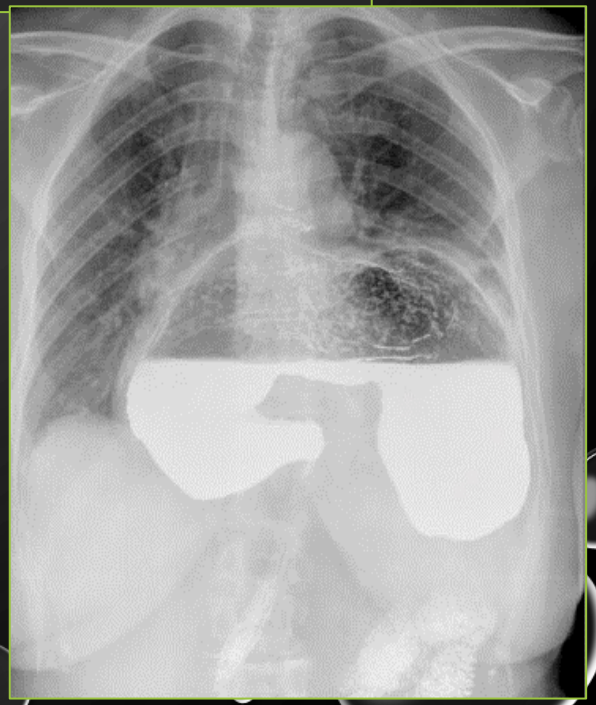


# CONTRAST STUDIES


- **Barium** is the contrast agent most frequently reported in the literature as used for this purpose.
- **Ionic water soluble contrast** in case of increased aspiration risk (volvulus)

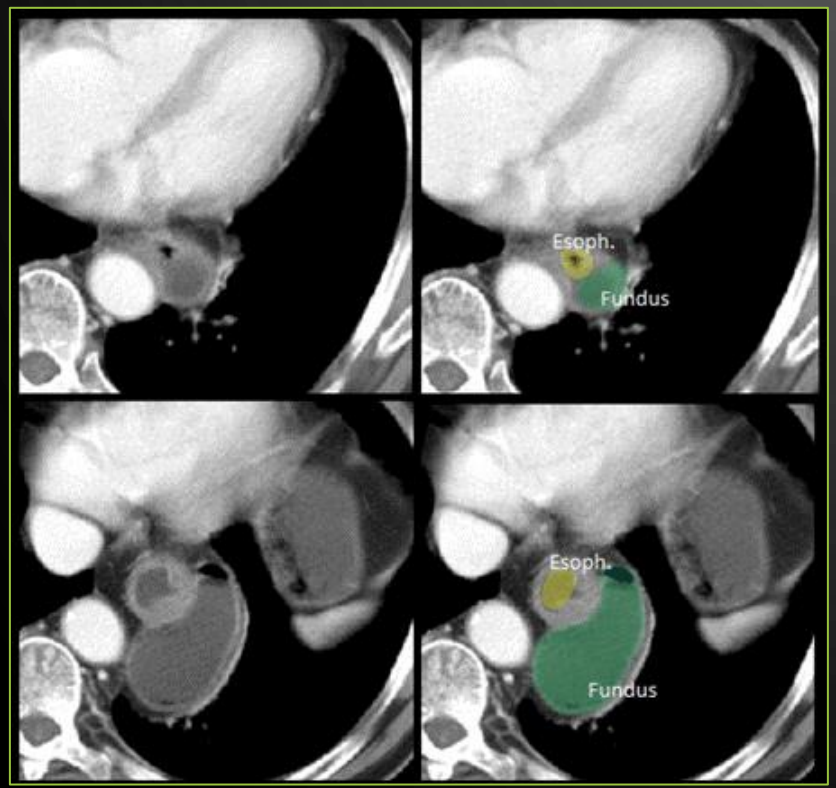
- Size and mobility of HH
- Cardia localization and presence of short esophagus
- Reflux-esophagitis – 95,5%

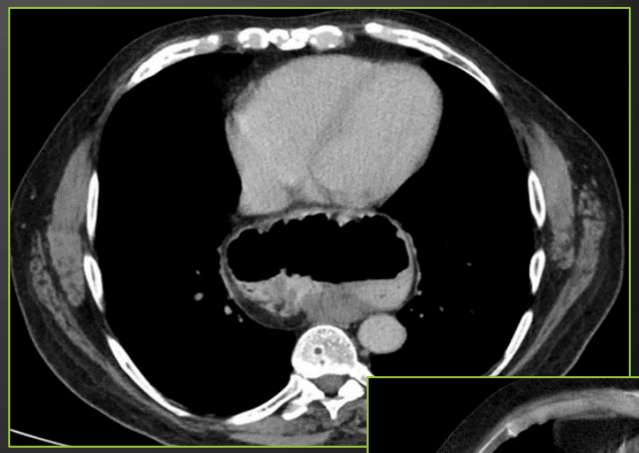


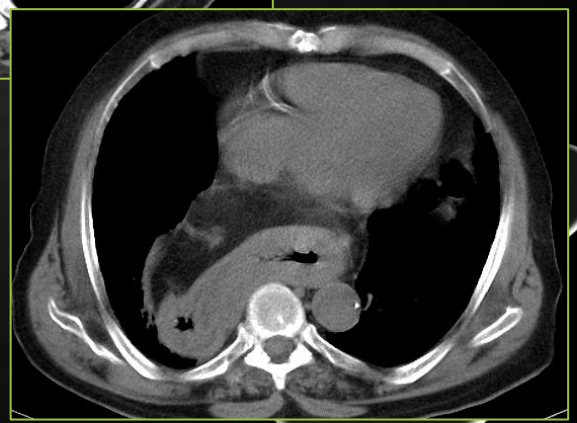


# COMPUTED TOMOGRAPHY

- Cranial dislocation of cardia or fundus
- Suspected gastric volvulus
- Intestinal obstruction - dilated loops of bowel proximally with normal-caliber or collapsed loops distally; air/fluid level in the chest or abdomen
- Also useful for recurrent HH, in case of mesh migration.

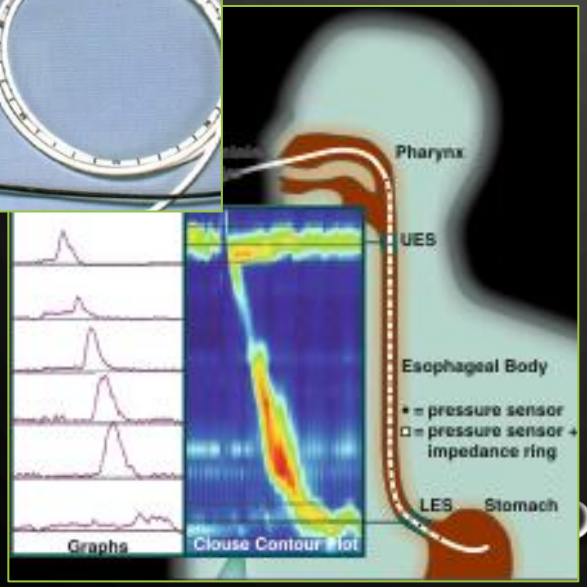


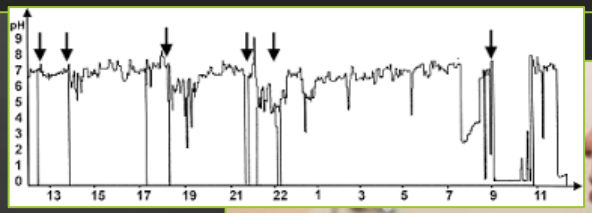





# ADDITIONAL METHODS

- ***Esophageal manometry*** can demonstrate the level of the diaphragmatic crura, the respiratory inversion point and the location of the lower esophageal sphincter.
- **pH testing** has limited relevance in the diagnosis of a hiatal hernia, but is critical to identify the presence of increased esophageal acid exposure in patients with sliding hiatal hernias that might benefit from antireflux surgery.




# INDICATIONS FOR SURGERY (SAGES)


- Repair of a type I hernia in the absence of reflux disease is not necessary (+++, **strong**)


- Type I HH. Surgery is indicated for removing of reflux ONLY:
  1. No effect from PPI;
  2. Constant need in PPI;
  3. PPI are contraindicated.

  Type I HH + no reflux = NO surgery (SAGES +++; strong recommendation)




- Type III-IV HH. All symptomatic paraesophageal hiatal hernias should be repaired (SAGES ++++, **strong**), particularly those with acute obstructive symptoms or which have undergone volvulus.

Moments, which should be considered (SAGES ++, **weak**):

- Lungs compression (decreased tidal volume and respiratory insufficiency)
- Iron deficiency anemia (about 50% in case of large HH)

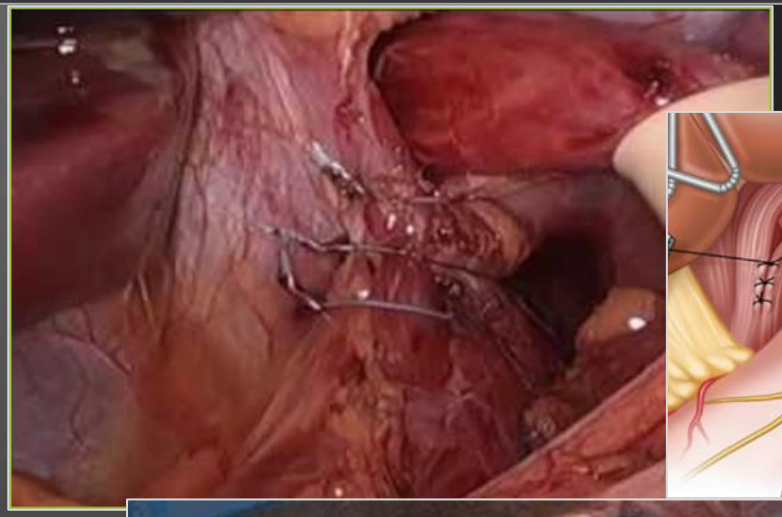
# ACCESS TYPE

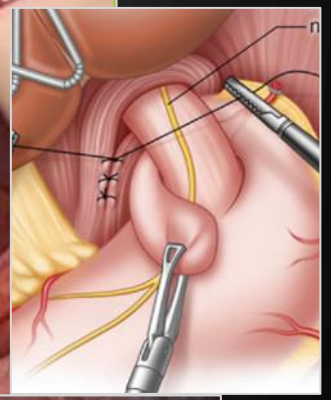
- Laparoscopic hiatal hernia repair is as effective as open transabdominal repair, with a reduced rate of perioperative morbidity and with shorter hospital stays. It is the preferred approach for the majority of hiatal hernias (++++, **strong**)

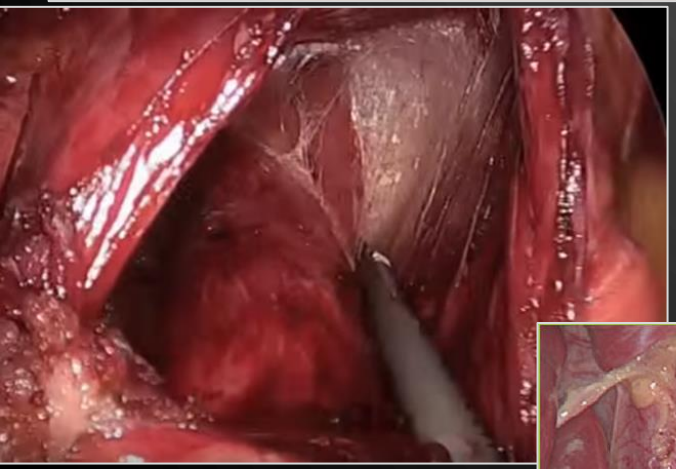
- **Open conversion** is occasionally necessary for reasons such as bleeding, splenic injury or dense adhesions, and it is important that surgeons taking these on as laparoscopic procedures are comfortable with an open repair should conversion become necessary.

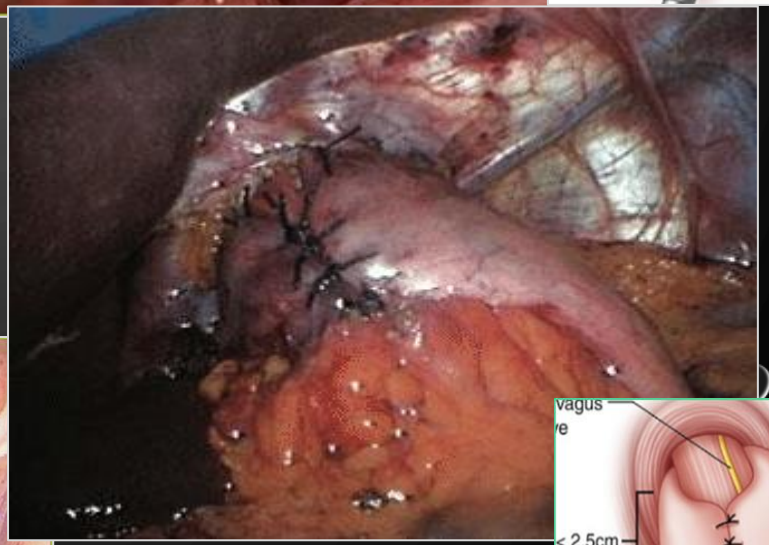
- Open conversion – urgent surgery:
  - Laparotomy of left-side thoracotomy;
  - Also useful for evaluation of gastric necrosis size in case of volvulus (SAGES ++++, strong).

