DEEP NECK SPACE INFECTIONS

PRESENTED BY

DR. Sheikh

OUTLINE

- Introduction
- Anatomical considerations
- Etiology, Pathophysiology,Clinical presentation
- Microbiology
- Workup and Treatment
- Specific entities-peritonsillar,Ludwig's,retro pharyngeal
- Complications
- Future and controversies

Challenging because:

- Complex anatomy
- Deep location
- Access
- Proximity
- communication

ANATOMICAL CONSIDERATIONS

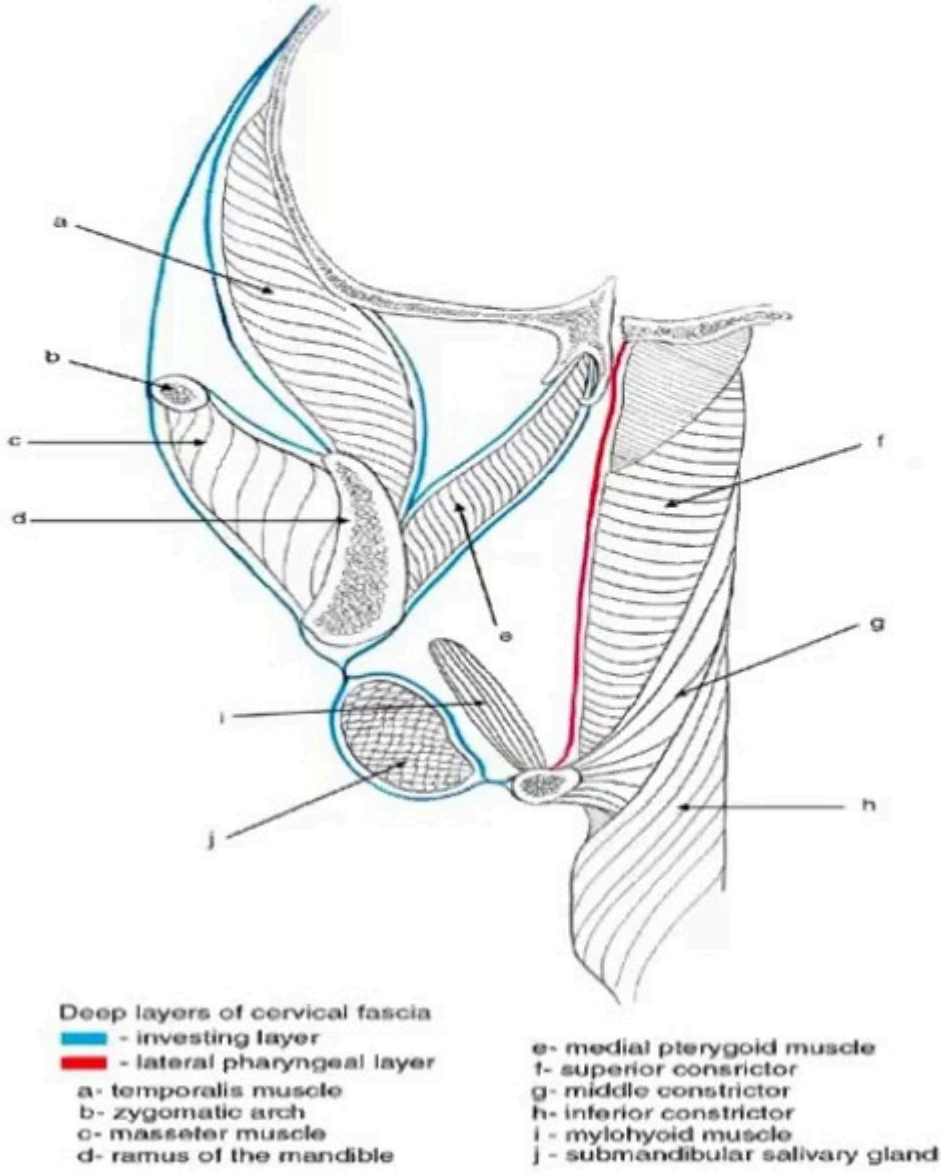
- CERVICAL FASCIA:

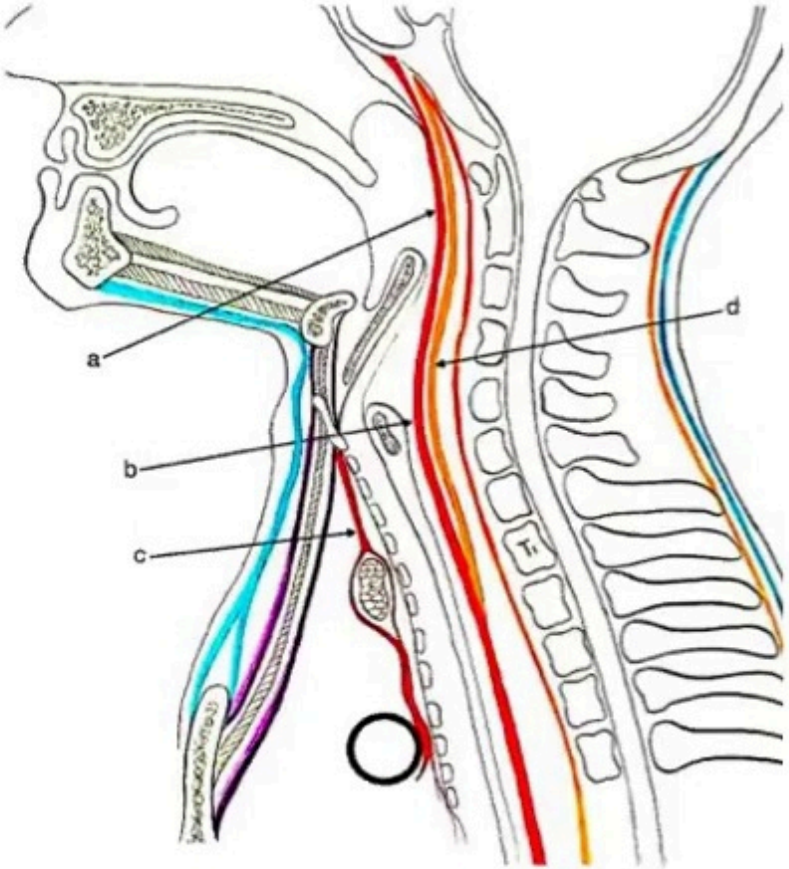
Superficial

Deep-*superficial layer of deep cervical fascia

*middle layer of deep cervical fascia

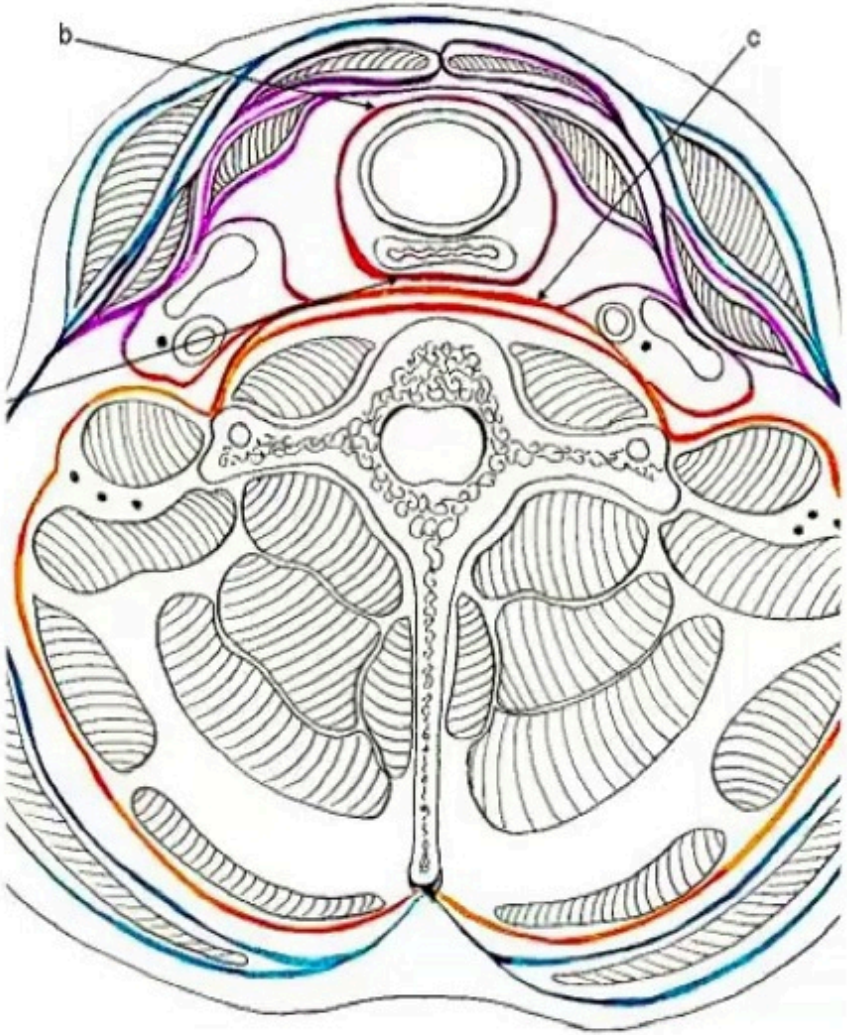
*deep layer of deep cervical fascia.

