

RADY 401 Case Presentation:
Ludwig's Angina
and
Descending Necrotizing Mediastinitis

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Focused patient history and workup

53 yo. F history of severe obesity (BMI 66), COPD, past DVT, HTN who presents to the ED at Cape Fear with 3-day history of increasing jaw pain and left sided neck swelling.

Vitals: 36.8 °C (98.3 °F) HR **110** RR 18 BP 168/95

WBC **19**, normal lactate

Physical Exam:

Mouth: Tongue is elevated but subglottic area is soft and nontender. Unable to visualize posterior oropharynx

Neck: Patient has significant swelling to the right side of her neck underneath her mandible on the left side. The area is firm and tender to palpation. Patient has **muffled phonation** but is maintaining secretions. No stridor noted.

Focused patient history and workup continued

Imaging at presentation to OSH: (could not obtain images)

CT Neck: Inflammatory changes at the left neck, involving the left parotid gland, left submandibular gland, uvula, left pharyngeal and left aryepiglottic fold. No fluid collection to suggest abscess.

Patient admitted to hospital and treated with antibiotics + supportive management.

On hospital day 3, patient developed acute respiratory distress requiring intubation

Repeat imaging was obtained suggesting acute mediastinitis requiring surgical intervention and patient was transferred to UNC.

List of imaging studies

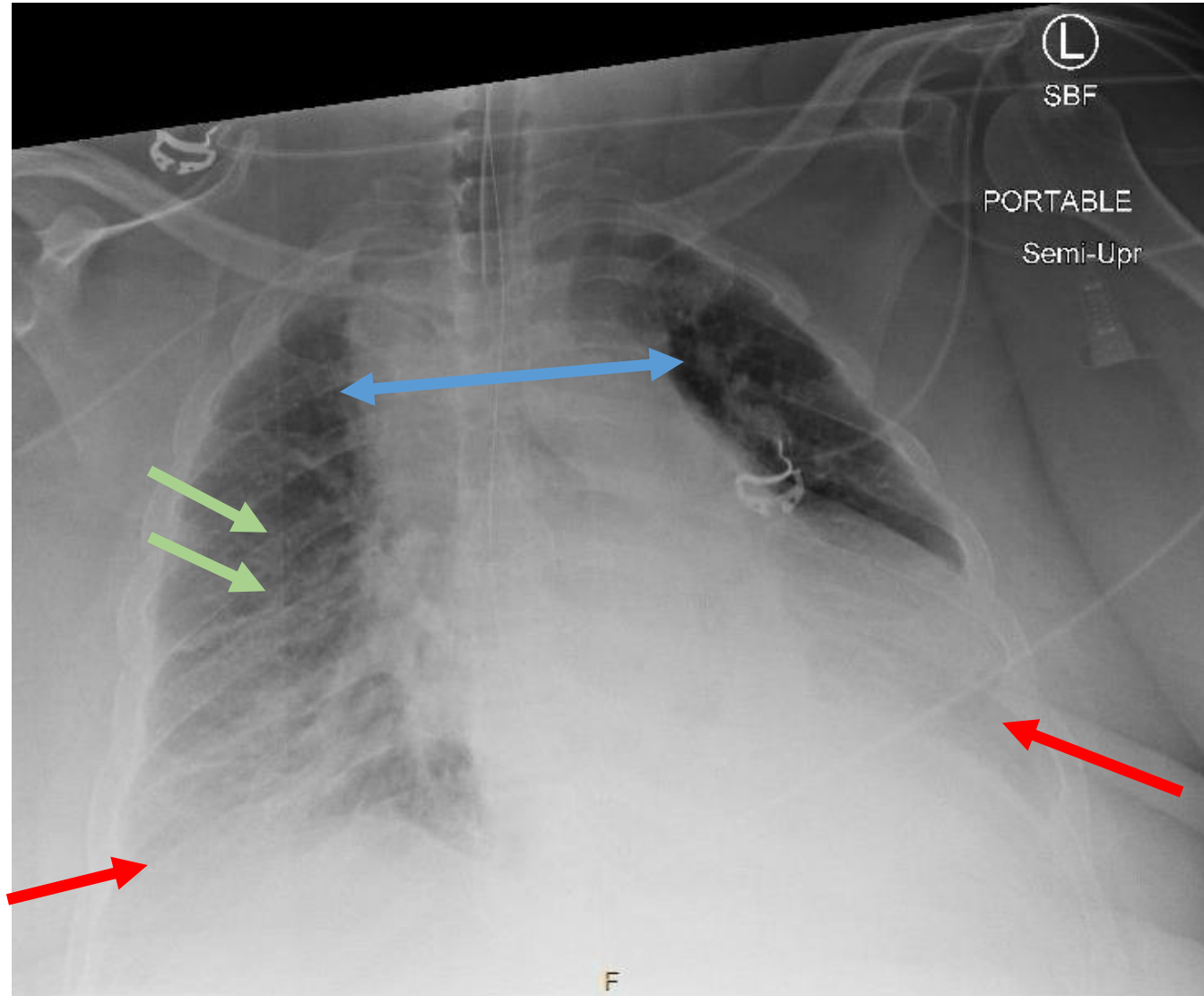
Initial:

