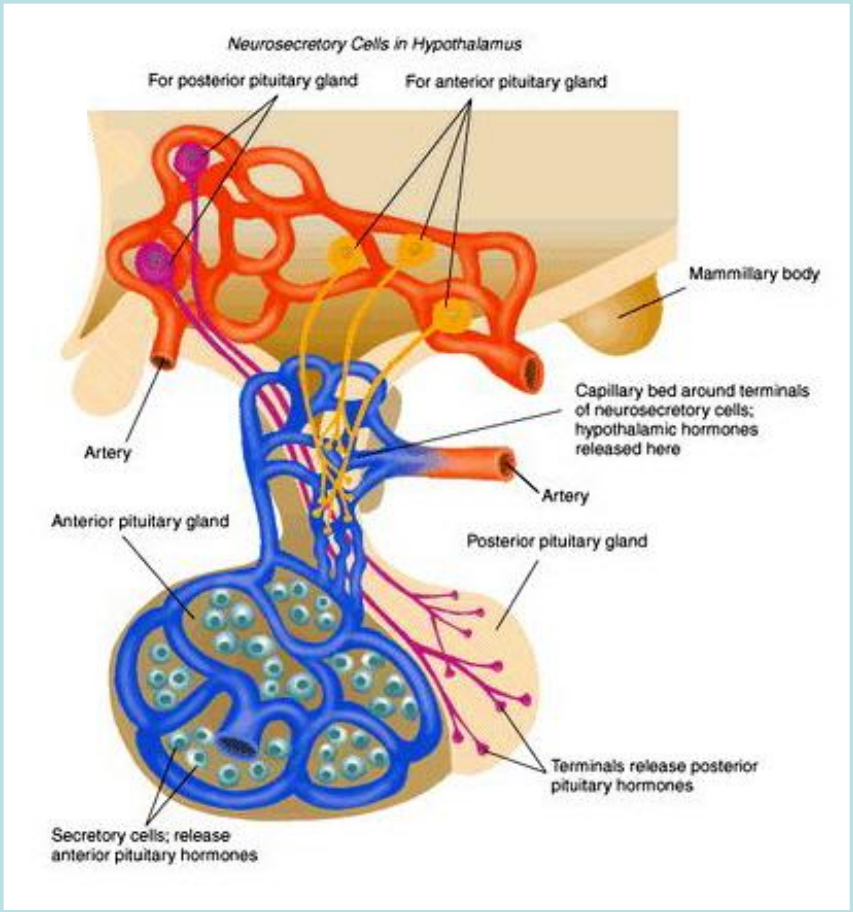
DISEASES OF THE PITUITARY GLAND

CLINICAL ASPECT

Asst. Prof. Paweena Chunharojrith, M.D.
Professor Sutin Sriussadaporn, M.D.
Division of Endocrinology and Metabolism,
Faculty of Medicine, Siriraj Hospital

Hypothalamic regulation of pituitary gland



Hypothalamus	Pituitary
TRH	TSH ↑
CRH	ACTH ↑
GnRH	LH ↑, FSH ↑
GHRH	GH ↑
Somatostatin	GH ▼
PIF (dopamine)	PRL ▼
PRF	PRL ↑

Diseases of the pituitary and hypothalamus

- Pituitary tumors (adenomas): Micro- (<10 mm) vs. macro- (> 10 mm)
  - Functioning (prolactin, GH, ACTH, TSH)
  - Non-functioning
- Hypothalamic (suprasella) tumors
  - Pituitary tumor with supra-sella extension
  - Craniopharyngioma
  - Meningiomas, germ cell tumor, other primary brain tumors
  - Metastatic tumors
- Surgery (pituitary-hypothalamus)
- Radiation (pituitary-hypothalamus)
- Ischemic necrosis
  - Postpartum (Sheehan syndrome), severe shock, sepsis
- Hemorrhage (apoplexy): of pre-existing potuitary tumor
- Non-ID inflam.: chr. lymphocytic hypophysitis, IgG4 related disease
- Infectious diseases: tuberculosis
- Infiltrative diseases: sarcoidosis, histiocytosis

Manifestations of pituitary disorders

Endocrine hyperfunction

- Galactorrhea
- Acromegaly/Gigantism
- Cushing's disease
- Hyperthyroidism

Endocrine hypofunction

- Growth hormone deficiency
- Hypogonadism
- Amenorrhea/infertility
- Hypothyroidism
- Adrenal insufficiency
- Diabetes insipidus

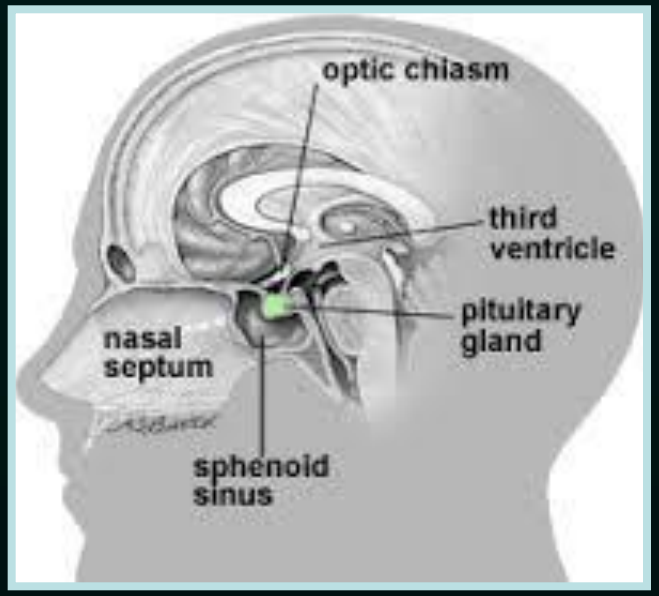
Pressure / mass symptoms

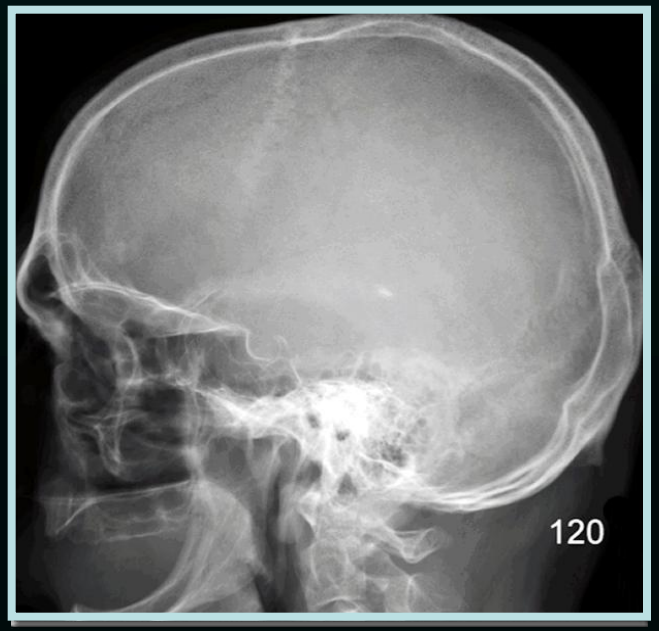
- Visual field defect (bitemporal hemianopia)
- Visual diminution
- Optic atrophy
- Diplopia
- Trigeminal neuralgia
- Facial hypoesthesia

