

# NEURO-OPTOMETRY

## LESIONS OF THE HEAD AND NECK

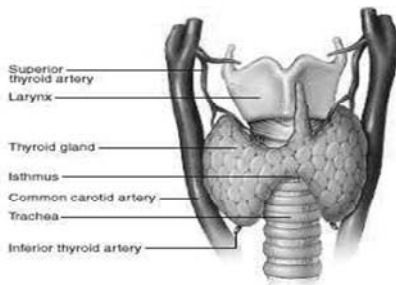
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## Thyroid Gland

### Thyroid Gland (Endocrine Gland)

- Location: anterior/either side of the larynx (just below the "Adam's apple")
- Shaped like a bowtie with two halves (lobes), joined at isthmus
- The function of the thyroid gland is to take iodine, found in many foods, and convert it into thyroid hormones
- Secretes hormones that control metabolism and growth of every cell in the body.
- Vesicles of gland contain thyroglobulin (protein precursor to thyroid hormone) along with two thyroid hormones (thyroxines):
  - T4: Composed of tyrosine and 4 iodine atoms
  - T3: Composed of tyrosine and 3 iodine atoms

### Thyroid Gland (Endocrine Gland)



### Thyroid (Mechanism of Control)

- Thyroid gland is controlled by the pituitary gland
- When T3 & T4 levels drop, the pituitary secretes thyroid stimulating hormone (TSH) which increases production of T3 & T4
- Think of the pituitary as the thermostat that controls the (heat) thyroid hormones

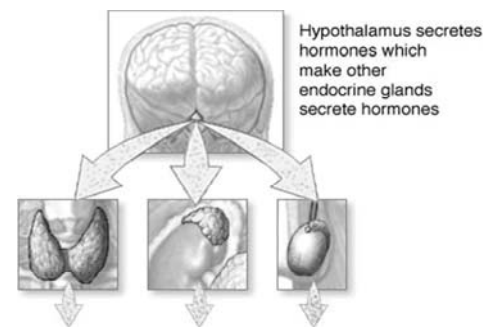
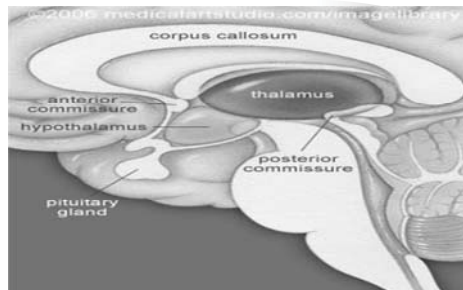
### Thyroid Gland (Endocrine Gland)

- 80% is T4
- 20% is T3
- T3 is 4x strength of T4 (action of both is similar)
- Low T3 causes low body temp, fatigue, & chronic pain
- Thyroid also secretes calcitonin which inhibits mobilization of Ca from bone; therefore lowers plasma calcium level
- Iodine essential for hormone function (frequently added to salt or bread)

## Hypothalamus

- Monitors hormone levels (T3,T4)
- Regulates the pituitary gland by releasing TRH (Thyrotropin Releasing Hormone); which tells the pituitary to release TSH
- Imagine the Hypothalamus as a 'person' who regulates the thermostat (Homeostasis)
- Control center for autonomic regulatory activities (brain of the brain)
- BP, body temperature, fluids, electrolytes, hunger, heart, mood, behavior (via serotonin, dopamine, norepinephrine, and acetylcholine secretions)

## Hypothalamus



ADAM

## Hyperthyroidism (Thyroidtoxicosis)

- Metabolic imbalance causes overproduction of thyroid hormone
- Most Commonly Affected:
  - 30-60 y.o.
  - Family history
  - Women more often affected than men
- Causes:
  - Inherited predisposition (recessive)
  - Defect in suppressor T-lymphocyte function → consequent production of auto antibodies
  - Excessive iodine
  - Stress, infection, toxemia of pregnancy

## Hyperthyroidism (Thyroidtoxicosis)

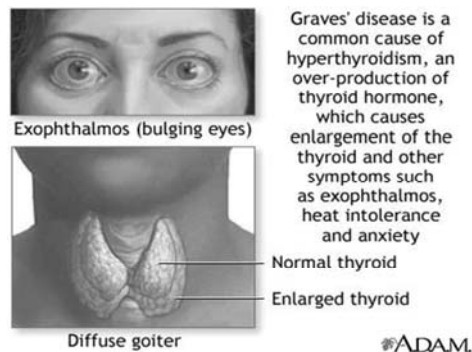
- Signs and Symptoms:
  - Goiter
  - Nervousness, tremor, palpitations
  - Heat intolerance, sweating
  - Weight loss with increased appetite
  - Fine tremor, mood swings, decreased libido
  - Exophthalmos
- Dx: T4 & T3 levels, TSH level, Ultrasound
- Treatment:
  - Antithyroid drugs (Methimazole)
  - Single dose radioactive iodine
  - Surgery

