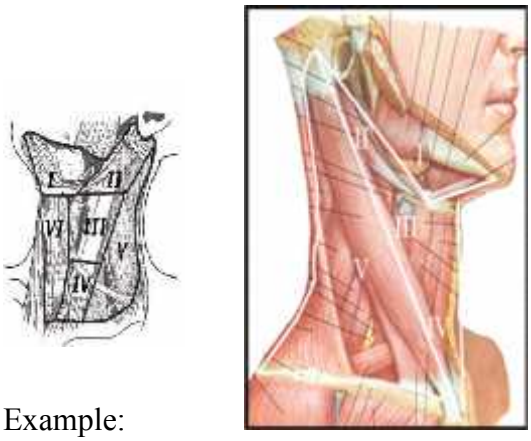
Head & Neck Tumors

Neck Masses

I. **Evaluation and Management of the Patient with a Neck Mass**

- Common clinical finding
- All age groups
- Very complex differential diagnosis
- Systematic approach essential
- Alarming Signs: Hoarsness, unilateral nasal blockage, dyspgahia, ear pain with normal examination.
- Maybe:
  A. Upper Neck Mass
  B. Lower Neck Mass



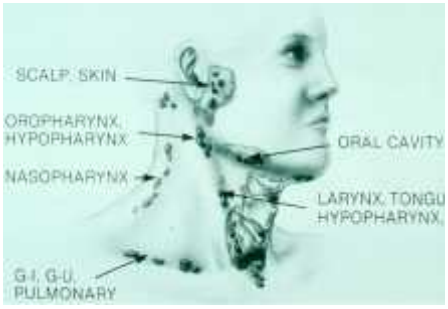
II. **Anatomical considerations –** to identify the location of the mass {Site} – helps to reach the proper Dx

- Airways landmarks and important for any ENT examination. Example: thyroid cartilage, thyrohyoid membrane, cricothyroid, trachea……
- Prominent landmarks
  - ***Triangles of the neck*** {Anterior-Posterior separated by Sternocleidomastoid}
    - Boundries of the **Anterior Triangle**: midline of the neck, posterior border of sternocleidomastoid muscle, and inferior border of mandible. (Has 3 divisions: Mandibular Triangle – Carotid Triangle – Muscular Triangle)
    - Boundries of **Posterior Triangle:** clavicle, posterior border of sternocleidomastoid, anterior border of Trapezius muscle. (Has an upper and lower part separated by the omohyoid muscle)
  - ***Lymphatic levels*** (for clinical examination it is only 5 levels)
    - Level one: submental and submandibular triangles – above the digastric muscle
    - Level two: between the base of the skull and the hyoid bone – malignant masses usually here
    - Level three: between the hyoid bone and omohyoid muscle
    - Level four: between omohyoid muscle and clavicle
    - Level five: posterior triangle lymph node , between the sternocleidomastoid, trapezius and clavicle – posterior to the other level
    - Level six: tracheal and paratracheal lymph node – anterior to them

Level 2-3-4 in the Anterior Triangle

  - ***Carotid bulb*** {Carotid Sheath contents}:
    1. The common carotid artery
    2. Internal jugular vein
    3. Vagus nerve
    4. Hypoglossal nerve – motor supply of the tongue

Metastasis Location according to Various Primary Lesions



5. Sympathetic trunk
6. Deep cervical lymph nodes
7. Glossopharyngeal nerve
8. Accessory nerve

III. **General Considerations**

- Patient age
  - Pediatrics (0 – 15 years): mostly benign
  - Young adults (16 – 40 years): similar to pediatric but rule out malignancy
  - Old adults (>40 years): High risk of malignancy (always malignant until proven otherwise)

  3 crucial questions: age, site and duration.
- Location
  - Congenital masses: consistent in location
  - Metastatic masses: key to primary lesion
  - Any mass in the neck or a unilateral ENT symptom has to be investigated quickly – SERIOUS.

IV. **Diagnostic Steps**

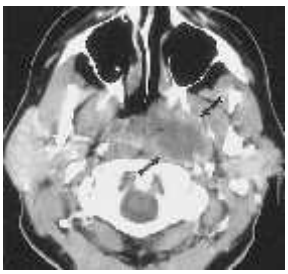
- **History:** 3 crucial questions: age, site and duration.
  1. *Age and Gender*
  2. *Chief complaint* – analyze it
  3. *History of presenting illness* – age, site,duration and size are the most important
     - Location **(Site)** of the mass is very important, it gives a clue about the type of the tumor and if metastatic – where it came from.
     - Duration: Less than a week – infection
       Week – Month: malignancy
       Years: benign
  4. *Past History and Family History* - Previous irradiation or surgery
  5. *Medication history and Allergy History* – very imp Ex. if the patient is on cardiac medication.
  6. *Social Histor*y - Personal habits (tobacco, alcohol-mucosal carcinoma of the nasopharnyx and oral cavity).
     - Associated symptoms (dysphagia, otalgia, voice)
     - Developmental time course