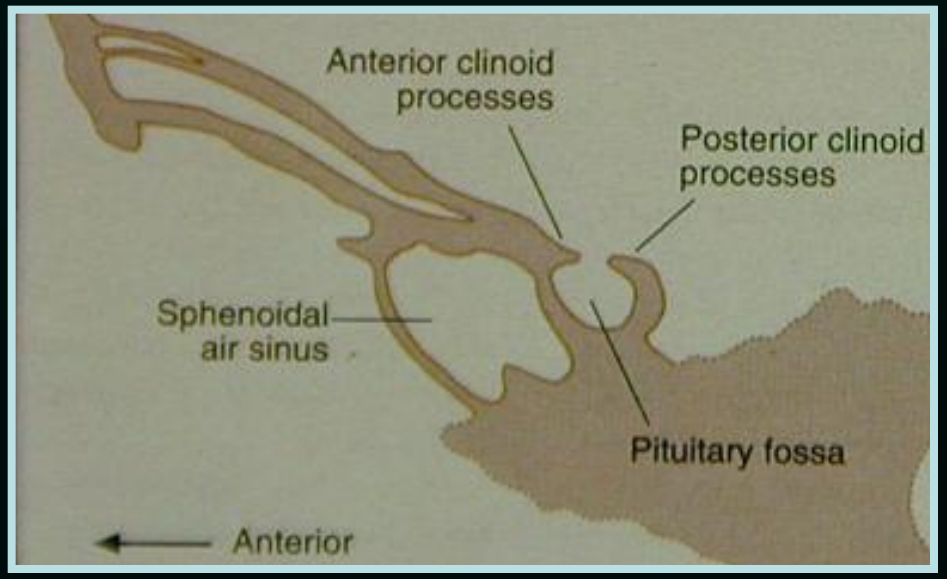
Radiological abnormalities

- Double floor sella
- Enlarged or ballooned sella
- Erosion of clinoid process

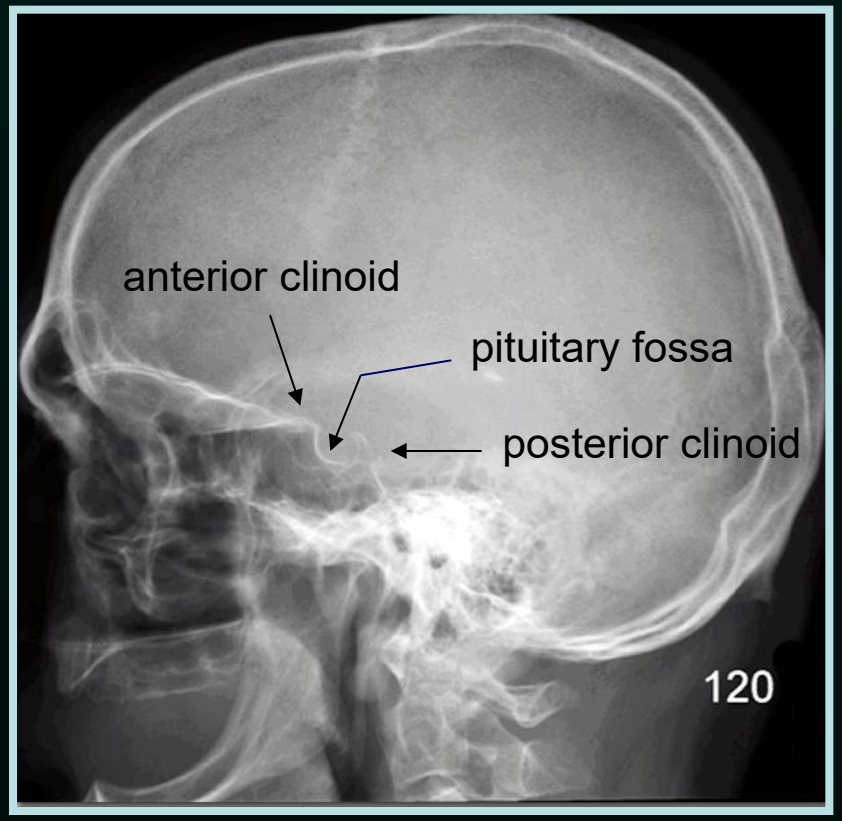
Skull x-ray and sella turcica



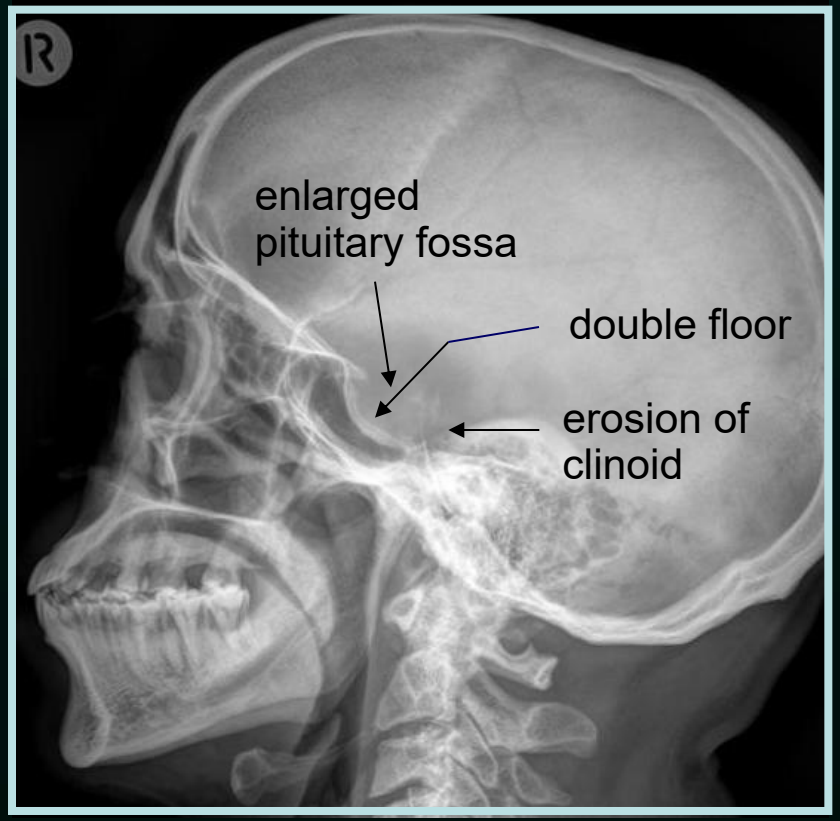




Skull x-ray: pituitary macroadenoma

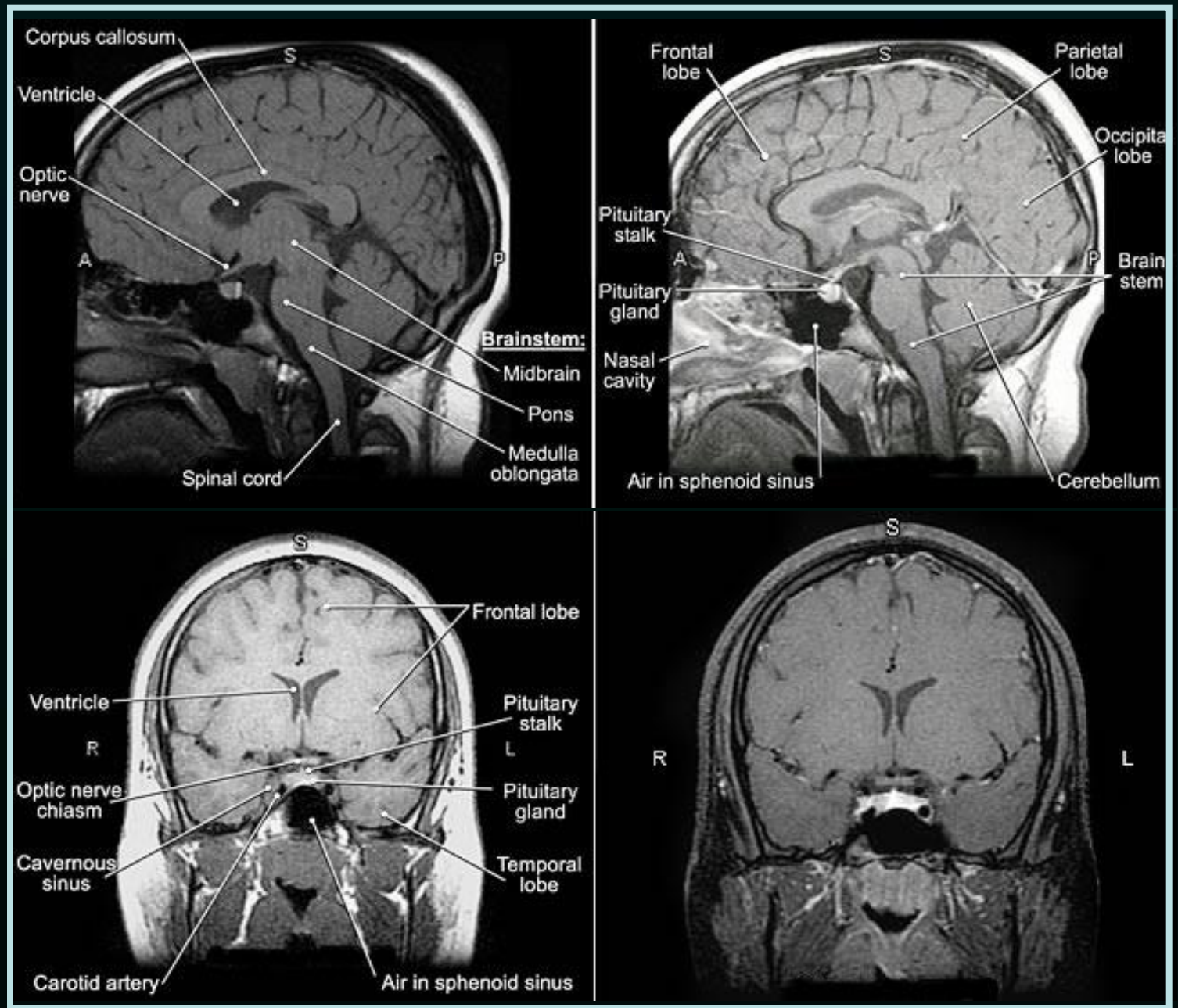


NORMAL



PITUITARY
MACROADENOMA

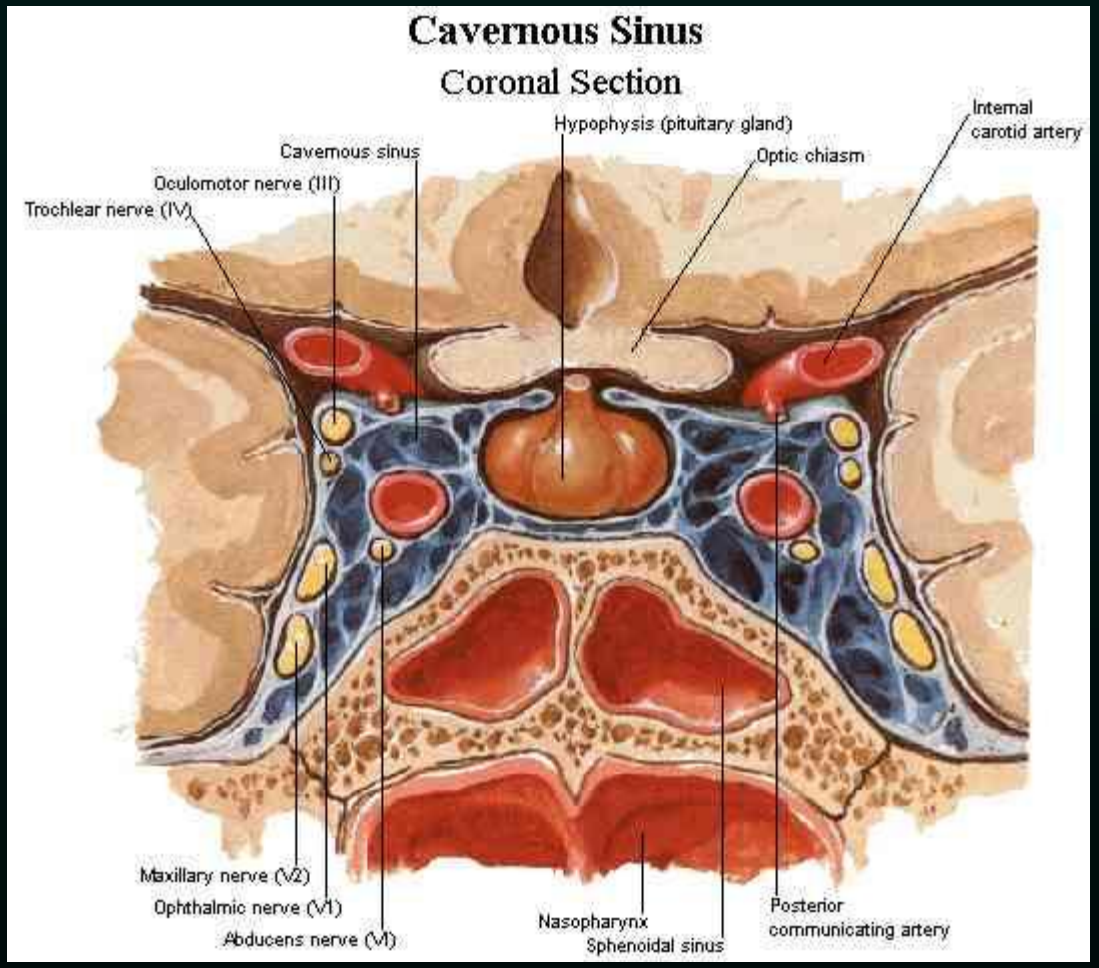
Pituitary imaging (MRI / CT scan)



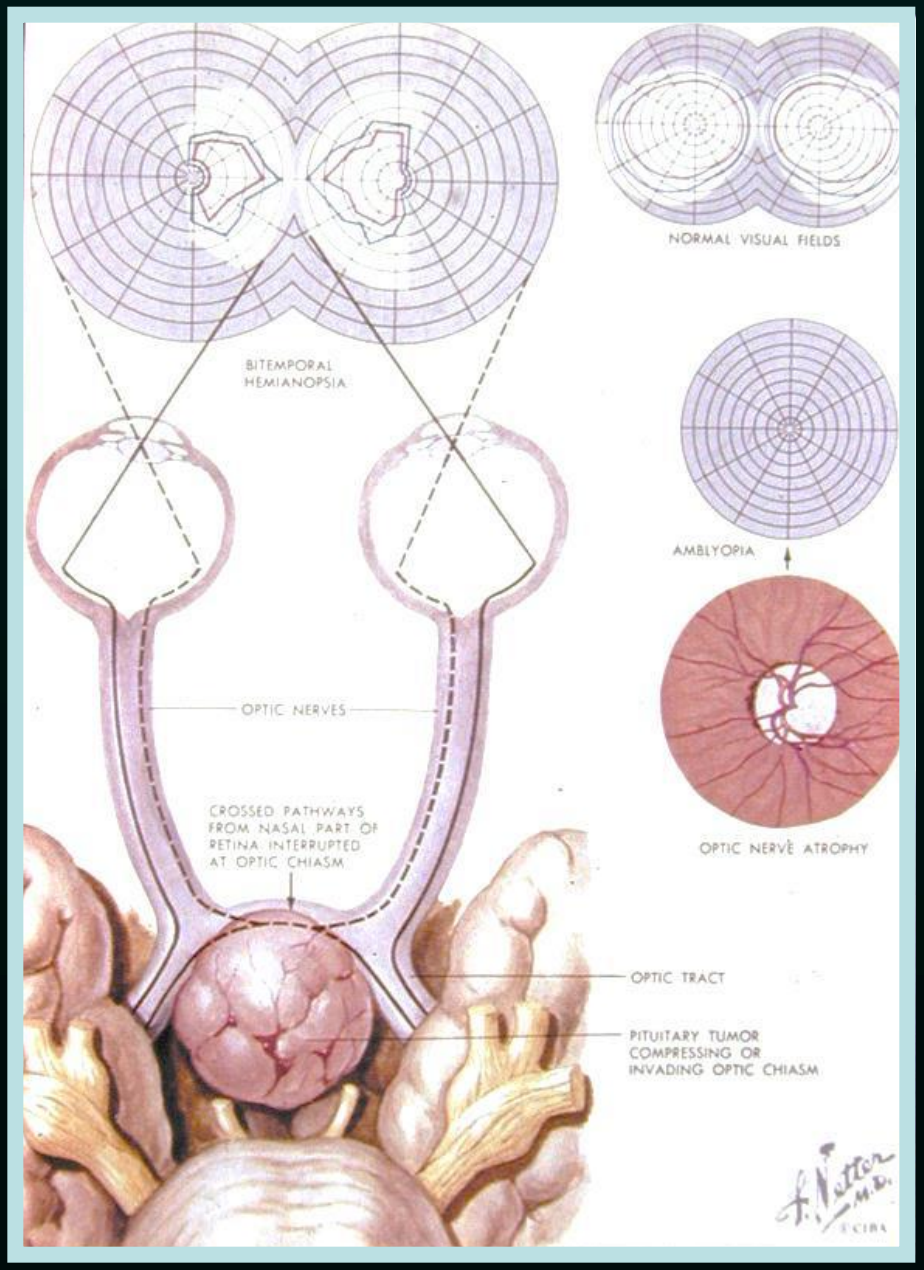
Pituitary macroadenoma

PITUITARY
MACROADENOMA

Pituitary fossa and its related structures

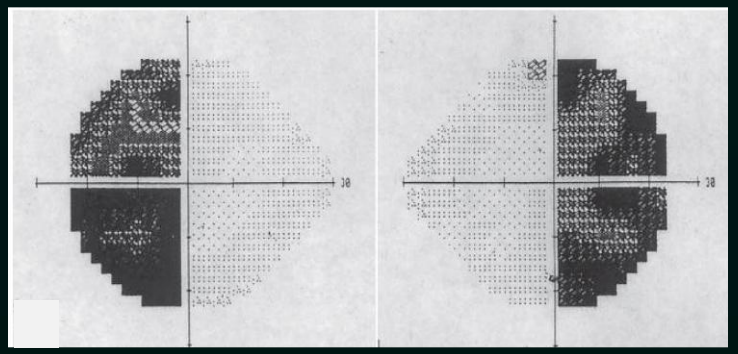


Pituitary tumours : Effect on optic nerves



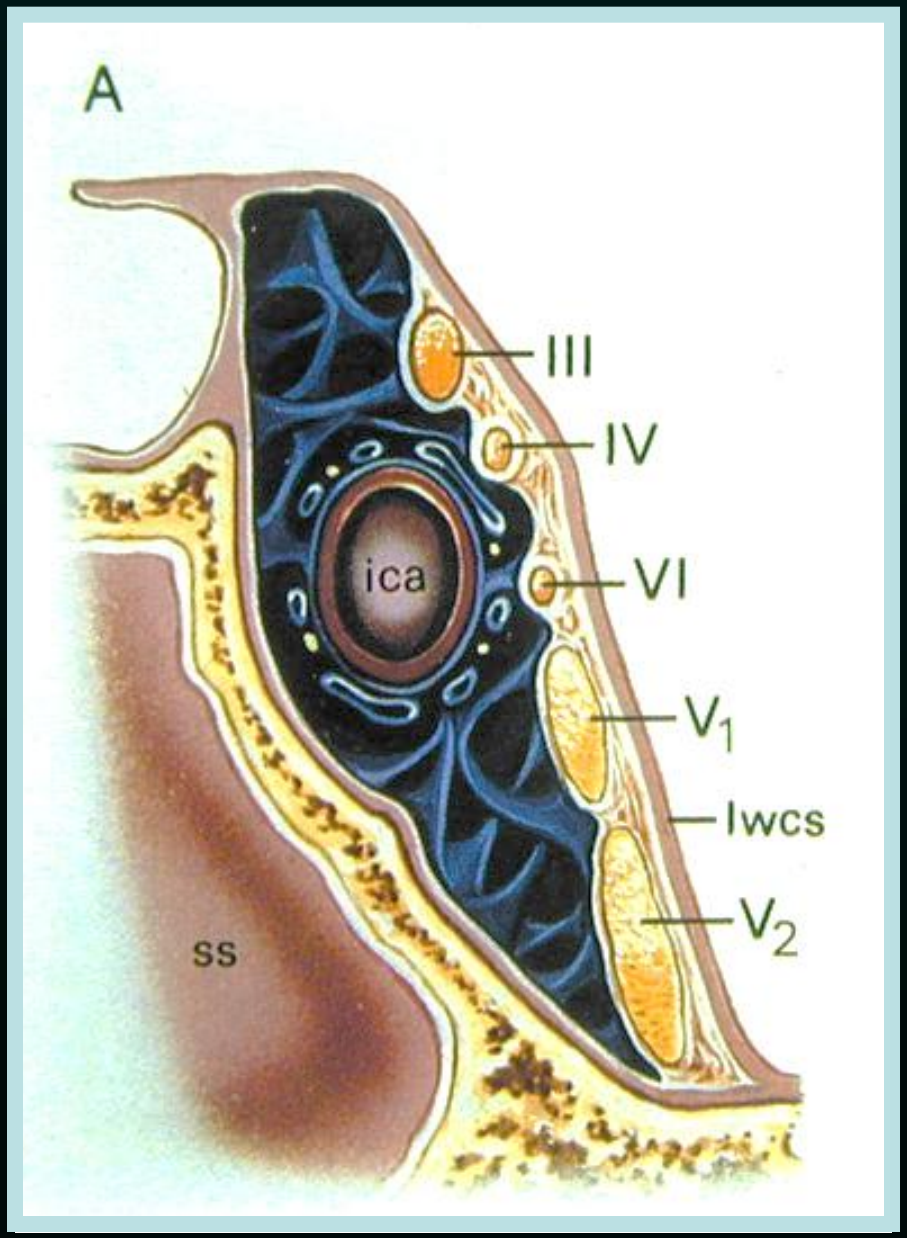
Pituitary tumours : Effect on optic nerves