## Graves Disease

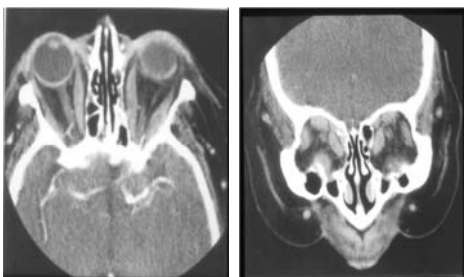
- Graves disease can precede any thyroid hormone change by a year or more
- Degree of orbital involvement does not correlate with degree of thyroid dysfunction
- Hypothyroidism may be associated with Graves
- CT and MRI used for evaluation
- Disease may resolve spontaneously (in majority of patients), or surgery to correct eyelid retraction or decompress optic nerve
- **Dalrymple's Sign:** abnormal wideness of the palpebral fissures with retraction of the upper lid

## Why Does Graves Exist?

- Graves caused by inflammation of the eye muscles by auto antibodies
- There are three areas of the body that share the same antigen sites:
  - Thyroid gland
  - Soft tissue of the eye
  - Dermis of the pretibial region of the leg



## Graves Disease



## Grave's Disease T/X: Orbital Decompression



BEFORE

AFTER

## Hypothyroidism

### Signs and Symptoms

- Weakness, fatigue, weight gain, forgetfulness
- Myxedema: decreasing mental stability, coarse, dry, flaky, inelastic skin, periorbital edema, dry sparse hair, upper lids droop
- Decreased cardiovascular output, slow pulse, CHF
- Anorexia, nystagmus, abdominal distention

## Hypothyroidism

- Hypothalamic, pituitary, or thyroid insufficiency or resistance to thyroid hormone
- Peak 40-50 years of age, women more often than men
- Thyroidectomy or radiation treatment
- Inflammation, chronic autoimmune
- Thyroiditis (Hashimoto's: auto antibodies destroy thyroid gland tissue)
- Iodine deficiency
- Hypothalamic failure
- Pituitary failure
- Amyloidosis or Sarcoidosis

## Hashimotos Thyroiditis

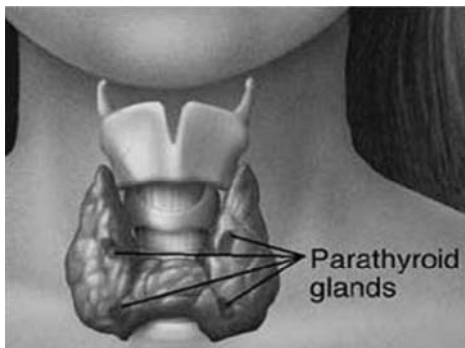
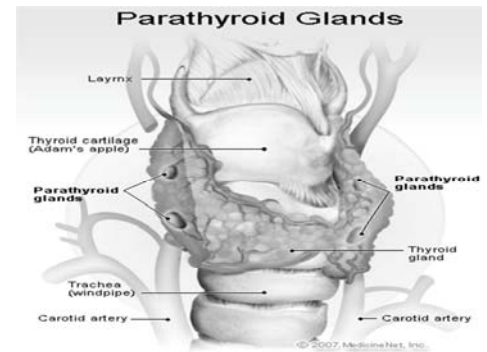
- Autoimmune disorder in which antibodies attack thyroid peroxidase
- Cause gradual destruction of the thyroid gland
- May also be associated with Graves Disease and non-Hodgkin's Lymphoma

## Hypothyroidism

- **DX Test:**
  - Radio immunoassay for (T3) (T4)
  - TSH Level
- **Treatment:**
  - Lifelong thyroid hormone replacement with T4 and occasionally T3
  - I.E. Levothyroid, Synthroid which are synthetic T4 or Armour Thyroid (T3 and T4)



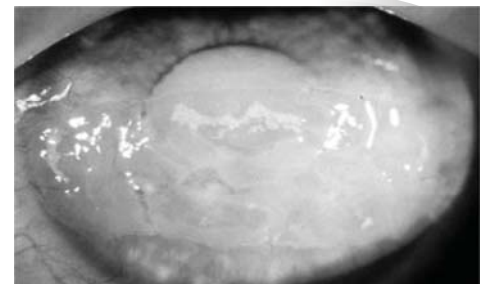
## Thyroid and Parathyroid Relationship



## Hyperparathyroidism

- Over-activity of the parathyroid glands, which results in excess production of parathyroid hormone (PTH)
  - PTH regulates calcium and phosphate levels and helps to maintain these levels
  - Excessive PTH levels leads to hypercalcemia (raised calcium levels)
- Common manifestations include: fatigue, bone pain, depression, decreased appetite, kidney stones, and band keratopathy