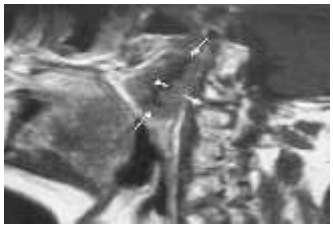
  7.occupational history: sinonasal risk.
- **Physical Examination**
  - **Complete head and neck exam** (visualize & palpate) – Lymph Nodes and Thyroid
  - **The Face** – parotid gland
  - **Oral Cavity** – nose and ear (rarely)
  - **Neck**: 5 levels of lymph nodes+ thyroid.
  - **Endoscopy** – flexible scope for 5 areas (nose, nasopharynx, oropharynx, laryngiopharynx, and larynx) – has to be done for a complete PE.
    Types: zero (thru the nose), seventy degree (for larynx), flexible (for head and neck)
    Emphasize on the location, mobility and consistency
- **Diagnostic Tests**

  -If a patient has a neck mass, we give antibiotics empirically for 10 days - 2 weeks and follow up, if no improvement then we to the following diagnostic test, we start

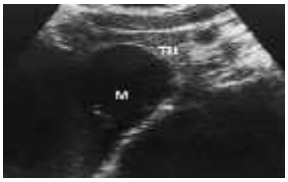
with CT with contrast (because it is less invasive) then FNA. Always start with these two.
- a scope is a must in any neck mass and its part of the physical examination.

1. ***Fine needle aspiration biopsy (FNAB) more accurate.***
   - Standard of diagnosis, the BEST, and most sensitive!
   - Indications:
     - Any neck mass that is not an obvious abscess
     - Persistence after a 2 week course of antibiotics
   - Small gauge needle:
     - Reduces bleeding
     - Seeding of tumor – not a concern
   - No contraindications (only in suspected vascular tumor)
   - Proper collection required
   - Minimum of 4 separate passes
   - Skilled cytopathologist essential
   - On-site review best
2. ***Computed tomography (CT)***
   - To Distinguish cystic from solid masses (character)
   - To know the Extent(size, site) of lesion and relation of the mass to other structures.
   - Vascularity (with contrast)
   - Detection of unknown primary (metastatic)
   - Pathologic node (lucent, >1.5cm, loss of shape)
   - Avoid contrast in thyroid lesions



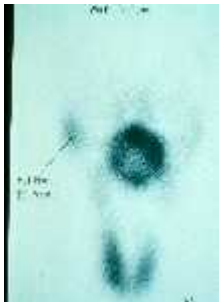


3. ***Magnetic resonance imaging (MRI)***
   - Similar information as CT – used in limited cases only.
   - Better for upper neck and skull base
   - Vascular delineation with infusion
4. ***Ultrasonography***
   - Less important now with FNAB
   - We do it for thyroid masses because CT with contrast is avoided.
   - In thyroid we do U/S with FNA rather than CT and FNA.
   - Solid versus cystic masses
   - Congenital cysts from solid nodes/tumors
   - Noninvasive (pediatric)



5. ***Radionucleotide scanning***

- Salivary and thyroid masses. Location – glandular versus extra-glandular
- Functional information. FNAB now preferred for for thyroid nodules
  - Solitary nodules
  - Multinodular goiter with new increasing nodule
  - Hashimoto's with new nodule



- Even if a benign mass, for 10 years you still do CT and FNA.

V. **Differential Diagnosis** – not imp

A. Congenital the most common according to the site
   1. Branchial cleft cyst
   2. Thyroglossal duct cyst. Upper anterior mass

B. Acquired
   1. Infection
   2. Iatrogenic
   3. Toxins
   4. Trauma
   5. Endocrine neoplasm – think neoplasm when the patient is above 40 years.
   6. systemic

Case: 42 year old lady with a level 2 neck mass seen by multiple ENT doctors and was reassured, came to your clinic after 3 months what do you do?

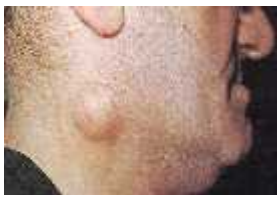
- Hx, PE, endoscopy – found a mass in the nasopharynx (a must), then FNA and CT and biopsy if possible. Dx: nasopharyngeal carcinoma

Case: 70 year old with a superficial neck mass for 10 years?

- Benign (duration is 10 years),on examination it moves with the skin movement so we do CT and FNA, Diagnosis is something superficial and benign Ex. Sebaceous cyst ……

Case: 20 year old male with a level 2 inflammatory neck mass for 2 weeks

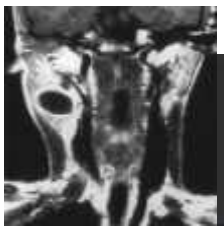
- Maybe infectious or a congenital branchial cyst if anterior to the sternocleidomastoid.
- We give him ABx for two week to treat the infection, if it didn't resolve and fluid persists, but because there is 1% chance of malignancy, we do CT scan and FNA and should be exiced.

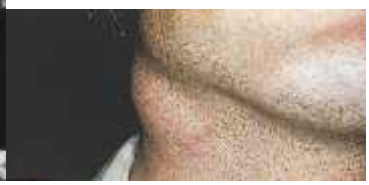


Congenital and Developmental Neck Masses

I. Epidermal and sebaceous cysts

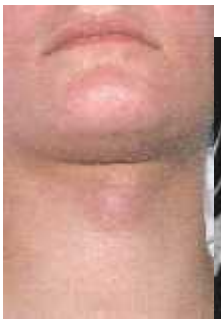
- Most common congenital/developmental mass, see in Older age groups. Excisional biopsy confirms
- Clinical diagnosis
  - Elevation and movement of overlying skin
  - Skin dimple or pore