Confrontation test



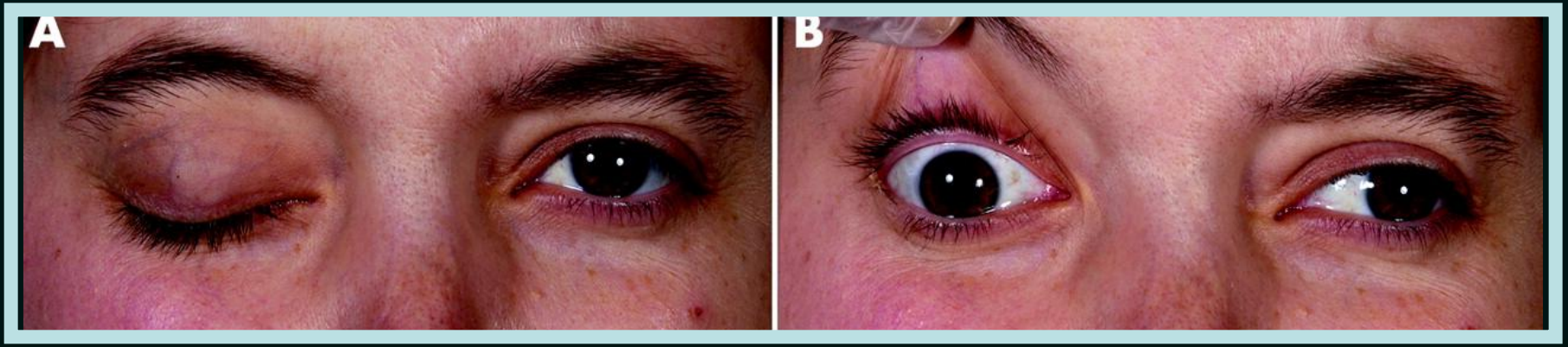
Perimetry

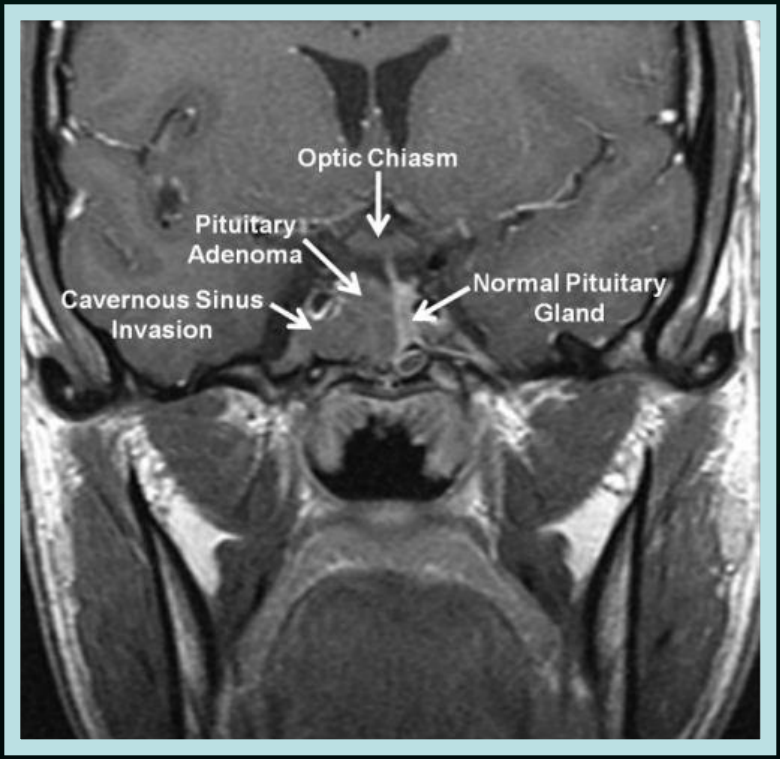
Cavernous sinus syndrome



- Chemosis
  Conjunctival edema
- Proptosis (exophthalmos)
- Ophthalmoplegia
- Ptosis
- Trigeminal sensory loss
  Loss of facial sensation
  V1 and V2

Cavernous sinus syndrome



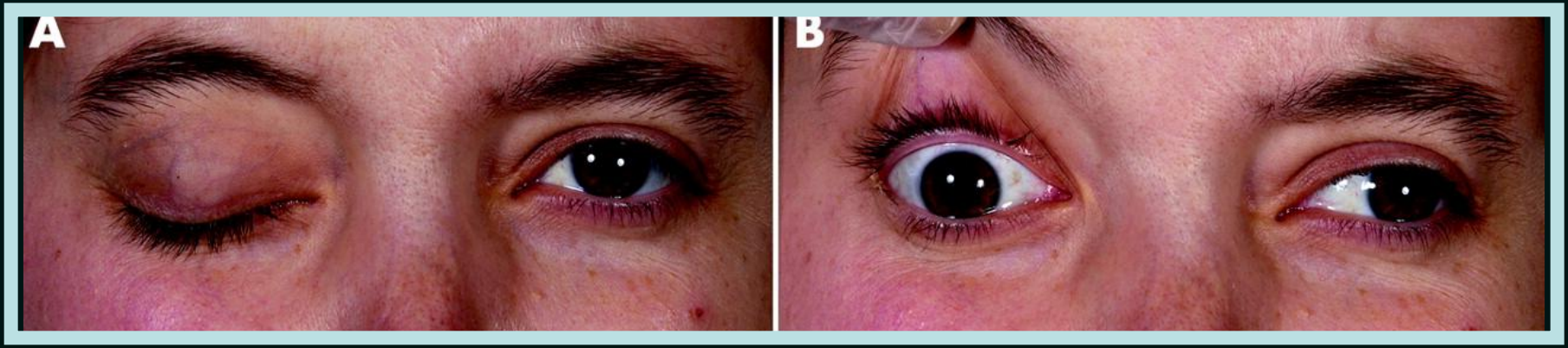


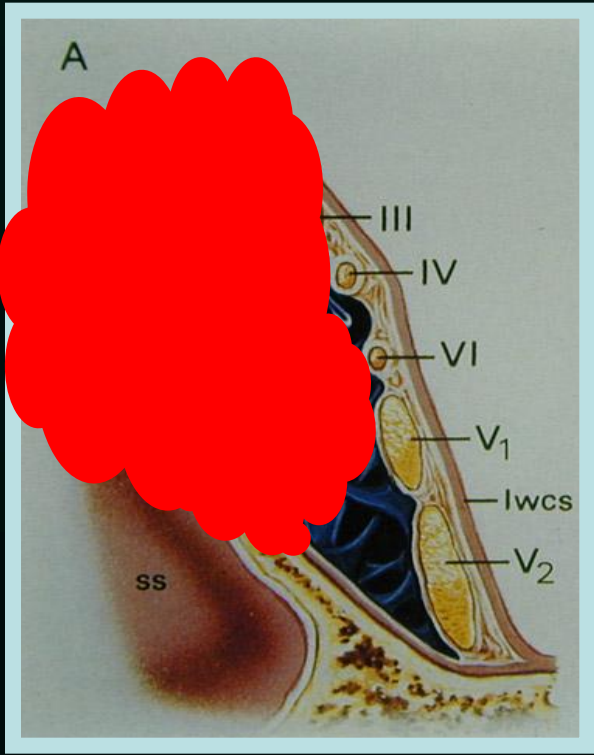
- Periorbital edema
- Chemosis

  Conjunctival edema
- Proptosis (exophthalmos)
- Ophthalmoplegia
- Ptosis
- CN V sensory loss

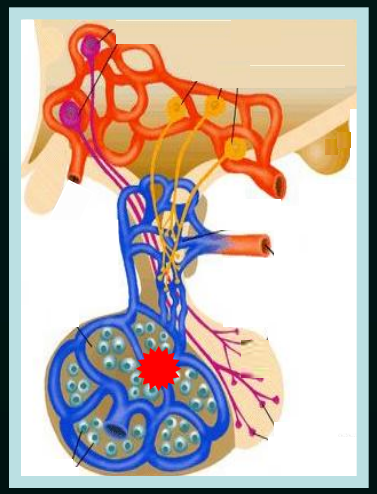
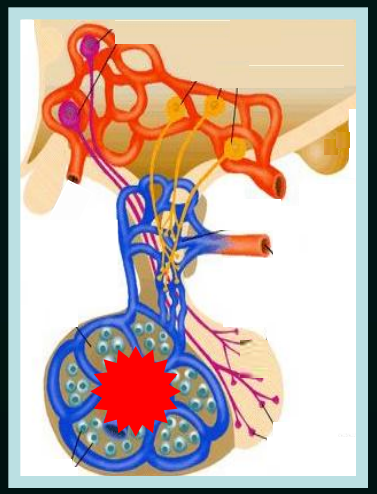
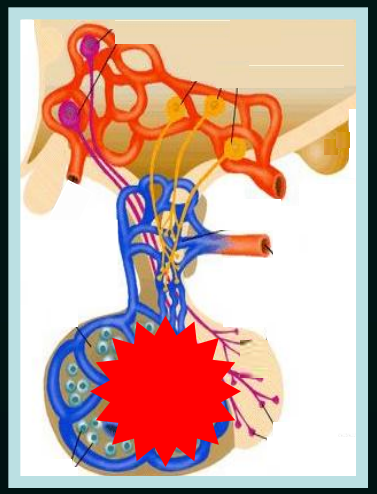
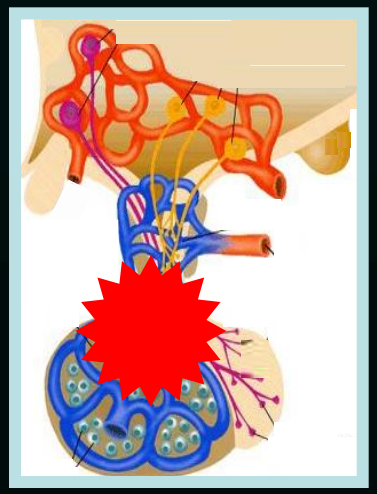
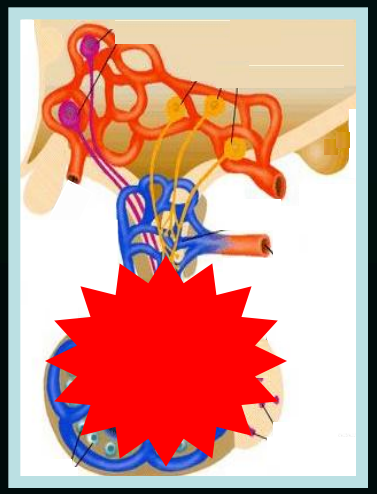
  Loss of facial sensation V1 and V2

Cavernous sinus syndrome



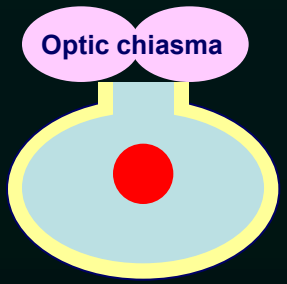


What would happen to the patient?

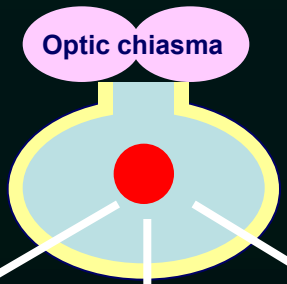

Effects of pituitary tumor: Microadenoma (<1 cm)

Microadenoma Nonfunctioning



No symptom

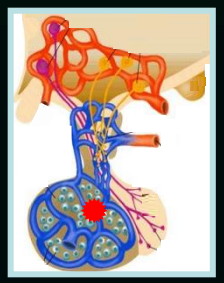
Microadenoma Functioning



Prolactin → Amenorrhea Galactorrhea

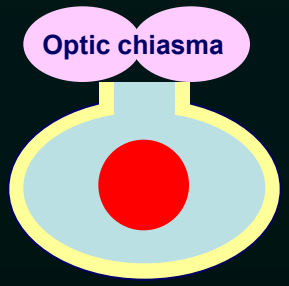
GH → Acromegaly /Gigantism

ACTH → Cushing disease

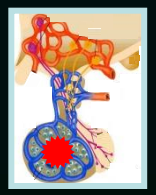


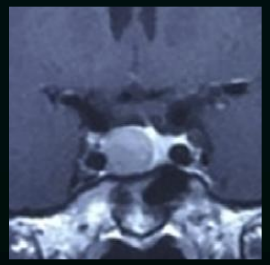
Effects of nonfunctioning macroadenoma (≥1 cm)

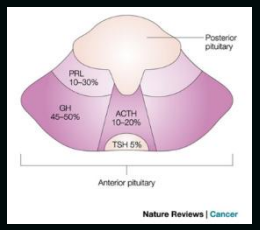
Macroadenoma Nonfunctioning



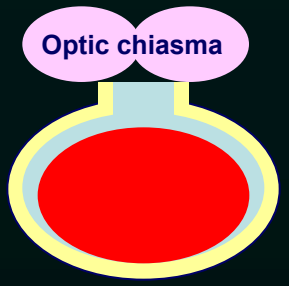
No symptom







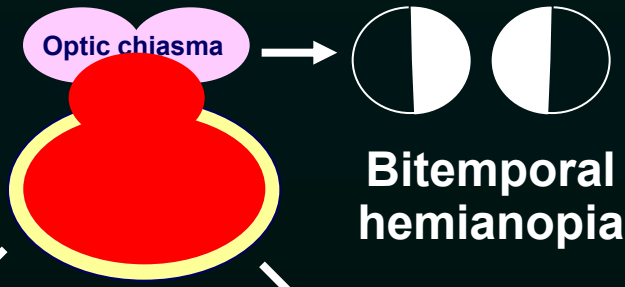
Macroadenoma Nonfunctioning



Hypopituitarism

- ↓ FSH / LH
- ↓ GH
- ↓ ACTH
- ↓ TSH

Macroadenoma Nonfunctioning



Bitemporal hemianopia

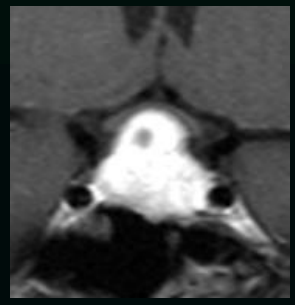
↑ PRL

ADH ↓

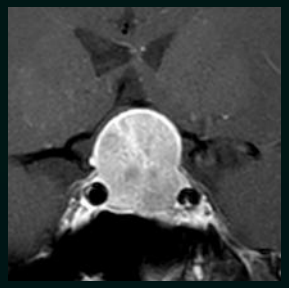
Hypopituitarism

- ↓ FSH / LH
- ↓ GH
- ↓ ACTH
- ↓ TSH

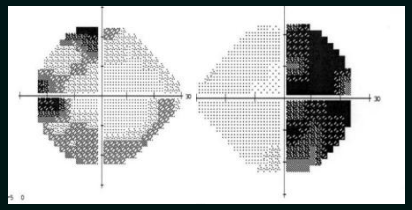
Diabetes insipidus



Effects of functioning macroadenoma (≥1 cm)



Macroadenoma Functioning



Optic chiasma

Bitemporal hemianopia

Hormone excess

↑ PRL

ADH ↓

Hypopituitarism

Prolactin

GH

ACTH

Amenorrhea Galactorrhea

Acromegaly Gigantism

Cushing disease

↓ FSH / LH

↓ GH

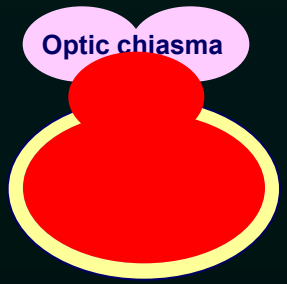
↓ ACTH

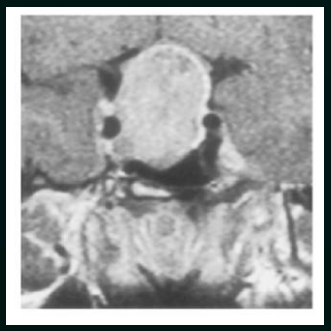
↓ TSH

Diabetes insipidus

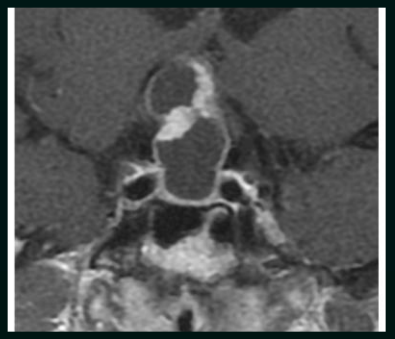
Effects of Pituitary macroadenoma vs. suprasella tumor