## Band Keratopathy



*"Doc! I Have a Terrible Frontal Headache!"*

### Case Presentation

- C.P.- 57 year old female with frontal headaches
- Radiology: CT/MRI
- Dx: Frontal sinus mucocele
- Discussion: Mucoceles result from obstruction of the ostium (opening) of a sinus cavity leading to accumulation of secretion trapped within sinus. Chronic inflammation is most common cause of obstruction. Rare in pediatrics, when present R/O cystic fibrosis. Pressure necrosis, bone devascularization, and release of osteolytic enzymes most important factors in mucoceles.

### Frontal Sinus Mucocele

- Common expansile lesion of sinus
- Occur when drainage of sinus is compromised
- Sinus fills with mucus
- Mucus accumulates; as it does, the sinus may expand from the pressure
- Inflammatory cells may accumulate as well, resulting in eroding of the sinus wall

### Case Presentation

- Clinical Finding- 60% frontal, 30% Ethmoid, 10% maxillary.
- Management: Usually surgery is indicated to achieve decompression of mucocele → to relieve symptoms associated with mass effect.

### Mucocele

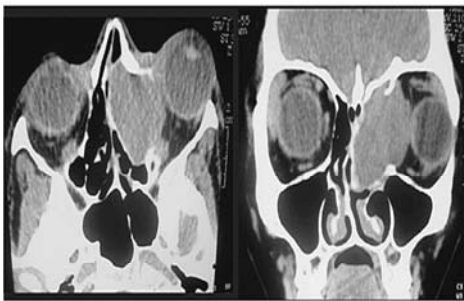
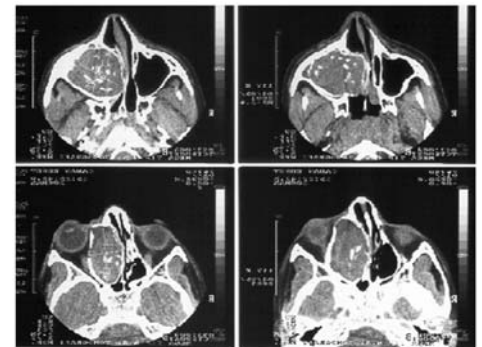
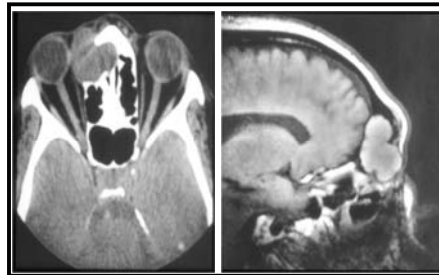


Figure 2. Nasal fossa and paranasal sinuses CT scan in axial and coronal sections evidencing image of left frontoethmoidal region with displacement of ocular globe on the left (proptosis).

### Orbital Cellulitis

- Infection of eye tissues posterior to the orbital septum
- Most commonly refers to an acute spread of infection into the eye socket from either the adjacent sinuses or through the blood

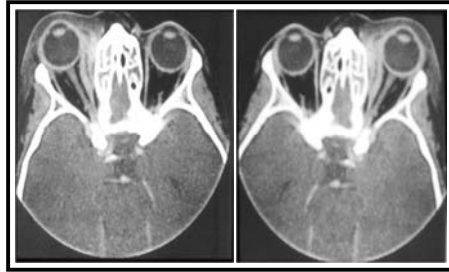
### Case Presentation

- C.P.- Orbital pain, swelling, decreased VA
- P.E.: Swelling, erythema of periorbital tissue proptosis, Chemosis, papillaedema, ophthalmoplegia.

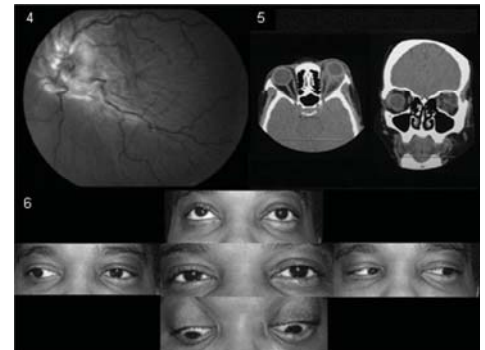
## Case Presentation

- Most common primary orbital disease process.
- Most common cause is sinusitis, usually Ethmoid sinus, also from pharynx and teeth.
- Most common is bacterial (Staph, Strep, Haemophilus, Pseudomonas).
- Viral (H.S., H.Z.)
- CT is best choice for Dx as it differentiates phlegm (thick mucous).
- Other manifestations can be thrombosis of superior ophthalmic vein or cavernous sinus.
- Treatment: Medical treatment with antibiotics directed against casual agent.

