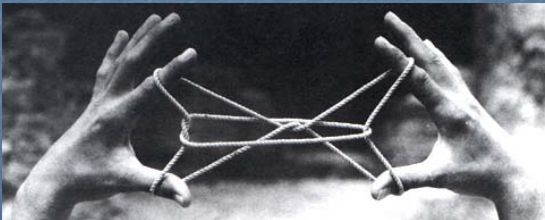
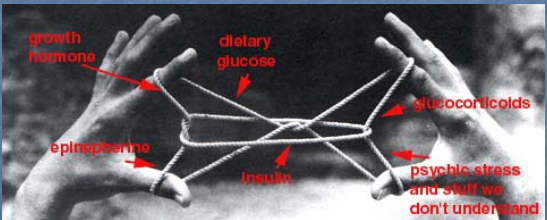


Endocrine Pathology

- ### Endocrine Pathology
- Cell signaling system
 - Surface receptors
 - cAMP and tyrosine kinase system
 - Cytoplasmic receptors
 - Penetrate cell membrane
 - Gene activation -> transcription -> translation
 - Intranuclear receptors
 - Gene activation -> transcription -> translation

- ### Endocrine Pathology
- Too much hormone activity
 - Too little hormone activity
 - Autoimmune destruction
 - Inflammatory destruction
 - Tumor or vascular destruction
 - Space occupying lesions (tumors)
 - Malignant
 - Benign

- ### Endocrine Pathology
- All parts of the endocrine system interconnect.
 - Cats Cradle
- 

- ### Endocrine Pathology
- All parts of the endocrine system interconnect.
 - Cats Cradle
- 

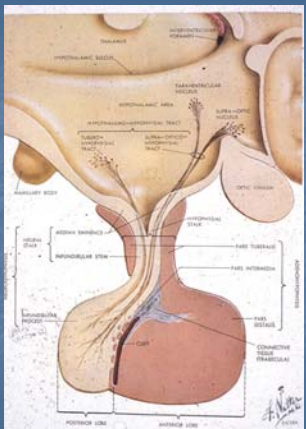


Pituitary Pathology

- Too much
- Too little
- Especially space occupying lesions

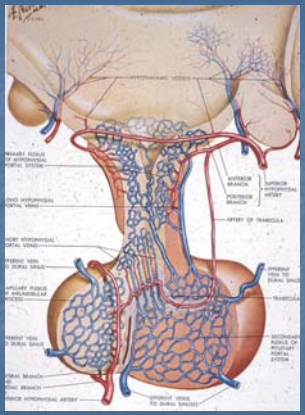
The Basics

- Anterior
 - Comes from GI
 - Controlled by hypothalamus
- Posterior
 - Hormones originate further up.

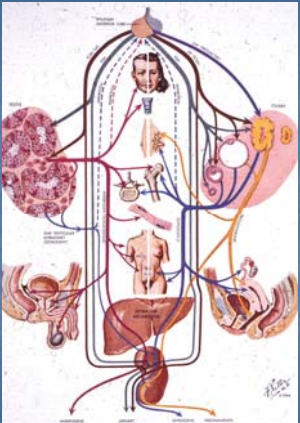


Pituitary Vascular

- Signaling proteins are release in hypothalamus.
- Travel by blood to anterior pituitary
- Cause release of many activating hormones
- System of amplification

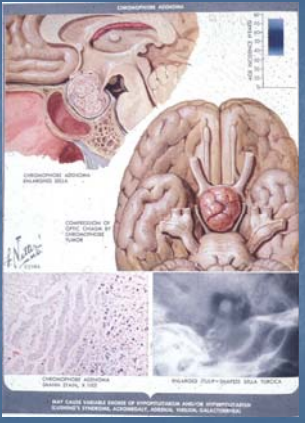


Pituitary Control



Space Occupying Lesions

- Tumors
- Embryonic rests
- Squeeze gland out of existence.
 - Generalized failure
- Visual field changes



Visual Fields

- Loss of temporal fields.
 - Nasal retina
- Damage to decussating optic nerve fibers

Pituitary Adenomas

- Rare
- Make nothing or
- Prolactin
- ACTH, GH, TSH are very rare
- More often end up with pituitary failure.
 - Squeeze the daylight out of the gland.