- Portable Chest X-ray
- CT Neck with contrast

Follow up

- Serial Chest X-ray
- CT Chest with contrast

Portable CXR



Findings:

Bilateral pleural effusions (red)

Diffuse R > L interstitial opacities (green)

Moderate enlargement of mediastinum and cardiac silhouette* (blue)

Support devices:

PICC line in R arm terminating in RA

ETT terminating above carina

NGT tip not seen

CT Neck with IV contrast - sagittal



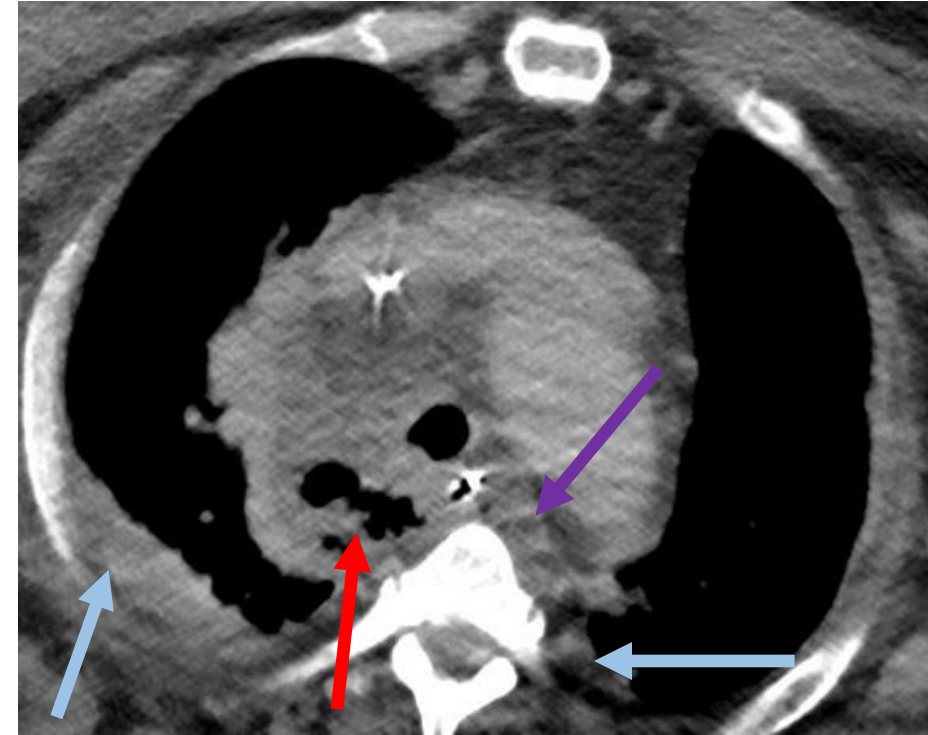
Findings:

- Air fluid level within sphenoid sinus (green)
- Significant swelling of tongue and tissues of submandibular space (blue)
- Extensive gas tracking through prevertebral soft tissue (red)

CT Neck with IV contrast - axial



Reactive cervical adenopathy (green)
Significant R sided soft tissue
emphysema (red)