## Orbital cellulitis

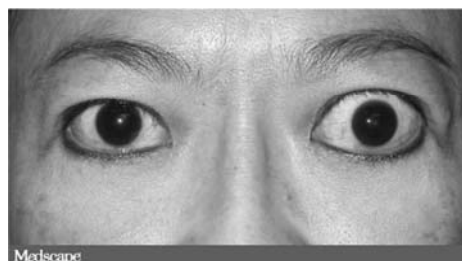


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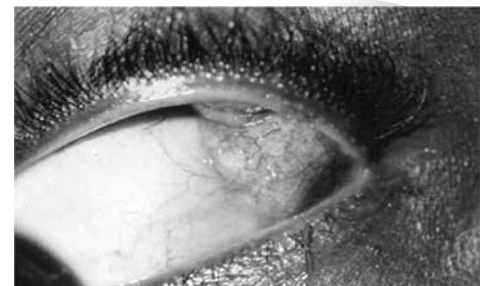


## Lacrimal Gland Enlargement

### Lacrimal Gland Enlargement: Unilateral Proptosis



### Lacrimal Gland Enlargement





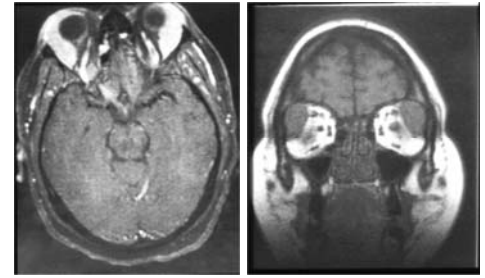
## Case Presentation

- C.P.- Adult female with new onset of unilateral proptosis.
- Radiological finding: (MRI) homogenous enlargement of lacrimal gland.
- Dx: Lacrimal gland enlargement due to acute dacroadenitis.

## Enlargement of the Lacrimal Gland

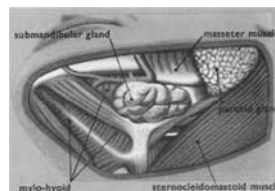
- Pathophysiology:
  - 50% are lymphoid/inflammatory.
  - 50% are neoplasms
  - Acute group (bacterial/viral) tends to involve younger age groups.
  - Sarcoid Sjogrens Disease: lymphocytic infiltration with enlargement of lacrimal and salivary glands. Associated with connective tissue disease; causes dry eyes and dry mouth.
- Management: depends on pathology involved.

## Lacrimal Enlargement



## Lymph Nodes

### Submandibular Lymph Node

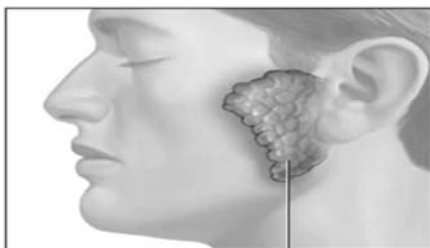


- Location: Along the underside of the jaw on either side.
- Lymphatic drainage: Tongue, submaxillary gland, lips and mouth, conjunct
- Common causes of enlargement: Infections of head, neck, sinuses, ears, pharynx

### Parotid Node

- Drains nose, eyelids, external auditory meatus
- Viral E.K.C.

### Parotid Lymph Gland



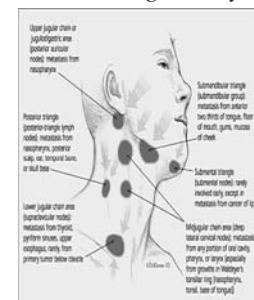
Swollen parotid gland

### Submental Lymph Node



- Location: Just below the chin
- Lymphatic drainage: Lower lip, floor of mouth, teeth, submental salivary glands, tongue, skin of cheek
- Common causes of enlargement: Mononucleosis syndromes, Epstein-Barr cytomegalovirus, toxoplasmosis, dental pathology such as periodontitis

### Jugular Lymph Node



- Location: Nodes that lie both on top of and beneath the sternocleidomastoid on either side of the neck, from the angle of the jaw to the top of the clavicle
- Lymphatic drainage: Tongue, tonsil, pinna, parotid
- Common causes of enlargement: Pharyngitis organisms, rubella