Macroadenoma Nonfunctioning

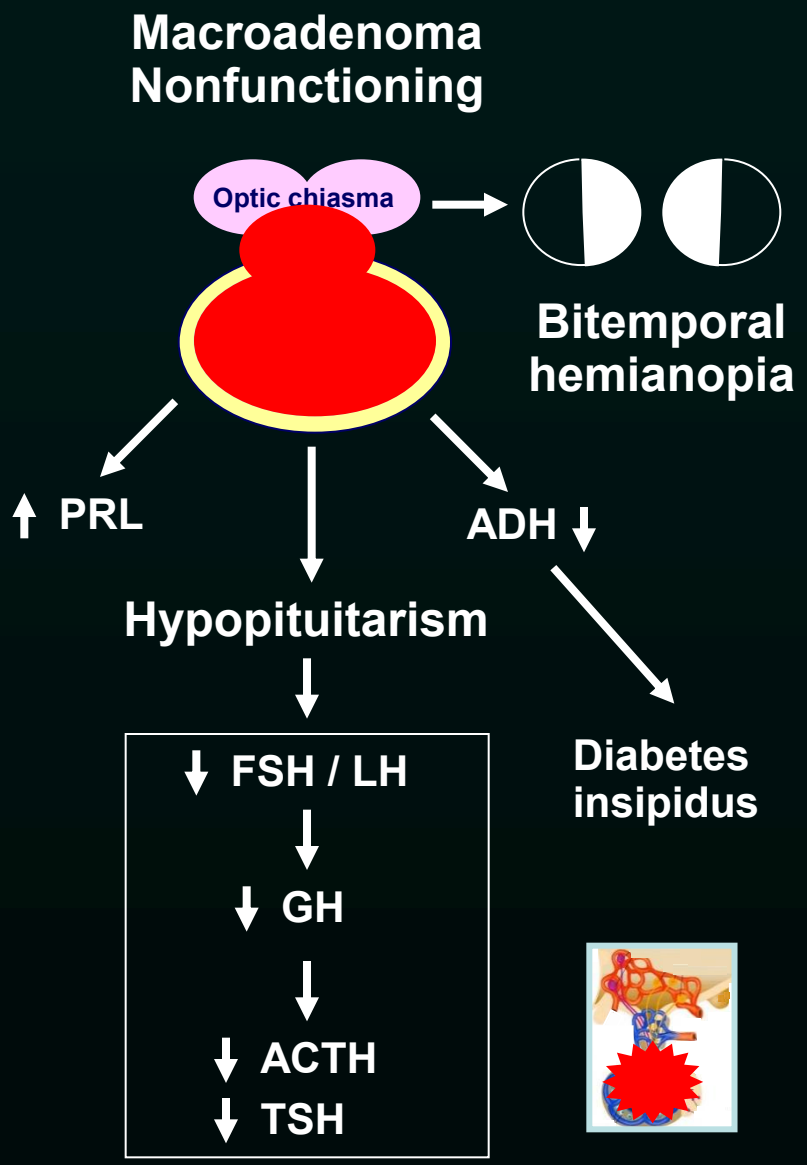


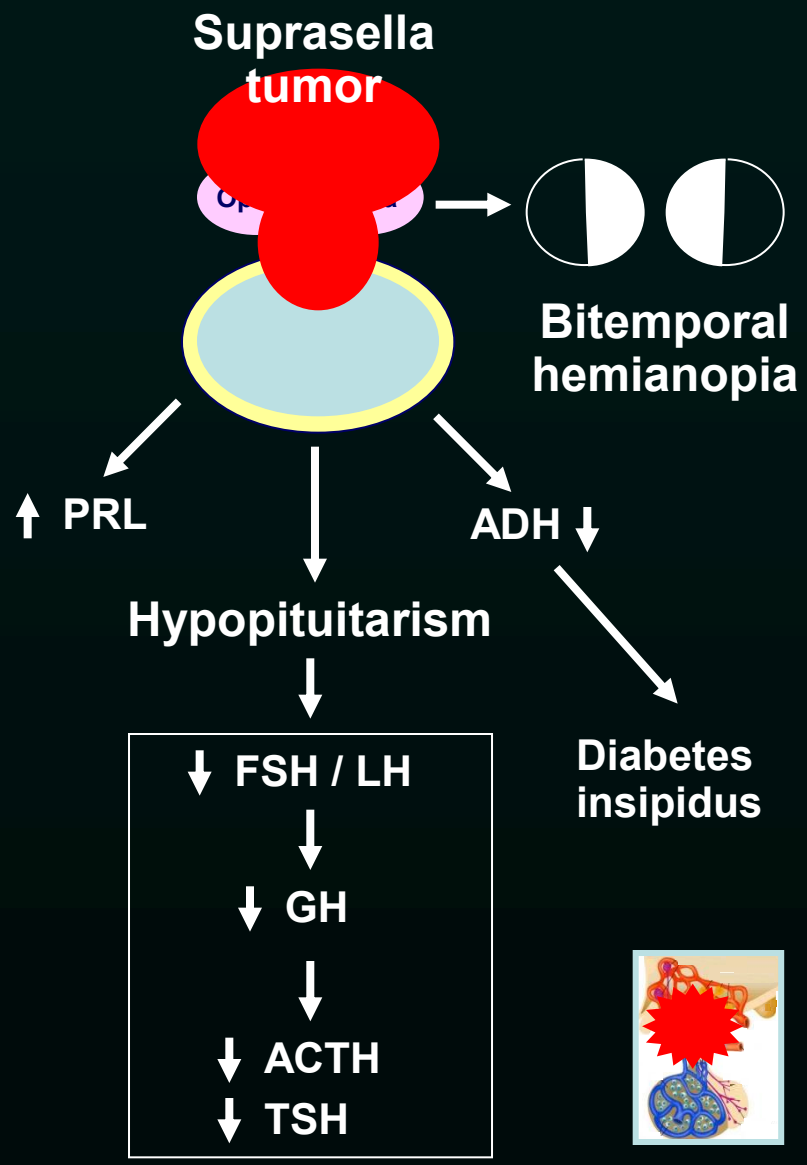


Suprasella tumor



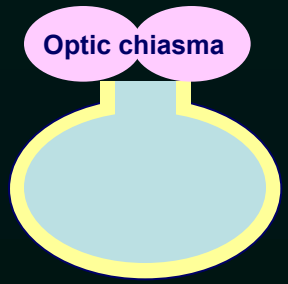
Effects of Pituitary macroadenoma vs. suprasella tumor



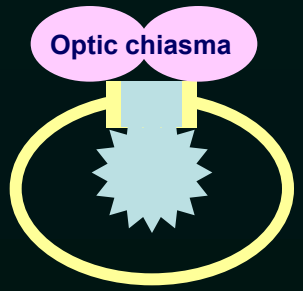


Effects of pituitary ischemia / necrosis

Normal Pituitary gland

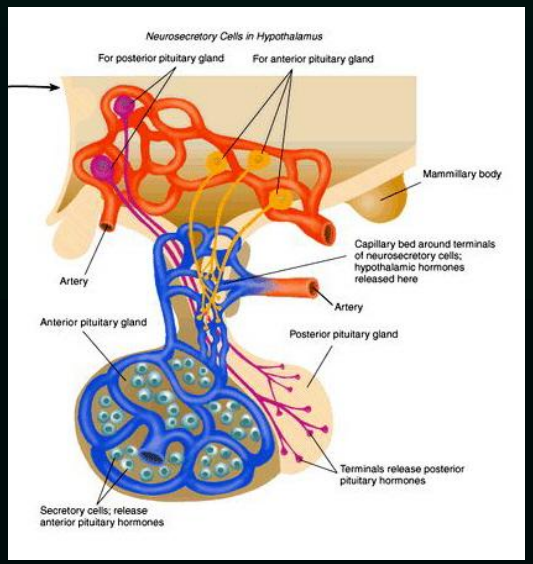


Pituitary Ischemia / necrosis

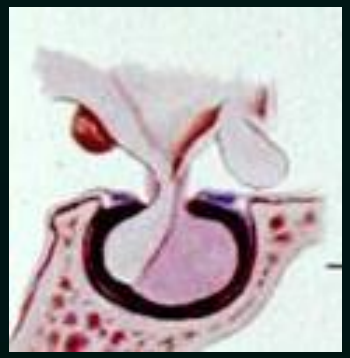


Hypopituitarism

- ↓ PRL
- ↓ FSH / LH
- ↓ GH
- ↓ ACTH
- ↓ TSH



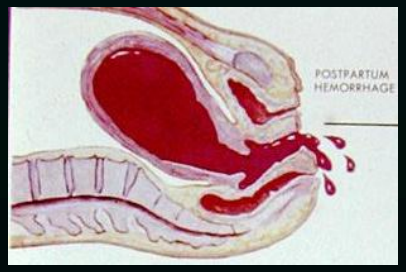
Postpartum pituitary necrosis : Sheehan syndrome

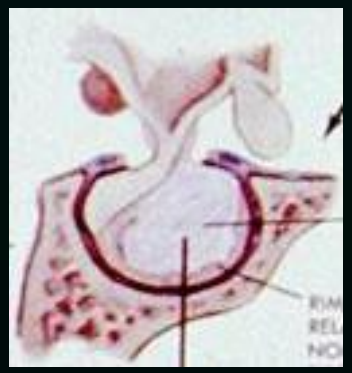


Pregnancy

Pituitary hyperplasia

Hemorrhage Shock





Pituitary necrosis Hypopituitarism

PRL → Lactational failure

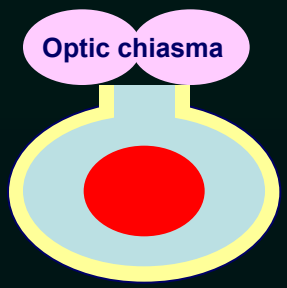
FSH / LH → Amenorrhea Infertile

GH → Hypoglycemia

ACTH → Adrenal insufficiency

TSH → Hypothyroidism

Pituitary apoplexy (pituitary hemorrhage)



Intratumor bleeding

Bitemporal hemianopia

↓ PRL

Hypopituitarism

Headache (sudden headache)

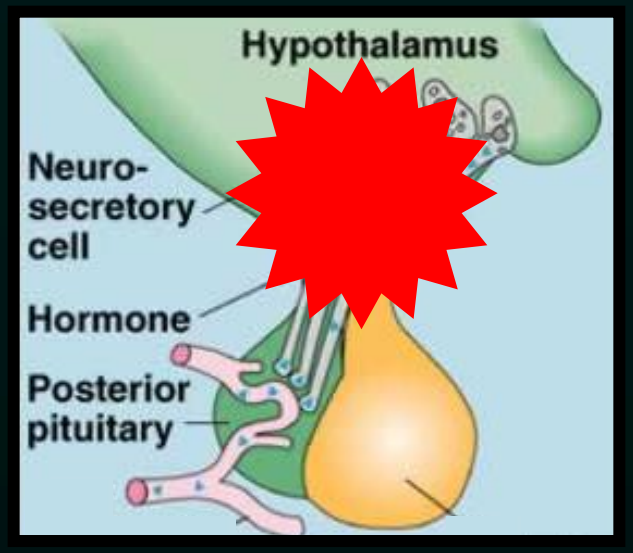
Blood leaks in to ventricles

Meningeal irritation
Stiff neck

↓ FSH / LH
↓ GH
↓ ACTH
↓ TSH

Adrenal Insufficiency (Hypotension)

AVP deficiency (central diabetes insipidus)



DECREASED VASOPRESSIN

DECREASED TUBULAR WATER REABSORPTION

Causes:

- Tumor
- Surgery
- Idiopathic

Clinical features

- Polyuria (>3,000 ml/d)
- Low urine Spgr. (<1.010)
- Low urine osmolality
- High serum Na
- High serum osmolality

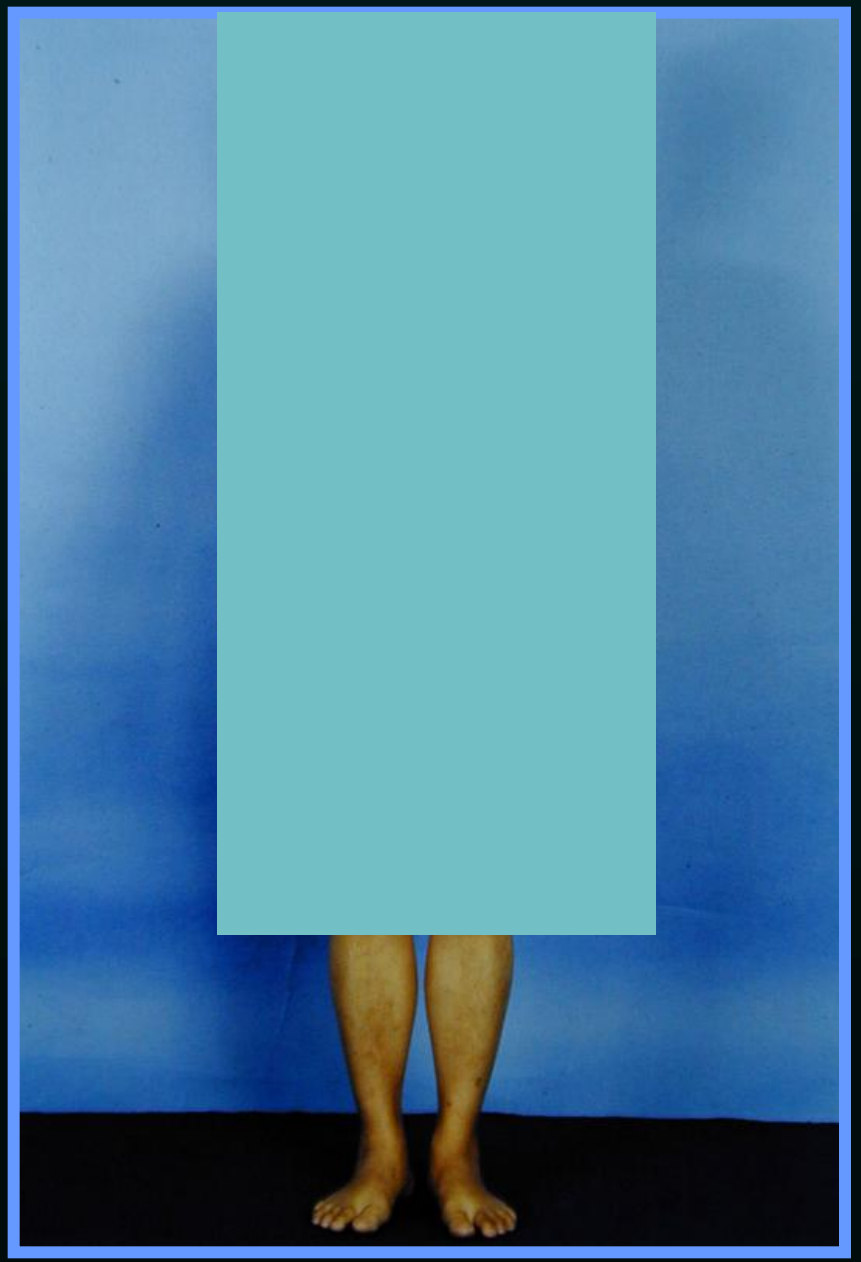
Manifestations of pituitary disorders

	HYPER-FUNCTION	HYPO-FUNCTION	MASS EFFECTS	RADIOLOGIC FEATURES		
				X-RAY	CT	MRI
MICROADENOMA • FUNCTIONING • NONFUNCTION						
MACROADENOMA • FUNCTIONING • NONFUNCTION						
ISCHEMIA INFARCTION						
HEMORRHAGE APOPLEXY						