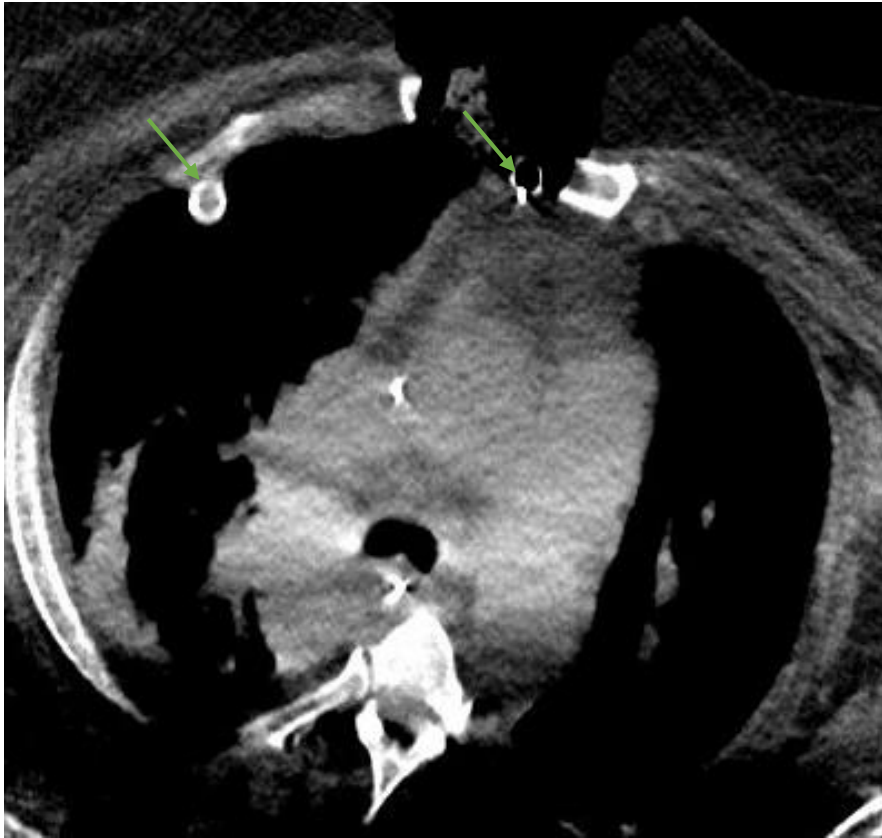
Bilateral R>L pleural effusions (blue)
Mediastinal emphysema (red)
Diffuse inflammatory changes in
mediastinum (purple)

Patient treatment and outcome

- Patient taken emergently to OR for mediastinal washout, cervical dissection and dental extraction. (Joint case between thoracic, ENT, OMFS).
- Extensive infection of the mediastinum required chest to be left open with antiseptic packing and admission to ICU. Patient ultimately required 5 serial washouts in the OR over the course of 3 weeks.
- Throughout hospital course, stay complicated by renal failure requiring inpatient dialysis, GI bleed, altered mental status and stroke workup
- Patient was discharged from the hospital after 2 months of antibiotics with tracheostomy, G tube, and admitted to long term rehab.

Comparison chest CTs HD 2 vs 17

Hospital day 2 – open chest with packing



Hospital day 17 – post chest closure



Interval decrease in mediastinal size.

Resolution of mediastinal emphysema.

R pleural effusion decreased in size.

Inflammatory changes within R major fissure (blue)

Chest tubes (green)

Initial workup for soft tissue infections of the head/neck

**American College of Radiology
ACR Appropriateness Criteria®
Neck Mass/Adenopathy**

Variant 1: Nonpulsatile neck mass(es). Not parotid region or thyroid. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
CT neck with IV contrast	Usually Appropriate	☼☼☼ ←
MRI neck without and with IV contrast	Usually Appropriate	○
MRI neck without IV contrast	May Be Appropriate	○
US neck	May Be Appropriate	○
CT neck without IV contrast	May Be Appropriate	☼☼☼
CT neck without and with IV contrast	Usually Not Appropriate	☼☼☼
CTA neck with IV contrast	Usually Not Appropriate	☼☼☼
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	☼☼☼☼
FDG-PET/MRI skull base to mid-thigh	Usually Not Appropriate	☼☼☼
MRA neck without and with IV contrast	Usually Not Appropriate	○
Arteriography cervicocerebral	Usually Not Appropriate	☼☼☼
MRA neck without IV contrast	Usually Not Appropriate	○