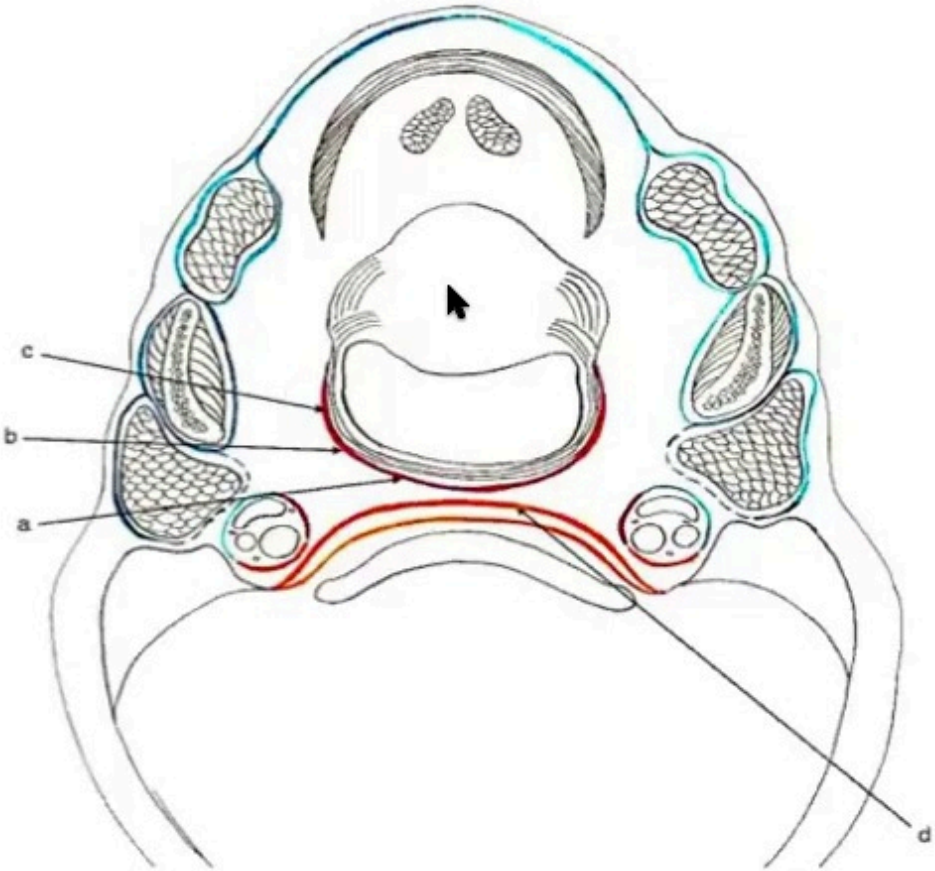




- Superficial Investing
- muscular layer
- Visceral layer
- Prevertebral fascia
- a - Pharyngeal fascia
  b – Oesophageal fascia
  c – Pretrachael fascia
  d – Alar fascia

Cross-section





FASCIAL PLANES

- In relation to the hyoid bone.
- The spaces are:

*Spaces involving entire length of the neck.

*Suprahyoid spaces.

*Infrahyoid spaces.

Levitt GW.cervical fascia and deep spaceinfx.laryngoscope,1970;80(3):409-35.

Spaces spanning the entire neck

- **Superficial space:**

Between superficial fascia and superficial layer of deep fascia.

Contents: loose areloar tissue,lymphnodes,

nerves and external jugular vein.

Diagnosis of abscess is easy and incise along langers lines.

- **Retropharyngeal space:**

Posterior to pharynx and esophagus

Ant:made of buccopharyngeal fascia (sup.) and visceral division of middle cervical fascia (inf.)

Post: Alar layer of the deep layer

Lat:carotid sheath

Extend-skull base to T2/tracheal bifurcation where the visceral and alar layers fuse

Contents: retropharyngeal lymphatics(glands of henle)-atrophy after 5 yrs

Most common site of abscesses in children.

- **Prevertebral space:**

Anteriorly and laterally limited by prevertebral fascia.

Posterior-limited by ant.longitudinal ligament,vertebral bodies and deep muscles.

Runs along entire vertebral column

- **Danger space:**

Lies post. to retropharyngeal space

Contents: loose areolar tissue thus little resistance to spread of infx.

Space btw alar and prevertebral layers

Extend-skull base to diaphragm

- **Visceral vascular space:**

Carotid space.

Space within carotid sheath.