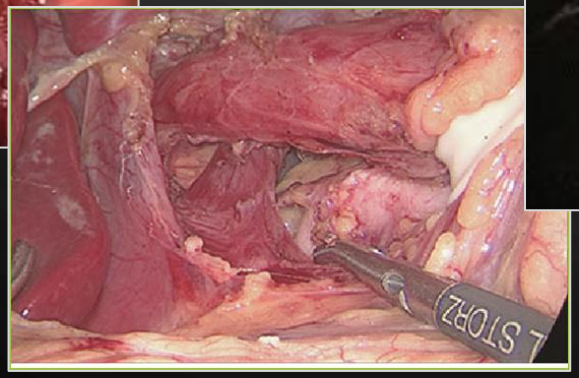
# Laparoscopic HH repair with crurorrhaphy and Nissen procedure

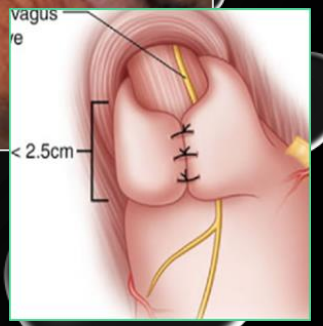




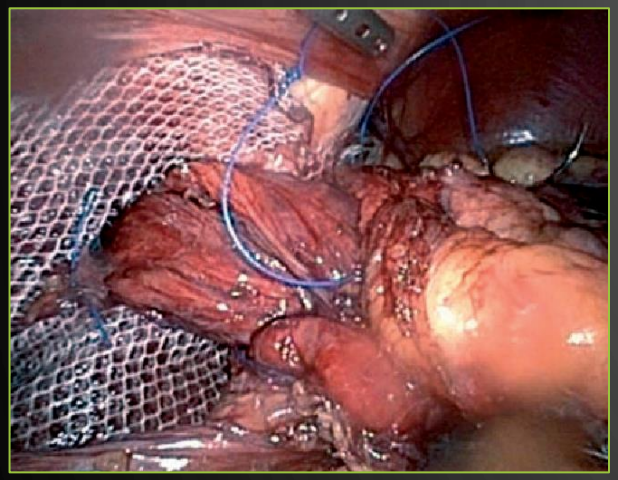






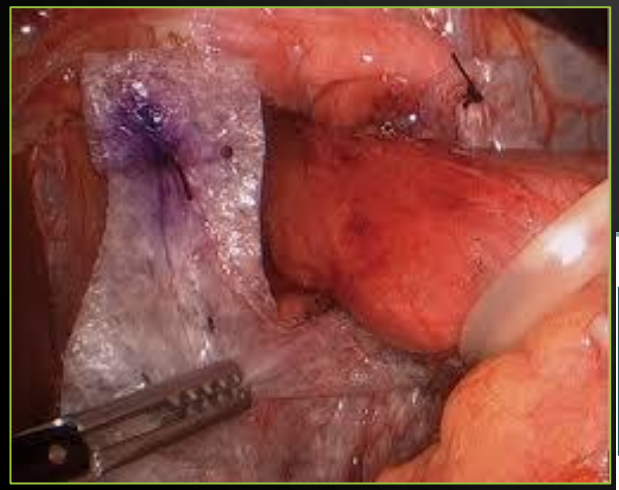


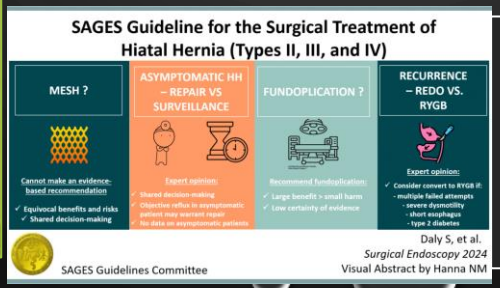
# MESH USAGE




**16 RCT (2004-2015):** 1089 patients, 385 - biologic mesh; 704 – PP mesh.

- Pooled term of observation - 53,4 months (>5 years).
  - Recurrence rates - biological 16,1% vs PP 6,8% (P <0,05).
  - Complications – no statiscally significant differences 4,6% vs 5,1% (P = 0,694)
    - Comlications related to PP mesh :12 (1,7% = 1/3).
  - Mortality = no data.
- Alloplastic is safe during short term observation;
- Biological mesh – more expansive, is not superior to PP mesh

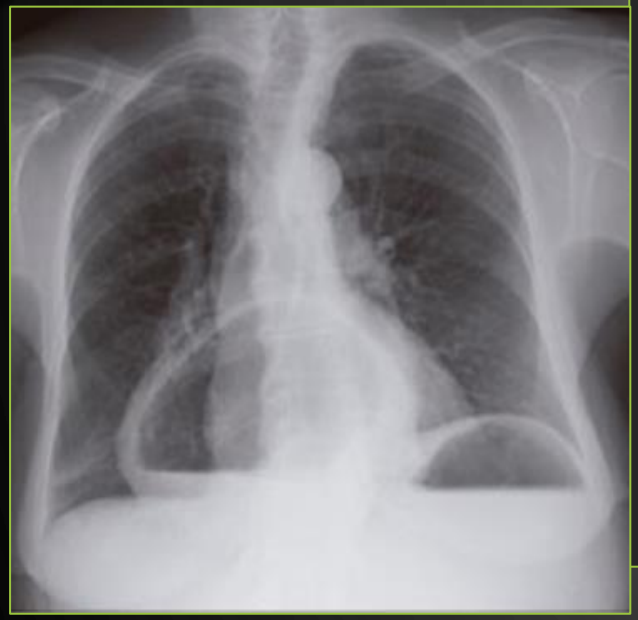





No recommendations for or agains (2024):

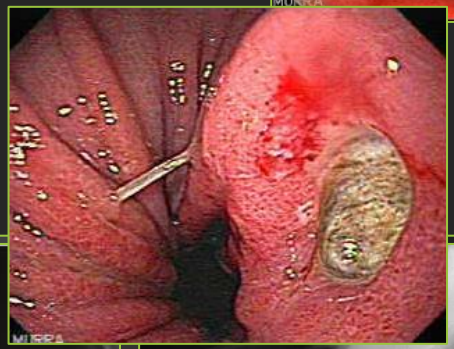
- Low quality of evidence for mesh usage

# URGENT SUGERY

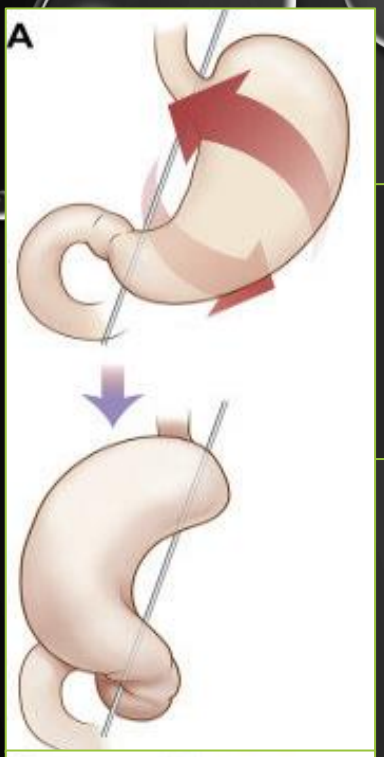


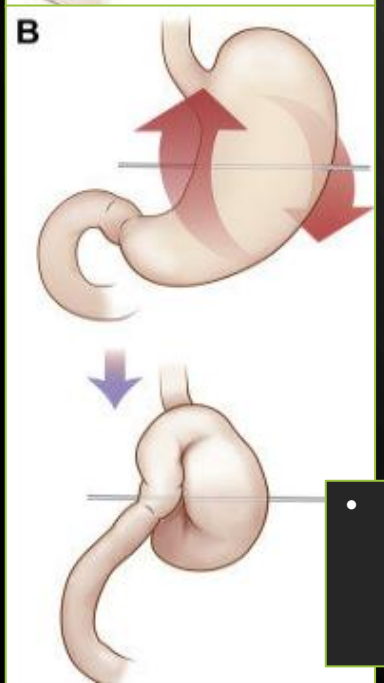
**INDICATIONS:**

- volvulus,
- incarciration,
- bleeding



# GASTRIC VOLVULUS

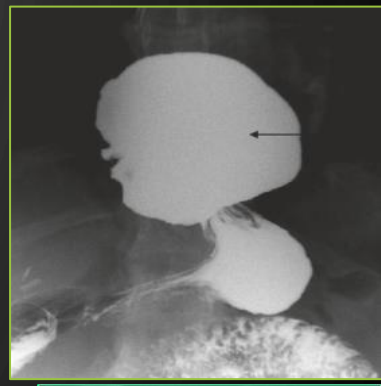



- Rare complication for III and IV types of HH
- There are two types of pathological rotation:
  - Along long axis: cardia-fundus, occurs often
  - Along short axis: the line between short and long curvatures
- Can occur in abdominal or in thoracic cavity

***Borchardt triad:***

- severe sudden epigastric pain
- intractable retching without vomiting
- inability to pass a nasogastric tube
  - Occurs more often in eldery

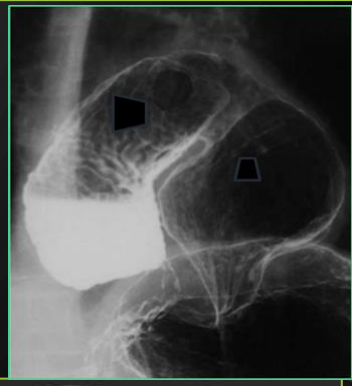



C. V. R. Brown et al. (eds.), *Emergency General Surgery*, https://doi.org/10.1007/978-3-319-96286-3_35

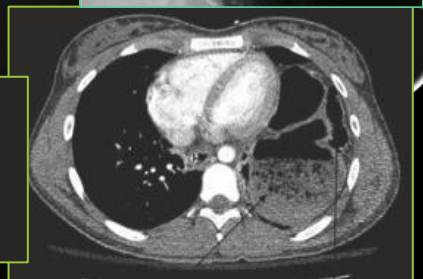
Paraesophageal Hernia and Gastric Volvulus

35

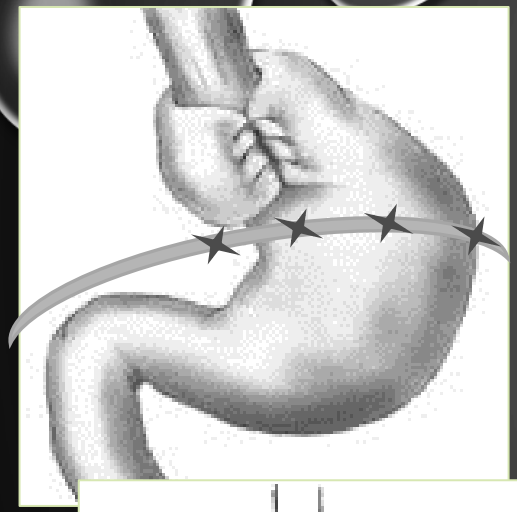
K. Conley Coleman and Daniel Grabo

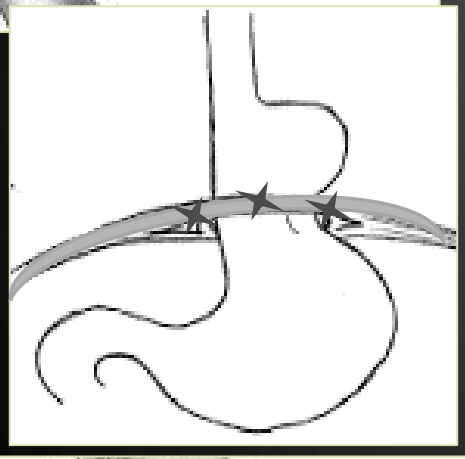


- **Indications for urgent surgery:**
  - Signs of obstruction
  - Bleeding, perforation
  - Respiratory dystress



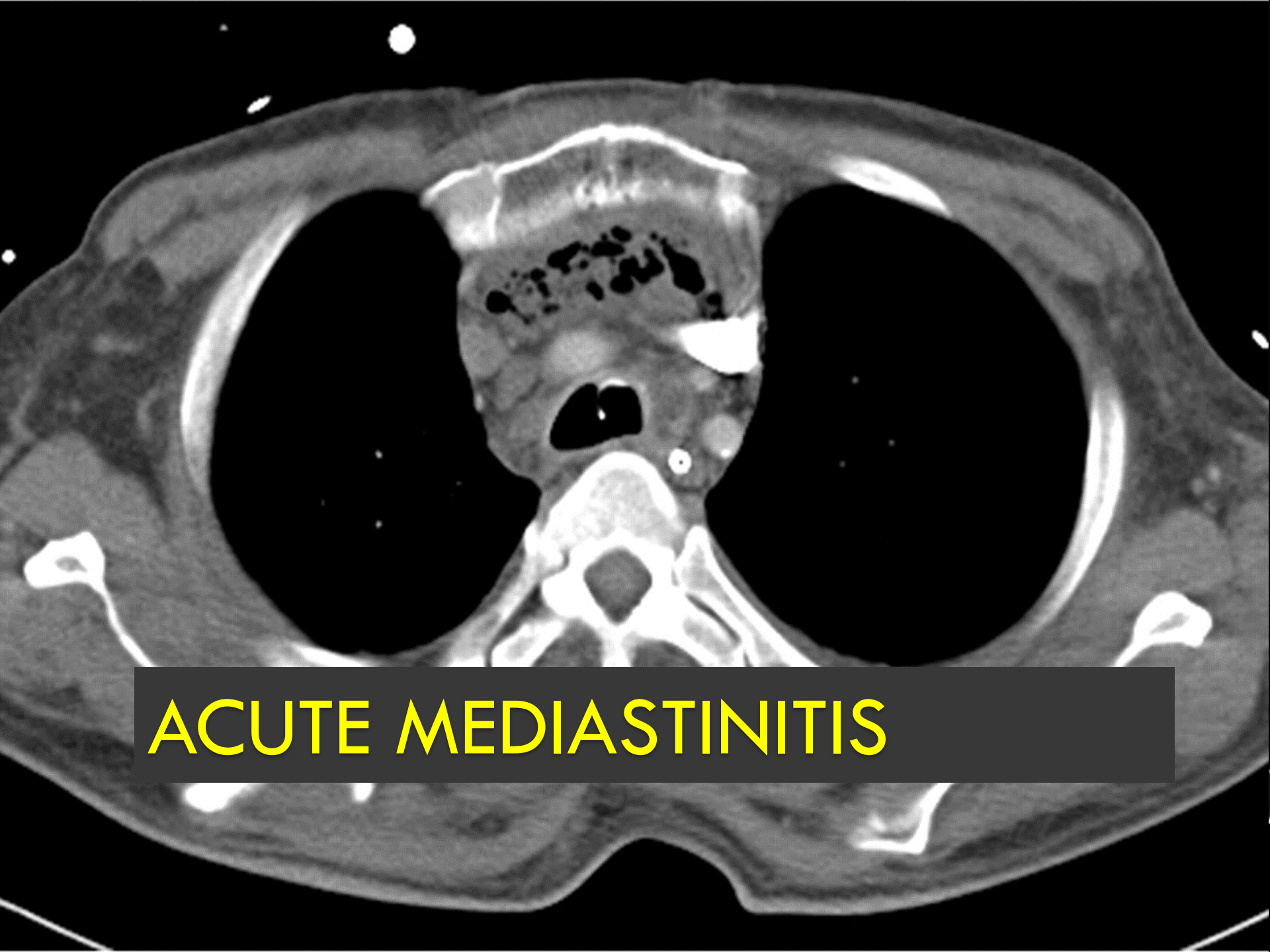
- Procedures (GL SAGES: ++++, strong):
  - Laparoscopy should be performed first, open conversion – in case of technical difficulties
  - Stomach should be mobilized and moved down, in case of necrosis resection should be performed