Acromegaly

- Growth hormone excess after closing of epiphyses.
- Periosteal bone growth.
- Diabetes
- Prognathism

Hypopituitarism

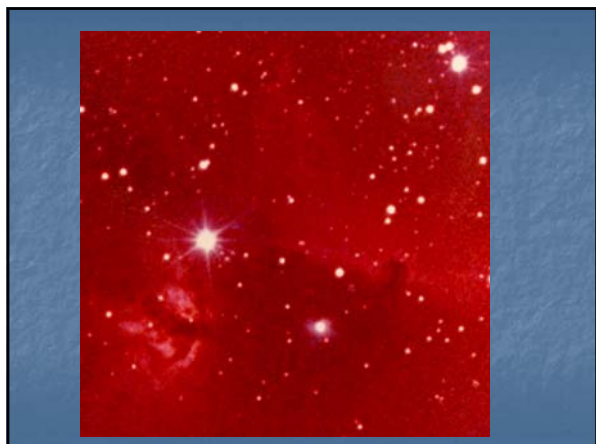
- Destruction of gland.
- Ischemia
- 'Benign' adenoma destroying gland
- Craniopharyngioma
 - Rathke's pouch remnant
 - Benign cyst, but really in the wrong place.

Ischemic Destruction

- Shehan's syndrome
- Post delivery problem
- No lactation
- In time general failure of 'downstream' systems
 - Thyroid
 - Adrenal cortex
 - Ovulation

Posterior Pituitary

- Loss of ADH
 - Diabetes insipidus
 - Dose not make concentrated urine
 - Large volumes of dilute urine
- Head injuries
- Tumors of periventricular area



Thyroid Disease

Control of Thyroid Hormone

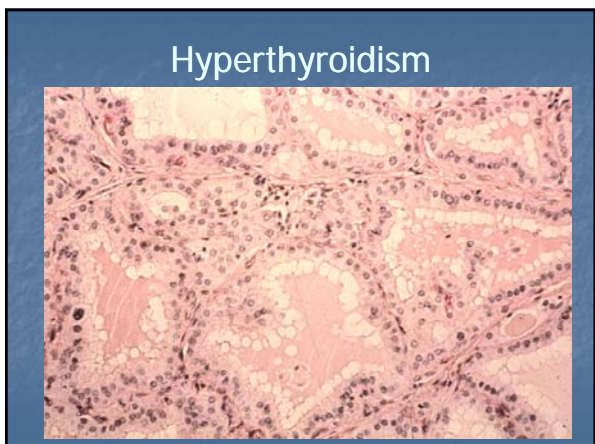
- Hypothalamus
- Pituitary
- Thyroid
- Tissue level
 - Establishes metabolic rate for the whole organism

Hyperthyroidism

- Clinical findings
 - Heat intolerance
 - Tremor
 - Tachycardia
 - Hyperactive
 - Increased body metabolism and temperature
 - Ocular changes
- Main causes
 - Graves Disease
 - Toxic goiter
 - Toxic adenoma

Hyperophthalmia

- Grave's disease
 - Antibody stimulates
- TSH receptors in extraocular muscles.
- Increased tissue in orbit causes eye to protrude.
- Won't go down
- Dry conjunctiva and increased risk of eye infections.



Hypothyroidism

- Genetics
- Gland destruction
 - Inflammatory
 - Surgical removal
 - Radiation treatment for hyperthyroidism
- Iodine deficiency
 - Can't make T4
- Hypothalamic and/or pituitary failure

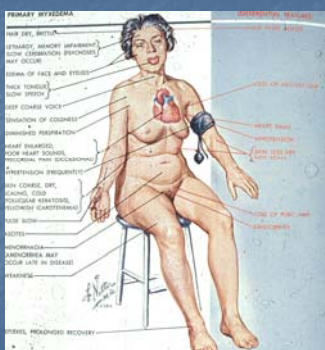
Hypothyroidism

- Genetics: Cretinism
- Cannot make T4
- Growth retarded
- Severe mental retardation
- Must recognize early