Compact with areolar tissue and thus resistant to infx.

Content: carotid artery,IJV,vagus,and sympathetic postganglionic fibers.

Suprahyoid spaces:

- **Submandibular space:**

Bounded ant. and lat. by mandible.

Postinf:hyoid

Inf:superficial fascia of the deep cervical fascia

Sup:lingual mucosa.

Mylohyoid muscle divides this space into:

Sup.sublingual space-contents:- loose areloar tissue,hypoglossal,lingual nerves,sublingual gland and wartons duct.

Inf. submylohyoid space-contents ant.belly of digastric and submandibular gland.

- **Parapharyngeal space:**

Pharyngomaxillary space/lateral pharyngeal space/ peripharyngeal space.

described as an inverted cone.

Base: base of skull

Apex: hyoid bone

Ant:ptergomandibular raphe

Post:prevertebral fascia

Medial:buccopharyngeal fascia

Lateral:superficial fascia of deep fascia,medial pterygoid and parotid gland.

Its divided by styloid process into:

Anterior,muscular or prestyloid compartment.

Posterior,neurovascular or post styloid compartment.

Prestyloid space :

bounded by tonsillar fossa medially and medial pterygoid lat.

Contents:inferior alveolar nerve,internal maxillary artery,lingual nerve and auriculotemporal nerve.

Post styloid space:

contents-carotid sheath and cranial nerves IX,X,XII.

Spread of infection from prestyloid to post styloid is restricted by stylopharyngeal aponeurosis of zuckerkandel.

- **Peritonsillar space:**

Medial- capsule of palatine tonsil

Lateral-sup.constrictor

Sup-ant.tonsillar pillar.

Inf-post.tonsillar pillar

Contents:loose areolar tissue esp.near soft palate.

- **Masticator space:**

Formed by the superficial layer of the deep cervical fascia as it surrounds the masseter lat;pterygoids medially

Contents-body and ramus of mandible,inferior alveolar nerves n vessels and tendon of temporalis muscle.

Communicates directly with temporal space.

- **Temporal space:**

Lat:superficial layer of the deep fascia

Medially:periosteum of temporal bone

Subdivided into:

Superficial and deep spaces by temporalis muscle.

Contents:internal maxillary artery and mandibular nerve.

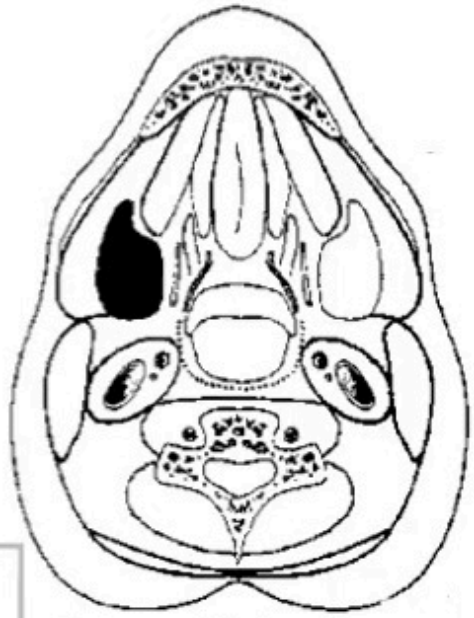
- **Parotid space:**

Surrounded by superficial layer of deep fascia that sends septae into the gland.

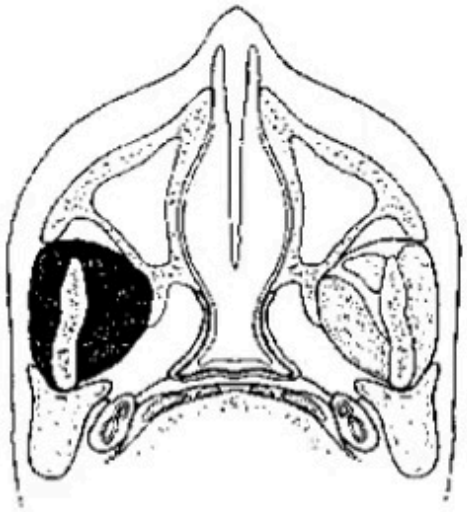
Contents:parotid gland,lymphnodes,facial nerve and post. facial vein.

Direct communication with the parapharyngeal space at the supero medial aspect.