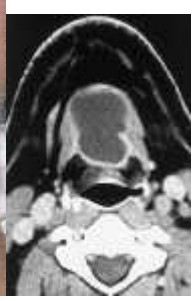




II. Branchial cleft cysts

- Branchial cleft anomalies – 4 types
- 2nd cleft most common (95%) – tract medial to XII nerve between internal and external carotids, Opens in the tonsillar fossa, usually anterior triangle deep to platysma.
- 1st cleft less common – near the mandible and parotid associated with the facial nerve. 3rd and 4th clefts rarely reported
- Present in older children or young adults often following URI. Some patients get it when they are over 40 years due to low immunity.
- Most common as smooth, fluctuant mass underlying the SCM. Skin erythema and tenderness if infected
- Treatment
  - Initial control of infection





- Surgical excision, including tract
- May necessitate a partial parotidectomy (1st cleft because near the facial nerve)

III. Thyroglossal duct cyst

- Most common congenital neck mass (70%)
- 50% present before age 20.
- Midline (75%) or near midline (25%)
- Usually just inferior to hyoid bone (65%)
- Dx: clinical and CT-scan
- Elevates on swallowing/protrusion of tongue (ask the patient to swallow and protrude the tongue)
- Treatment is surgical removal (Sis trunk) after resolution of any infection

Lymphangioma

Summary

- Extensive differential diagnosis
- Age of patient is important
- Accurate history and complete exam essential
- FNAB – important diagnostic tool
- Possibility for malignancy in any age group
- Close follow-up and aggressive approach is best for favorable outcomes

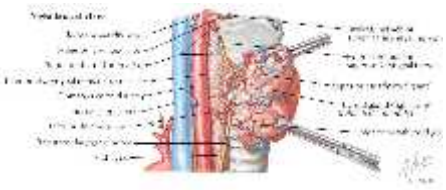
Thyroid Gland

I. Anatomy

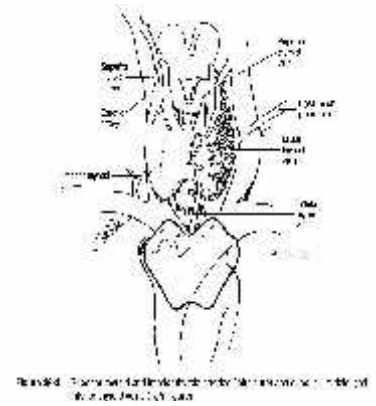
- Shield shaped, may be H- or U-shaped
- 2 lateral lobes connected by an isthmus
- Isthmus at level of 2nd to 4th tracheal cartilages (may be absent)
- Rarely, small muscle (levator of the thyroid gland) attaches gland to hyoid bone
- **Lobes of thyroids**
  - Each lobes measures approx 4cm high, 1.5cm wide, 2cm deep
    Lobes have superior and inferior poles
  - Superior pole: may extend as far as the oblique line of the thyroid cartilage
  - Inferior pole: may extend inferiorly as far as the 5th or 6th tracheal rings
- **Attachments of Thyroid**
  - Firmly attached to larynx and trachea
  - Elevated with deglutition
    May allow to distinguish between thyroid nodule and other mass (LN, dermoid, branchial cleft cyst)
  - Attached by anterior and posterior suspensory ligaments

Anterior -> anterior trachea to undersurface of thyroid
Posterior (Ligament of Berry) → lateral upper tracheal rings to bilateral thyroid lobes

- **Arterial Blood Supply**
  1. External Carotid Artery > Superior Thyroid Artery (for the superior pole of thyroid)
  2. Subclavian Artery > Thyrocervical trunk > ***Inferior Thyroid Artery***
  - *Superior thyroid artery (STA)*
    1. 1st branch of ECA
    2. Followed by SLN until superior pole
    3. Anastamoses with contralateral STA
  - *Cricothyroid Artery*
    1. Small branch off STA near superior pole to cricothyroid muscle
    2. Anastamoses with contralateral artery
    3. Cricothyroidotomy



- **Venous Drainage** - 3 pairs of veins
  - Superior thyroid vein
    - Parallels course of STA on ant surface thyroid
    - Ascends to drain into internal jugular vein (IJV)
  - Middle thyroid vein
    - Direct lateral course from thyroid to IJV
    - Shortest of 3 veins
  - Inferior thyroid vein
    - Ant surface thyroid (opposite of ITA)
    - Vertical downward course to brachiocephalic vein



II. Evaluation of Thyroid Nodule

- Start with P/E, Hx, and Ultrasound. In any thyroid mass.
- If a there was a thyroid mass with retropharyngeal extension do CT scan.
- ***Investigation:***
- **FNA gold standard.**
  - To know if:
    - **Benign:** e.g. thyroditis, adenoma, goiter *follow up after 6 months with US we can suppress it by thyroxin for 3 months and then repeat it*
    - **Malignant:** *total thyroidectomy* (TTE)
    - **Suspicious** *(intermediate or follicular lesion): hemithyroiectomy*
    - **Insufficient** *(non-diagnostic): re-aspiration is diagnostic in 50%. repeat FNA if malignant than TTE*
- Disadvantage: cannot differentiate between follicular carcinoma and follicular adenoma (both of them in FNA don't have capsular invasion or vascular invasion) > do hemithynroidectomy for Dx. Inability to distinguish benign microfollicular adenomas from differentiated FTC
- ***Trial of suppression of TSH***
  - Benign or indeterminate FNA (controversial)
  - May do a Thyroid function test, to suppress the mass then evaluate by US if the mass suppress unlikely to be malignant.

