PATHOLOGY OF THE ENDOCRINE SYSTEM

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Pituitary gland pathology

Pathology of anterior pituitary gland.

According to symptoms of anterior lobe pathology: there are 3 syndromes

I. *Hyperpituitarism:* This disorder arises from *excess secretion of anterior lobe hormones (Trophic hormones).*

- ***Causes:***

1. Adenoma of anterior pituitary lobe (most common cause of hyperpituitarism).
2. Hyperplasia of anterior lobe.
3. Carcinoma of anterior lobe.
4. Ectopic hormones secretion (many non pituitary tumors are secreting many hormones resemble to those of anterior pituitary lobe resulting in hyperpituitarism).

II. ***Hypopituitarism.***

This disorder is *caused by deficiency of trophic hormones of anterior lobe* .

Causes:

1. Ischemia.
2. Surgery or radiation to CNS.
3. Inflammation.

4. Non-functioning pituitary adenoma.
 Which destruct adjacent pituitary tissue lead to hypopituitarism.

III. *Local mass effects.*

Earliest changes related to mass effects of pituitary tumors are:

1. Expansion of Sella turcica.
2. Erosion of surrounding bones.
3. Compression of optic chiasma results in visual field defect.
4. Signs of increase intracranial pressure like headache, vomiting, nausea….etc.).
5. Invasive pituitary adenomas are those extend beyond the Sella & produce seizure or fit, cranial nerve palsy.

Hyperpituitarism & Pituitary Adenomas

- Mostly due to adenoma of anterior lobe.
- Functioning pituitary adenomas are usually composed of a single cell type & produce a single predominant hormone like prolactinoma, GH adenomas….etc.; however
- Some of the pituitary adenoma secretes more than one hormone type although composed of single cell type.

Classification of adenomas

- (a) Morphologic classification (acidophilic adenoma, basophilic adenoma & chromophobe adenoma).

This classification is of little functional & clinical significance.

- (b) Adenomas are classified according to hormones produced by their neoplastic cells & detected by immunohistochemical (IHC) stains. Into:-

1. Prolactin cell adenoma 20%-30%.
2. Growth hormone adenoma 5%.
3. Mixed growth hormone / prolactin 5%.
4. Adrenocorticotropic hormone cell adenoma 10%- 15%.
5. Gonadotrophic hormone cell adenoma 10%- 15%.
6. Null cell adenoma 20%.
7. Thyroid stimulating hormone cell adenoma 1%.
8. Other 15%.

Pituitary adenoma account for 10% of intracranial tumors.

They are usually in adults; peak age incidence is between 4th & 6th decades.