### Posterior Cervical Lymph Node



- **Location:** Extend in a line posterior to the sternocleidomastoid muscles but in front of the trapezius, from the level of the mastoid bone to the clavicle (on the side of the neck near to the back)
- **Lymphatic drainage:** Scalp and neck, skin of arms and pectorals, thorax, cervical and axillary nodes
- **Common Causes of Enlargement:** Tuberculosis, lymphoma, head and neck malignancy

### Suboccipital Lymph Node



- **Location:** Located at the junction between the back of the head and neck.
- **Lymphatic drainage:** Scalp and head
- **Common causes of enlargement:** Local infection

### Postauricular Lymph Node



- **Location:** Behind the ears
- **Lymphatic drainage:** External auditory meatus, pinna, scalp
- **Common causes of enlargement:** Local infection

### Preauricular Lymph Node



- **Location:** In front of the ears
- **Lymphatic drainage:** Eyelids and conjunctivae, temporal region, pinna
- **Common causes of enlargement:** External auditory canal infection

### Supraclavicular Lymph Nodes



### Right Supraclavicular Lymph Node

- **Location:** Right side in the hollow above the clavicle, just lateral to where it joins the sternum
- **Lymphatic drainage:** Mediastinum, lungs, esophagus
- **Common causes of enlargement:** Lung, retroperitoneal or gastrointestinal cancer

### Left Supraclavicular Lymph Node

- **Location:** Located on the left side in the hollow above the clavicle, just lateral to where it joins the sternum
- **Lymphatic drainage:** Thorax, abdomen via thoracic duct
- **Common causes of enlargement:** Lymphoma, thoracic or retroperitoneal cancer, bacterial or fungal infection.

### Clinical Features of Abnormal Lymph Node Enlargement

- **Commonly results from infection/immune response, cancer and less commonly due to infiltration of macrophages filled with metabolite deposits (e.g., storage disorders)**
- **Infected lymph nodes tend to be firm, tender, enlarged, and warm. Inflammation can spread to the overlying skin, causing it to appear reddened**
- **Lymph nodes harboring malignant disease tend to be firm, non-tender, matted (i.e. stuck to each other), fixed (i.e., not freely mobile but rather stuck down to underlying tissue), and increase in size over time**
- **Lymph nodes occasionally remain permanently enlarged, though they should be non-tender, small (less than 1 cm), have a rubbery consistency and none of the characteristics described for malignancy and infection. Also known as 'Shotty Lymph Nodes'.**

### Clinical Features cont.

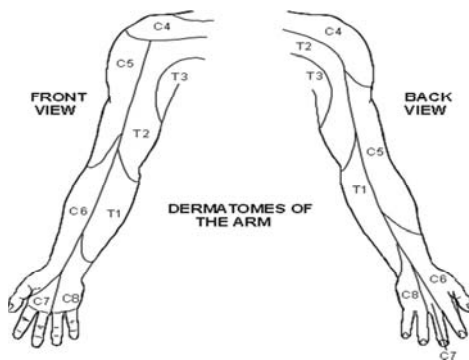
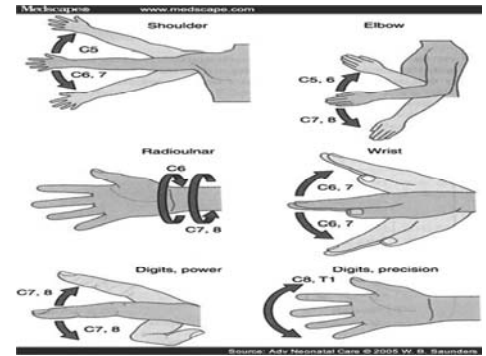
- **Children:** lymph nodes larger than 2 cm in diameter (along with an abnormal chest radiograph and the absence of ear, nose and throat symptoms) were predictive of granulomatous diseases (i.e. tuberculosis, cat-scratch disease or sarcoidosis) or cancer (predominantly lymphomas)
- **Pain/Tenderness:** When a lymph node rapidly increases in size, its capsule stretches and causes pain. Pain is usually the result of an inflammatory process or suppuration, but pain may also result in hemorrhage into the necrotic center of a malignant node. The presence or absence of tenderness does not reliably differentiate benign from malignant nodes.

## Clinical Features cont.

- **Consistency:** Stony-hard nodes are typically a sign of cancer, usually metastatic. Very firm, rubbery nodes suggest lymphoma. Softer nodes are the result of infections or inflammatory conditions. Suppurant nodes may be fluctuant. The term "shotty" refers to small nodes that feel like buckshot under the skin, as found in the cervical nodes of children with viral illnesses.
- **Matting:** A group of nodes that feels connected and seems to move as a unit is said to be "matted".