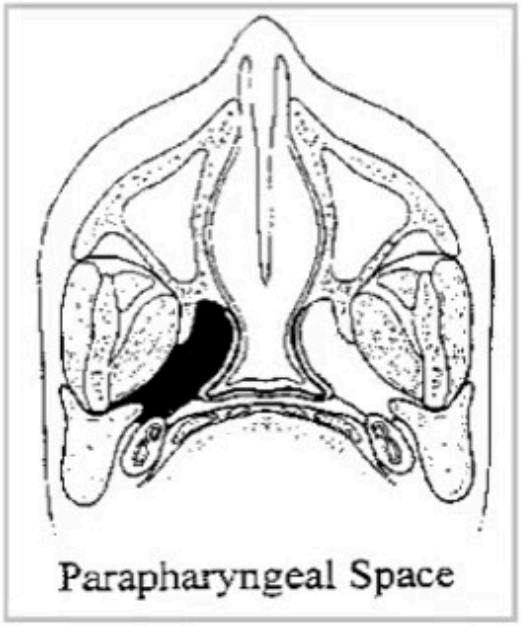
Suprahyoid spaces:



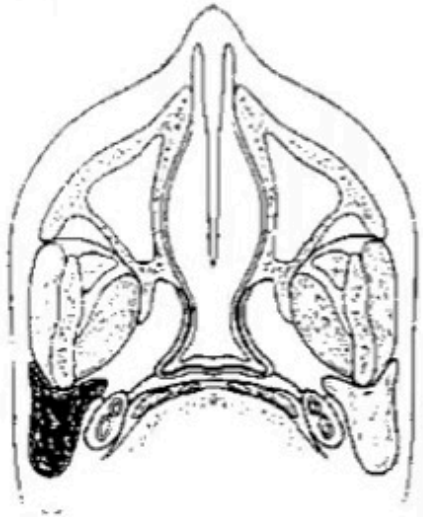
Submandibular Spa



Masticator Space



Parapharyngeal Space



Parotid Space

Infrahyoid spaces.

- **Anterior visceral space:**

Pretracheal space.

Enclosed by middle layer of deep cervical fascia.

Contents-thyroid gland,esophagus,trachea

Extent-from thyroid cartilage into anterior superior mediastinum.

Distribution of neck abcesses.

- Retropharyngeal abcesses more in kids-96%occur before age of 6 yrs(bcoz of the lymphnodes that regress at the age of 5)
- Peritonsillar abcesses are most common in adolescents.

that those from lower socioeconomic status were at risk-?poor dental/oral hygiene.*

Also noted to be high in the far east coz frequent foreign body ingestion-fish bones.*

ETIOLOGY

Tonsillitis/URTI for children.

Odontogenic in adults.

- Tonsillar and pharyngeal infections.
- Oral surgical procedures.
- Dental infections/gum dx.
- Salivary gland infx.
- Trauma.
- Foreign bodies-fishbone.
- Instrumentation.
- Congenital cysts.
- Infx of neck structures.

- Ear infections.
- Unknown etiology.
- Tuberculosis.
- Immunosuppression increases risk.
- IV drug use.

Pathogenesis.

- Spread via lymphatics-retropharyngeal abscess
- Along the deep neck spaces
- Direct-trauma

Clinical presentation:

- Signs and symptoms depend on:

Mass effect of the abscess on the surrounding structures

Direct involvement of the surrounding structures

deep neck spaces involved.

- HISTORY:

Pain?

Recent dental procedures.

URTI.

Neck or oral trauma.

Respiratory difficulties.

Dyspahgia.

Immunocompromise status.

Rate of onset.

Duration of symptoms.

- PHYSICAL EXAM:

Location of the infection-

Deep spaces involved.

Any functional compromise?

Complications?

Vitals- fever,tachycardia,tachypnoea

Oral cavity,ears,nasal cavity

Neck.

Deep neck space infections.

- **Retropharyngeal space infections:***

In pediatric group etiology is from nose/adenoids/ nasopharynx/paranasal sinuses.

Usually a preceeding hx of a URTI.

In adults rare but may be caused by trauma/ instrumentation

Complications-spread to prevertebral space/ chest.

Presentation-70% of pediatric group have lymphadenopathy,

Fever,irritable,neck stiffness and torticollis.

Trismus is uncommon

Lateralized bulging of the post.pharyngeal wall.

Adults-snoring/nasal blockage/regurgitation.

- **Danger space infections:**

Infections are usually an extension of retropharyngeal,

parapharyngeal and prevertebral infections

Rapid spread of infection coz of loose areloar tissue.

Complications- mediastinitis,

empyema and sepsis.

- **Prevertebral space infections:**

Commonest etiology- trauma.

Can have tuberculosis/ spread from other spaces.

Symptoms are unspecific- neck/back pain that worsens with swallowing,dysphagia.

If in cervical region- midline bulge in the oropharynx.

Complications- osteomyelitis and spinal instabilty.