(C) Pituitary adenomas are also classified according to their size into:-

I. Macro adenomas (if they are exceed 1cm in diameter).

II. Micro adenomas (their diameter are less than 1cm).

Morphology of pituitary adenoma

Usual *pituitary adenomas are characterized by the followings*

1. Well circumscribed, soft.
2. Small adenomas are confined to Sella turcica.

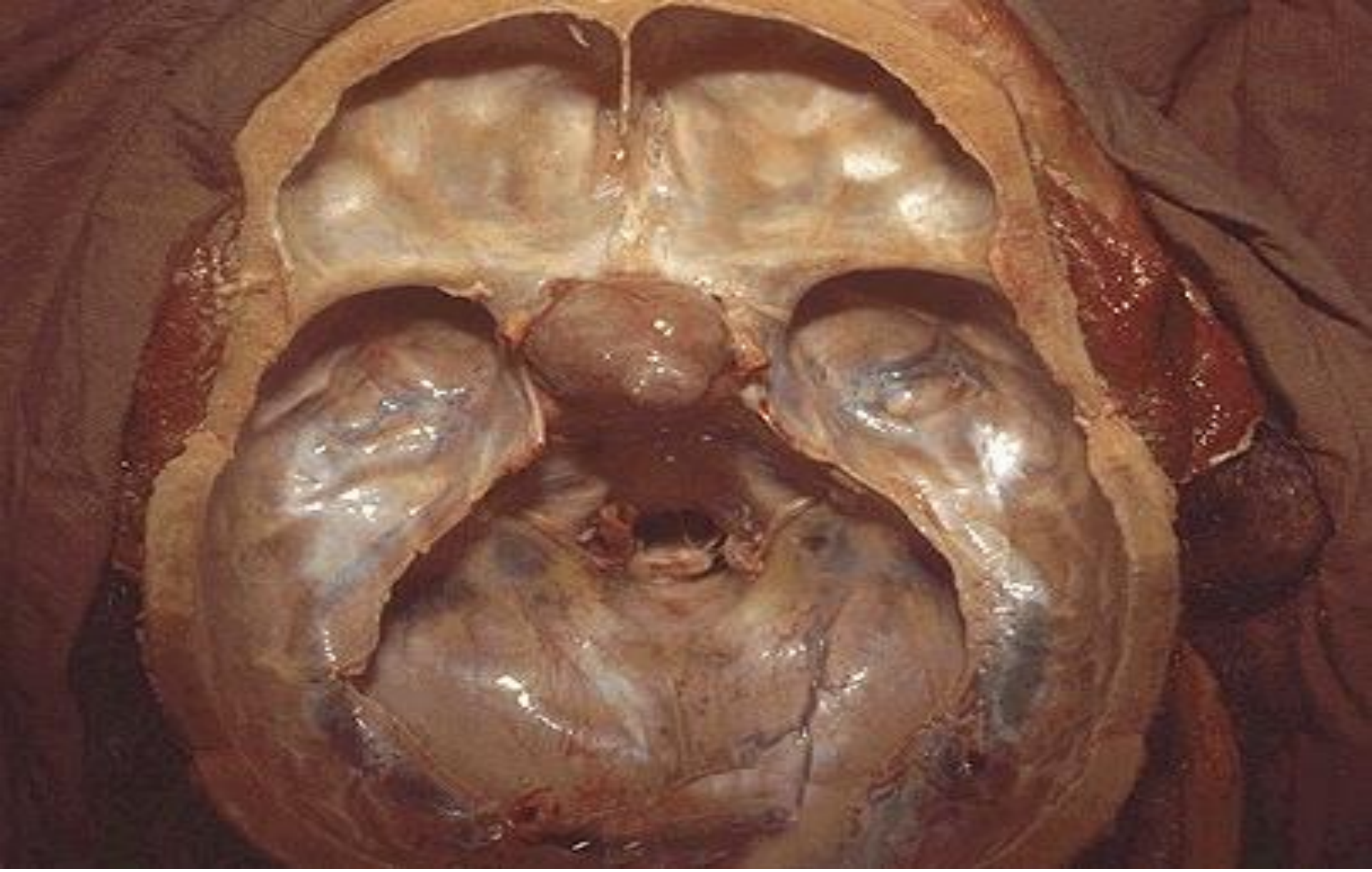
While larger tumors are extend to suprasellar region.

3. (30%) of cases are invasive adenoma (noncapsulated & infiltrate the adjacent bones, dura, uncommonly brain).