- Maintain TSH level between 0.1 and 0.5 mlU/L per day
- Decrease tumor volume up to 50% in 40% pts.
- A shrinking tumor is not likely malignant

- Other ***Imaging:***

A. **U/S**

- Accessible, inexpensive, safe, more accurate than CT for thyroid
- Micro-calcifications and central blood flow - Suggests CA
- F/u a benign, non palpable nodule
- F/u a cystic nodule for reaccumulation
- Important here because we cannot use CT with contrast because the contrast has iodine so it will intervene with the treatment of thyroid > we'd have to wait 3 months to start Treatment.
- Not useful for large masses
- Help locate nodule, assist with FNA
- Often first modality, helps delineate architecture

B. **CT**

- Useful for cervical lymphadenopathy
- Dye can interfere with function testing and radioactive treatment for up to 8 weeks
- The contrast will affect the post op iodine if the patient has Grave's disease.
- Can provoke hyperthyroidism from dye.
- We don't usually do a CT scan for thyroid except 5 indications … not imp to know them just know that the first modality for a thyroid mass is US we rarely do CT
- Recommended for FNA showing PTC

N.B.

- Evaluate the recurrent laryngeal nerve by endoscope.
- We do NOT use MRI/CT unless we want to evaluate the Lymph Node (metastsis)

III. Thyroid Cancer: Types & Treatment

A. Management of Thyroid Nodule

Same as neck masses but U/S is important here.

Serial exam

- **Physical examination**
  - Benign. We usually do not operate on benign lesions.
  - Asymptomatic palpable nodule

Risk factors for Thyroid Cancer {high risk groups}

1. Age (<20 or >60)
2. Male (Female > risk of nodules, but Male more aggressive)
3. Rapid Growth
4. Invasive or compressive Symptoms (hoarsness, infiltration of lymph node)
5. Previous Radiation exposure

6. Prior Thyroid disease - Goiter, Hashimoto, Grave's, adenomas
7. Family History

B. <u>Malignant Thyroid Lesions</u>

1. Well Differentiated (85%)
- Papillary Thyroid Carcinoma (PTC) – the most common
- Follicular Thyroid Carcinoma (FTC)
- Hurthle Cell Carcinoma (HCC)

2. Poor differentiated malignant neoplasms
- Medullary thyroid carcinoma (MTC)
- Anaplastic thyroid carcinoma (ATC)

3. Other malignant tumors:
- Lymphoma
- Metastatic tumors into the thyroid gland

Well Differentiated Carcinomas

<u>I. Papillary Carcinoma</u>
- Ill defined margins
- The most common type.
- Rule of 80 {80% survivor rate for 10 years}
  {80% metatsize to other lobes}
- **Lymph node involvement in 30% - 40%**
- **Predisposing Factors**
  - Ionizing radiation history
  - Familial (Cowden Syndrome = hamartomas, breast tumors and follicular / papillary tumors), 5 - 10% of pts have +ve Family Hx

- Treatment: total thyroidectomy+ iodine 131+ neck dissection (40% have L.N involvement).
- **Clinical presentation**
  - Young females, palpable mass in thyroid or cervical LN (1/3rd have lymphadenopathy)
- Histology = papillae and typical nuclear features
- Psammoma bodies (concentric calcified layers)
- Multicentric involvement of thyroid
- Extra-thyroidal extension common
  - Muscle, RLN and Trachea
-

<u>II. Follicular Carcinoma</u>
- 2nd most common type
- More aggressive, well differentiated compared to PTC
- Less metastasis to L.N but more with distant metastasis.
- Hematogenous spread more common than PTC
- Treatment: total thyroidectomy.
- 10 yr survival = 60% (PTC = 95%)

- More hypercellular
- Malignant lesion = capsular +/- vascular invasion
- No characteristic cytology
  Impossible to dx on FNA, difficult with Frozen
- Two variants: Minimally invasive vs Widely invasive
- Predisposing Factor
  - Radiation exposure
  - Goitre endemic areas

- Clinical Presentation
  - Solitary neck nodule or mass
  - Distant mets in 10 - 15% of cases

III. Hurthel Cell Carcinoma

- Subtype of FTC (15% of FTC's) but with lymph node metastsis
- Like FTC, cannot exclude carcinoma vs adenoma based of FNA or frozen
- Clinical Presentation
  - Thyroid nodule or mass
  - 35 % will have distant mets during illness
  - Higher rate of nodal mets than FTC

Poorly Differentiated Carcinomas

I. Medullary Thyroid Carcinoma

- When a patient presents with Medullary Thyroid Carcinoma it is very imp to know if it's sporadic or familial?
- **Sporadic (80%)**
  - More aggressive type, we treat with total thyroidectomy with neck dissection
  - Late presentation (age 40 – 60)
  - Worst prognosis with spindle cell variant, increased CEA staining, decreased calcitonin staining
  - Early mets to regional lymph nodes (50%)
  - Larger tumors (>1.5cm) often have distant mets (70%)
- **Familial**
  - MEN11A and MENIIB syndrome, phaechromocytoma (we cannot anesthesize the patient because he will enter into a hypertensive crisis) so we have to do an abdominal CT and parathyroid function test and examine the skin for any signs of phaechromocytoma to rule it out before surgery.
  - We have to screen all family memebers because it is autosomal dominant. If any family member is positive we have to do surgery for them immediately.
- **Treatment**
  - Total thyroidectomy with bilateral SLND (neck dissection)
  - Prophylactic surgery for relatives with RET mutation (preferably before age 7)
  - No adjuvant therapy advocated