ACR guidelines do not explicitly state recommendations for imaging deep neck space infections. CT neck with IV contrast usually appropriate for neck masses, especially given severity of this infection.¹

Costs from UNC chargemaster:³

Chest X-ray - \$165

CT Neck with contrast - \$3477

CT Chest without contrast - \$3327

Relative radiation doses (background radiation):²

Chest X-ray – 0.1 mSv (10 days)

CT Neck – 1.2 mSv (5 months)

CT Chest – 6.1 mSv (2 years)

Ludwig's angina

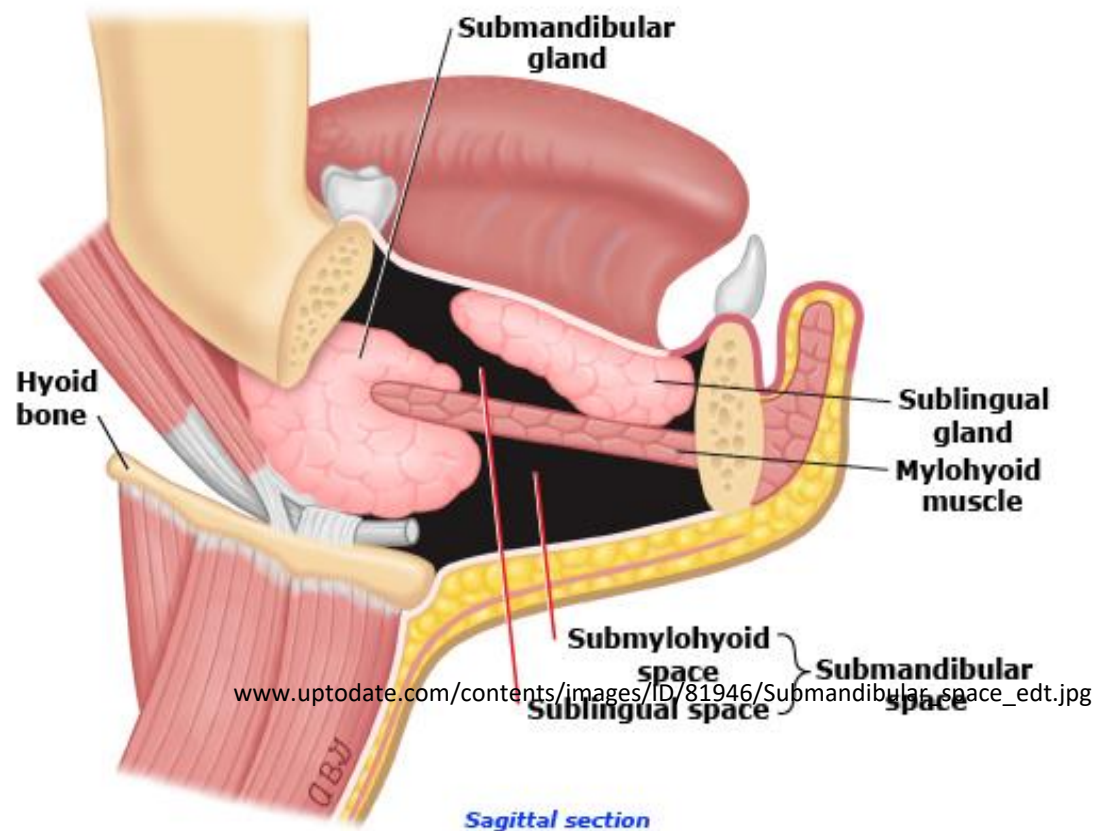
- Infection of the submandibular space commonly arising from dental infection ~85%.⁴
- May present with general sx of pharyngitis, cellulitis, neck swelling, lymphadenopathy but is rapidly progressing and has high risk of airway obstruction.⁵
- **Red flags** for impending airway collapse
 - Stridor
 - Tracheal deviation
 - Inability to tolerate secretions
 - Swollen/raised tongue
 - Muffled voice



4 diagnostic criteria per Dr. Grondinsky (1939)⁵

- Bilateral infection involving >1 spaces
- Productive of serosanguinous, putrid fluid.
- Involving connective tissue/fascia but not glandular tissue
- Spreading via fascia planes but not lymphatics or hematogenous routes