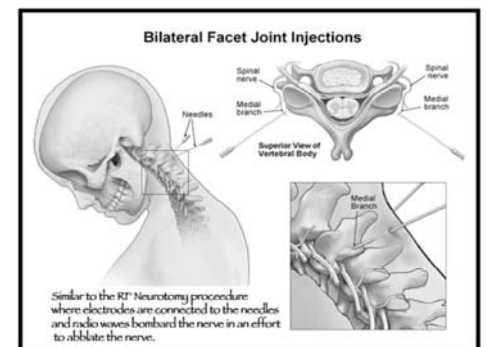
## Neck Pain?

- Degenerative conditions are common in the neck or cervical spine
- Found almost universally in people age 50 and above (varying degrees)
- Origin in the inter-vertebral discs, then affect the posterior inter-vertebral (facets) joints, causing pain and stiffness of the neck
- Sometimes referred symptoms in an upper limb occur

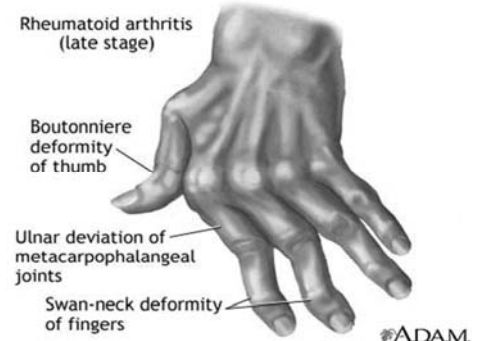
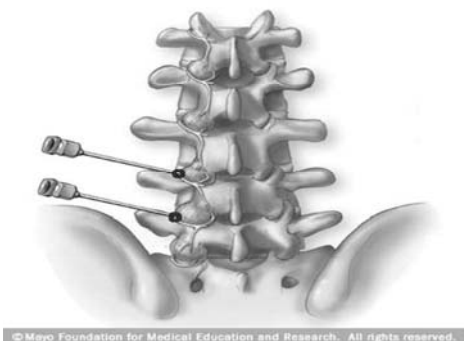


## Pulsed Radiofrequency Neurotomy (PRFN)

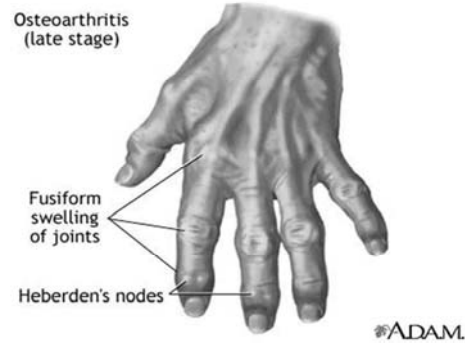
- Minimally invasive procedure which disables and prevents a specific spinal nerve from transmitting pain signals
- Entire procedure is performed under a fluoroscope using a pulsed radiofrequency electrode
- Electric energy is applied for 2 to 4 minutes to "stun" the nerve
- Procedure is repeated for each targeted nerve root
- Modified version of Radiofrequency Therapy (RT); main difference is that PRFN "stuns" rather than destroys nerve tissue
- Patients can expect a significant reduction in pre-procedural pain in one to four weeks



## Rheumatoid and Osteo Arthritis



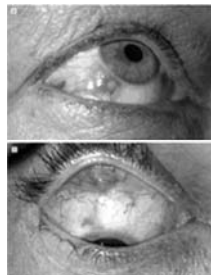




### *Ocular Manifestations of Osteoarthritis*

- Sicca syndrome
- Myositis
- Iritis

### *Myositis*



### *Iritis*



### *Ocular Manifestations of Rheumatoid Arthritis*

- Sjogren's syndrome
- Sicca syndrome
- Corneal inflammation/melting
- Corneal infection
- Scleritis/Episcleritis

### *Episcleritis*

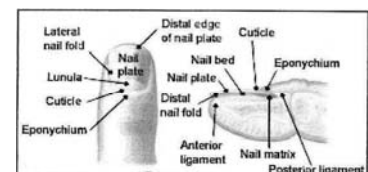


### *Scleritis*

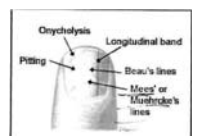


### *Nail Disorders*

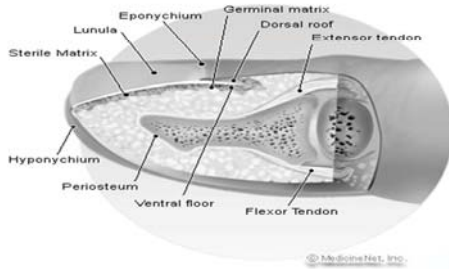
"Look at the nails!"