- **Para pharyngeal space infections:**

Communicates with

retro pharyngeal space(posteromedially),

submandibular space(inferiorly),

masticator space(laterally).

It provides a central connection for all spaces.

If prestyloid region-pain,dysphagia,trismus,

medial bulge of the lat.pharyngeal wall.

+/-swelling at the angle of the mandible.

If post styloid-no trismus or tonsillar displacement

Complications-cranial neuropathies,horners syn,septic IJV,carotid artery rupture.

- **Masticator space infection:**

Likely to spread to

Para pharyngeal,parotid and temporal space.

Causes: dental infx:particularly of 3rd mandibular molar and post. removal of suspension wires after reduction and fixation of facial fractures.

Symptoms:trismus.

edema and induration of the posterior floor of mouth.

May have a swelling over ramus of mandible.

- **Carotid space infections:**

Indirect invol.from Para pharyngeal space.

Direct spread by injection of drugs resulting in IJV thrombophlebitis;

thrombosis of carotid artery.

- **Pretracheal space infection:**

Caused by perforation of ant.esophageal wall by FBs;trauma;

instrumentation.

Sec.to thyroid infx.

Symptoms:hoarsness,

dyspnoea,dysphagia.

Examine:erythema of

hypopharynx,ant.neck edema.

- **Temporal space infections:**

Pain and trismus.fullness over temporal region.

- **Parotid space infections:**

Common in the immunocompromised;

poor dental/oral hygiene.

Those with salivary gland duct obstruction,

sjorgens syn.

Trismus,bulging of postero lateral pharyngeal wall and swelling over angle of mandible.

- **Submandibular space infections:**

Causes:oral trauma,sublingual sialadentitis,dental abscess of mandibular teeth.(70-85% are odontogenic in origin).

If apex of 1st molar is above mylohyoid-inv.sublingual space.

If apex of 2nd and 3rd molars below mylohyoid-submylohyoid space.

Presentation:pain,drooling,

dysphagia,neck stiffness,trismus is uncommon,indurations of floor of mouth with displacement of tongue.

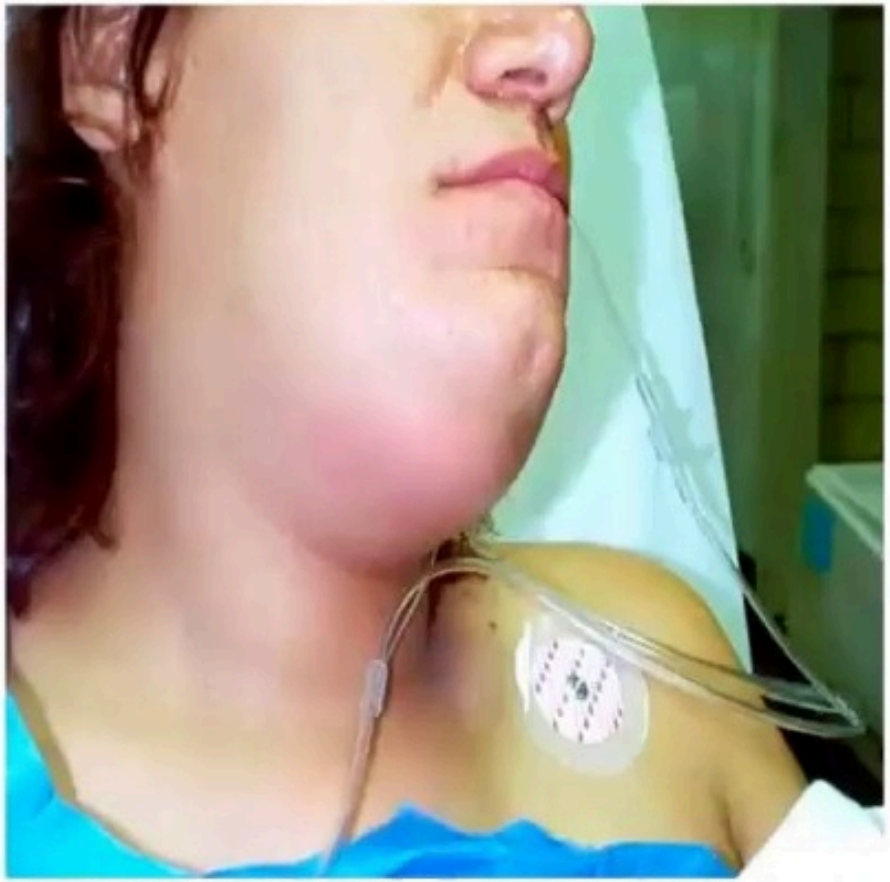
LUDWIG'S ANGINA:

Prototypical submandibular space infx.