Image correlation to patient



Superiorly/posteriorly displaced tongue (blue)

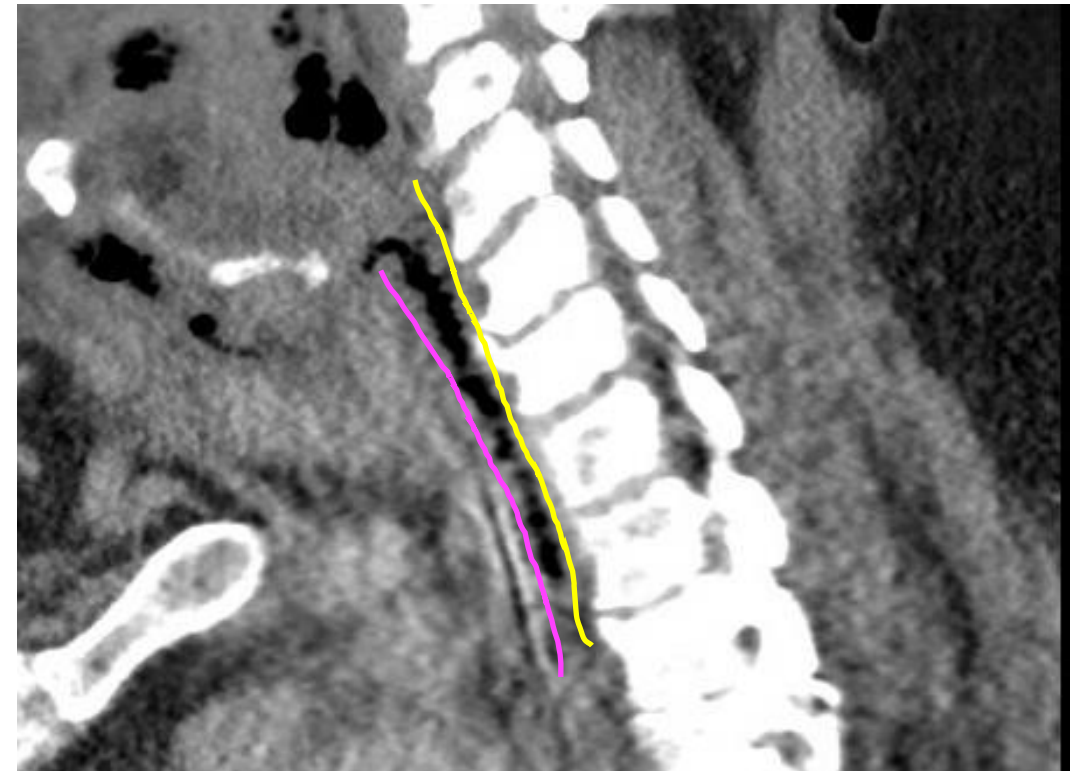
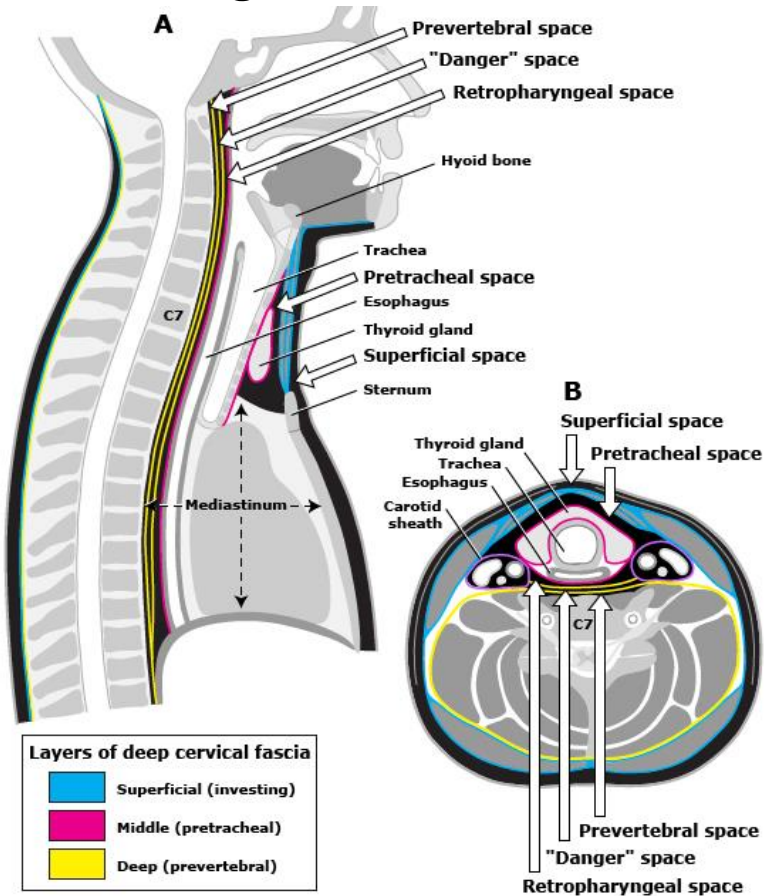
Generalized edema of: Submylohyoid space (green)