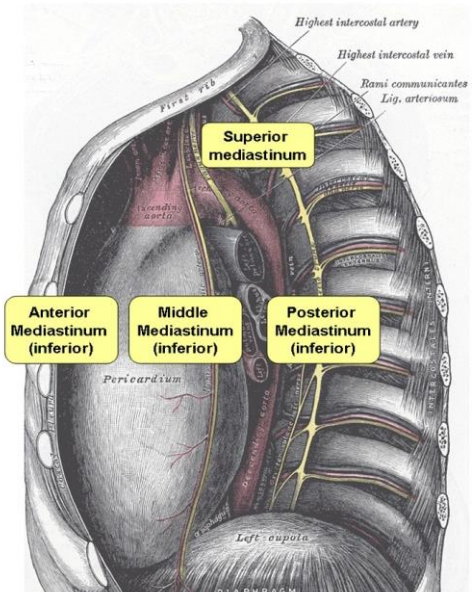


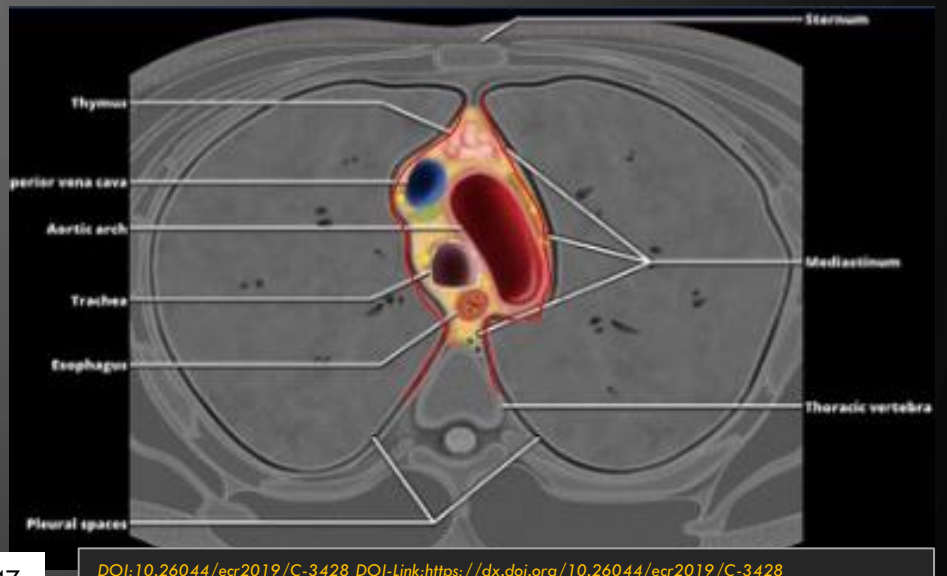
# HH IN HIGH RISK PATIENTS

- Hernia reduction with **gastropexy alone** and no hiatal repair may be a safe alternative in high-risk patients but may be associated with high recurrence rates (++, weak). Formal repair is preferred (++++, strong).
- **Crurorhaphy** is better than gastropexy alone.
- **Gastropexy** is not the aim of procedure, but compelled manipulation


ACUTE MEDIASTINITIS

# ANATOMY




Case courtesy of Mr Gray's Illustrations, Radiopaedia.org, rID: 14547

DOI:10.26044/ecr2019/C-3428 DOI-Link:https://dx.doi.org/10.26044/ecr2019/C-3428

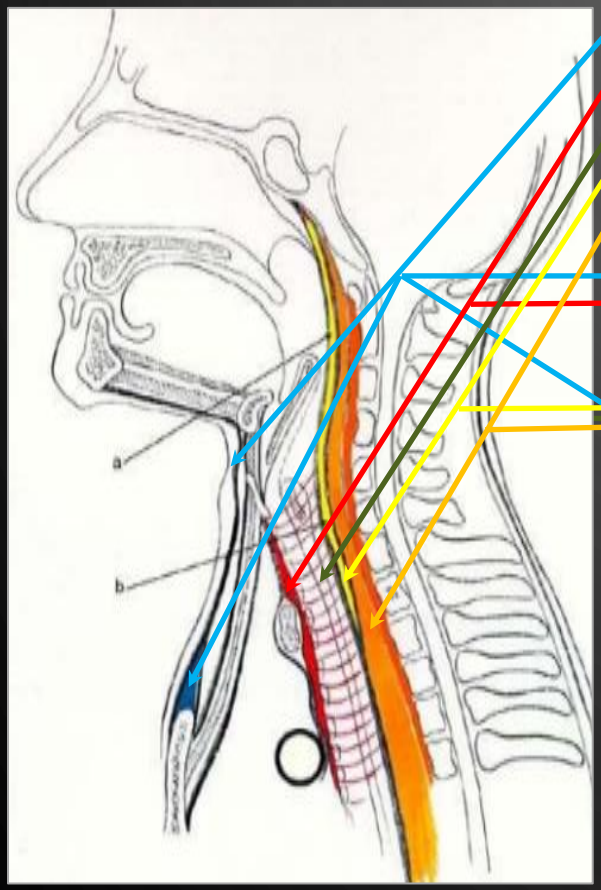
Mediastinum extends from the posterior aspect of the sternum to the anterior surface of the vertebral bodies and includes the paravertebral sulci. The mediastinum is limited bilaterally by the mediastinal parietal pleura and extends from the diaphragm inferiorly to the level of the thoracic inlet superiorly.

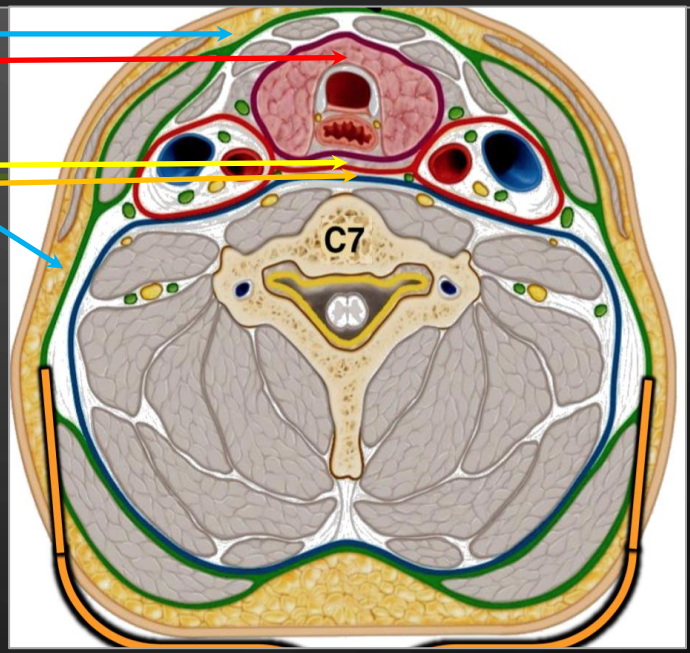
- **Mediastinum contents:**
  - **Superior:** aortic arch and great arteries; right and left brachiocephalic veins, left superior intercostal vein, upper half of superior vena cava; phrenic, vagus and cardiac nerves; cardiac plexus; left recurrent laryngeal nerve; lymph nodes: brachiocephalic; tracheobronchial; paratracheal; trachea; esophagus; thoracic duct; thymus.
  - **Inferior:**
    - **Anterior:** thymus, lymph nodes, and may contain the portions of a retrosternal thyroid;
    - **Middle:** pericardium; heart; great vessels joining the heart; ascending aorta; pulmonary trunk; right pulmonary artery; left pulmonary; artery; the lower half of the superior vena cava; both main bronchi; phrenic nerves; cardiac plexus; tracheobronchial lymph nodes.
    - **Posterior:** esophagus; descending aorta; thoracic trunk; thoracic spinal ganglion; sympathetic trunk and major branches; rami communicantes of intercostal nerves; phrenic nerves; vagus nerve.
  - **Organs are surrounded with connective fatty tissue.**

# ACUTE DESCENDING MEDIASTINITIS

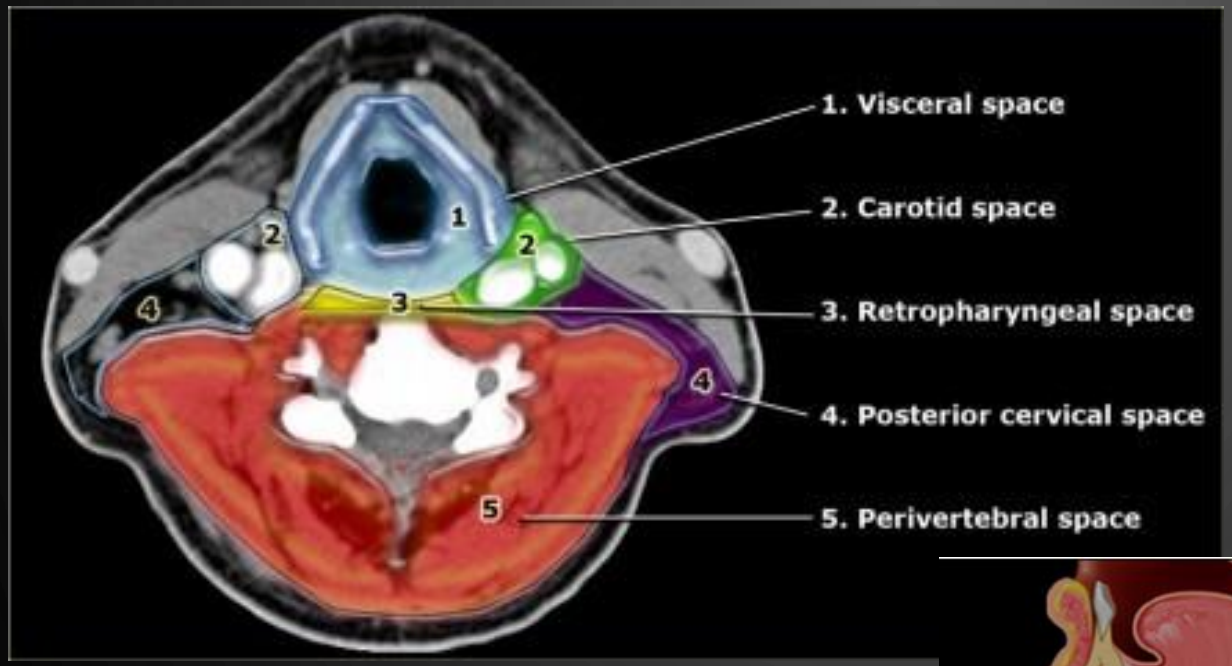
Deep spaces of neck:

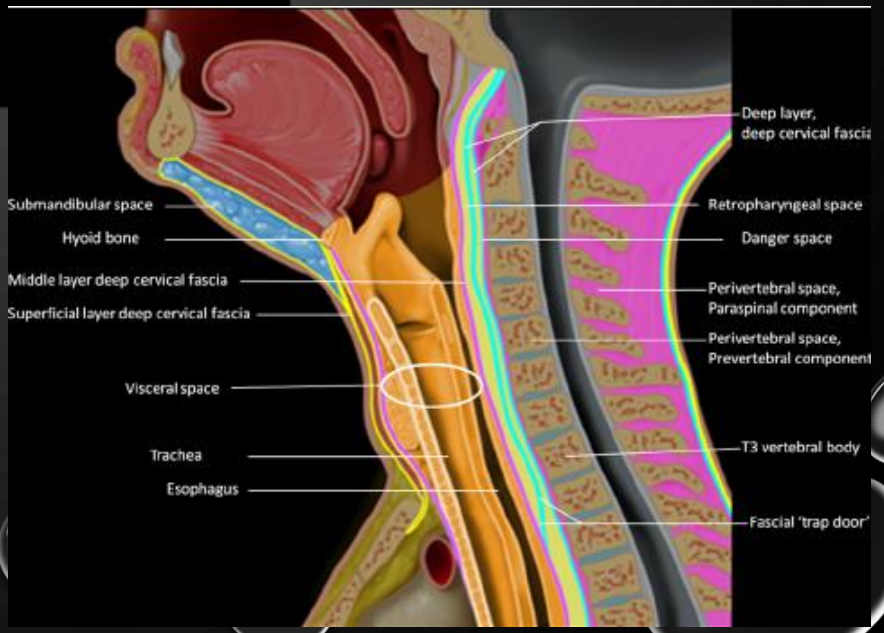
- Superficial;
- Pretracheal;
- Carotid;
- Retropharingeal
- Prevertebral (dangerous)





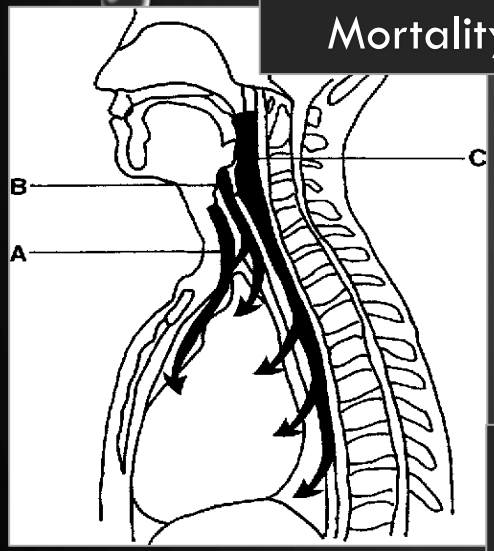
# ANATOMY BACKGROUND: SPACES OF THE NECK



# ACUTE MEDIASTINITIS

- Mediastinitis – acute infectious inflammation of mediastinal connetive tissue. Mortality 10-67%.