Manifestations of pituitary disorders

	HYPER-FUNCTION	HYPO-FUNCTION	MASS EFFECTS	RADIOLOGIC FEATURES		
				X-RAY	CT	MRI
MICROADENOMA						
• FUNCTIONING	YES	NO	NO	-	+ / -	+++
• NONFUNCTION	NO	NO	NO	-	+ / -	+++
MACROADENOMA						
• FUNCTIONING	YES	NO / YES	NO /YES	+ / -	+++	+++
• NONFUNCTION	NO	NO / YES	NO / YES	+ / -	+++	+++
ISCHEMIA INFARCTION	NO	YES	NO / YES	-	+ / -	+ / -
HEMORRHAGE APOPLEXY	NO	YES	NO / YES	+ / -	+++	+++

Describe the differences



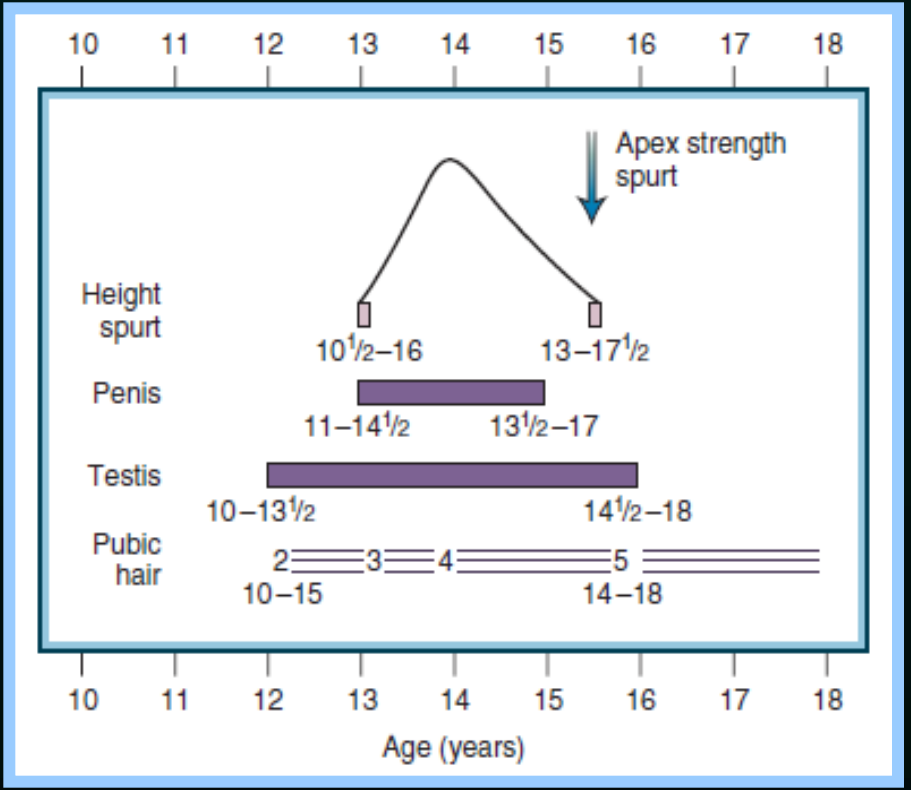
Clinical features

- Female
- 15-year-old

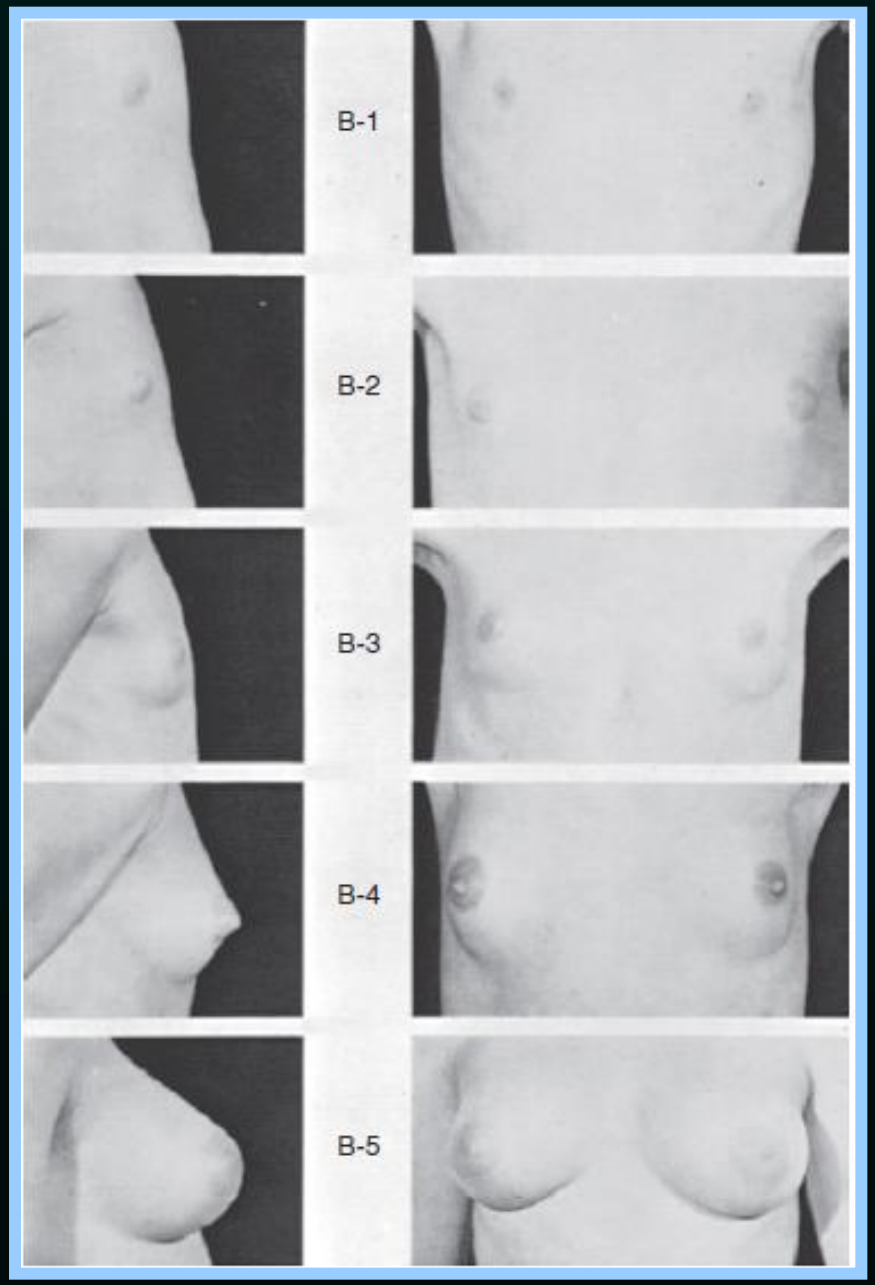
Clinical features

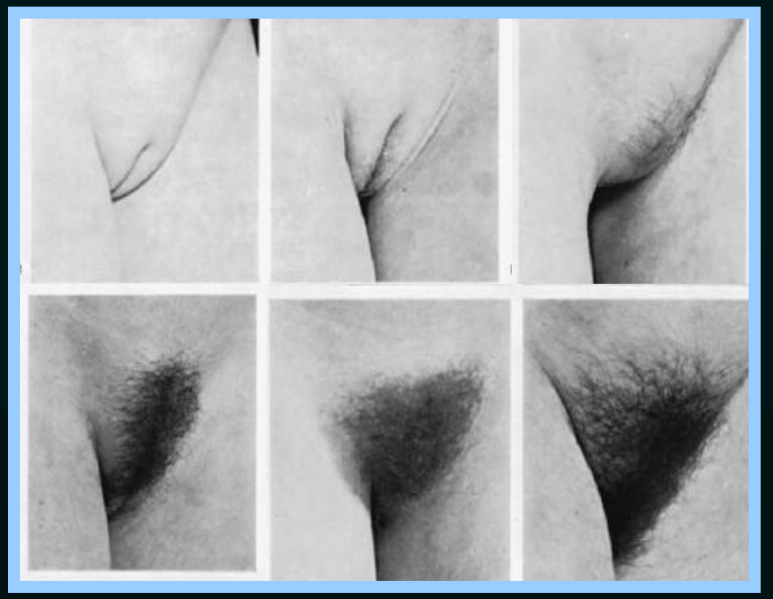
- Female
- 15-year-old
- Short stature
- 1^{o} amenorrhea
- No 2^{o} sex characteristics
- Delayed bone age
- Polyuria (DI)
- VF defect

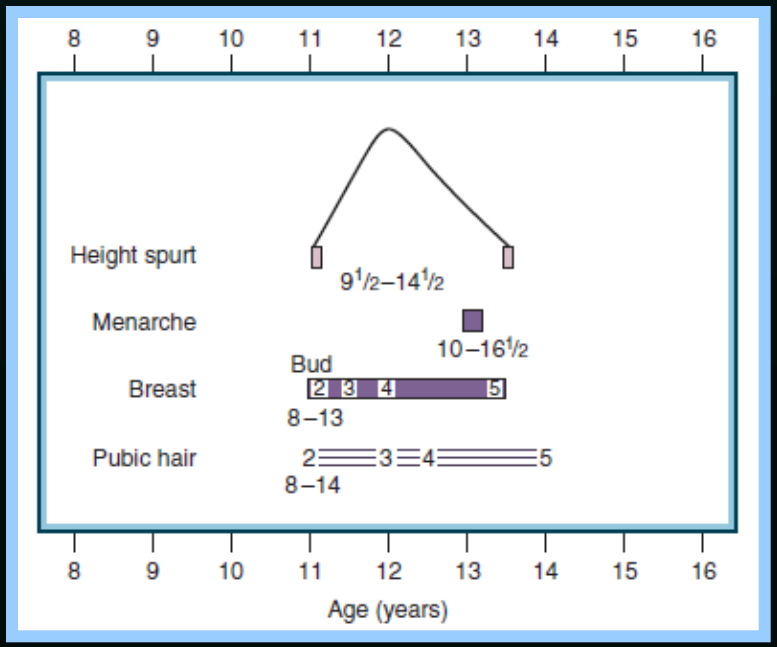
Marshall and Tanner staging of pubertal development



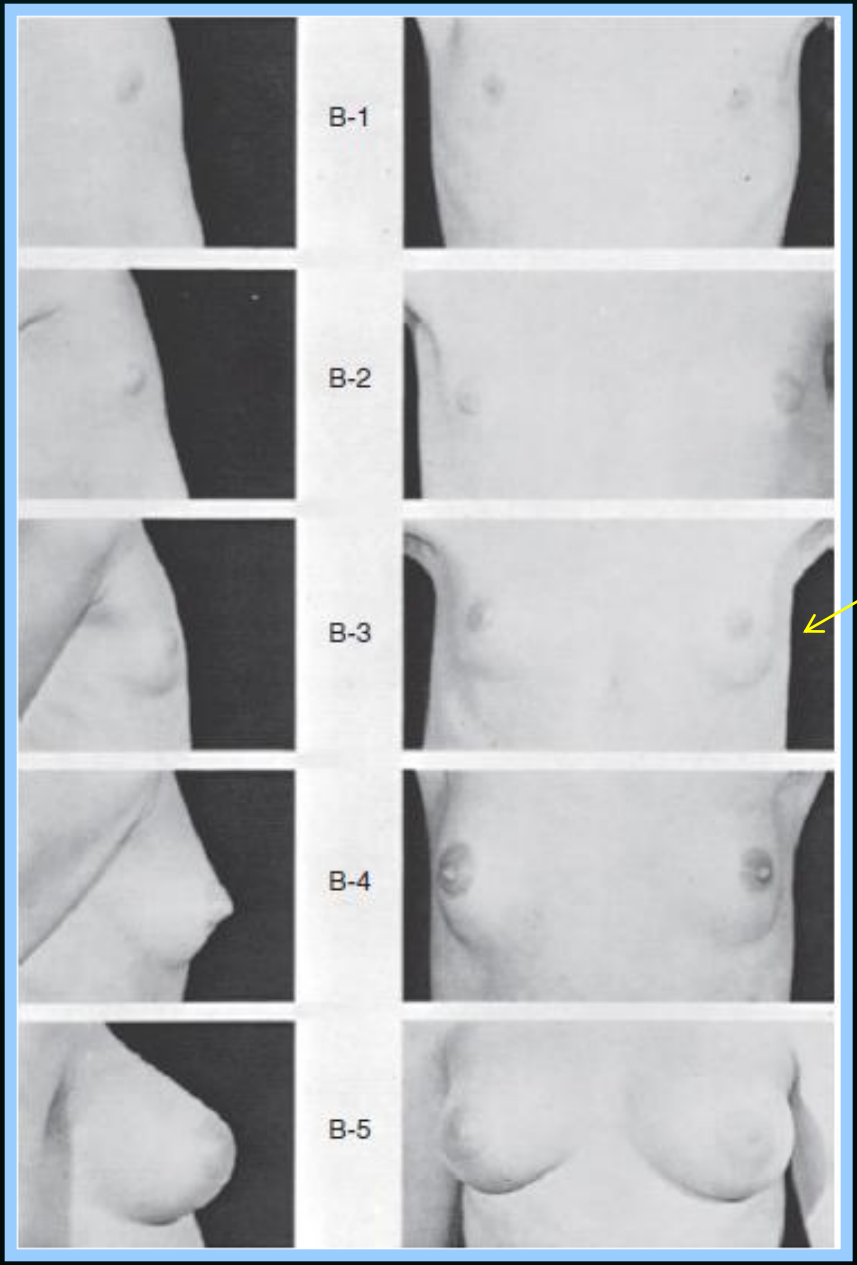
Marshall and Tanner staging of pubertal development