Ludwig (1836)described it as absence of pharyngeal infm,woody indurations of neck and floor of mouth,limitation of involvement in neck to sub mental and submandibular triangle and lack of cervical lymphadenopathy.

Newer criteria(Grodnisky's):

- Cellulitic process of submandibular space.
- Invol.of only submandibular space.
- Findings of gangrene with foul serosanguinous fluid but no frank pus.
- Inv.fascia,muscle and connective tissue with sparing of the gland
- Direct spread versus lymphatics.



- **Peritonsillar space infection:**

Direct extension of infx from suppurative tonsillitis.

Symptoms-progressively worsening sore throat-often localized to one side.

Fever

Dysphagia

Otalgia

Odynophagia.

Physical exam:- erythematous,swollen tonsil with contralat.uvular deviation,Trismus,

edema of palatine tonsil,purulent exudate on tonsil,drooling,muffled,

hot potato voice,cervical lymphadenopathy.

MICROBIOLOGY..

- Mostly polymicrobial infx.-90% of patients.*
- Often aerobes.
- Staph.aureus most common pathogen in KNH.*
- In KNH-15%anaerobes.
- Other aerobes- H.influenza,

S.pneumonia,M.catarrhalis, klebsiella.

- Anaerobes- peptostreptococcus,

fusobacterium,

bacteroides

Diabetics-klebsiella pneumonia/fungal<1%*

Aswani JM 1999:prospective study on bacteriology of deep neck abcesses at KNH.

Prevelance of HIV in head and neck abcesses-ndiritu 2009

huang TT,lui TC,chen PR.deep neck infx.analysis of 185 cases heada nd neck.oct 2004;26(10):854-60.

WORK UP.

- LABORATORY STUDIES:

FHG-raised WBC,neutrophilia,elevated ESR.

Biochemistry is essentially normal unless sepsis.

Blood cultures in those who are toxic.

Abscess culture-gram stain;ZN stain.

- IMAGING STUDIES:

Lateral neck radiograph:

Soft tissue swelling in the prevertebral region.if over C2->7mm

If over C6>14mm for kids and >22mm for adults.

Mostly for retropharyngeal and prevertebral infx.

Sensitivity 88% versus 100% Ctscan*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- *Mandible series:*

Suspect a dental source.

attention to 2nd and 3rd mandibular molars.

- *Chest radiograph:*

To evaluate the mediastinum/chest.

- *High resolution ultrasound:*

Doesn't reveal anatomical details.

helps distinguish a phlegmon and abscess.

Used to guide FNAc

Intraoral ultrasound for peritonsillar abscess.

- *CT Scan:*

Modality of choice. Contrast enhanced.

Difficult in our setup: financial and patient bulk.

Superior anatomical details,delineates extent of infx;can ddx btw cellulitis and abscess.

Abscesses are seen as low density lesions with rim enhancement,loculation and occasionally air fluid levels.

- *Magnetic resonance imaging:*

Excellent anatomic details

Abcence of ionizing radiation,safer contrast,increased soft tissue sensitivity,multiplanar images, less artifacts.

Expensive; increased examination time, dependent on patient cooperation. hardly practical in view of an emergency.

TREATMENT:

Keys to management:

- Protection and control of airway.
- Antibiotic therapy.
- Surgical drainage.
- Combined surgical and medical.

Airway management.

- Depends on the stability of the patient,extend of disease,neck space inv.
- Oral intubation can be difficult coz of:

Rupture of abscess with risk of aspiration pneumonia.

Difficult to identify the anatomy coz of edema,displacement.

Symptoms such as trismus.

Antibiotic therapy:

- Age old dictum that old abcesses must be drained has been put to question.*
- Most authors agree that if a patient doesn't improve within 24-48hrs of medical therapy-reimaging and surgery is then indicated.
- Many reports on patients improving with just antibiotics.

- Decision on which antibiotic to start depends on the organism most isolated.
- Most infx are polymicrobial hence broad cover.
- Most centers choice of antibiotic is directed by culture results.

- Ndiritu showed in KNH in 2009 –amoxicillin clavulinic acid is most sensitive.
- Common combinations used are:

Penicillin+flagyl+steroids

Cephalosporins+flagyl +steroids.

Clindamycin for penicillin allergic patients.

Surgical drainage.

- Levitt's thinking-antibiotics are not a substitute for surgery and should be used in conjunction with proper surgical drainage.
- Approach depends on the location and surrounding anatomy.
- Approaches:-

Intraoral/transoral-now can access most deep neck spaces with the advent of CTscan.nagy et al found 22/23 rx with transoral approach for retro or parapharyngeal abcesses.