Hypothyroidism

- Clinical
 - Cold intolerance
 - Bradycardia
 - Heart failure
 - High lipids
 - Lethargic
 - Photophobia
 - Myxedema
 - Skin and hair changes

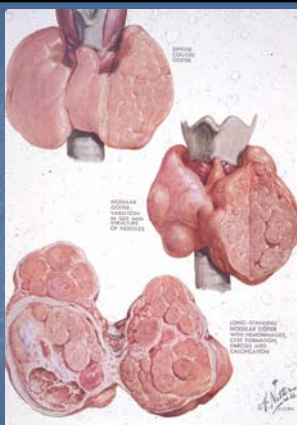


Tumors and Changes in Size



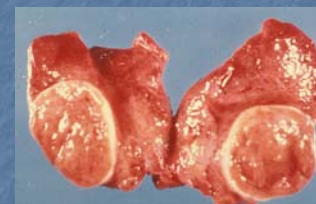
Goiter

- Nodular
- Uniform increase
- Scarring
- Cysts
- Generally euthyroid
- May cause airway compression



Thyroid Adenomas

- Benign
- Solitary
- Common
- Encapsulated
- Generally not hyperactive

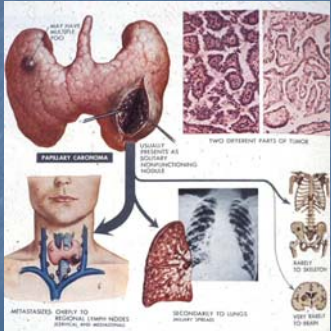


Malignancies of Thyroid Origin

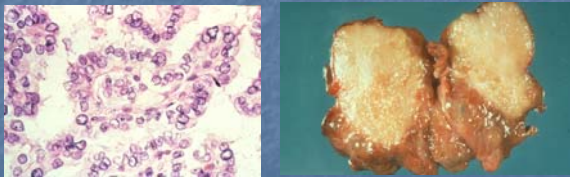
- Arising from follicular cells
 - Papillary Carcinoma
 - Follicular Carcinoma
 - Mixed pattern
- Interstitial cells (Calcitonin producing cells)
- Anaplastic, who knows
 - Very aggressive tumor

Papillary Carcinoma

- Papillary groups
- May have multiple sites
- Not actively producing T4
- Readily treated
- Spread
 - Nodes
 - Lung
 - Bone
 - Brain

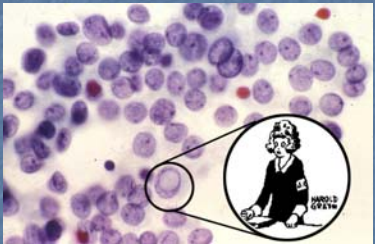


Papillary Carcinoma



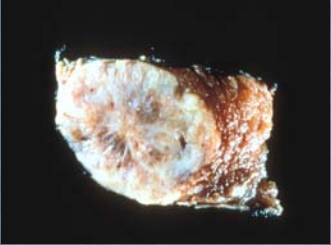
Orphan Annie Nuclei

- Needle aspirates
- Open eyed nuclei
- indicative of papillary ca

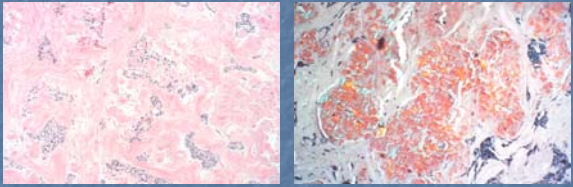


C Cell Carcinoma

- Interstitial cells
- Makes calcitonin
- Makes amyloid
 - Beta pleated sheet protein
- Often part of a multiple endocrine neoplasia syndrome



C Cell Carcinoma



Inflammatory Conditions

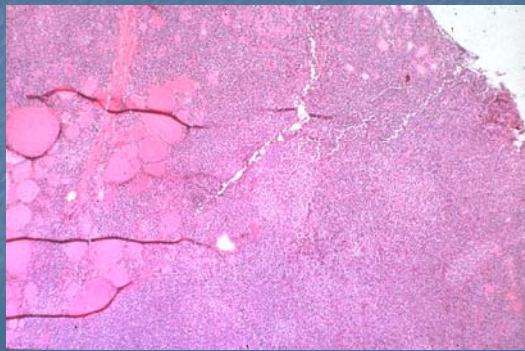
- Autoimmune
- Viral
- Bacterial

Hashimoto's Thyroiditis

- Many antibodies
- T & B cells
- Active germinal centers
- Women 5:1
- Scarring
- In time hypothyroid
- Other autoimmune
 - Arthritis
 - PA
 - Lupus
 - Addison's