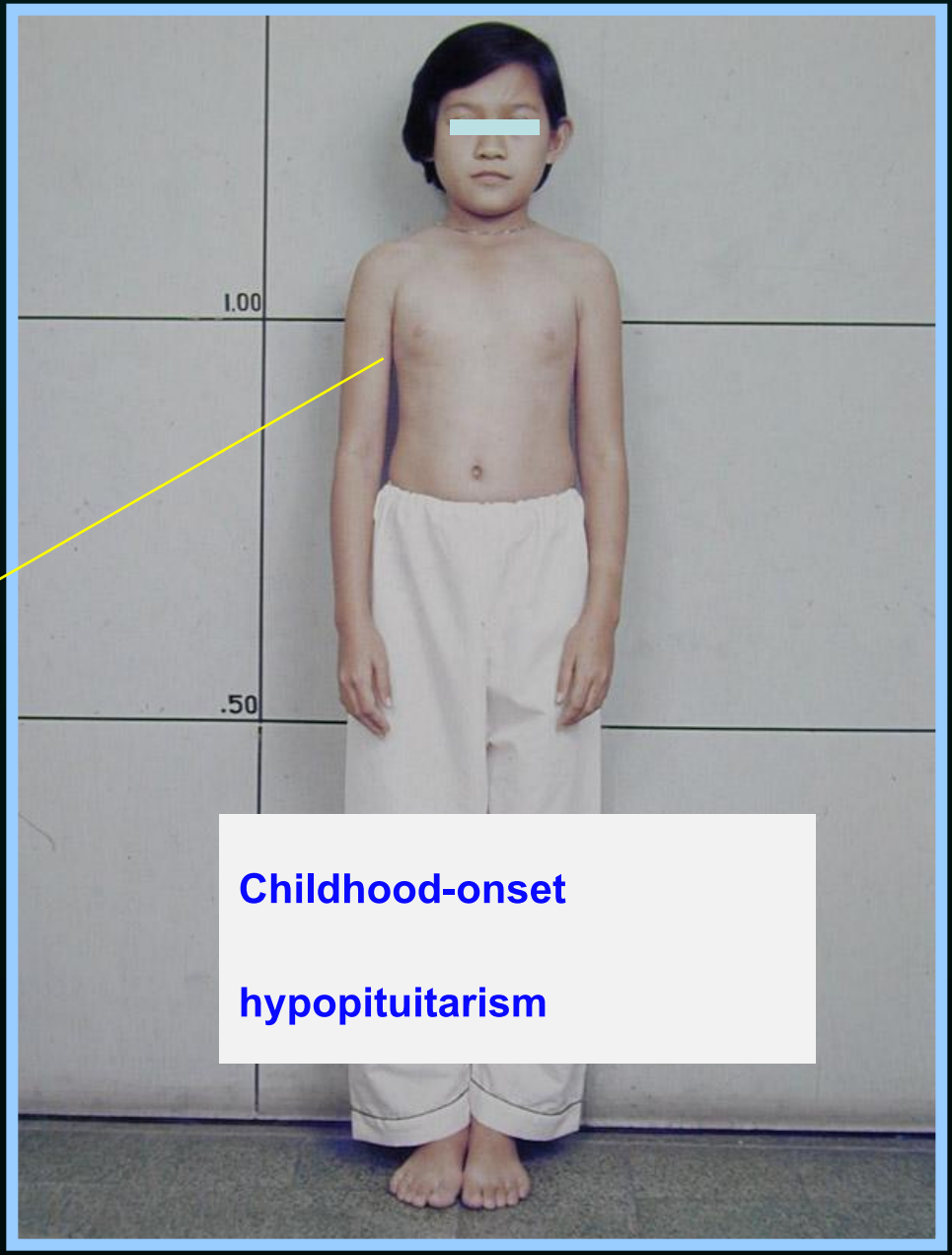






A 15-year-old female



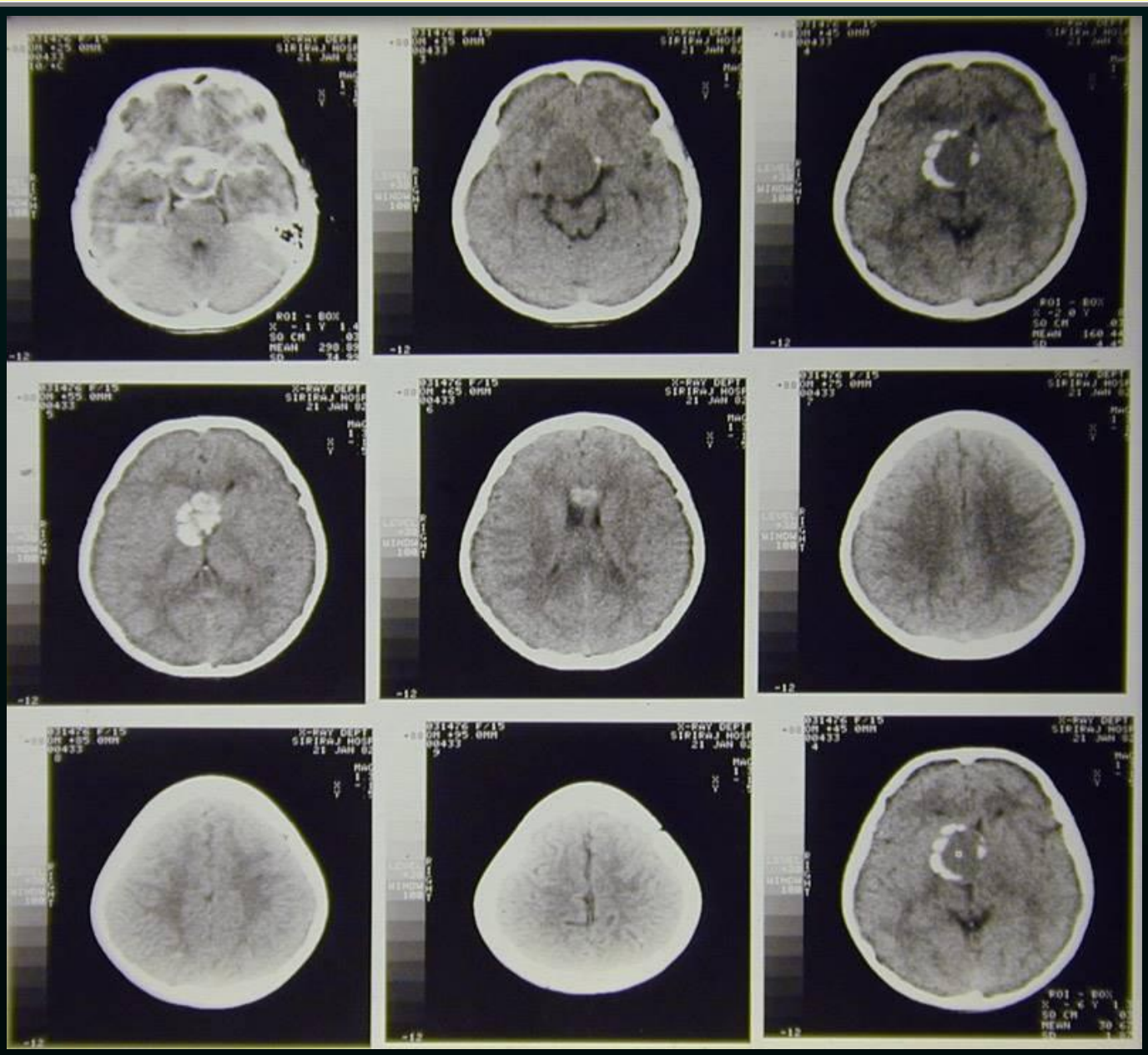


Childhood-onset

hypopituitarism

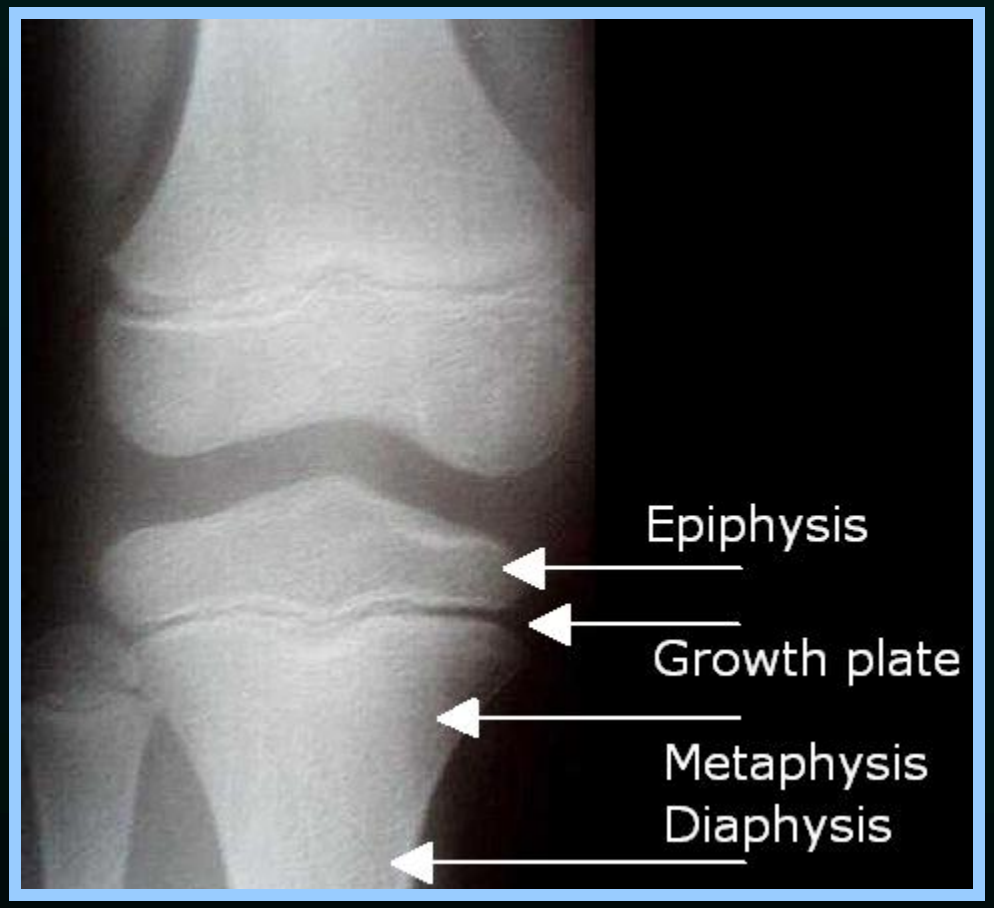
Suprasella tumor

Suprasella tumor : Craniopharyngioma

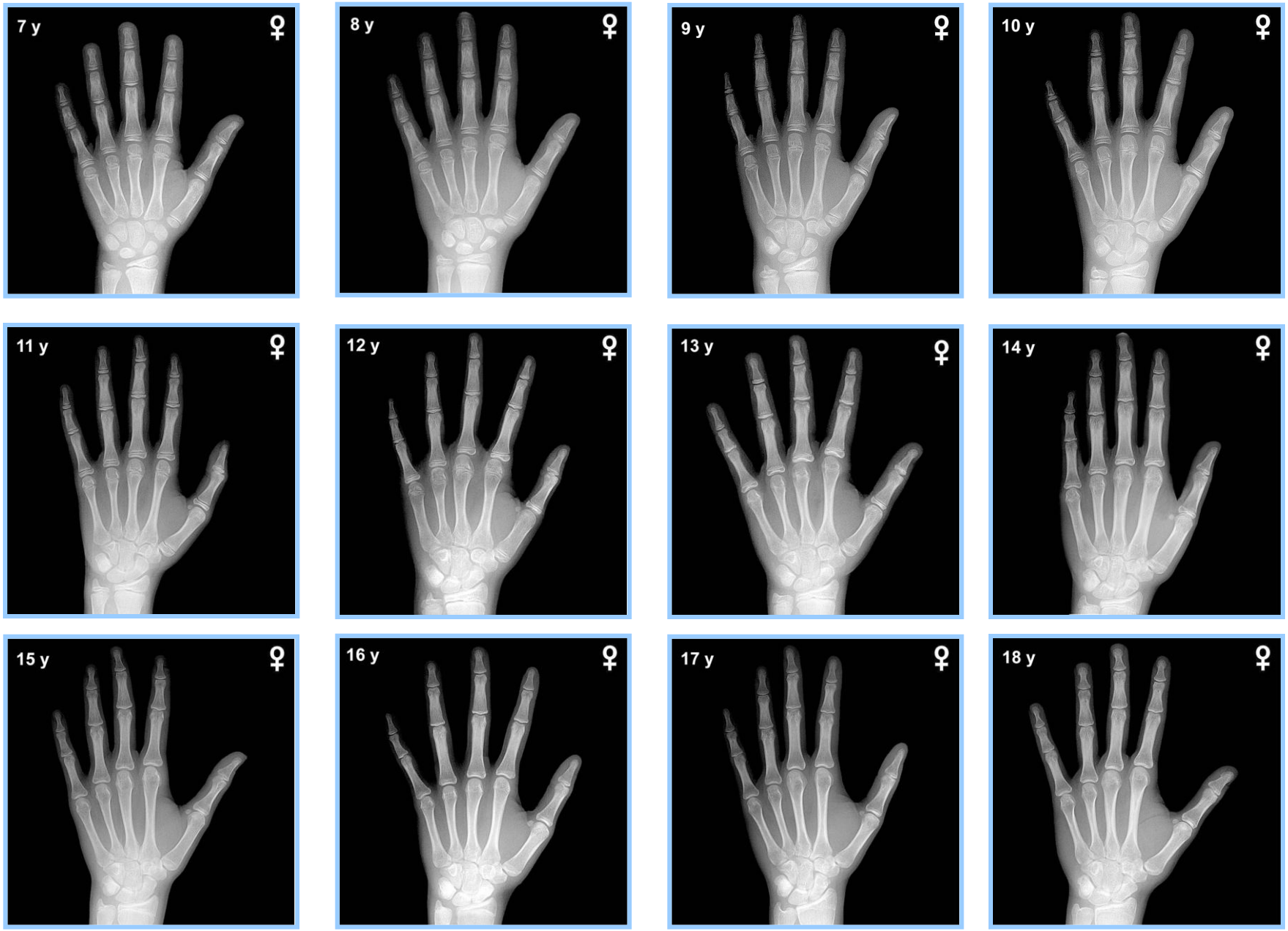


Hypopituitarism : Delayed bone age

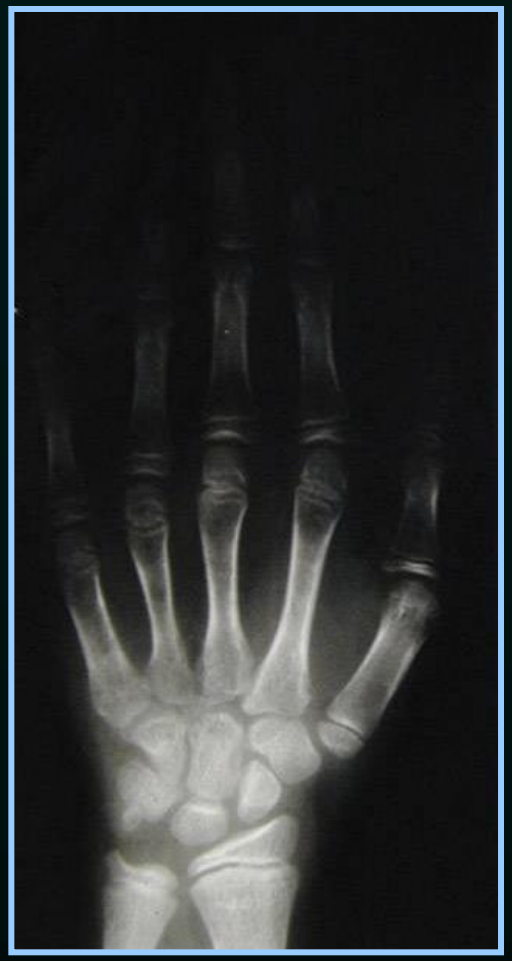
Epiphyseal closure and bone maturation



Hand bone age reference: Girls

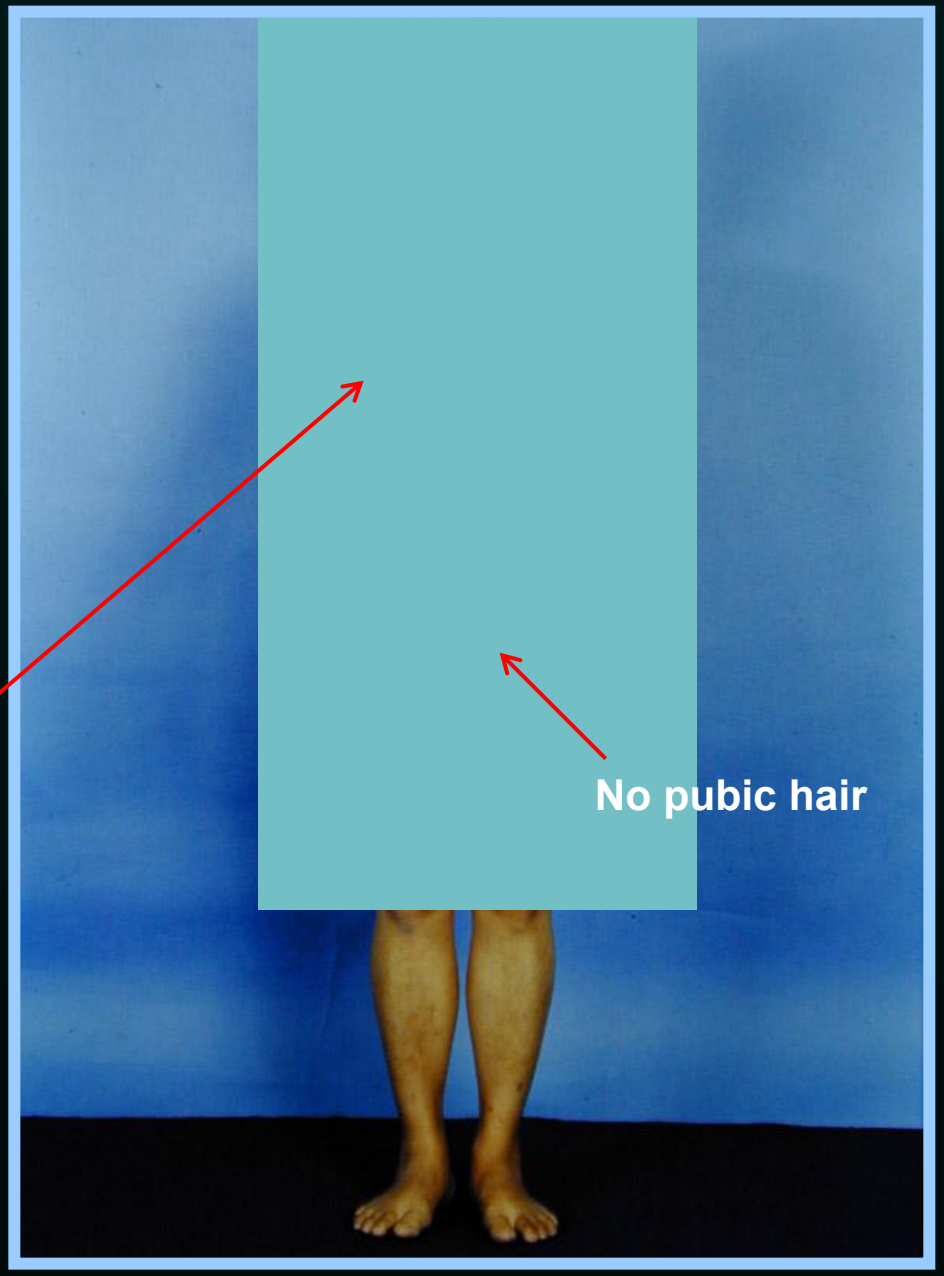


Bone age assessment/estimation



Describe the abnormalities

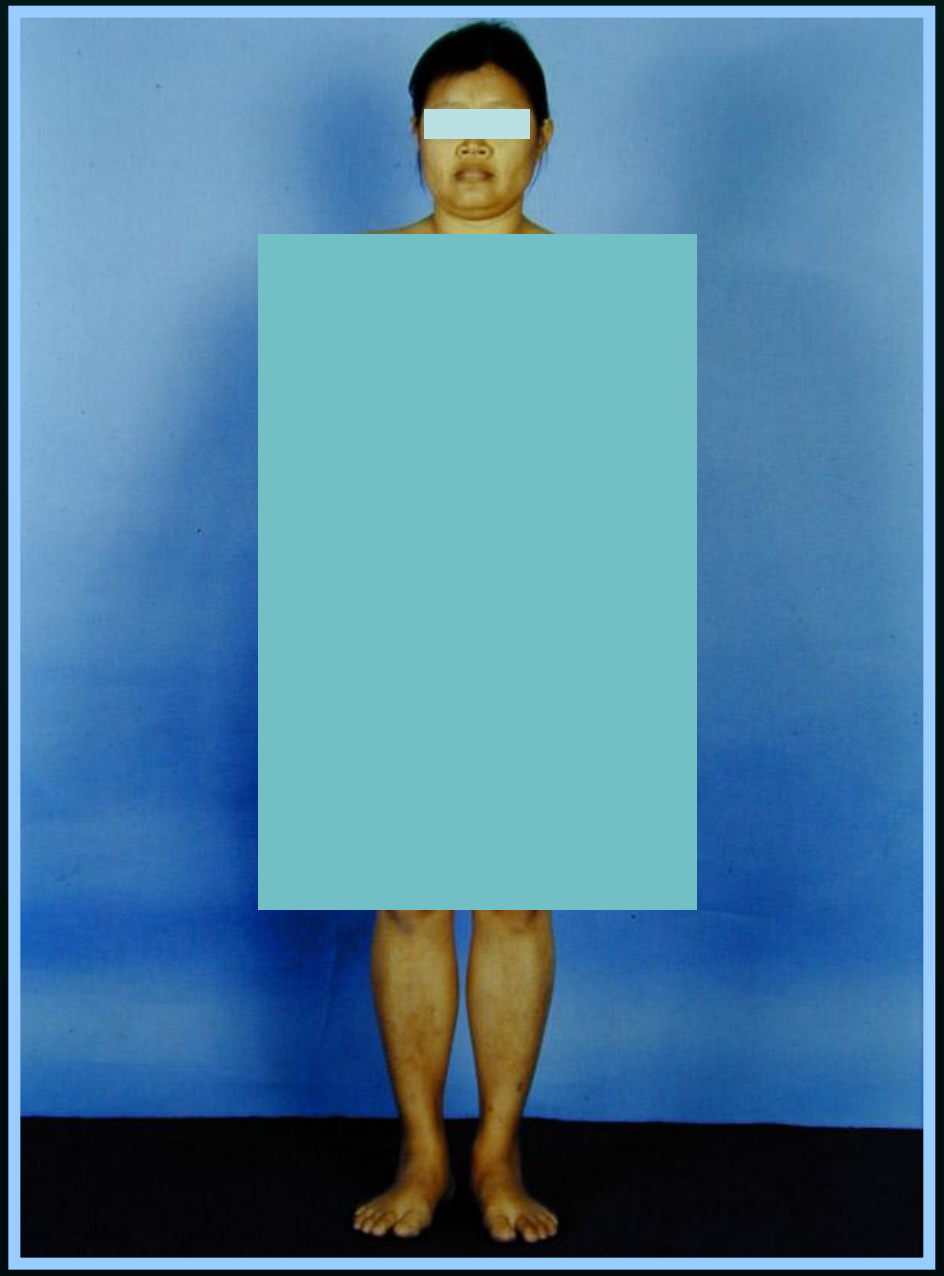
- Female
- 34-year-old
- Hypotension after car accident



Describe the abnormalities

- Female
- 34-year-old
- Hypotension after car accident