4. Adenomas are composed of sheets or papillae of uniform cells with sparse support connective tissue.

5. Nuclei of neoplastic cells are uniform or pleomorphic with scanty mitotic activity.

6. Cytoplasm of neoplastic cells may be acidophilic, basophilic, or chromo phobic.



Pituitary Adenoma

The most common functioning adenomas which cause hyperpituitarism are:-

I. Prolactinoma (prolactin secreting pituitary adenoma).20%-30%

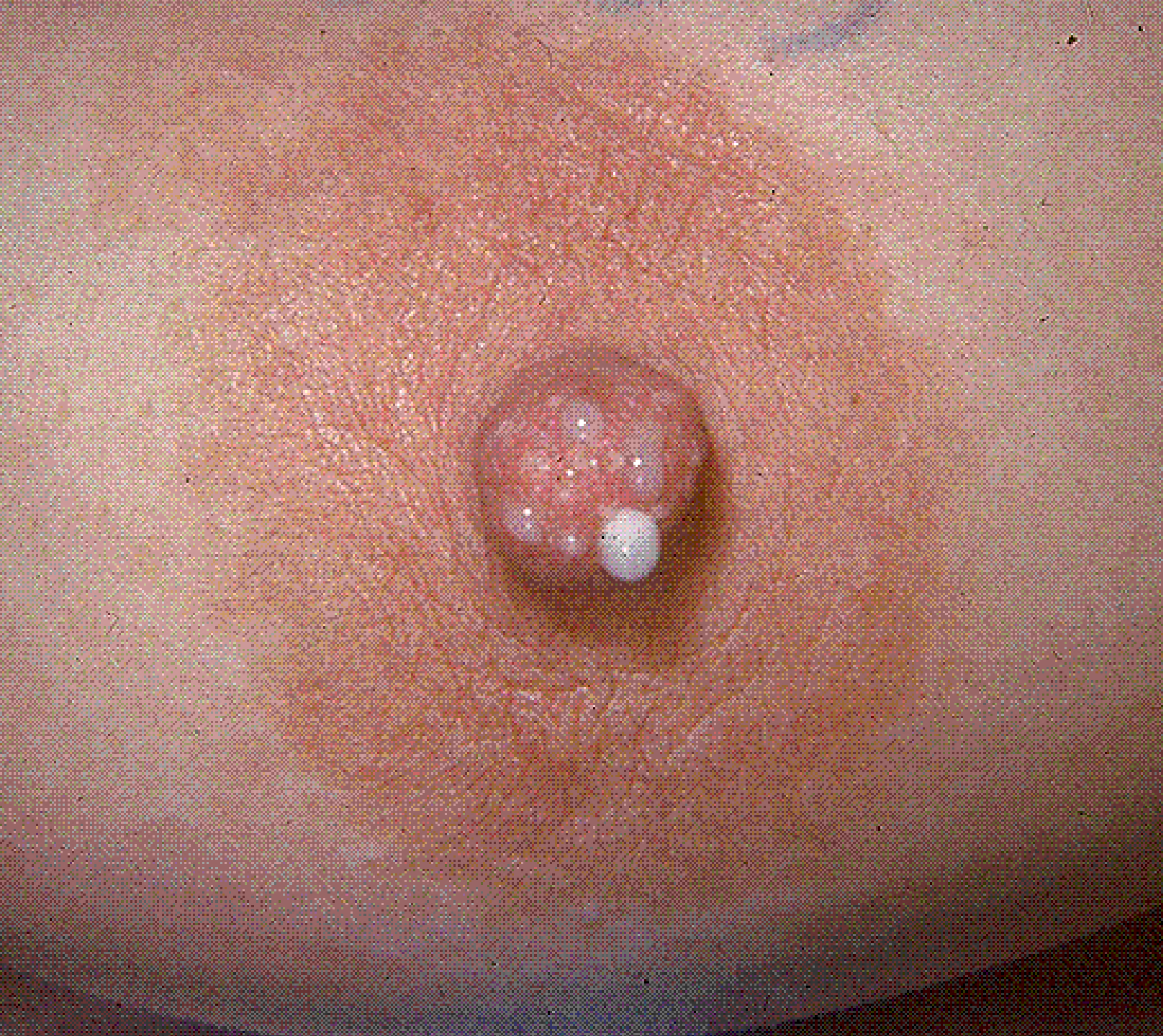
II. GH Adenomas (growth hormone secreting adenoma).5%

PROLACTINOMAS.

- Most common type of hyper functioning pituitary adenoma.
- Range from micro adenoma in young female to macro adenoma in male & postmenopausal female.
- These adenomas cause hyperprolactinemia which lead to different symptoms.
- **In female cause amenorrhea & galactorrhea while in male cause galactorrhea.**

Causes of hyperprolactinemia

1. Adenomas.
2. Pregnancy.
3. High dose of estrogen treatment.
4. Renal failure.
5. Hypothyroidism.
6. Hypothalamic tumors.
7. Suprasellar tumors that press the stalk between the pituitary & hypothalamus.
8. Dopamine inhibitor drugs. Like reserpine.