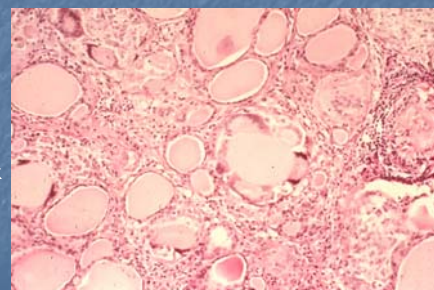


Hashimoto's Thyroiditis



De Quervain's Thyroiditis

- Subacute
- Giant cells
- Granulomas
- Viral?
- Painful neck



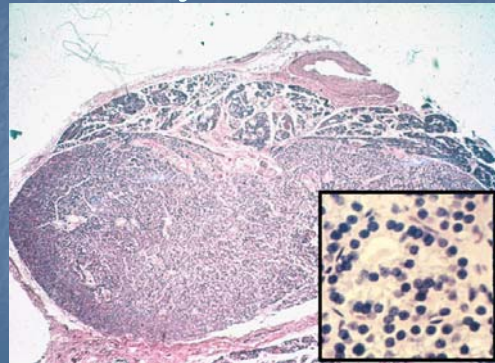
Parathyroid

- Come from the pharyngeal pouches
- Most of us have 4
- Make PTH
- Mobilizes calcium
- Released by low serum calcium
- High serum phosphate

Hyperparathyroidism

- Primary
 - Parathyroid adenoma 80%
 - Hyperplasia 10-15%
 - Parathyroid ca <5%
- Hypercalcemia
 - Stones, bones, abdominal groans and psychic moans
 - Bone wasting
 - Generalized
 - Osteitis fibrosa cystica

Parathyroid Adenoma



Secondary Hyperparathyroidism

- Renal failure almost always
 - Phosphates build up in the blood.
 - Cause calcium to drop.
 - PTH is made
 - Phosphate itself can cause release of PTH
- Glands begin to function autonomously

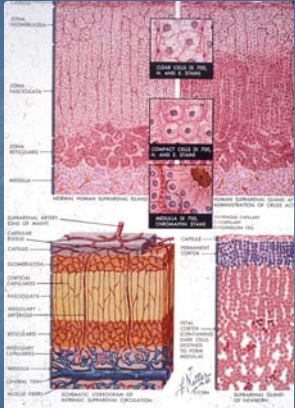
Hypoparathyroidism

- Increased neuromuscular excitability
 - May lead to tetany
- Irritability and possibly even psychosis
- Parkinson-like symptoms
- Cataracts
- Causes
 - Autoimmune destruction
 - Accidental removal with thyroid
 - Congenital absence



Adrenal Gland

- Really two glands in one.
 - Cortex ->
 - Salt
 - Sugar
 - Sex
 - Medulla
 - Epinephrine
 - Norepinephrine



Adrenal Pathology

- Same as for all
 - Too much
 - Too little
 - Tumors

Cushing's Syndrome

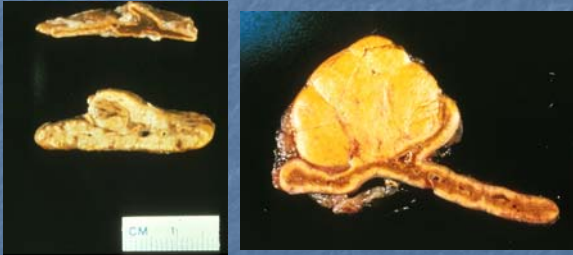
- Effects of too much cortisol
 - Moon face
 - Central obesity
 - Buffalo hump
 - Osteoporosis
 - Fractures
 - Hypertension
 - Weakness