Cruciate incision the mucosa then blunt dissection till sup.constrictor.

Complication-great vessel damage esp. if they are medial or within the abscess.

External approach-

Landmarks:

- Tip of greater horn of hyoid
- Cricoid cartilage
- Styloid process
- SCM

External drainage- location of abscess and the spaces inv.

Ant or post approach for retro,danger,prevertebral and visceral vascular spaces.

Ant. approach:

- incision parallel the ant.border of SCM.
- dissect along that border.
- retraction of the carotid sheath,medial retraction of trachea,larynx and thyroid,and expose abscess cavity.

Post. approach:

- incision behind the SCM.
- medial and ant.retraction of muscle and carotid sheath.
- open into the abscess from post.to the great vessels.
- risk-sympathetic plexus and phernic nerve.

Submandibular space:

- transverse incision parallel and 2cm below the mandible.
- post belly of digastric is identified and retracted lat.
- the mylohyoid is divided perpendicularly thus opening this space.

Parapahryngeal space:

- an incision along the ant.border of the SCM,submandibular incision or a T incision that combines the two.

Parotid space:

- parotidectomy incision and blunt dissection in the direction of facial nerve.

Peritonsillar abscess

Gold standard for diagnosis-aspiration of pus from the peritonsillar region.

3 main mx modes:

Needle aspiration.

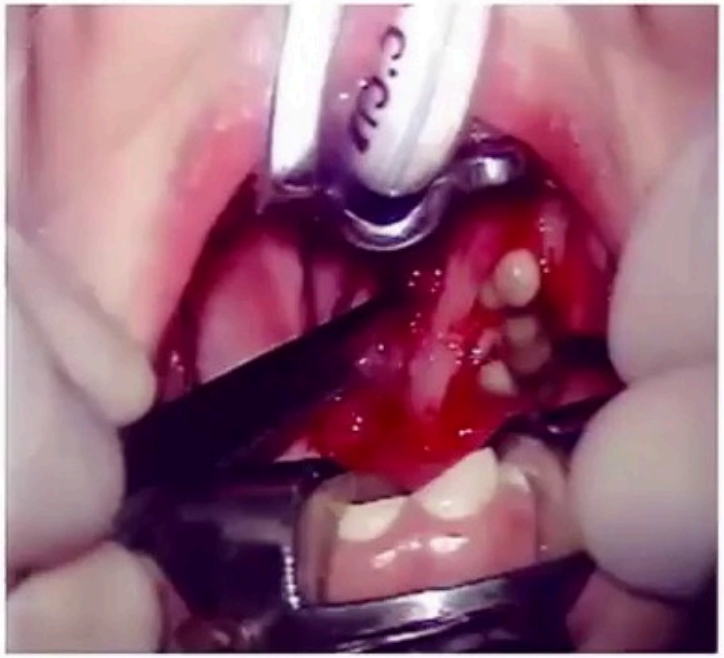
Incision and drainage.

Immediate tonsillectomy.

Comparison of needle aspirate and incision and drainage:

No significant differences.

Most ENT consider incision and drainage as gold standard.



Ludwigs angina

- Airway management is the foundation.
- Never attempt blinded nasotracheal intubation coz of bleeding and rupture.
- Initiate antibiotics as soon as possible.
- Broad spectrum.
- Use of intravenous steroids.
- 65%may develop suppurative complications that require drainage.
- Imaging(CT scan) is indicated to det true extend.

COMPLICATIONS:

- Airway obstruction and asphyxia.
- Rupture of abscess - aspiration pneumonia,lung abscess,empyema.
- Vascular complications- jugular vein thrombosis,carotid artery rupture.

Lemierre's syn-jugular vein thrombosis in ass.with deep space infx.fever,prostration and swelling and pain along SCM.

Can result in pul.emboli.

Most common organism- fusobacterium necrophorum

Common in IV drug users- stap.

Rx-antibios+/- anticoagulants(controversial)

Sx:if medical mx fails. ligation and excision of the vessel.

- Carotid artery rupture-high mortality(20-40%).infx weakens the arterial wall.

Can be heralded by small recurrent bleeds from the ear,nose,mouth.

Control by ligation,grafting/ patching

- Horner's syn.,cranial nerve dysfxn.

- Mediastinitis-esp. from ant.visceral,retrophayngeal ,visceral vascular,danger or prevertebral spaces.

Difficulty breathing and chest pain

CXR-widened mediastium

- Necrotizing cervical fascititis:necrosis of connective tissue that spreads via fascial planes
- Osteomyelitis-spread to spine,mandible or skull base.
- Grisel syn: infm.torticollis causing cervical vertebral sublaxation.

- Thank you