- Radiotherapy and chemotherapy for palliation (usually ineffective)

II. Anaplastic Thyroid Carcinoma

- Less than 5% of thyroid malignancies
- Highly aggressive and fatal – no Treatment
- Median survival 3 - 6 months, seen in elderly
- Distant mets common (lung)
- Grossly, large and bulky tumors with huge neck mass
  - Invade into surrounding tissue
- Clinical Presentation
  - Rapid expansion
  - Horner's Syndrome (ptosis, miosis, enopthalmos, anhydrosis)

- P/E
  - Firm, irregular mass fixed to surrounding structures
  - RLN involvement and VC paralysis common
- Treatment (often palliative intent) – but mostly no adequate treatment (they die in 6 months)
  Surgery + Adjuvant Radiotherapy + Chemotherapy

Lymphoma

- Rarely presents within thyroid gland
- Dx in 60's
- Females > males
- Low - intermediate grade B-cell NHL
- Increased risk wth Hashimoto
- Clinically
  - Rapidly expanding mass on background of Hashimoto
  - Hoarsness, dysphagia, VC paralysis, Horner Syndrome
- Treatment
  - Radiotherapy, Chemotherapy

Indications for Thyroid surgery:

1. Compression symptoms
2. Suspicion of malignancy
3. Confirmed malignancy
4. Uncontrolled hyperthyroidism
5. Prophylactic for familial type
6. Cosmetic

Management of WDTC (Well-Differentiated Thyroid Carcinoma)
Who does the surgery?

1. General surgery subspecialty in head and neck
2. ENT subspecialty in head and neck
3. General surgery subspecialty in endocrine surgery

- If benign > follow up with US

- If undetermined > repeat FNA at least 3 times if still undetermined
- Hemithyroidectomy for Diagnosis (to see if there is capsular or vascular invasion) > if results show malignancy > total thyroidectomy
- If benign and over 40 years and the mass is more than 4 cm > thyroidectomy better
- If malignant= surgery
  -Low risk patients :either hemi or total thyroidectomy
  -High risk patients(family history or radiation exposure): neck dissection if there is lymph node involvement
- So well differentiated thyroid carcinoma – TOTAL THYROIDECTOMY + iodine-131 post-op

Surgical options

- Total thyroidectomy (>1.5cm)
- Thyroid lobectomy (<1.5cm)
- +/- Neck dissection

- Bailey's
  - High risk patients → total thyroidectomy
  - Low risk → total thyroidectomy if gross nodules in contralateral lobe, otherwise lobectomy
- Adjuvant Therapy: Post-op I-131
- External beam RT
  - Tumors that do not pick up I-131
  - Advanced disease (mets, residual disease)

Post-Operative complications - IMP

- Recurrent Laryngeal Nerve Injury
- Hypocalcemia
- Hematoma

Summary:

- The most common thyroid cancer – PTC
- The most common risk factors: exposure to radiation and family history
- Treatment for WDTC – total thyroidectomy + iodine 131 post-op
- Medullary is very rare. But is it sporadic or familial? Treatment is the same for both.

Salivary Glands

I. Anatomy

- Salivary gland tumors one of the most difficult head and neck surgries
- 6 major salivary glands: 2 parotid, 2 submandibular, 2 sublingual.
- 100-1000 of minor salivary glands lining the upper aerodigestive tract (lips to cervical esophagus)

- Main job…. Saliva!!!!

1. Parotid Gland

- We have 2 parotids, which has a superficial and deep loop which is separated by the facial neve, and part of the superficial loop will be the tail of the parotid.
- The gland has superficial and deep components and a tail. The facial nerve lies between the superficial and deep components and is therefore prone to injury during surgical procedure leading to Facial palsy. Serous cells only – less bacteriostatic – so more prone to INFECTIONS
- Parotid Duct - ***Stensen's duct*** Opens in mouth lateral to 2nd upper molar teeth.
- The duct runs parallel to the buccal nerve branch of the facial nerve 1.5 cm below the diloma.
- The parotid produces the most saliva when stimulated, whereas the submandibular without stimulation. Therefore, patients who undergo total bilateral parotid excision complain of dry mouth.

2. Submandibular Glands – level 1 of the neck

- *Mucous and serous secretions (mixed)* – more bacteriostatic – more prone to STONES, less likely to be infected. The most gland that secrete saliva without stimulation.
- Submandibular triangle: anterior and posterior bellies of digastric and inferior margin of the mandible.
- Medial and inferior to the mandible.
- Duct (Wharton's Duct): Exits the gland from the medial surface travels b/w the hyoglossus and mylohyoid muscles enters the genioglossus muscle and opens into the floor of mouth just lateral to lingual frenulum.
- CN XII (hypoglossal) inferior to the duct and lingual nerve is superior to the duct {**HDL**).IMP
- Hypoglossal nerve - Wharton's duct (connects submandibular to lingual gland) - Lingual nerve
- **More prone to stone formation** for 4 reasons: IMP
  1. The secretions are alkaline and viscous
  2. Composed of Ca and Phosphate
  3. Vertical orientation of the duct (against gravity)
  4. angulation over mylohyoid
- **3 nerves maybe injured in submandibular gland diseases or surgery**: IMP
  1. Marginal Mandibular nerve – most common to be injured
  2. Lingual nerve (carries submandibular ganglion)
  3. Hypoglossal nerve
- Gland innervation:
  - Sympathetic stimulation stimulates mucoid saliva.
  - Parasympathic stimulates watery saliva.
  - PNS pre-ganglionic fibres come from the chorda tympani n. via the lingual n. to the submandibular ganglion. Then to the gland itself.