### **Nail Disorders**



## Anatomy of the Fingernail



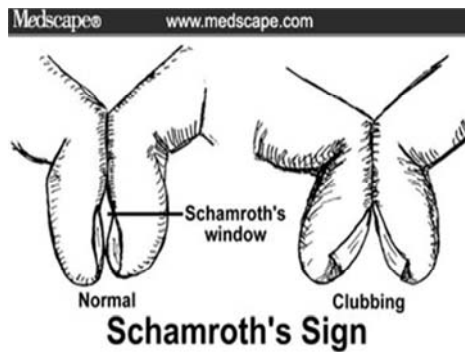
## Clubbing

- Thickening of soft tissue under proximal nail and thickening in that area of digit.
- Associated with a variety of diseases, such as idiopathic pulmonary fibrosis, lung cancer, bronchiectasis, lung abscess, cystic fibrosis, cyanotic congenital heart disease, infective endocarditis, inflammatory bowel disease, and cirrhosis.
- Etiology is poorly understood, may result from megakaryocytes and platelet clumps that may escape filtration in pulmonary bed.



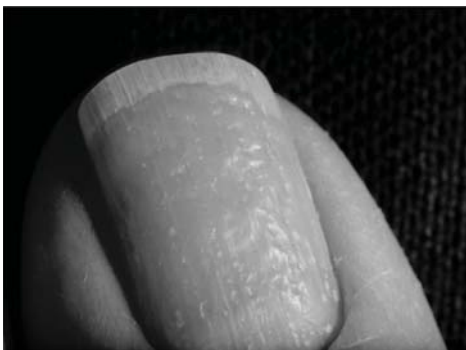
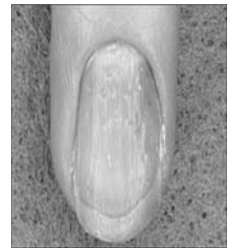
## Schamroth Sign

- Angle between the finger proximal to the nail and the proximal nail plate is straightened.
- Occurs in neoplastic lung disease, pulmonary fibrosis, cystic fibrosis, congenital heart defects, and inflammatory bowel disease.



## Pitting

- Punctate depressions in nail plate.
- Usually associated with psoriasis, variety of systemic disorders, sarcoid, and pemphigus.



## Beau's Lines

- Transverse Linear Lesions
- Normal nail growth is 1mm x 6-10 days.
- Caused by any disease severe enough to disrupt normal growth.
  - Trauma
  - Exposure to extreme cold temperatures (Raynaud's Disease).
- Lines move toward the end of the nail as the nail grows

## Beau's Lines



## Mees Lines

- Transverse white bands (parallel lunula)
  - Arsenic poisoning
  - Hodgkin's
  - CHF
  - Chemotherapy
- Lines move toward the end of the nail as the nail grows



## Beau's vs. Mees: Differential

### Beau's

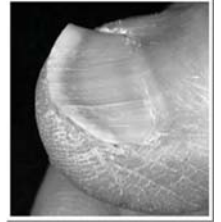
- Deep, horizontal grooved lines
- Main causes: infection of nail plate, trauma, pulmonary disorders, beta blockers, diabetes

### Mees

- Horizontal lines of discoloration
- Main causes: poisoning from arsenic or thallium; renal failure

## Koilonychia

- Transverse and longitudinal concavity of the nail.
  - "Spoon-shaped" nail
- Results from:
  - Trauma
  - Exposure to petroleum-based solvents
  - Iron deficiency
  - Anemia
  - Raynaud's Disease



## Yellow Nail

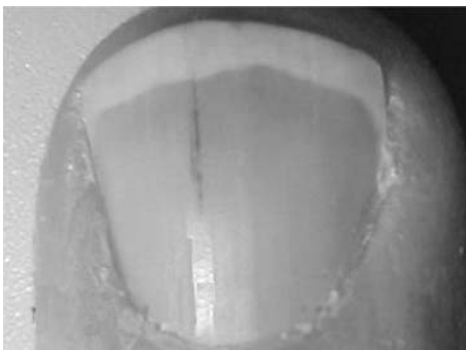
- Nails grow slowly and develop a "heaped-up", thickened appearance.
- Lunula disappears and nail takes on a yellow hue.
- Seen in patients with chronic sinusitis, internal malignancies, immunodeficiency syndrome, rheumatoid (esp. gold therapy)
- Also associated with impaired lymphatic drainage.