- Additional history
- Had 2 kids (G2,P2,A0)
- No lactation after G2
- 2° amenorrhea
- Easily fatigue

Adult-onset hypopituitarism



Galactorrhea

Definition

- Spontaneous flow of milk from the breast
- Non-pregnant
- No lactation

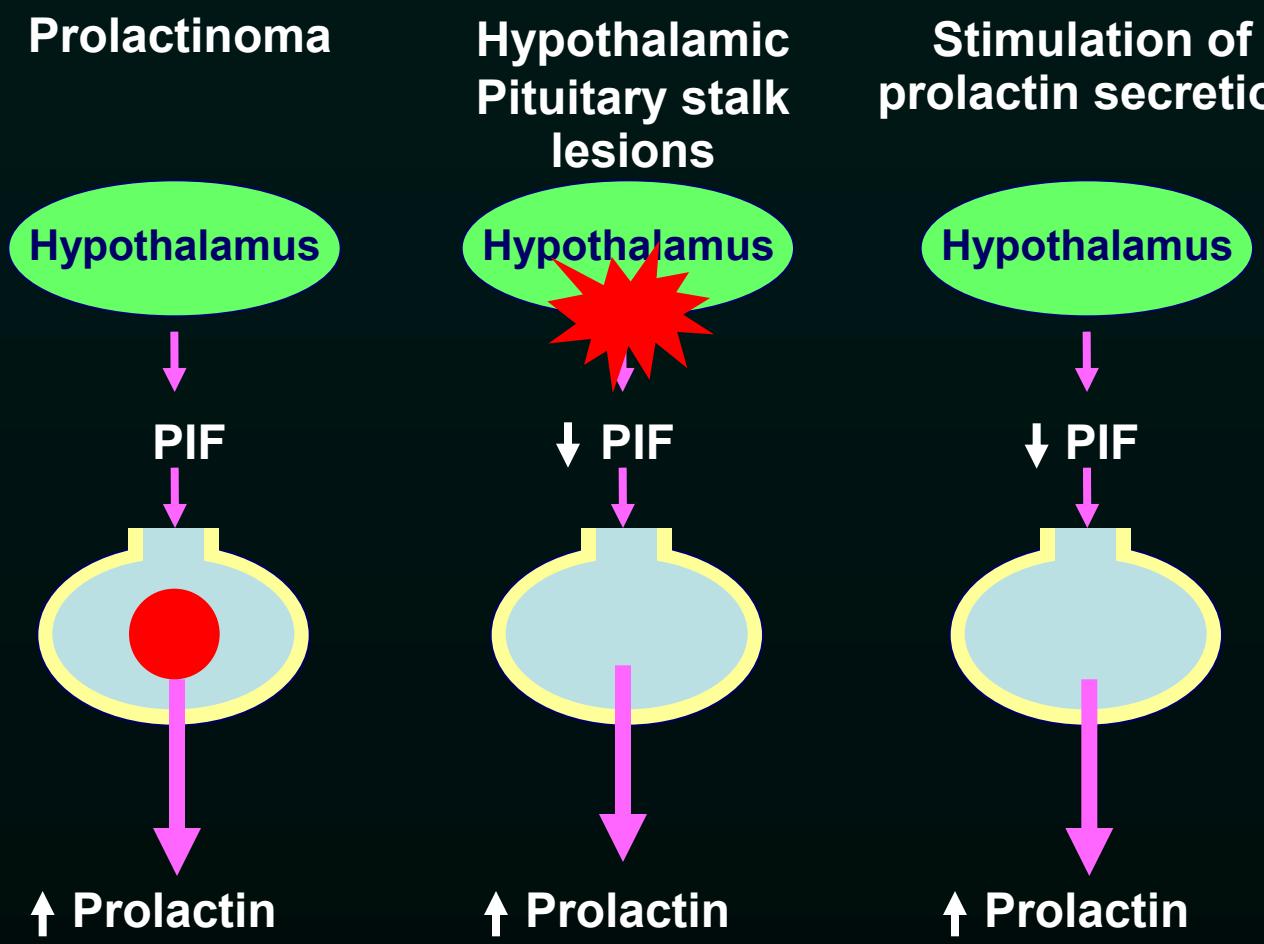
Characteristics

- Bilateral (usually)
- Milky color
- Fat globule

Mechanism

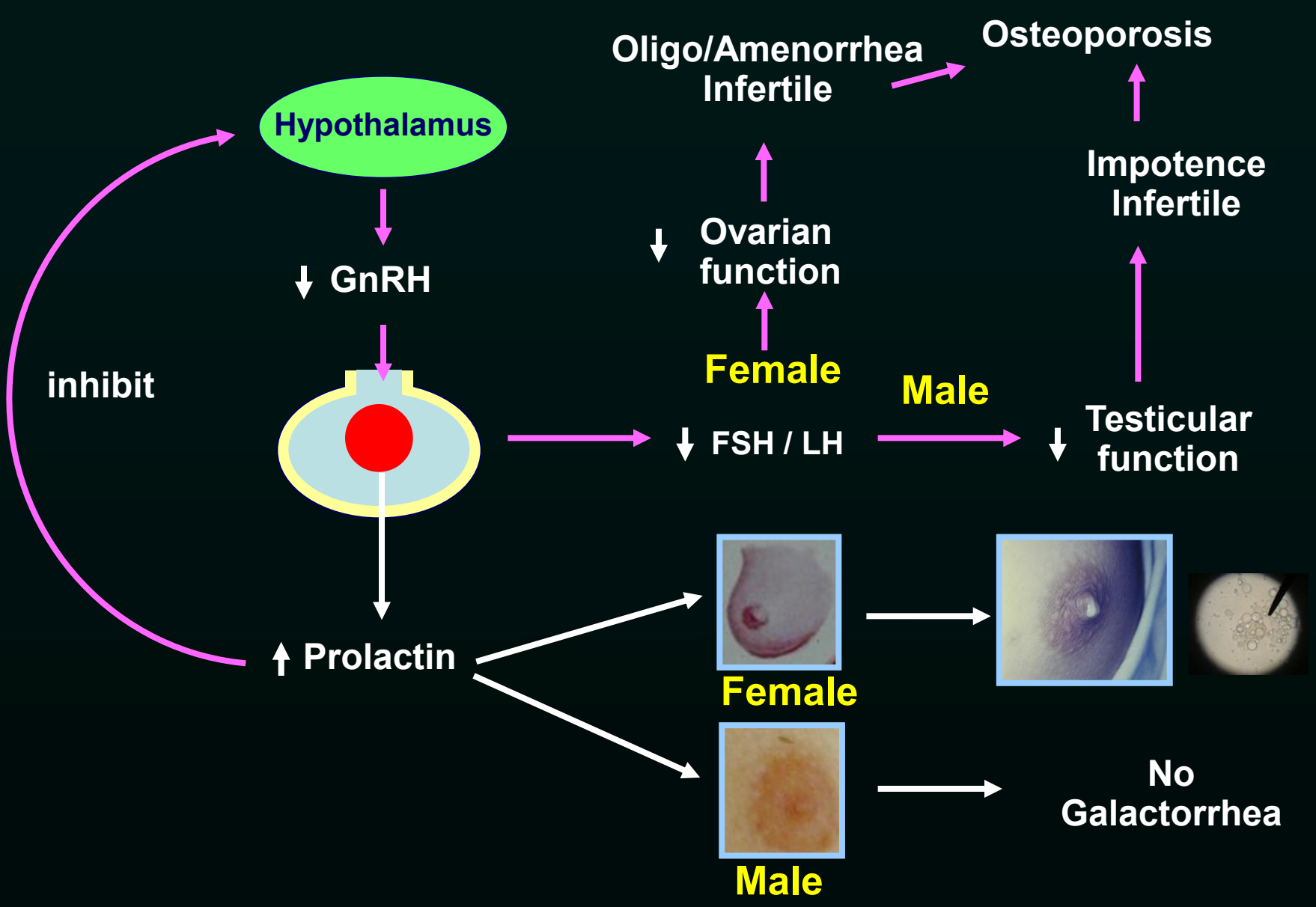
- Estrogen priming breast tissue (mammary galnds)
- Prolactin stimulation

Causes and mechanisms of hyperprolactinemia

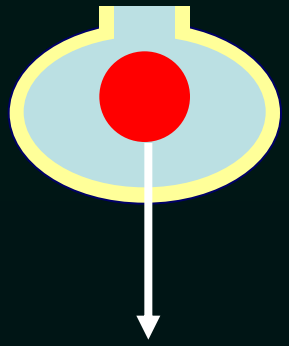


- Breast stimulation
- Pregnancy
- Stress
- Medications
  - Estrogen
  - Antidepressants
  - Antipsychotics
  - Antiemetics
  - H_2-blockers
- 1°Hypothyroidism
- Renal failure