Sublingual space (red)

Hyoid - white arrow

Descending necrotizing mediastinitis (DNM)

Rapidly progressing infection that travels down from naso-oropharynx to the mediastinum via deep cervical fascial planes and its spaces. Once had a mortality up to 42% in 1980's but now is cited to be between 5-14% with advances in surgical management.^{6,7}



Descending necrotizing mediastinitis diagnosis

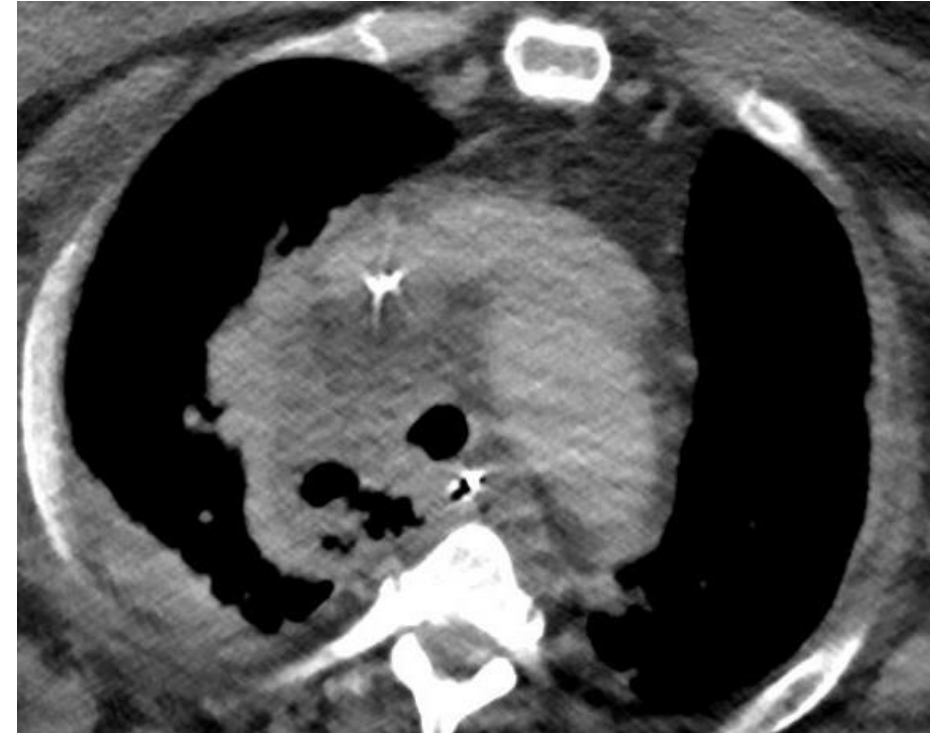
Diagnostic criteria of DNM Estrera (1983)⁶

- (1) clinical manifestations of severe infection;
- (2) demonstration of characteristic radiographic findings;
- (3) documentation of necrotizing mediastinal infection in operation
- (4) establishment of oropharyngeal/cervical infection with descending necrotizing mediastinitis relationship.

Radiographic Findings:

Xray - subcutaneous emphysema, prevertebral soft-tissue swelling, mediastinal gas, and/or superior mediastinal widening.