Cushing's Disease

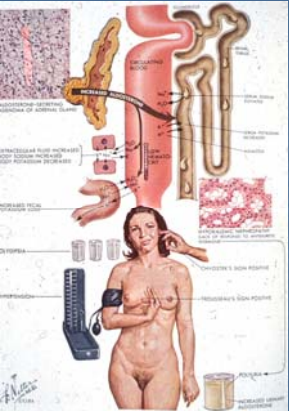
- Altered feedback regulation at level of hypothalamus and pituitary
 - It only takes a small increase in ACTH
 - Loss of cortisol diurnal cycle
- Pituitary adenoma
- Ectopic ACTH
 - Small cell carcinoma of lung
- Adrenal tumors autonomously functioning

Cushing's Disease



Hyperaldosteronism

- Conn's syndrome
- Adenoma (65% of the time) causing high blood pressure.
- Over production of aldosterone
- Zona glomerulosa
 - No ACTH control
- Retention of Na⁺
- Urinary loss of K⁺
- Serum alkalosis



Congenital Enzyme Deficiency

- A number of possibilities, but 21-beta-hydroxylase is most common.
 - Salt losing
 - Androgenizing

Hypoadrenalism

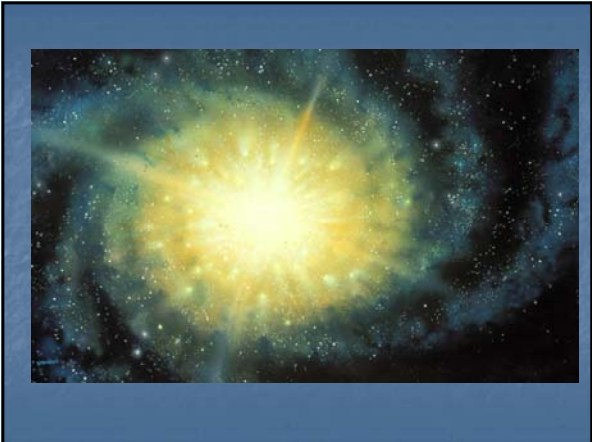
- Acute loss vs. Chronic
- Pituitary vs. adrenal
- Acute
 - Waterhouse-Friderichsen syndrome ->
 - Overwhelming infection with encapsulated bacteria.
 - Leads to vascular infection.
 - Hemorrhagic destruction of adrenal glands
 - Medical crisis

Addison's Disease

- Slowly develops
- Loss of adrenal glands
- Lots of ACTH, but nothing it can do.
- Metastatic tumor
- TB
- Clinical
 - Weight loss
 - Hypotension
 - Hyperpigmentation

Adrenal Medulla

- Pheochromocytoma
- Catecholamines
- Elevated blood pressure
- Syncopal episodes
- Headaches
- Nose bleeds
- Anxiety
- Maybe an isolated tumor or part of a multiple endocrine tumor syndrome.



Multiple Endocrine Neoplasia, MEN

- Neural crest derivative cells
- Give rise to hormonally active tissue
- Migrate from the neural crest to many organs
 - Anterior pituitary
 - Parathyroids
 - Adrenal Medulla
 - Thyroid, interstitial cells
 - Bronchial and bowel mucosa

MEN I

- MEN I, Wermer's Syndrome
 - Tumor suppressor gene, chromosome 11
 - Parathyroid adenomas
 - Pancreas Islet cell adenomas
 - Pituitary adenomas (prolactin)

MEN IIA

- Sipple syndrome
- Proto-oncogene, chromosome 10
 - Thyroid, medullary carcinoma
 - Adrenal medulla, pheochromocytoma
 - Parathyroid adenoma

MEN IIB

- Thyroid, medullary carcinoma
- Adrenal, pheochromocytoma
- Ganglioneuromas and neurofibromas
 - Lips
 - Face
 - Oral cavity
 - Eyes
 - GI tract



Pancreatic Islet Cell Tumors

- Benign or malignant
- Hormone depends on cell of origin
 - Beta cell, insulin secreting
 - Hypoglycemic episodes
 - Delta cell, Zollinger-Ellison syndrome
 - Gastrin secreting
 - Intractable ulcers
 - Alpha cell adenoma
 - Glucagon secreting
 - Become diabetic