- SNS fibres originate in the superior cervical ganglion and travel with the lingual artery to the gland.

3. Sublingual Glands

- Mucous secreting.
- Just below the floor of mouth mucosa.

-Ducts of Rivinus (~10) along the superior aspect of the gland open into the mouth along sublingual fold in the floor of mouth.

- Bordered by genioglossus/hyoglossus medially, mandible laterally, and mylohyoid inferiorly.
- Wharton's duct and lingual n. travel b/w SL gland and genioglossus muscle.
- No fascial capsule.
- Innervated by the PNS/SNS systems in the same way as the SM gland.
- Gland supplied by sublingual branch of the lingual a. and the submental branch of the facial a. Drained by the corresponding veins.
- Lymphatic drainage is primarily by the submandibular nodes.

4. Minor Salivary Glands

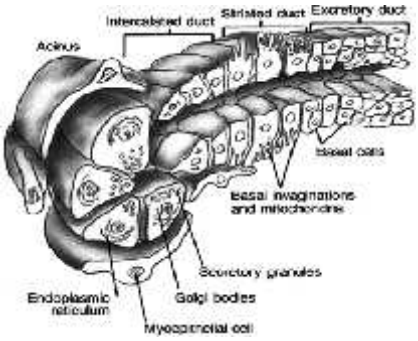
- Either mucous serous or both. 600-1000 /person
- Each gland has it's own duct. Found most commonly in buccal, labial, palatal, and lingual regions.

II. Physiology

- *Function of salivary glands is to produce Saliva. Role of saliva:*

1. Lubricates
2. Moistens, help with mastication
3. Cools hot food
4. Buffers chemicals
5. Cleans the mouth (lavage)
6. Protects mucosa
7. Prevent dental caries
8. Helps form enamel, provides inorganic ions
9. Antibacterial (lysozyme, IgA, peroxidase)
10. Homeostasis

Secretory Unit



- The glands are composed of a secretory units and tubules, collecting ducts and acinus.
- It is and active process. First it secretes the saliva from the acinus then before it leaves the collecting ducts the saliva change into hypotonic and is then secreted to the oral cavity.

The salivary glands are innervated by the parasympathetic nervous system:

- The brain stem >> glossopharyngeal IX >> otic ganglion >> auriculotemporal nerve >> parotid gland.
- The Facial nerve >> Chorda Tympani >> lingual nerve (branch from CN V) >> submandibular ganglion >> sublingual and submandibular glands.
- The main neurotransmitter is Ach.
- Rate of saliva production ~1000-1500 ml/24hrs, or 1 ml/min.
- Unstimulated 69% of flow from SM gland, 26% parotid, 5% SL.

- Stimulated parotid and SM reverse contributions.
- Minor glands independent of stimulation usually account for 7-8% total flow.
- Flow independent of age. Acinar cells degenerate with age, flow still constant. Xerostomia in elderly likely due to meds.

III. Acute and Chronic Infections

A. Viral infection – Mumps

- Most common nonsuppurative infection mostly in pediatric
- Commonly affects Children
- Parotid gland, Bilateral, generalized swelling
- Paramyxovirus
  - Highly contagious
  - Air-borne droplet spread
  - Incubation 18 days
  - Virus spread for 1 week following swelling
- Ductal epithelial desquamation leads to obstruction and secondary infection
- Complications: Parainfluenza, echovirus, EBV, choriomeningitis virus
- Symptoms: Low grade fever, arthralgia, HA, malaise
- Treatment: Hydration, Rest, Modify diet to decrease gland stimulation, isolation, Painkillers.
- Bilateral enlarged cystic parotid – rule out HIV infection, treat them with Anti-HIV medications and confirm the diagnosis by biopsy

B. Acute Suppurative Sialoadentitis

- "Surgical parotitis", "Surgical mumps"
- Occurs in post-operative patients and in elderly with chronic medical conditions.
- Retrograde migration of bacteria from the oral cavity
- Risk Factors: dehydration, trauma, immunosupression, debilitation
- **Parotid gland** most frequently involved – serous secretions, Inferior bacteriostatic properties
- Pathogenesis
  1. Normal healthy flow flushes ducts
  2. Stasis permits retrograde flow (the first step)
  3. Compromised host resistance
  4. Poor oral hygiene (increase oral bacteria)
  5. Chronic disease or prolonged recovery
  6. DEHYDRATION
  7. Anticholinergics or diuretics
  8. Anorexia reduces salivation
  9. 25% bilateral
- Symptoms
  - **Acute Rapid onset of severe pain**, swelling, induration
  - **Fever**, chills, malaise

- Increased WBC count
- Suppurative discharge from the gland

- Organisms
  - **Staph. Aureus is the most common**, all types of strept, H.influenza.
- Untreated acute suppurative sialoadenitis may lead to an abscess. Therefore saliva from the affected gland should be cultured.
- Treatment: you initially treat the infection if it persists rule out cancer.
  - Antibiotics
  - Steroids
  - Analgesics, its very painful because the capsule is tight.
  - Cold compressors
  - Massage and citrus intake (lemon and orange) to stimulate salivation
  - Increased fluid intake
  - If no improvement after 48 hr do CT scan if it showed an abscess (which is common) do surgery.
  - CT or US to rule out abscess
  - Sialogram C/I in acute phase