- Main causes
  - Dissemination of oropharyngeal infections
  - Esophageal perforation,
  - Postoperative (after sternotomy).
- Rare causes:
  - Pleural empyema, pancreatitis, subdiaphragmatic abscess, osteomyelitis of breastbone, hematogenic infections.

- Classification

1. Origin: primary/secondary
2. Inflammation type: abscess, phlegmon.
3. Localization: upper, lower (anterior and posterior), total.
4. Type of exudate: serous, purulent, ichorous, etc.
5. Causative agent: Staphylococcus spp., E.coli, Klebsiella spp., etc.
6. Clinical course type: acute, chronic.
7. Complications type: pleural effusion/empyema, pericarditis, osteomyelitis, etc.

# SIGNS AND SYMPTOMS

- Depends on:
  - localization of primary infection focus
  - quickness of disease progression

- Typical but NOT specific signs:
  - Tachycardia and hyperthermia
    - fulminant form – septic shock, death during 24-72 houers.

- Chest pain – common but not constant sign:
  - Anterior localization – behind breastbone, increases during head tilting,
  - Posterior localization – deep pain between shoulder blades, increases during processes spinosus percussion, long back muscles rigidity
  - Superior localization – the same as anterior but with irradiation to upper extremities
  - Pain during swallowing and breathing – involvement of mediastinal pleura.

- Dysphagia, crepitation in the upper thoracic aperture – esophagus perforation.
- Dyspnea – Compression of trachea and bronchi.
- Voice changes – recurrence nerves involvement.
- Constant hiccup – phrenic nerve involvement.
- Horner's syndrome (ptosis, miosis, enophthalmos) – sympathetic trunk involvement.
- Face/neck cyanosis, tinnitus, neck veins dilation – compression of upper cava vein.

# WORKUP

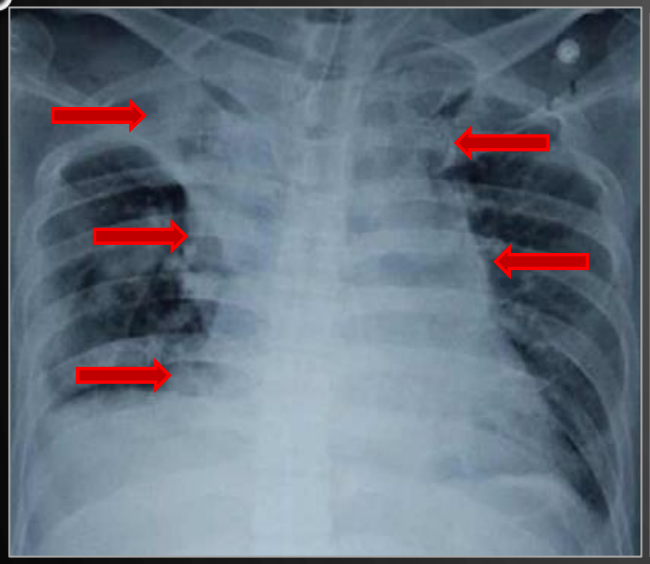
- Life history – not significant, but attention should be paid to:
  - Oropharyngeal infections,
  - Medical procedures on esophagus,
  - Cardiosurgery procedures.

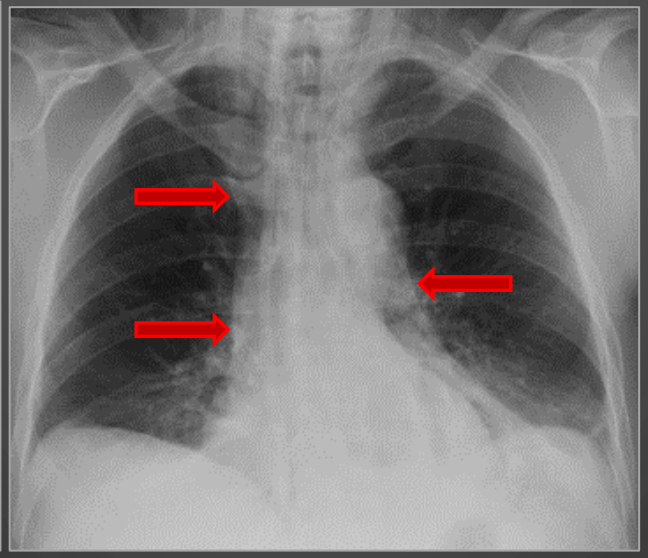
- Lab test - not significant, but
  - Pay attention to WBC count, CRP, PCT

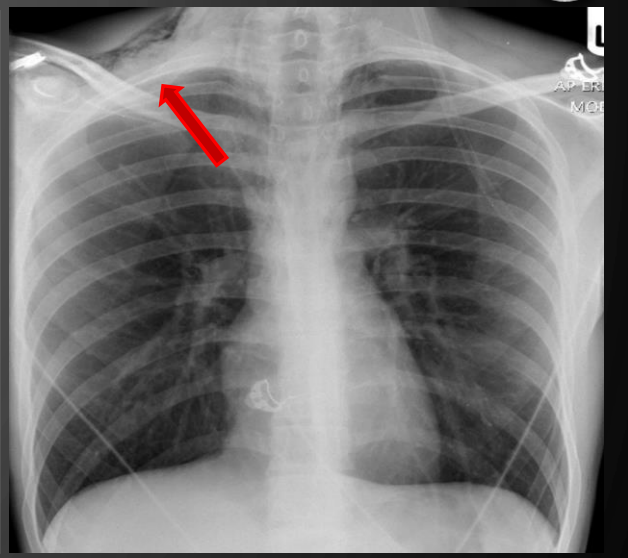
- Visualization methods are the most informative, especially:
  - Plain chest X-ray
  - CT with intravenous enhancement.

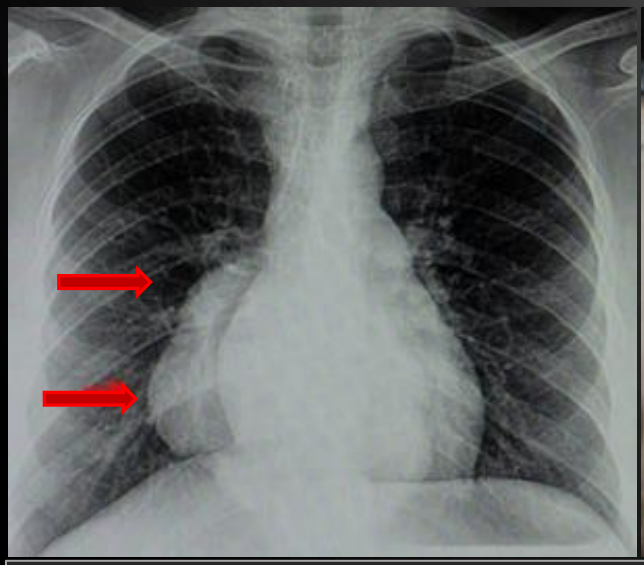
- For proper early antibiotic treatment:
  - Microbiology tests of exudate
  - Blood microbiology tests (can be even MORE informative)

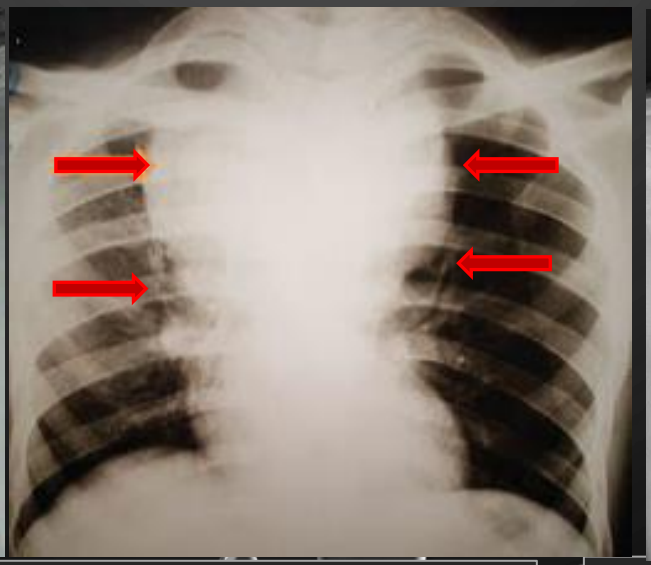
# PLAIN CHEST X-RAY

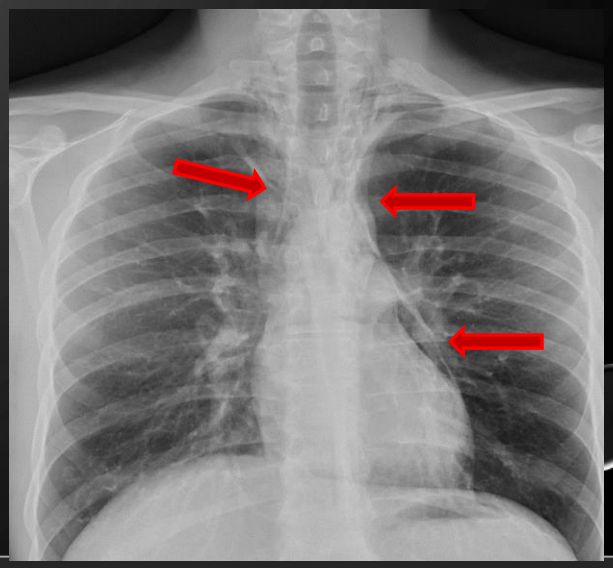












- enlargement of mediastinum (relatively often)

pneumomediastinum (relatively rare)

# DNM CLASSIFICATION

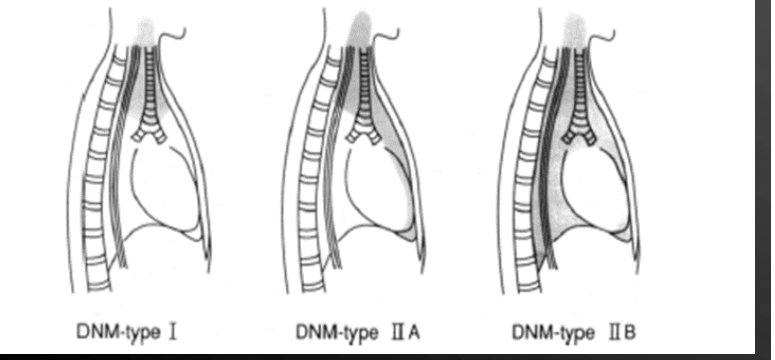
Case Reports › Jpn J Thorac Cardiovasc Surg. 1999 Jan;47(1):14-9. doi: 10.1007/BF03217934.

## Guideline of surgical management based on diffusion of descending necrotizing mediastinitis

S Endo [1], F Murayama, T Hasegawa, S Yamamoto, T Yamaguchi, Y Sohara, K Fuse, M Miyata, H Nishino

*Shunsuke Endo, MD, Department of Thoracic Surgery, Jichi Medical School*

The Japanese Journal of Thoracic and Cardiovascular Surgery

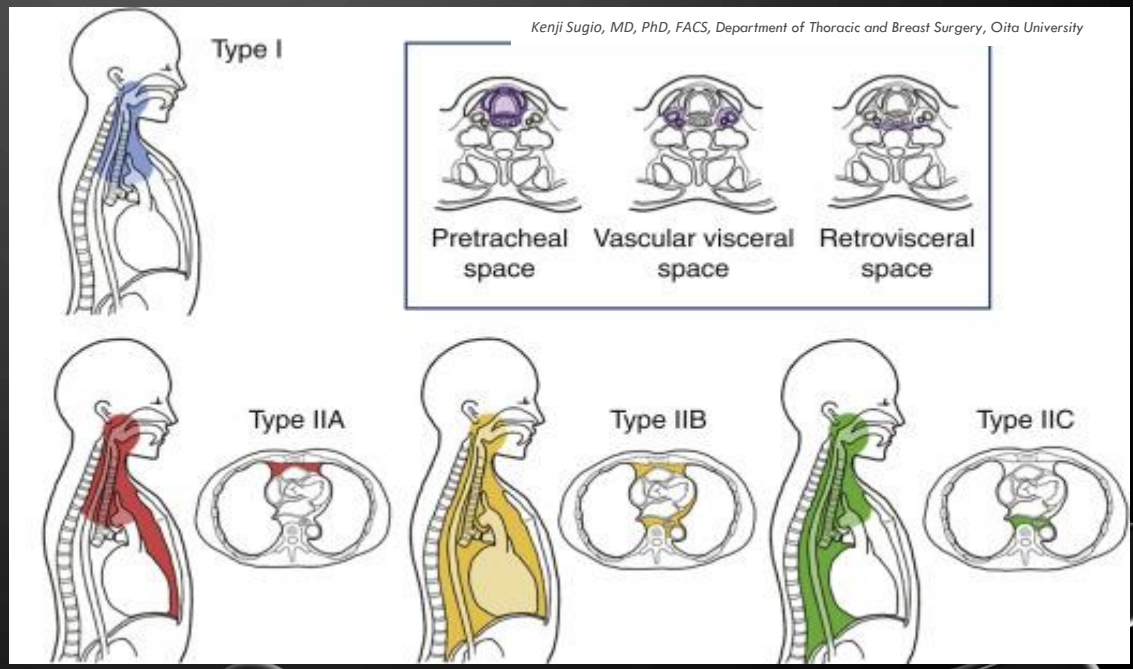



› JTCVS Open. 2021 Aug 19;8:633-647. doi: 10.1016/j.xjon.2021.08.001. eCollection 2021 Dec.