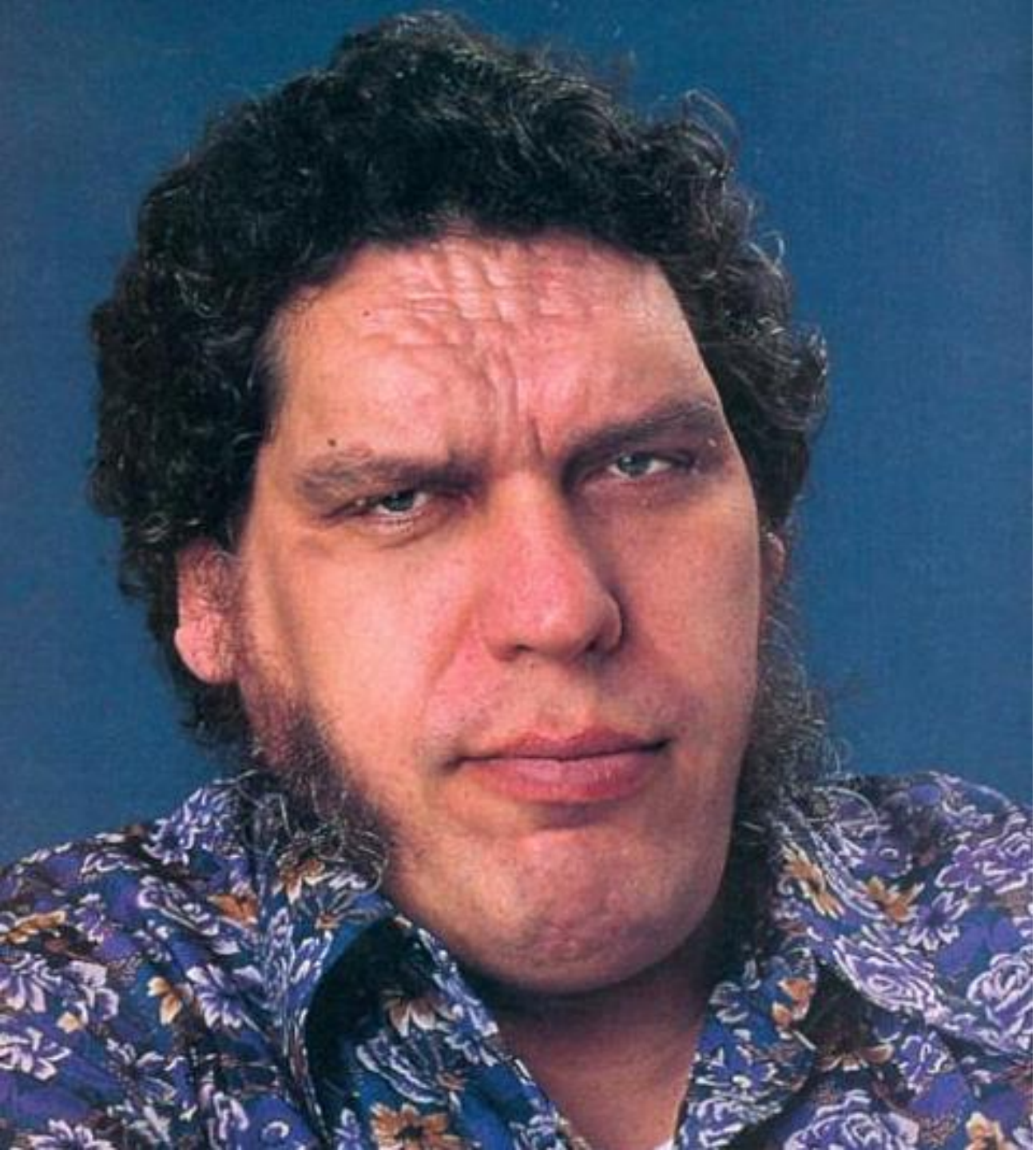
GALACTORRHEA

Growth hormone Adenomas

- Second most common type of hyper functioning pituitary adenoma.
- Usually macro adenoma at the time of diagnosis.
- Secrete excess GH. that causes clinical symptoms depend on age of patient.

In early age during childhood, it will result in clinical condition called Gigantism (increase in size of body before the closure of epiphyseal plate).

While in young age & adult after the closure of plate result in acromegaly (bone & soft tissue enlargement).