C. Chronic Sialoadenitis

- Repeated episodes of pain and inflammation – either due to autoimmune or severe infection
- Parenchymal degeneration and fibrous replacement of the gland
- We do a CT scan and give them antibiotics – no stones or tumors and no signs of inflammation so we assure the patient only. We avoid surgery due to high risk of adhesions and facial nerve injury.
- Treatment
  - No consistent Tx – first reassure the patient
  - Tympanic neurectomy – high risk of injury during surgery
  - Duct ligation
  - Gland excision

Extra notes on chronic:

- Initial severe acute infection
- Duct obstruction
- Depressed glandular secretion
- Parotid
- More infections = more damage to gland and duct
- Pathophysiology
  - Obstruction of salivary flow
  - Intraductal calculus
  - Stricture
  - Mucous plug
  - Ductal papilla lesion
  - Extrinsic compression

D. Sialolithiasis

- Formation of hardened intraluminal deposits in the ductal system
- Common with chronic sialoadenitis – commonly affects the submandibular (Wharton's) (the most common to be affected) because:
  1. *The secretions are alkaline and viscous.*
  2. *Composed of Calicium and phosphorus.*
  3. *Vertical orientation of the duct.*
  4. *The angulation over the mylohyoid.*

  The last two factors are against gravity.
- Hilus of the gland most common site
- Location
  - **80% Wharthon's duct**
  - 19% Stenson's
  - 1% sublingual
- Composition
  - Calcium phosphate and carbonate
  - Mg, Zn, NH3
  - Glycproteins, mucopolysaccharides, cellular debris
  - No correlation with calcium and phosphate levels
- Symptoms
  - Colicky postprandial pain
  - Swelling

  The most important symptom is recurrent swelling and pain with eating.
- Management
  - If it's small – hydration
  - If it's big (>5mm) – surgical excision
  - Incise duct orifice, Sialodochoplasty to open the duct
  - Stenting or Surgical excision
  - The most commonly injured nerve – marginal nerve

IV. Tumours of Salivary Glands

-The most common benign tumors are pleomorphic regardless the site and size followed by warthin tumors.

-The most common 2 malignant tumors are:

1. **Mucoepidermoid (the most common in parotid only)**
2. **Adenoid cystic carcinoma in all others.**

-80 % of parotid tumors are benign, 60% of submandibular tumors are benign while 60% of sublingual tumors are MELIGNANT. The bigger the size of the gland the least the risk of malignancy in it.

-Rule of 80:

1. **80 % of tumors are in the parotid gland**
2. **80% of these tumors are benign**
3. **80% of these benign tumors are pleomorphic.**

Tumors origin theories

I. Multicellular Theory

Neoplastic cells originate from secretory unit counterparts

Ex. Acinus >> acinic cell carcinoma >> intercalated duct >> warthin tumor

II. Bicellular Theory
Neoplastic cells originate from basal cells in intercalated and excretory ducts ll tumors arise from intercalated ducts except, mucoepidermoid and squamous cell Carcinoma wich arise from excretory ducts.

Distribution: IMP

- 95% in adults
- 80% of tumors present in the Parotid; 80% benign; 80% pleomorphic **(rule of 80s)**
- Submandibular: 15% overall; 50% benign
- Sublingual/Minor: 5% overall; 40% benign
- The larger the gland the more benign, the smaller the more malignant **(rule of size)**
- The most common benign – pleomorphic followed by warthin (regardless of site and size)

Most Common Parotid Tumours IMP **(rule of type)**

- **Benign**
  1. Pleomorphic adenoma
  2. Warthin tumour
- **Malignant**
  1. Mucoepidermoid (MEC)
  2. Adenomic cystic carcinoma (ACC) – more in minor glands

Most Common SMG Tumors

- **Benign**
  1. Pleomorphic adenoma
- **Malignant**
  1. ACC
  2. MEC

Most Common Minor Salivary Gland Tumors

- **Benign**
  1. Pleomorphic adenoma
- **Malignant**
  1. ACC
  2. MEC

Benign Neoplasms

1. **Pleomorphic Adenoma**
   - Most common of all salivary gland neoplasms
   - 70% of parotid tumors(mostly in the tail of the gland in the superficial lobe), 50% of submandibular tumors,
   - 4^{th}-6^{th} decades, more common in females.
   - Slow-growing, painless mass
   - Benign tumors have to be excised due to high risk of malignancy transformation
   - Treatment: **complete surgical excision** ALWAYS with
     - No biopsy because high rate of recurrence.
     - Superficial Parotidectomy with facial nerve preservation because possibility of malignant transformation.
   - **Why do we surgically remove pleomorphic?** IMP
     1. Malignant transformation 5-10% chance.
     2. Cosmetic.
     3. Inaccurate FNA – least accurate in head and neck tumors we don't rely on it

2. **Warthin's Tumor**
   - AKA: papillary cystadenoma lymphomatosum
   - Older, Caucasian, males, smoking is a risk factor, increasing in women
   - Risk of malignany 3 in 1000
   - Presentation: slow-growing, painless mass in parotid tail
   - Surgical excision here is an option, same reasons as pleomorphic but less. But surgery is still a must.