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## Splinter Hemorrhages

- Longitudinal thin lines, red or brown in color beneath the nail plate.
- Associated with trauma, psoriasis, or localized fungus but they are a classic finding in patients with endocarditis (esp. proximal nail plate- "Janeway's lesion").
- Look for Roth's spots in retina.



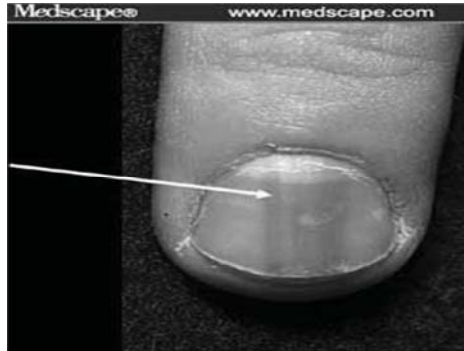
## Half and Half Nails

- Lunula obliterated, proximal nail turns white, and the distal turns brown.
- Associated with renal failure.



## Terry's (White) Nail

- Nail plate turns white (ground glass).
- Decrease in vascularity and increase in connective tissue in the nail bed.
- Lunula is obliterated.
- 80% caused from severe liver disease.

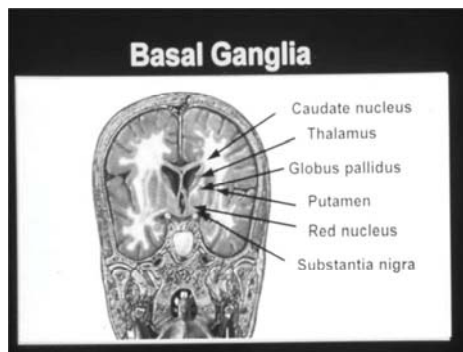


## Basal Ganglia

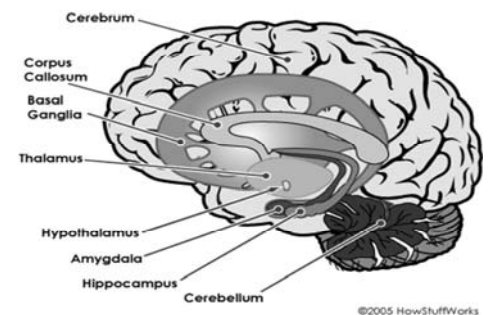
- Collection of nuclei deep in white matter of cerebral cortex
- Fine motor function control
- Cholinergic (excitatory activity)
- Dopaminergic (inhibitory activity)
- Balance out to aid in fine motor control
- Parkinson: Degeneration in substantia nigra
- Instance equal in males and females, mostly over age 40

## Basal Ganglia

- Basal ganglia and cerebellum are large collection of nuclei that modify movement
- Motor cortex sends information to both, both send information back to cortex via the thalamus
- Output of cerebellum is excitatory, while basal ganglia is inhibitory
- Balance beta receptors allow for smooth coordinated movement



## Basal Ganglia and Limbic System



## Tremors

### Tremor and Abnormal Movement

Awkwardness of Movement is Characteristic of Both Cerebellar and Basal Ganglion Lesion

- I. Intention Tremor
- II. Resting Tremor; Chorea
- III. Postural Tremor (Essential/Familial Tremor)

\*Test: Observe Archimedes Spiral\*

## Intention Tremor

- Awkwardness of intended movement suggests lesion in cerebellum
- Dyskinetic disorder: tremor worsens when a person is moving, particularly reaching for something toward end of reach
- Etiology: drugs, alcohol intoxication, M.S., strokes, tumors

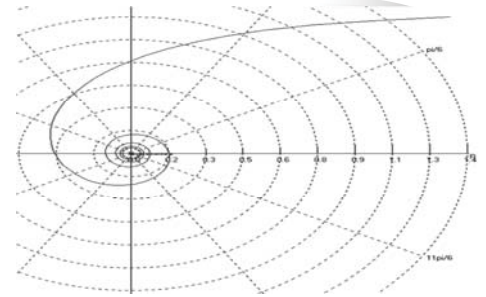
### *Resting Tremor; Chorea*

- Awkwardness of involuntary movement; characteristic of basal ganglia lesions, tremor-at-rest i.e. PD, loss of inhibitory influence of dopamine
- Balance out to aid in fine motor control
- Parkinson: degeneration in substantia nigra
  - Instance equal in males and females over age 40

### *Postural Tremor (Essential/Familial Tremor)*

- Present when body part is held in one position
- Cause is unknown, believed to be familial
- May involve head, jaw, and voice
- 4% of affected persons are age 40 and above
- Tremor increases with physical or mental stress
- Worse in performance situations
- T/X: Beta blocker, ETOH

### *Archimedes Spiral*



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