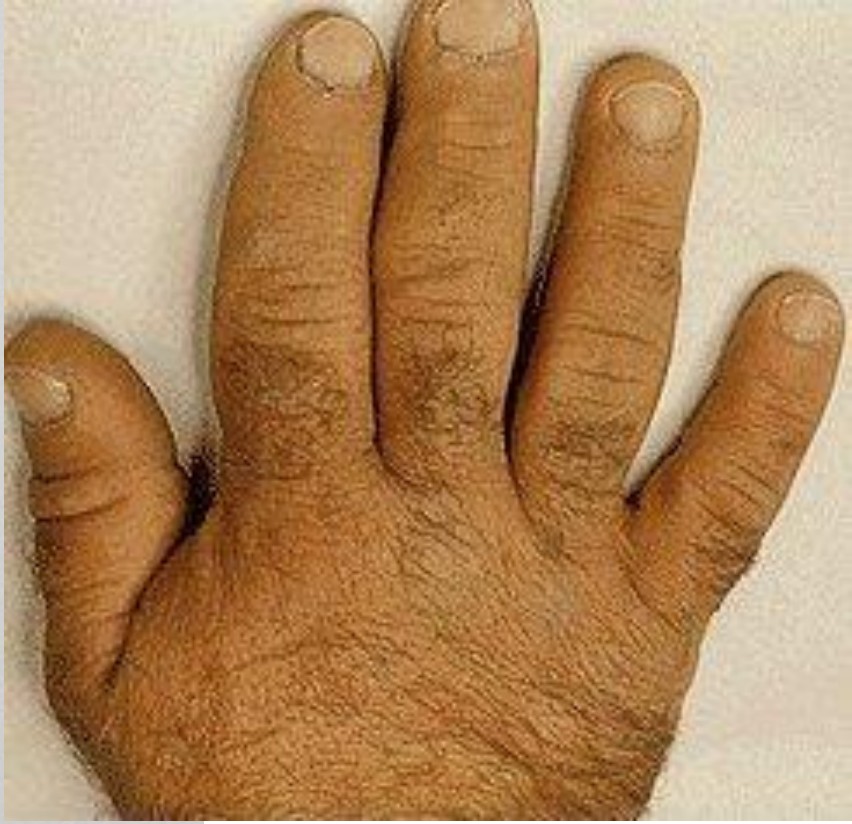
GIGANTISM

(excess somatotropin [GH]

BEFORE

epiphyseal

closure)



ACROMEGALY:

(excess somatotropin [GH] AFTER epiphyseal closure)

Hypopituitarism

Means hypofunction of the anterior pituitary gland. Which occur with loss or absence of 75% or more of the anterior pituitary parenchyma.

Causes.

1. Congenital causes.
2. Acquired causes. Which include :-
   (a) Non secreting pituitary adenomas.
   (b) Ischemic necrosis of pituitary.
   (c) Ablation of pituitary by surgery or radiation.
   (d) Other like . Empty Sella syndrome.
   Sarcoidosis, tuberculosis.
   Metastatic tumor.

- **Nonsecreting pituitary adenomas.**
- These adenomas compress anterior pituitary gland sufficiently which lead to hypopituitarism.
- May occur as a consequence of gradual enlargement of the adenomas or as a result of acute hemorrhage (pituitary apoplexy).

Ischemic necrosis of the pituitary (Sheehan syndrome).

- Means destruction of large amounts of the anterior pituitary parenchyma (>/= 75%) and as a result sings & symptoms of hypopituitarism will develop.

- **In general, the anterior pituitary gland tolerates ischemic insults fairly well; loss of up to half of anterior pituitary parenchyma is without clinical consequence.**

- **Sheehan syndrome** or postpartum necrosis of anterior pituitary is the most common form of clinically significant Ischemic necrosis of anterior pituitary.

Pathogenesis of Sheehan syndrome:

- During pregnancy, anterior pituitary enlarges considerably, largely because of increase number & size of prolactin secreting cells; however, this physiologic enlargement of the gland is not accompanied by an increase in blood supply from the low pressure portal venous system, such enlarged gland is vulnerable to this ischemic injury in patient who develops significant hemorrhage & hypotension during peripartum period.

The posterior pituitary gland which receive blood supply directly from arterial branches, is much less susceptible to ischemic injury.

Other causes of ischemic necrosis of anterior pituitary are (DIC, Sickle cell anemia, Shock of any origin).

- Clinical features of hypopituitarism depend on the specific hormones that are lacking such as:

1. Dwarfism (growth failure in children) as a result of GH deficiency.
2. Amenorrhea, infertility in women & loss of libido, impotence in male due to lack of GnRH.

Posterior pituitary pathology

The clinically important posterior pituitary syndromes are:-

1. Diabetes insipidus (Deficiency of ADH).

2. Secretion of inappropriately high level of ADH (SIADH).

- Diabetes insipidus.

A condition characterized by excessive urination (Polyuria) caused by inability of the kidney to properly reabsorb water from the urine due to deficiency of ADH.

Under normal condition, ADH acts on collecting ducts of kidney to promote water reabsorption from the urine & so prevents the urination.

Causes

1. Head trauma.
2. Neoplasms & inflammatory disorders of hypothalamus & pituitary.
3. Surgical procedures involving the hypothalamus or pituitary.
4. Idiopathic.

Secretion of inappropriate high level of ADH (SIADH).

A clinical syndrome characterized by excess ADH secretion. It causes reabsorption of excessive amounts of free water, with prominent hyponatremia,ADH excess is caused by a number of extracranial and intracranial disorders.

Causes.

1. Extracranial disorders: include ectopic ADH secretion by malignant neoplasms (particularly small cell carcinoma of the lung).

2. Intracranial disorders: trauma to the hypothalamus and / or pituitary.