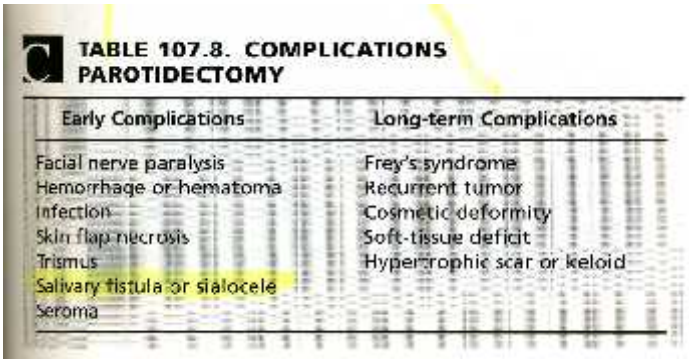


TABLE 107.8. COMPLICATIONS PAROTIDECTOMY

Early Complications	Long-term Complications
Facial nerve paralysis	Frey's syndrome
Hemorrhage or hematoma	Recurrent tumor
Infection	Cosmetic deformity
Skin flap necrosis	Soft-tissue deficit
Trismus	Hypertrophic scar or keloid
Salivary fistula or sialocele	
Seroma	

N.B. Surgical excision in benign pleomorphic tumors if the patient was not candidate for surgery either due to old age or has a cardiac problem:

- **If he has both risk factors we don't operate**
- **If he has only one (either cardiac risk or old) risk factor we operate.**

While in warthin bengn tumor we do not operate if there were any of the risk factors. (Even if one only is present because surgery is more optional than in pleomorphic).

Malignant Tumors

Mucoepidermoid and adenoid cystic carcinoma spread through nerves.
Pleomorphic tissue most likely comes from salivary glands.

I. **Mucoepidermoid Carcinoma**

- Most common parotid salivary gland malignancy
- peak in 5th decade, more in females.
- Presentation:
  - Low-grade: slow growing, painless mass
  - High-grade: rapidly enlarging, +/- pain
- **Treatment:**
  - Influenced by site, stage, grade
  - **High-grade tumors: treated aggressively by:** total parotidectomy, neck dissection removing some L.N and postoperative radiotherapy.
  - **Low-grade tumors**: complete resection by partial/superficial parotidectomy – Tx as benign

II. Adenoid cystic carcinoma:

Subtypes: cribroform, tubular, solid

Treatment: total parotidectomy, neck dissection and postoperative radiotherapy.

Complications – IMP

1.facial nerve weakness or paralysis.

2.***Frey's syndrome (aka. Gustatory sweating)***.

- Flushing and sweating of the face resulting from eating.
- *Aberrant reinnervation of postganglionic parasympathetic nerves to the sweat glands of the face*
- Cutting the postganglionic parasympathetic nerves during surgery, so there will be regeneration of these nerves to the sweat glands, so when the patient eats he will sweat instead of producing saliva.
- Diagnosis: **Minor's starch iodine test:** after eating we test for sweating in which iodine in oil is painted on the skin followed by dusting with a starch powder which turn blue-black in the presence of iodine and moisture.
- Treatment: Prevent injury during surgery. How? Make a thick flap during surgery to prevent it and localize the facial nerve. {Box 61-13}

These two are complication of parotid gland procedures.

3. Marginal nerve injury in submandibular gland surgeries.

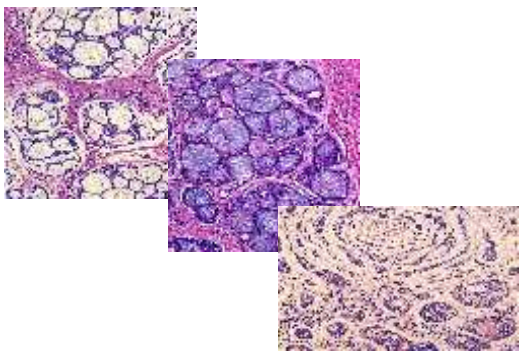
Was not mentioned in class or 427:

III. **Adenoid Cystic Carcinoma**

- Overall, 2nd most common salivary gland malignancy
- 2nd most common of parotid, Most common in submandibular, sublingual and minor salivary glands
- M = F, 5th decade
- Presentation:
  - Asymptomatic enlarging mass
  - Pain, paresthesias, facial weakness/paralysis
- Histology

i) cribriform pattern

- Most common



- "swiss cheese" appearance

ii) tubular pattern
- Layered cells forming duct-like structures
- Basophilic mucinous substance

iii) solid pattern
- Solid nests of cells without cystic or tubular spaces

- Treatment:
  - Complete local excision (total parotidectomy) + post-op radiotherapy
  - Tendency for perineural invasion: facial nerve sacrifice
  - Postoperative *Neutron Beam* XRT
  - Long-term F/U mandatory
- Prognosis:
  - Local recurrence: 42%
  - Distant metastasis: lung, bone
  - Indolent course: 5-year survival 75%, 20-year survival 13%

Common Salivary Gland Tumours in Children

- **Benign**
  1. Hemangioma (mesenchymal)
  2. Pleomorphic adenoma (epithelial)
  3. Lymphangioma
- **Malignant**
  1. 85% in parotid
  2. MEC 3.Acinic cell carcinoma. 4. Adeno Ca.

BOX 61-13

TREATMENT OF GUSTATORY SWEATING

Nonsurgical
- Topical glycopyrrolate
- Topical antiperspirant

Botox injection

Surgical
- Fat grafting
- Dermal grafting
- Temporalis fascia interposition flap
- Sternocleidomastoid interposition flap
- Tympanic neurectomy