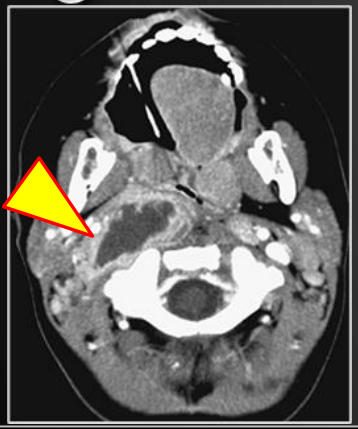
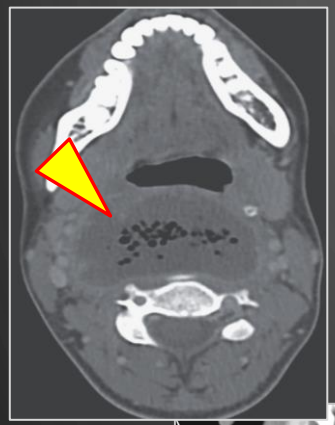
## Descending necrotizing mediastinitis and the proposal of a new classification

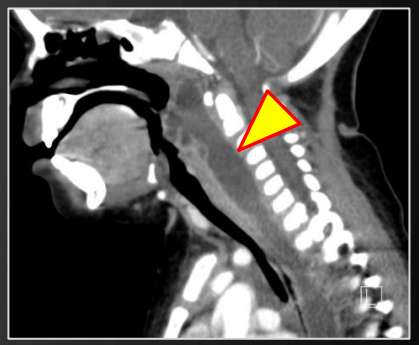
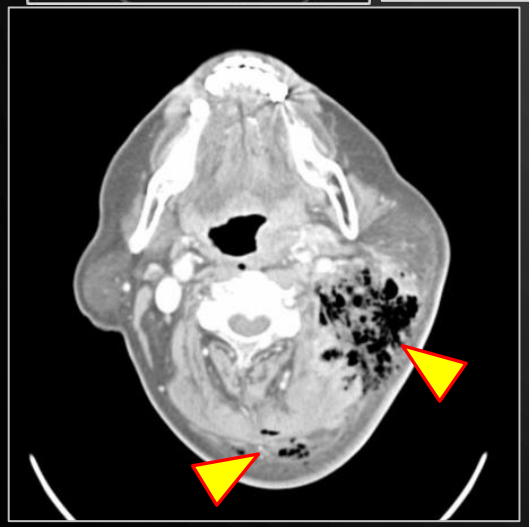
Kenji Sugio [1], Tatsuro Okamoto [1], Yoshimasa Maniwa [2], Yasushi Toh [3], Morihito Okada [4], Taku Yamashita [5], Shogo Shinohara [6], Ichiro Yoshino [7], Masayuki Chida [8], Hiroyuki Kuwano [9], Akihiro Shiotani [10]

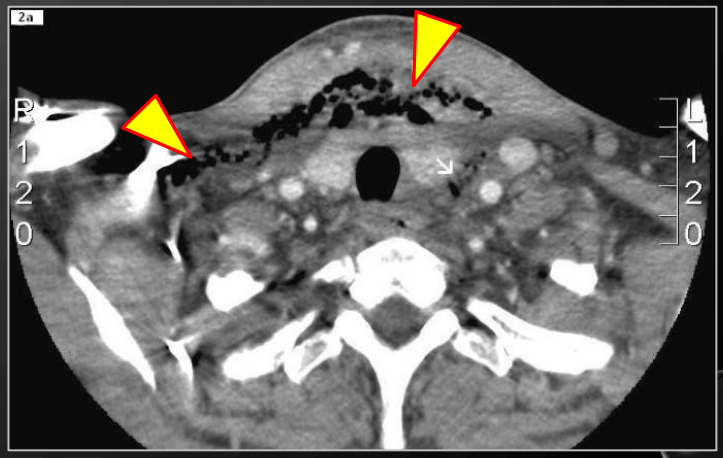
*Kenji Sugio, MD, PhD, FACS, Department of Thoracic and Breast Surgery, Oita University*



# NECK: VISUALIZATION OF DNI AND DNM FOCI



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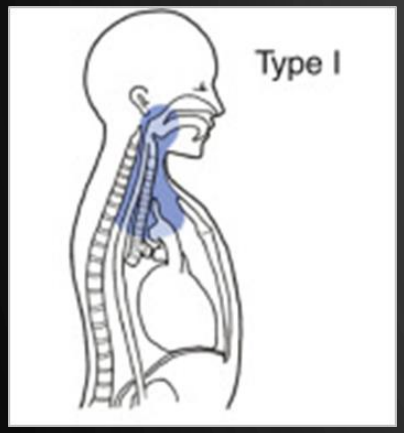


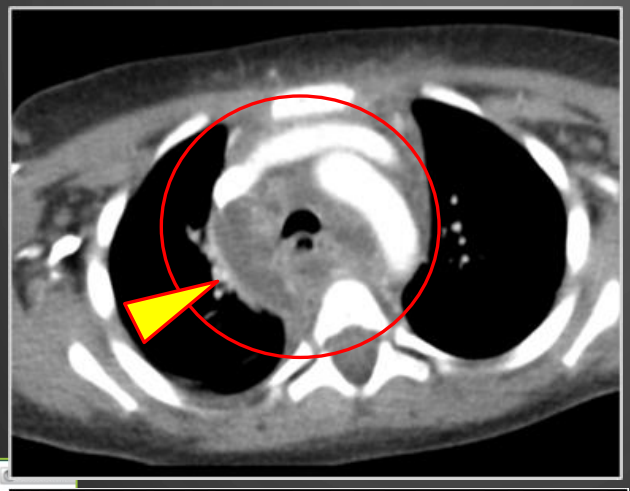

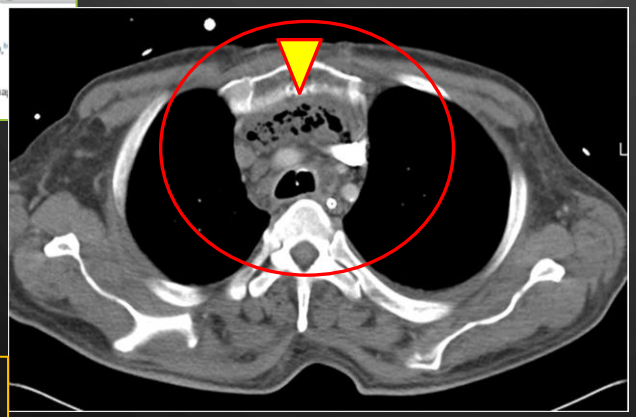

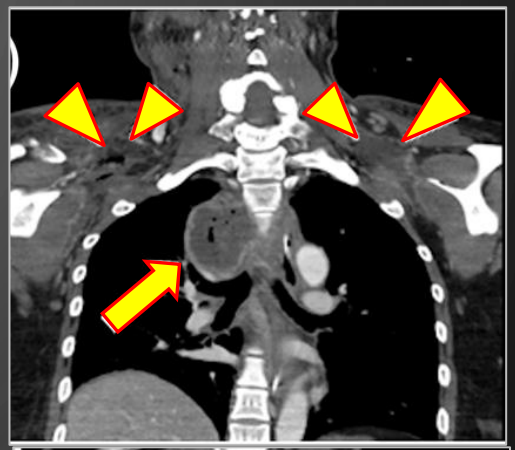

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Type I: 100 patients (44.4%)
Type II: 125 patients (56.6%)
IIA: 20 (16.0%)
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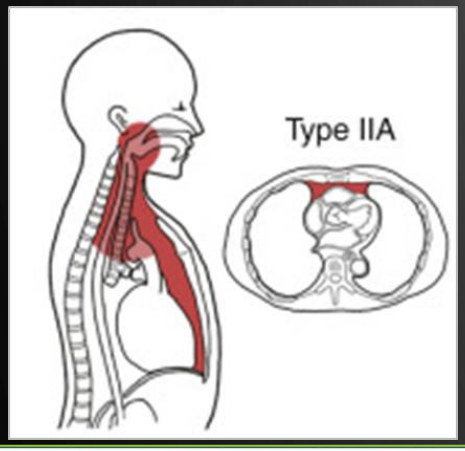
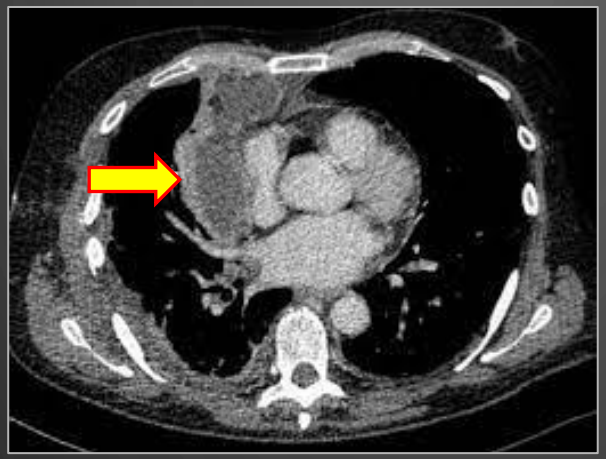
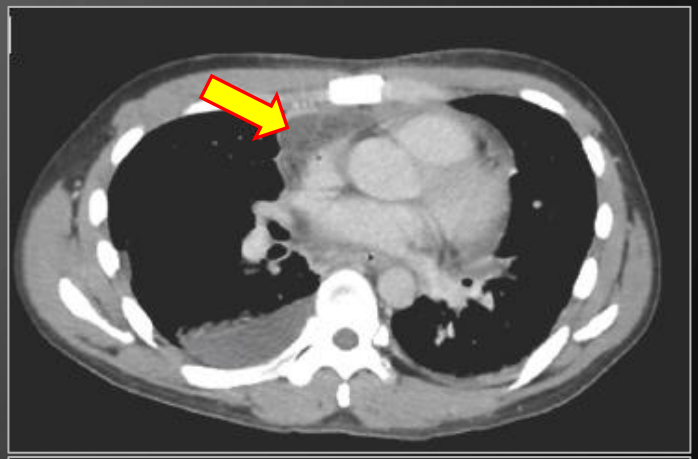
IIC: 43 (34.4%)

https://www.sciencedirect.com/science/article/pii/S2666273621002254

# DNM, TYPE IIA





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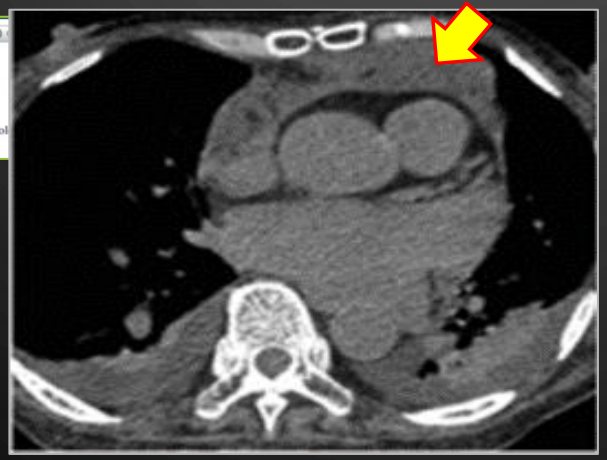

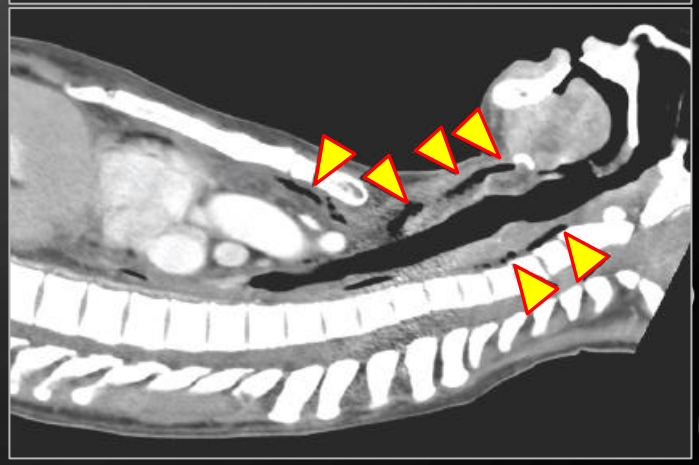

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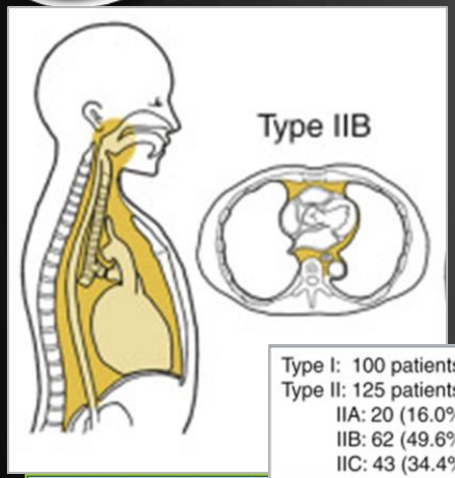


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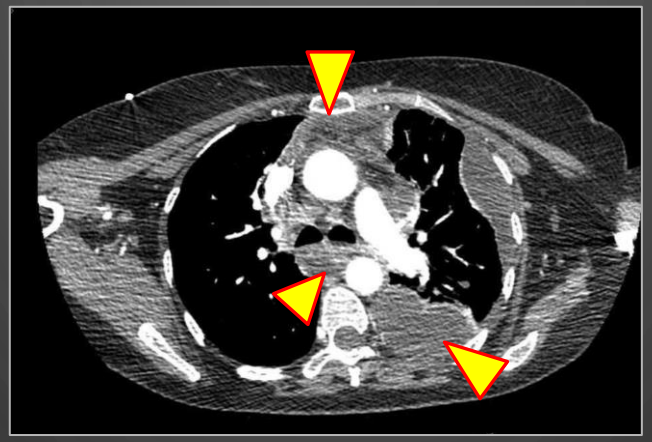