CT - mediastinal gas +/- fluid collections, fat stranding, lymphadenopathy, tissue thickening, enhancement of cervical fascia and muscles



Guidelines for surgical management

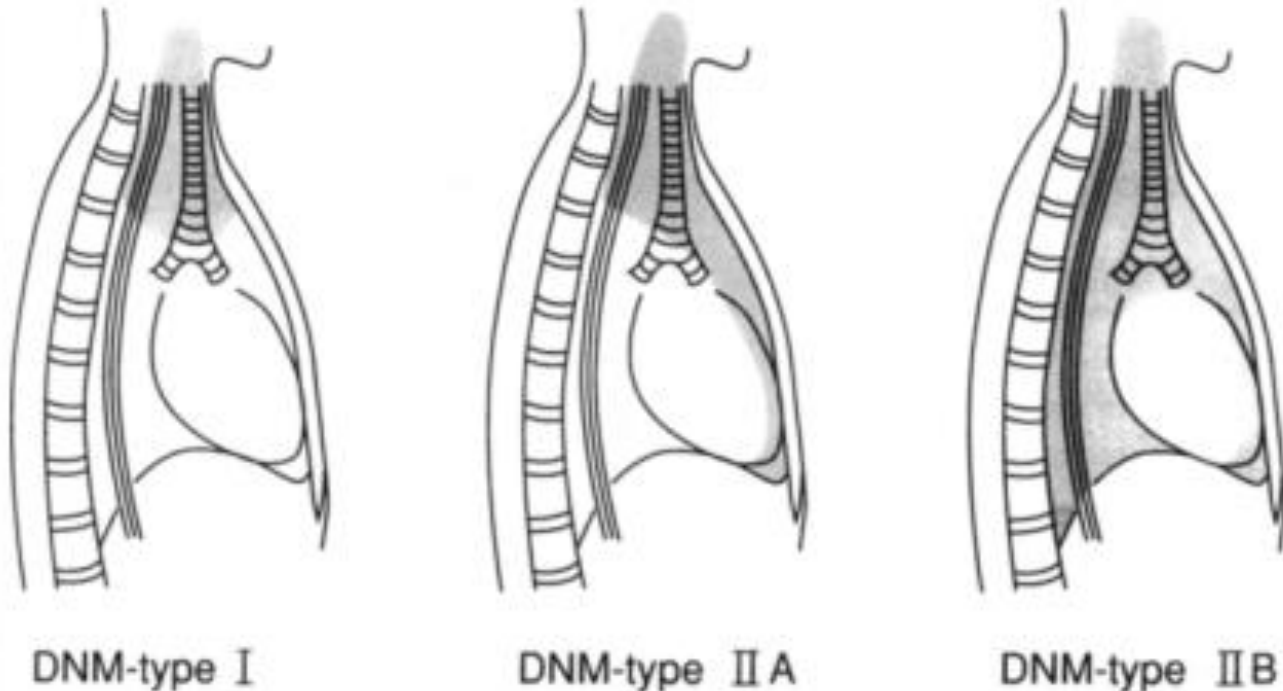


Fig. 2. Diagram of DNM classifications. Shading indicates the extension of mediastinitis.

- Type I: DNM is localized in the upper mediastinum above the tracheal bifurcation.
- Type II A: DNM extends to the lower anterior mediastinum.
- Type II B: DNM extends to the anterior and lower posterior mediastinum.

Radiographic correlation for extent of infection on CT Chest helps guide surgical management.⁸

Type I – does not require aggressive mediastinal drainage, transcervical

Type II A - transcervical + anterior mediastinal drainage through a subxiphoid incision

Type II B- most aggressive, recommends open thoracic approach.

UNC Top Three

- Ludwig's angina commonly presents as a complication of a primary tooth infection. Patients generally will present with diffuse edema of bilateral submandibular space without evidence of fluctuance or abscess on imaging. Must know the red flags for impending airway compromise!
- Infections of head and neck can rapidly spread across avascular fascial planes and into the mediastinum. Patients require early broad-spectrum antibiotic therapy, imaging, and close monitoring.
- Surgical management often guided by imaging findings. Extent of surgical invasiveness dictated by extent of infection evidenced on CT neck and CT chest.

References

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