Effects of hyperprolactinemia: Female and Male



Growth hormone excess

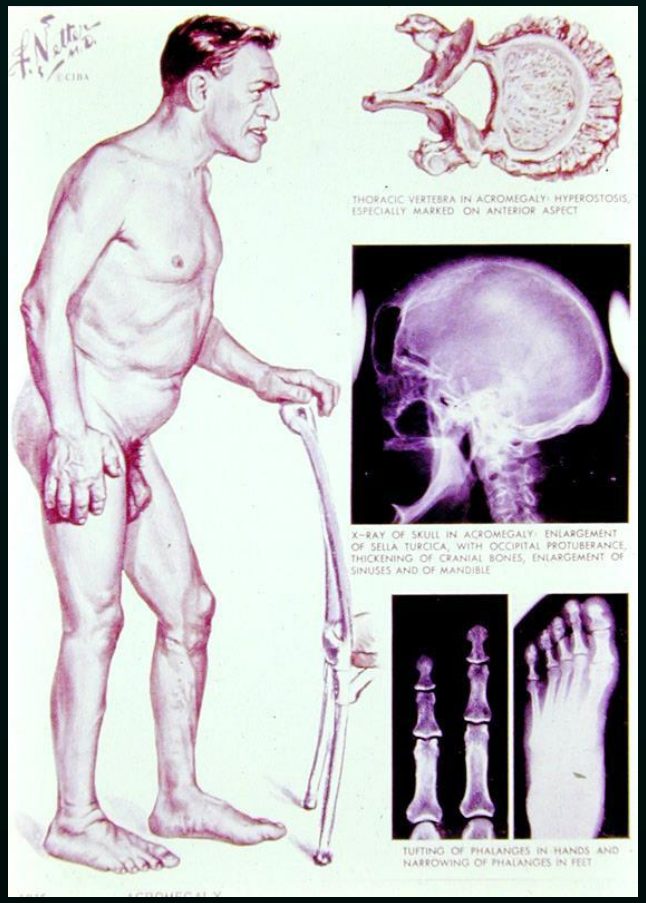


↑ Growth hormone

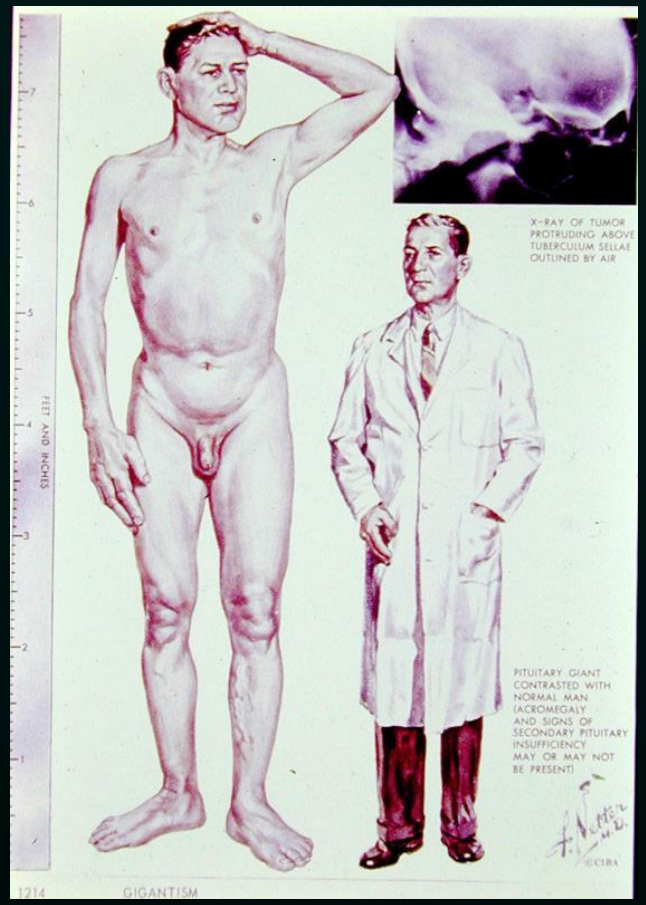
↑ IGF-1

ACROMEGALY

GIGANTISM



ACROMEGALY



GIGANTISM

Acromegaly

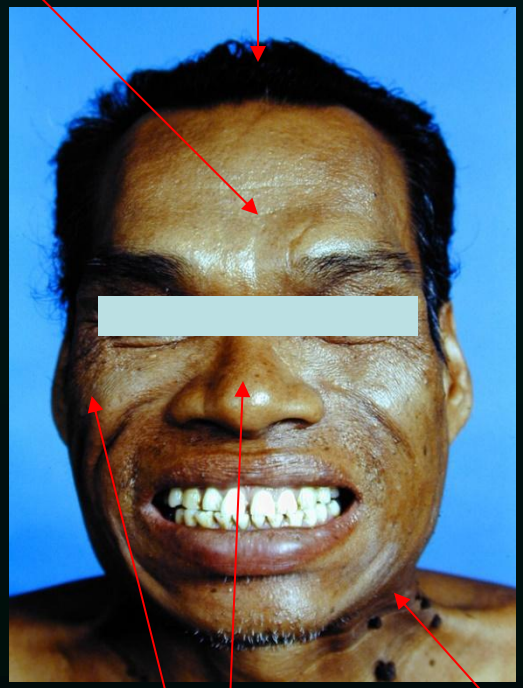
- Facial changes
  - prognathism, widening tooth spaces
  - increased size of malar and nasal bones
  - frontal bossing
  - skin thickening of forehead, scalp, lips
  - cutis verticis gyrata
- Macroglossia (thick tongue)
- Acral enlargement
  - spade-like hands, heel pad thickening
- Coarse and oily skin, skin tag
- Carpal tunnel syndrome
- Joint overgrowth, joint capsule thickening
- Organomegaly: thyroid, spleen, heart
- Abnormal glucose tolerance: DM, IGT
- Hypertension
- Colon cancer (associated with skin tag)

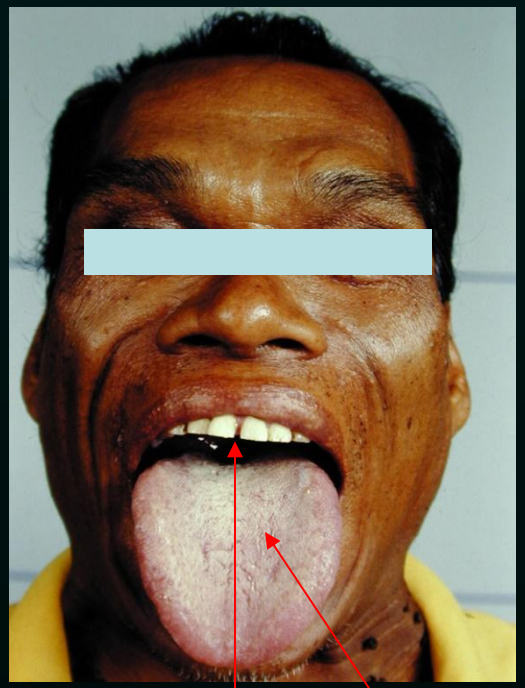
Acromegaly

Thickening of forehead

Frontal bossing

Thickening of scalp
Cutis verticis gyrata





Thickening of lips

Skin tag

Coarse and oily skin

Increased size of nasal and malar

Prognatism

Widening tooth space

Macroglossia

Acromegaly: macroglossia

Acromegaly

- Acral enlargement
  - spade-like hands,
  - Heel pad thickening
- Carpal tunnel syndrome
- Joint overgrowth, joint capsule thickening
- Organomegaly: thyroid, spleen, heart
- Abnormal glucose tolerance: DM, IGT
- Hypertension
- Colon cancer (associated with skin tag)

Acromegaly with organomegaly

Frontal bossing

Prognathism

Thyroid enlargement

Acral enlargement
Spade-like hands

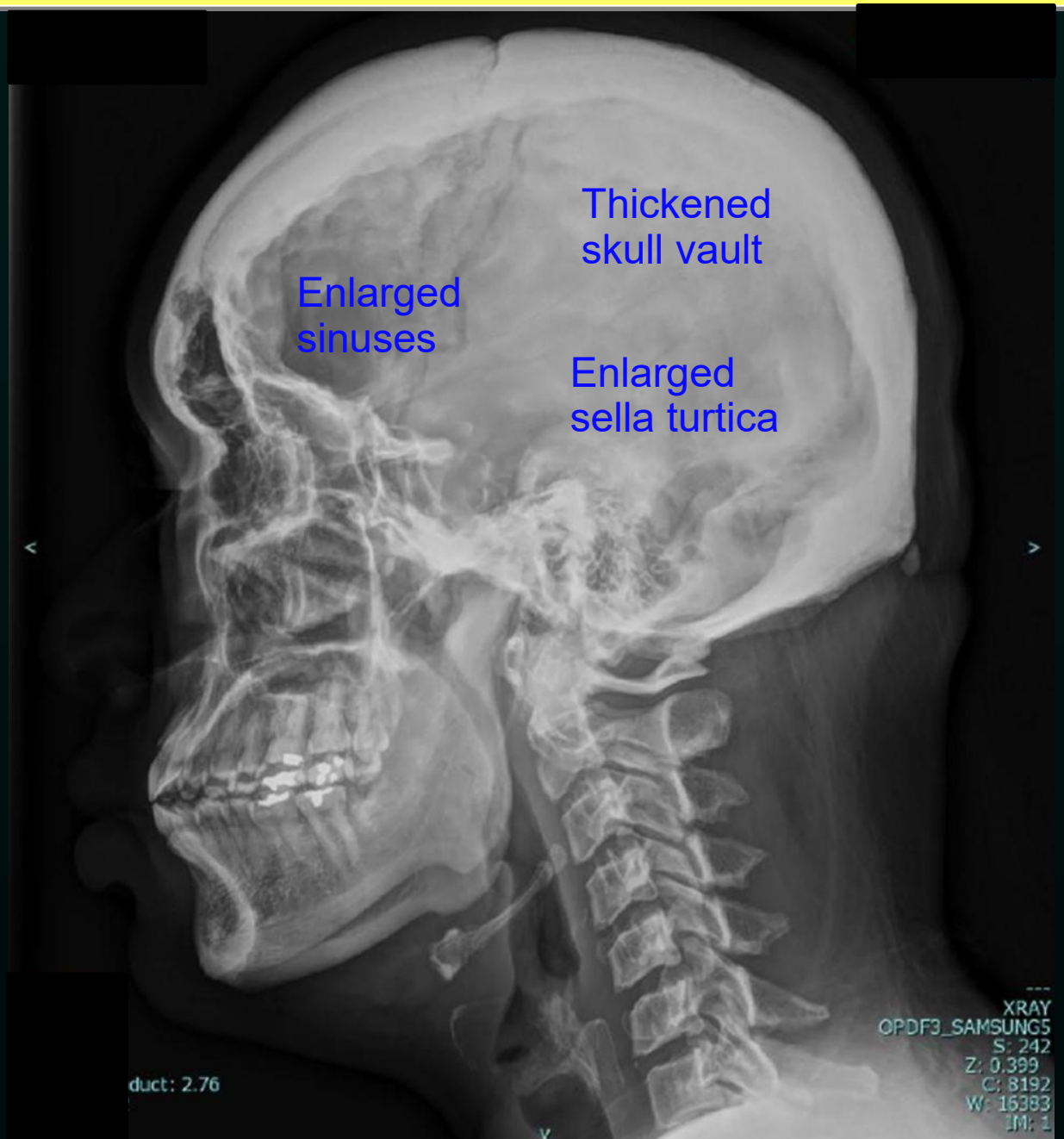
What are the differences?

What are the differences?

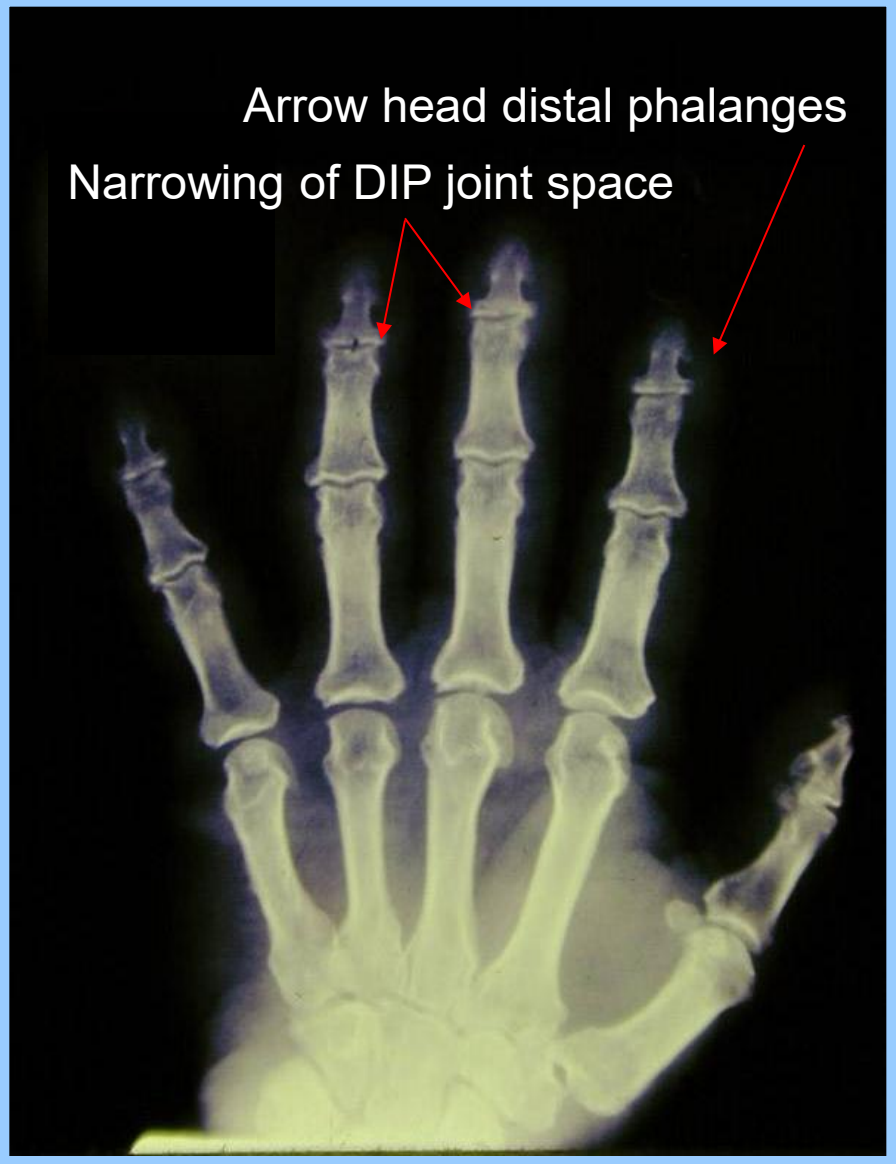
ACROMEGALY

NOT ACROMEGALY

Acromegaly : Skull x-ray



Acromegaly : Changes in bone and soft tissue



Acromegaly : Heel pad thickness

Thank you