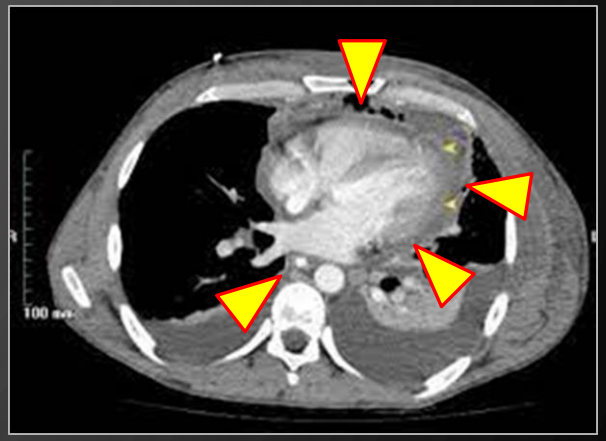

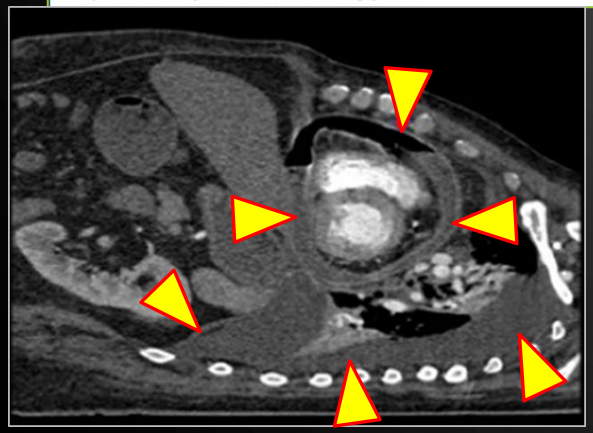

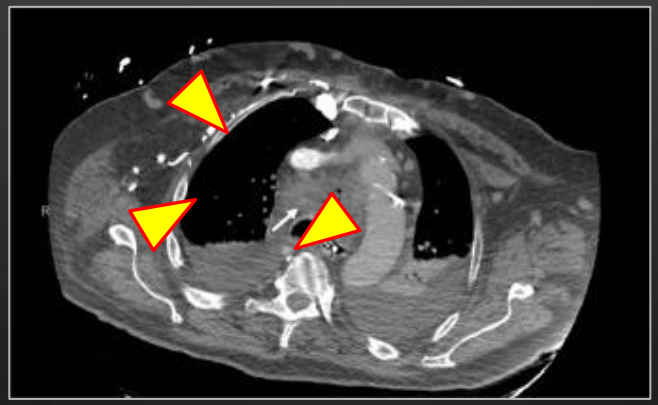

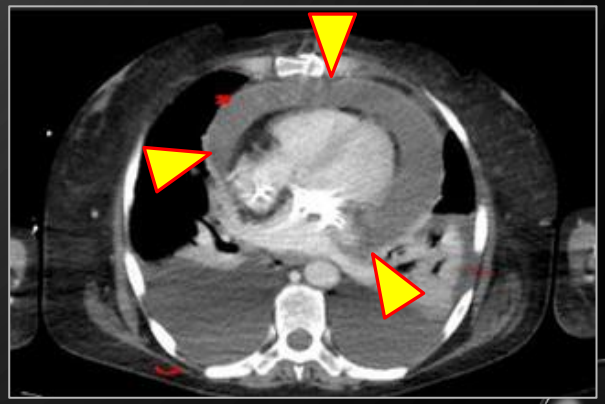

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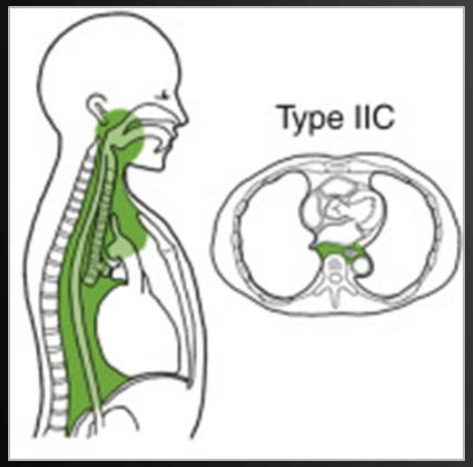
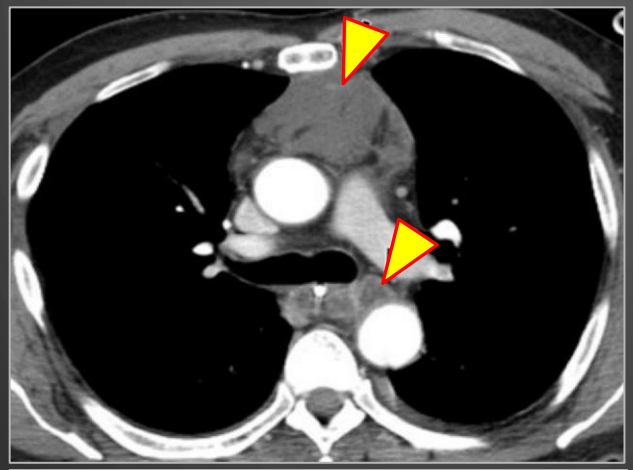
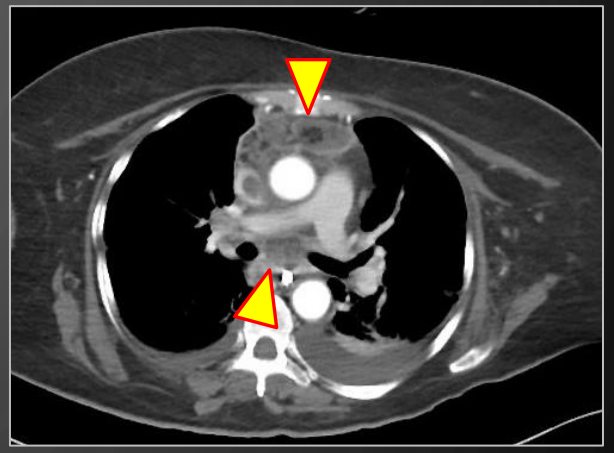
# DNM, TYPE IIC





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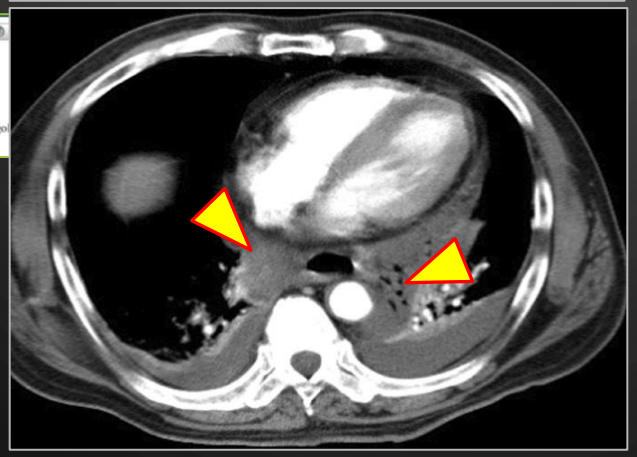

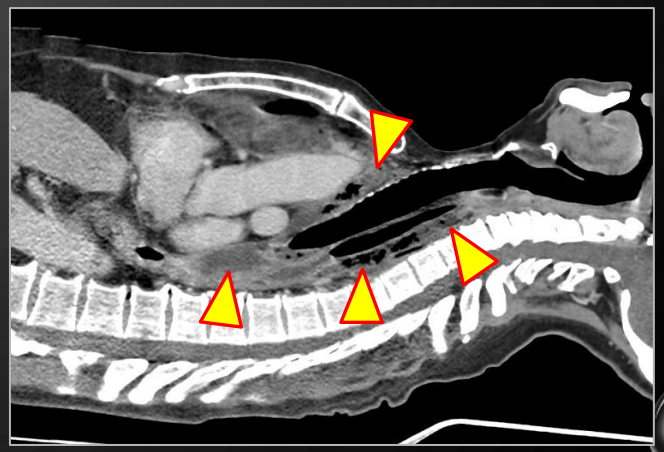

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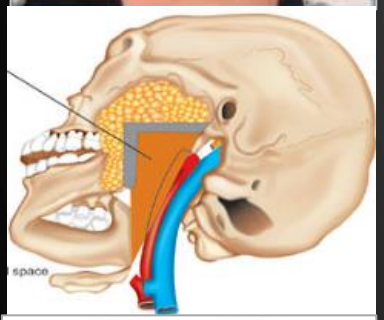
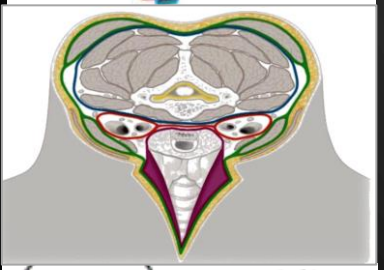
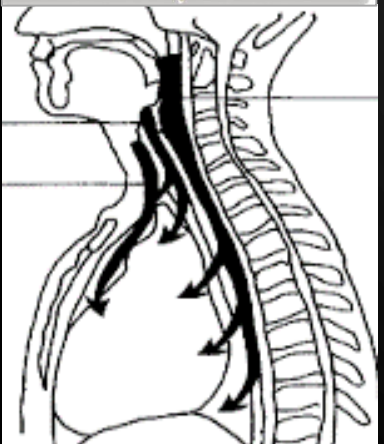






# ODONTOGENIC DESCENDING NECROTIZING MEDIASTINITIS

- Ludwig's angina (progressive submaxillary cellulitis of the floor of the mouth) with dissemination to pretracheal space (superior mediastinum infected)
  - As a rule visceral, carotid and posterior cervical spaces are affected
- Involving of posterior/inferior mediastinum happens more seldom (retropharingeal, prevertebral (dangerous) spaces)
- Before antibiotics invention ~ 30% of all mediastinitis, nowadays ~5%

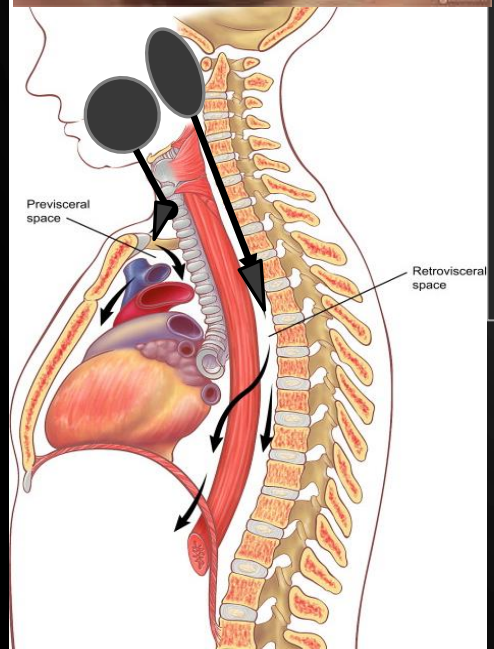
- Presentation (K.R. Cardenas-Malta et al. 2005):
  - High body temperature (100%),
  - Dysphagia (80%),
  - Dyspnoe (80%),
  - Chest pain (60%),
  - Orthopnoe (40%),
  - Tachycardia (20%).

- In case of anaerobic causative agent:
  - Gas production with emphysema and compression (upper v. cava syndrome)
  - Destruction of visceral pleura and empyema

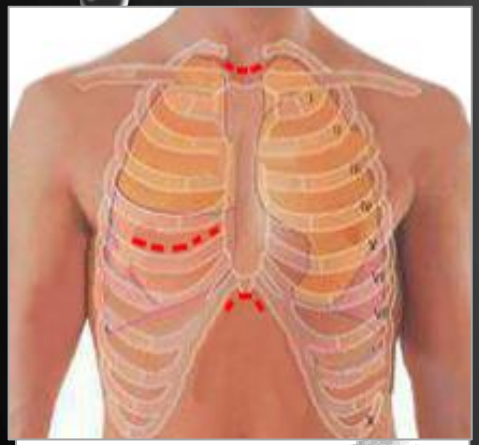
- Types of clinical course:
  - Acute mediastinitis (infection spreads gradually):
    - First focus of infection (tooth mainly) – floor of the mouth – deep neck spaces – superior mediastinum
  - Fulminant mediastinitis:
    - Quick spread of infection to mediastinal and neck spaces
    - Very rapid deterioration with septic shock.

# DESCENDING NECROTIZING MEDIASTINITIS FROM PRIMARY PHARYNGEAL FOCUS

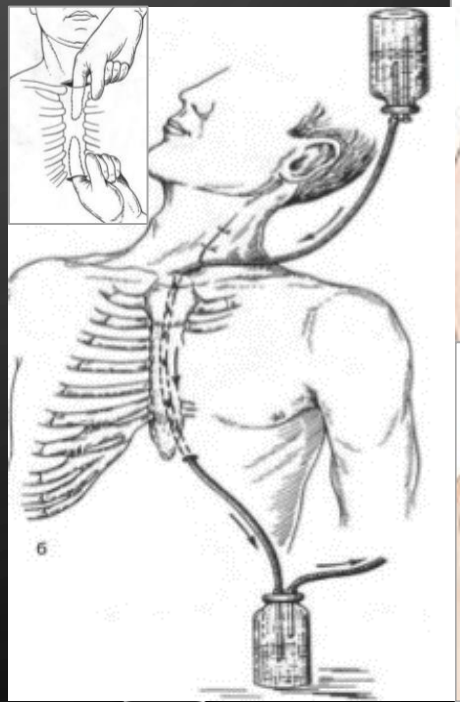
- Peritonsillar abscess - infection spreads to visceral or retropharyngeal spaces:
  - Dull voice.
  - Severe pain in the throat, unilateral, especially during swallowing
    - Odynophagia
  - Trismus
  - Enlargement of pharyngeal wall with dislocation of uvula
  - Edema under the lower jaw

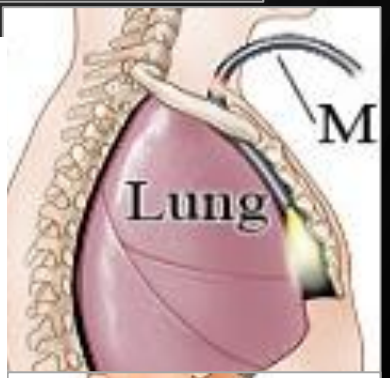


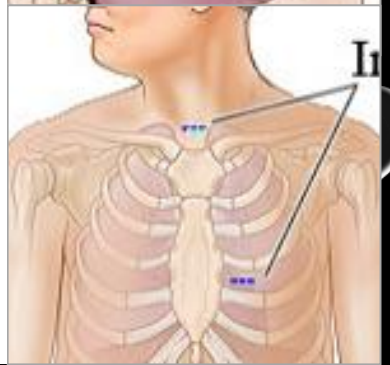
# SURGERY IN DESCENDING NECROTIZING MEDIASTINITIS

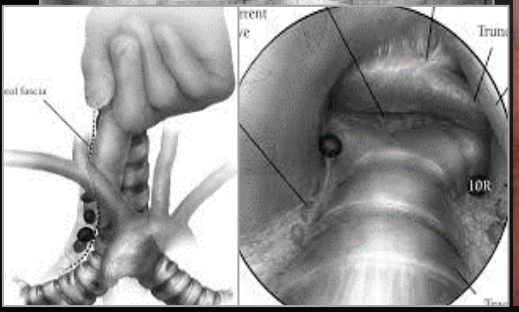


- Debridement, sanation and control over infection source
  - Superior mediastinitis – transcevical access and drainage,
    - Videoassited thoracoscopy (VATS);
  - Below carina tracheae – cervical and transthoracic access and drainage
- Surgery must follow the established diagnosis during 24 hours







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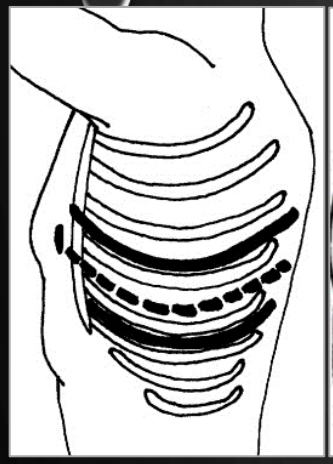
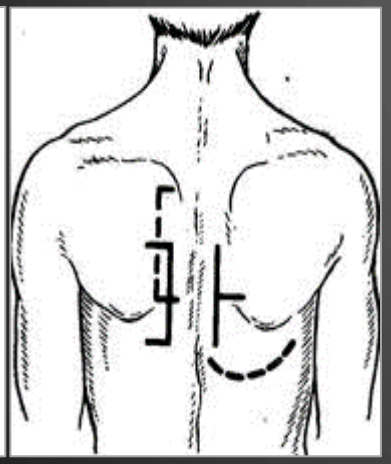
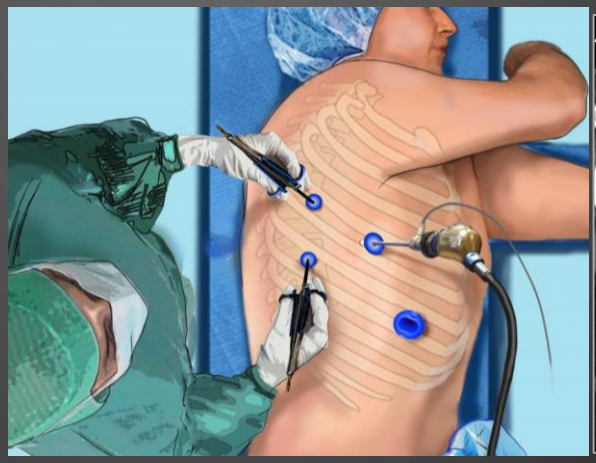
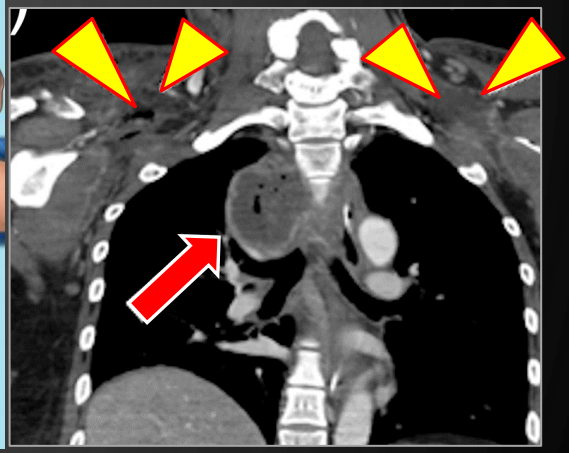
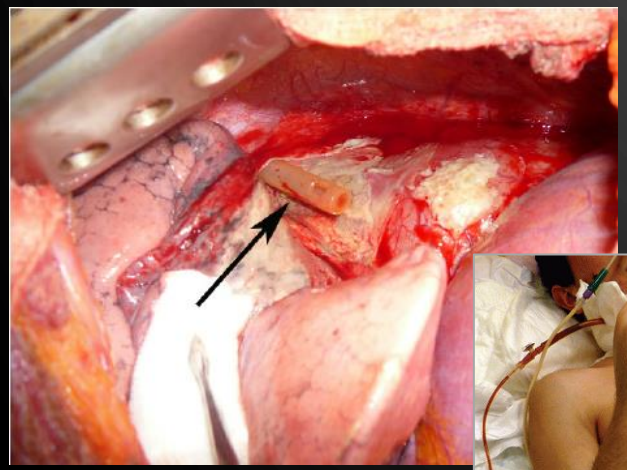
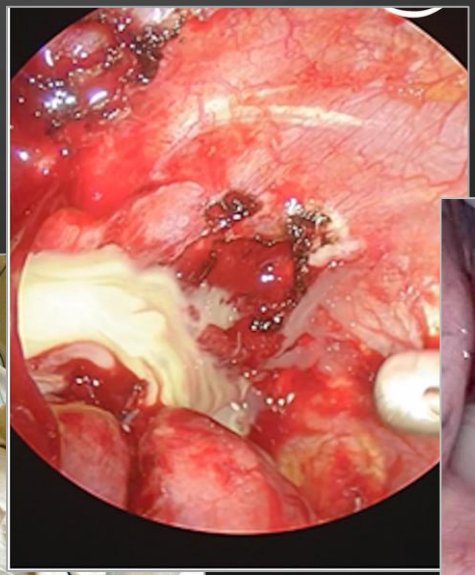


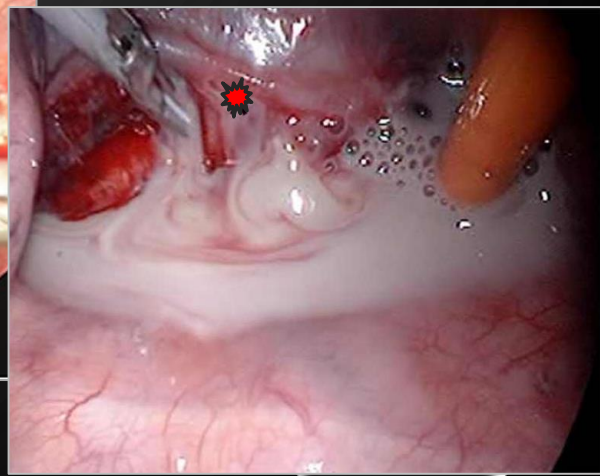




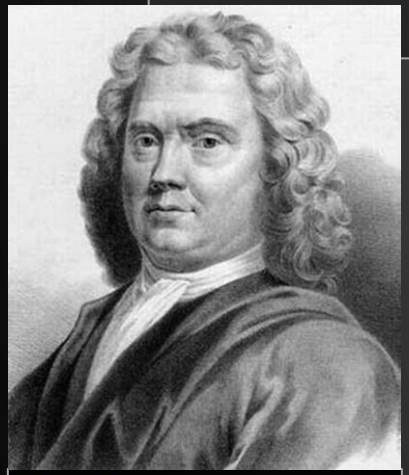








# Boerhaave's syndrome



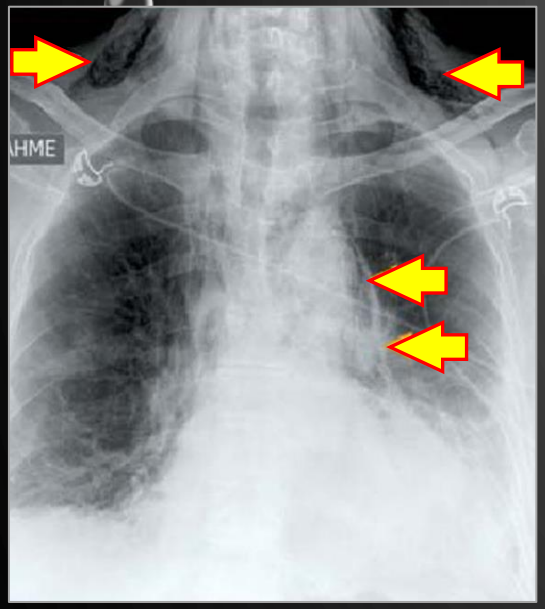
In 1724, Hermann Boerhaave, a Dutch physician and professor of clinical medicine, first described spontaneous rupture of the esophagus, which typically occurs after forceful emesis.

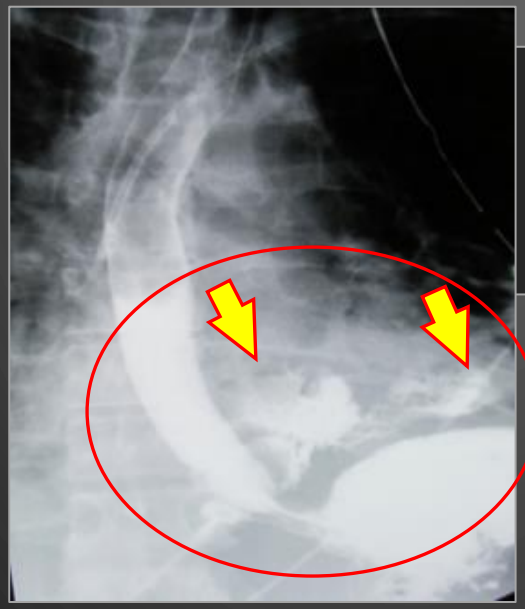
It occurs in 15-20% of all esophageal perforations


- Mackler triade:
  - Vomiting with recently eaten food
  - Subcutaneus emphysema,
  - Severe cutting pain in the chest or epigastrium. It appears during vomitimg and intensifies during swallowing

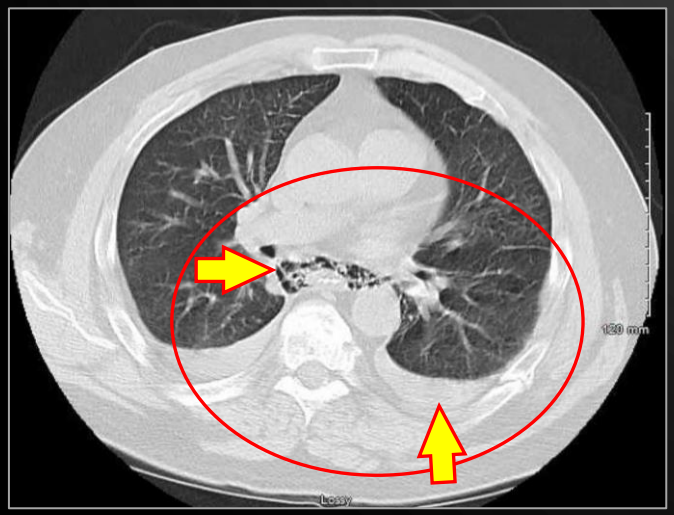
- Pathogenesis:
  - It is a result of a sudden rise in intraluminal esophageal pressure produced during vomiting
  - Transmural longitudinal rupture 4-12 cm of length.
  - The most common (90%) anatomic location is at the left posterolateral wall of the lower third of the esophagus, 2-3 (3-6) cm proximal to the gastroesophageal junction.
  - Chemical mediastinitis caused by gastric contents contaminating the mediastinal cavity;
  - Left-sided empyema is common due to damage of mediastinal pleura during rupture.

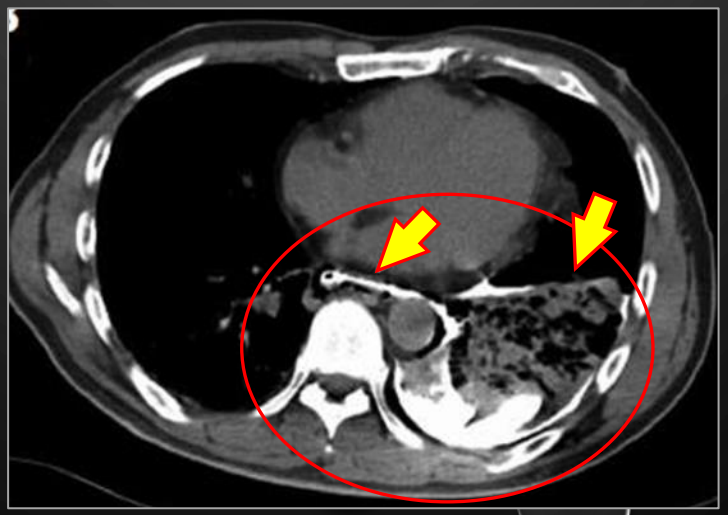
# WORKUP



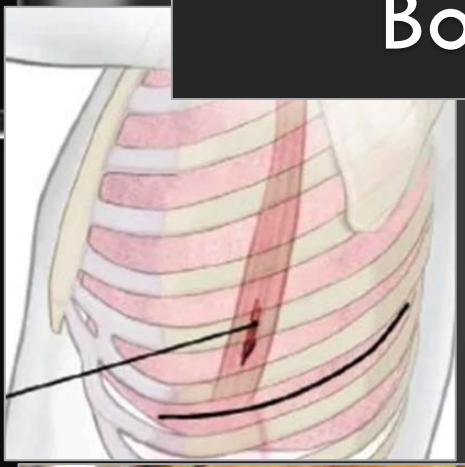


- Chest X-ray,
- Fluoroscopy with water soluble duy
- CT
- EGDS (in unclear cases ONLY)

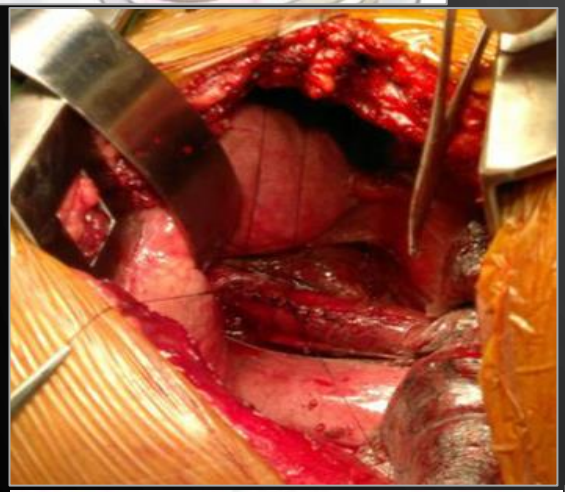


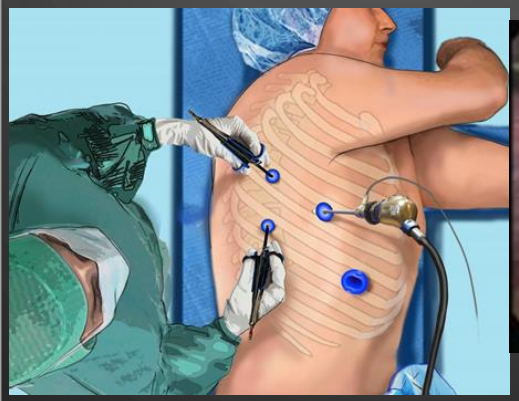


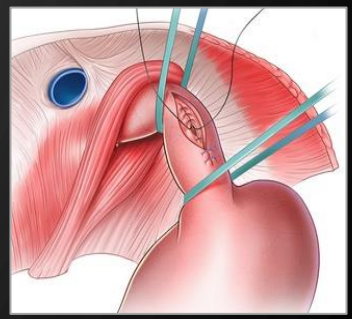
# Boerhaave's syndrome: SUGERY

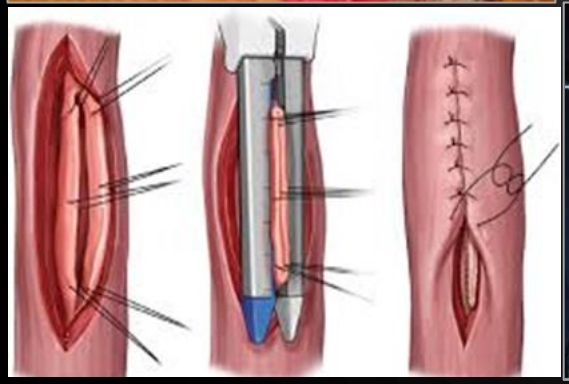


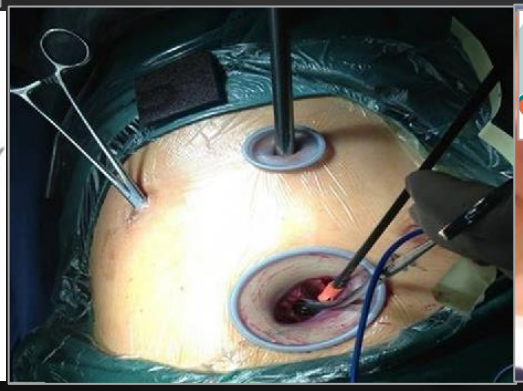
- Vast infected area in the mediastinum causes severe patient condition including sepsis
  - Thoracotomy: defect suturing or resection and fistula; sanation, drainage
  - Gastrostomy: feeding and decompression

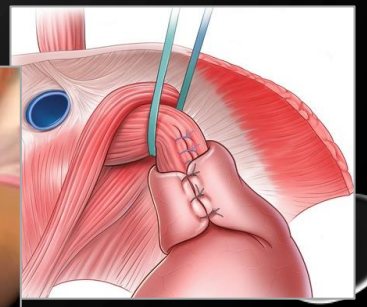




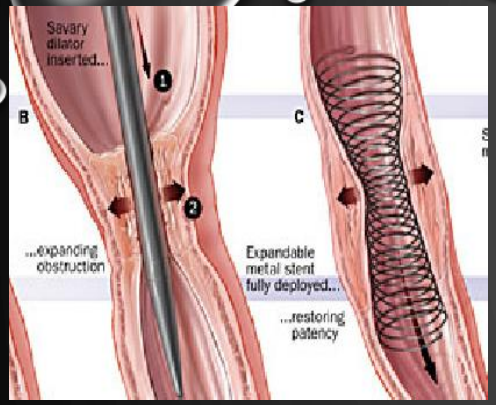


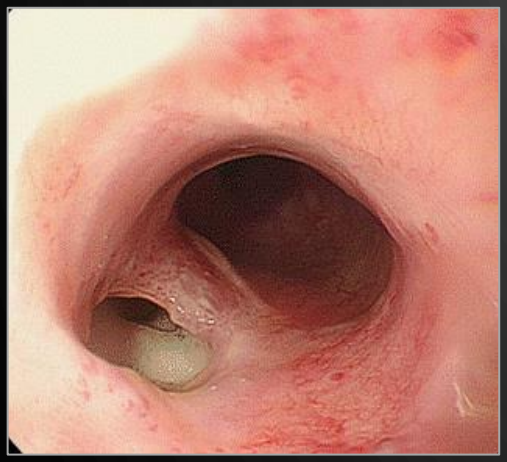


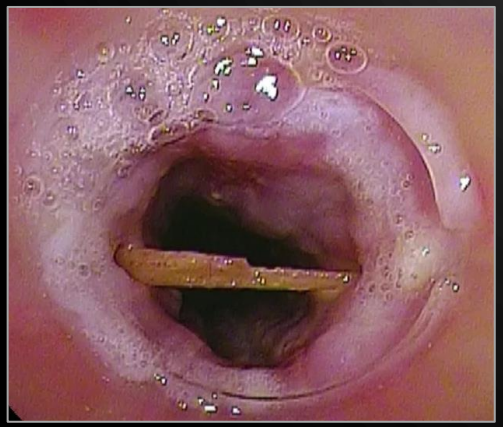




# MEDIASTINITIS AFTER ESOPHAGUS PEFORATION



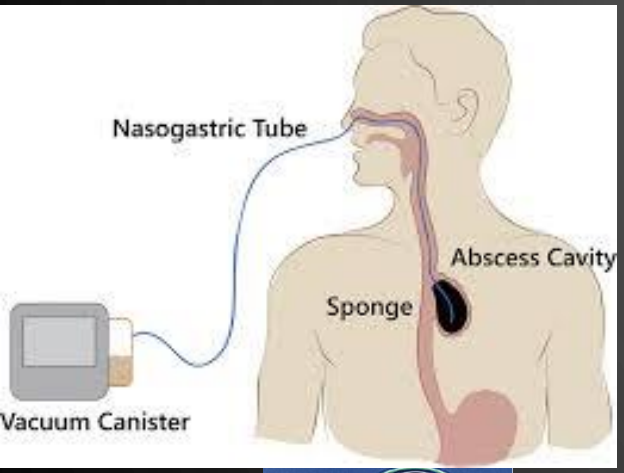


- 75% of perforations are iatrogenic:
  - Balloon dilatation of strictures (risk of perforation 4-17%);
  - Diagnostic EGDS – insufficient experience, tumors, diverticula, strictures, etc.
  - Coagulation/ sclerotherapy during hemostasis:
  - Stent placement;
  - Intubation of trachea; nasogastric tube placement;
  - Foreign bodies evacuation;

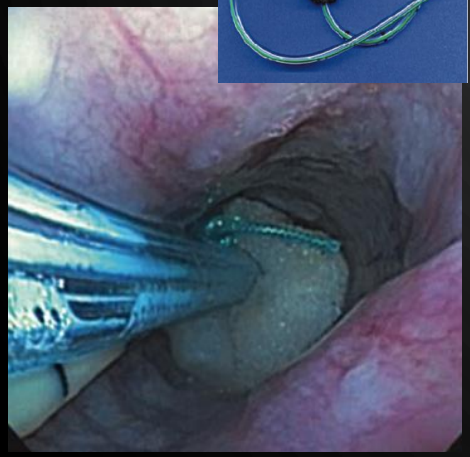
- Clinical signs can be both good manifested or not clear
  - Pain
    - Cervical part perforations – neck pain, which accelerates with movements
    - Thoracic perforations – chest pain.
  - High body temperature and tachycardia,
  - Subcutaneous emphysema in aperture thoracica superior

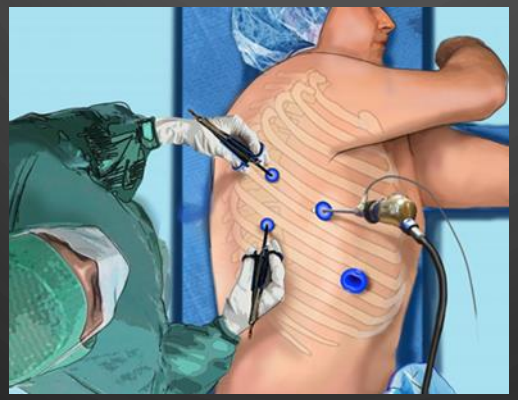
- Pathogenesis:
  - Small defects in strictures, which consist of sclerotic tissues;
  - No aggressive gastric content,
  - Infection focus locates in mediastinum. Mediastinal pleura is rarely affected.

# SURGERY FOR TREATMENT OF ESOPHAGEAL PERFORATIONS

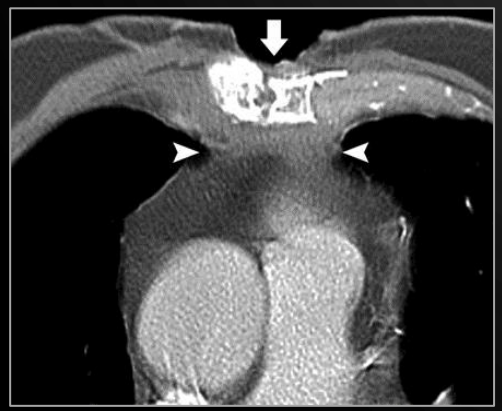



- Stable patients with no severe symptoms. They have:
  - Abscess, which drains into esophagus lumen
  - Small iatrogenic perforations, which were early diagnosed
    - Medical treatment with careful surveillance
      - Antibiotics
      - Nasogastric tube
      - Endoscopic placement of drainage to the cavity of lesion/VAC therapy.





# POST-STERNOTOMY MEDIASTINITIS



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POSITION STATEMENT

Cite this article as: Abu-Omar Y, Kocher GJ, Bosco P, Barbero C, Waller D, Gudbjartsson T et al. European Association for Cardio-Thoracic Surgery expert consensus statement on the prevention and management of mediastinitis. Eur J Cardiothorac Surg 2017;51:10–29.

**European Association for Cardio-Thoracic Surgery expert consensus statement on the prevention and management of mediastinitis**

Yasir Abu-Omar[a,*,†], Gregor J. Kocher[b,†], Paolo Bosco[a], Cristina Barbero[c], David Waller[d], Tomas Gudbjartsson[e], Miguel Sousa-Uva[f,†], Peter B. Licht[g,¶], Joel Dunning[h], Ralph A. Schmid[a] and Giuseppe Cardillo[i,j]

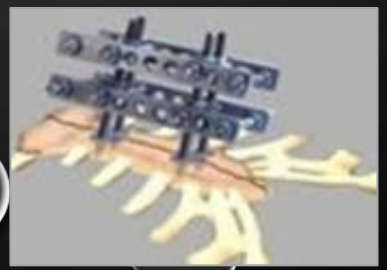
- Post-sternotomy mediastinitis is one of severe complications In cardiosurgery:
  - post-sternotomy form of mediastinites is the most common one in developed countries,
  - Majority appears after cardiac surgery:
    - After heart or lung transplantation – 2,5-7,5% of cases
    - After other cardiac surgical procedures – 0,5-4,5% of cases

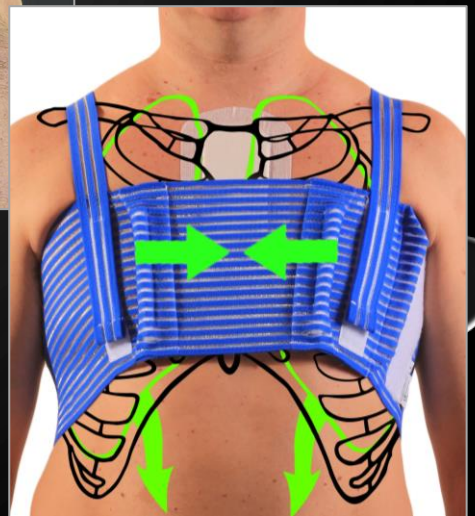
- **The definition of mediastinitis requires at least one of the following criteria:**
  - Symptoms manifestation during 14 days post-surgery
  - Purulent exudate in wound or in tubes
  - Chest pain or sternal instability
  - Patient has organisms cultured from mediastinal tissue or fluid.
  - Patient has evidence of infection on X-ray, CT, MRI
  - Fever (>38C)

- Types of post-sternotomy mediastinitis:
  - **superficial** — skin and subcutaneous tissue
  - deep – infection reaches under the sternum and the anterior mediastinum.
  - Causative agents – skin bacteria, Staphylococcus aureus nasal carriage.

# POST-STERNOTOMY MEDIASTINITIS: TREATMENT TACTICS

- Surgical strategies
  - Open – revision with open dressings;
  - Closed – primary closure, closed irrigation;
  - Negative pressure wound therapy (NPWT; VAC) with changes of , polyurethane foam every 48-72 hours – **optimal method** (IB).
  - Reconstruction with vascularized soft tissue flaps
    - Indications: unstable chest; chronic pain;
    - Can be performed on clean, granulating wound
    - Omentum or pectoral muscle flap are used.





# MEDIASTINITIS TREATMENT

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- Prompt surgical management is the main principle of effective treatment
  - debridement and source control matter
  - simultaneous work of surgical teams:
    - mediastinum – thoracic surgeon
    - head and neck – oral and maxillofacial surgeon or otolaryngologist
    - esophagus perforation – general (abdominal) surgeon.

- Empiric antibiotic therapy:
  - Esophagus perforation/neck and odontogenic infections:
    - Causative agents – Staphylo/Streptococcus spp., Anaerobes, Gram negative bacteria
    - Main groups:
      - Carbapenemes or piperacillin/tazobactam
      - Cephalosporines IV (Cefepime) + metronidazole/clindamycin.
    - Additionally:
      - Suspicious for MRSA – vancomycin or daptomycin.
  - Post-sternotomy mediastinitis:
    - Causative agents – nosocomial bacteria (MRSA, Enterococcus spp., Gram negative bacteria);
      - Main groups (MRSA; Streptococcus, Enterococcus spp.)
        - Vancomycin or daptomycin.
      - Additionally (Gram negative bacteria incl. P.aeruginosa):
        - Carbapenemes or piperacillin/tazobactam
        - Cephalosporines IV (Cefepime) + metronidazole/clindamycin.

# MORTALITY IN MEDIASTINITIS

- Esophagus perforation - 15-20%,
- Descending necrotizing mediastinitis -10-20%,
- Post sternotomy mediastinitis – <5%.
- Early surgical intervention (<24 h) decreases mortality **remarkably.**
  - Reconvalescents have increased death risk (59% during 10 years) in comparison with people, who did not suffer from this disease.


THANKS FOR
YOUR ATTENTION