PITUITARY GLAND

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The Pituitary gland or " Hypophysis" is a small pea sized compound endocrine gland located in a the sella turcica – a concavity in the sphenoid bone. It is situated immediately just behind the optic chiasma and remain connected to the brain through infundibulum.

Most of the endocrine glands & all somatic cells are stimulated by the secretion from this system. The pituitary is an essential link in the neuro endocrine system so inturns the pituitary gland is regulated by nervous and neurosecretory stemming from the hypothalamus or by blood borne agents that are carried through the hypothalamus . It is subservient to the nervous and endocrine system & hence reflected as "Master gland " of the body .The female pituitary is slightly larger than the female.

The pituitary has a dual origin embryologically. It is originated from Rathek 's pouch an evagination from roof of the primitive oral region and is met by an out-pouching of the floor of the 3rd ventricle destined to become neurohypophysis. The Rathek'pouch undergoes much more extensive proliferation to form adenohypopysis or anterior lobe.

- **HISTOLOGY**:- The human pituitary can be divided into following manners-

A.) Adenohypophysis or Anterior lobe- It is the largest and 2/3 of the gland and is composed of three lobes—

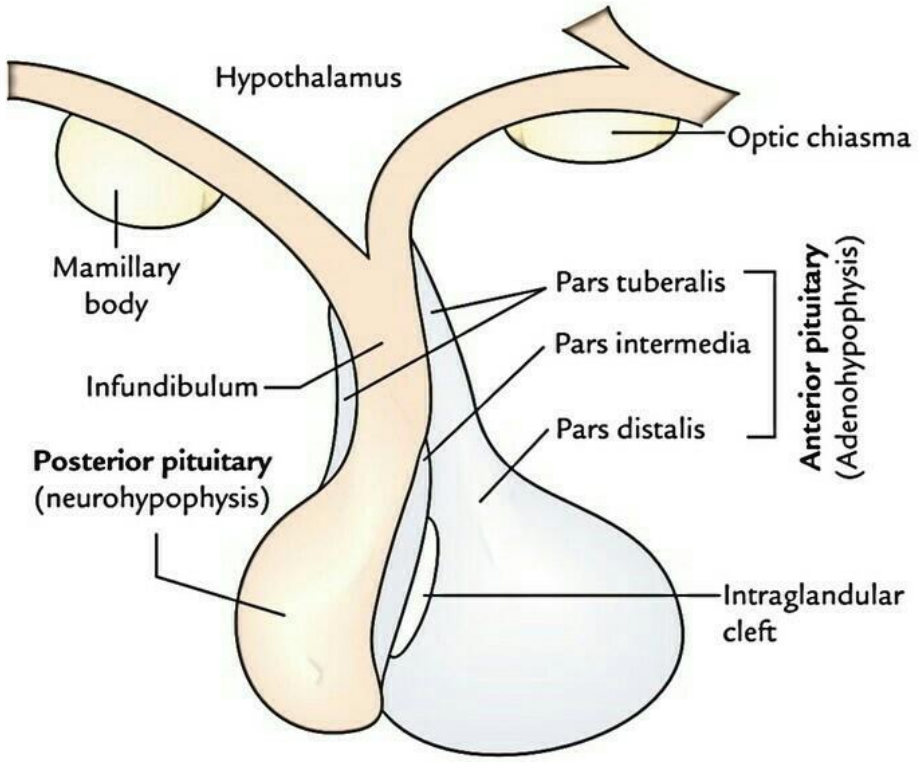
1. Pars distalis – It forms anterior two third of the gland and covers the pars nervosa on the anterior and ventral side. It is composed of irregular masses and cord cell. Two types of cells called Chromophils and chromophobes and framework of connective tissue and blood sinusoids are present in between. BALKER (1974) and TAURETTETA etal (1969) have studied the cell types of the pars distalis on the basis of the differences in cytoplasmic granules, ER ,mitochondria ,Golgi, nucieus etc . On these basis pars distalis contains two kinds of acidophills and four kinds of basophills.

2. Pars tuberalis – Pars tuberalis is athin epithelial plate of cells that is formed by the fusion of two outgrowth of the embryonic pars distalis.Their cells are undifferentiated having α and β or acidophilic and basophilic cells .These cells

contains granules lipid and colloid droplets .No definite function has been assigned to it.

3. Pars intermedia – It is present between the pars distalis and neural lobe. It is composed of polygonal basophilic cells. There is no functional significance of this region.

B.) Neurohypophysis or Posterior lobe – The pars nervosa consists of branching cells called pituicytes which is modified neuroglial cells and a thick network of unmyelinated nerve fibers coming from the hypothalamic nuciei.The pituicytes have no endocrine function but supporting role only. The nerve cell of hypothalamus called neurosecretory cells secreate "Releasing factor" which reach to the anterior pituitary through the hypothalmo- hypophysial portal system.



PITUITARY GLAND OF MAMMAL

- **Physiology** - Control of hormone secretion from pituitary is modulated by regulating factor coming out from hypothalamus. The following are the hypothalamic hormones which control secretion of pituitary hormones-
  1. Corticotrophin (ACTH) releasing hormone or CRH or CRF.

2. Thyrotrophin (TSH) releasing hormoneor TRH.
3. Leutinizing hormone (LH) releasing hormone LHRH or LHRF.
4. Follicle stimulating hormone (FSH) releasing hormone FSH—RH
5.Growth hormone (GH) releasing hormone GHRH.
6. Prolactin releasing hormone PRH or PRF.
7.Melanocyte stimulating hormone(MSH)releasing hormoneMSHRH.

In these instances, both stimulating and inhibiting regulators are known. This "ON &OFF" regulation may be particularly useful for rapid control of pituitary secretion.

Hormones of Ant. Pituitary—

A.) Somatotrophin (Growth hormone) - It is single polypeptide globulin secreted by acidophilic cell of adenohypophysis.

FUNCTION –

- It does act directly on target tissues,having variety of effects on different tissues, including muscles, adipose tissues and liver.
- In general it causes total growth and gigantism in children . GH deficiency in children result in dwarphism. The hypophysial dwarf are frequently immature sexually and at adult age may attain a height no taller than 3 or 4 feet.The head is generally large in relation to the body.
- Hypersecretion of the hormone after the usual age result in "Acromegaly" or overgrowth of the bone of hand and feet, jaw, cheek, face. There is a bowing of the spine.
- It stimulates overall protein synthesis results in a pronounced increase in nitrogen and phosphorous retention. Blood amino acid and urea are decreased . Thus growth hormone act synergistically with insulin.
- It is lipolytic and release free fatty acid and glycerol.
- In muscles growth hormone antagonises the effect of insulin, impairment of glycolysis occur at several steps as well as inhibition of transport of glucose.It promotes glyconeogenesis from amino acids.
- It increases intestinal absorption of calcium,sodium, potassium, magnesium and phosphorous.
- It stimulates mammary gland , lactogenesis etc.

2. PITUITARY TROPHIN—

- GONADOTROPHIN- FSH promotes follicular growth,prepare the follicle for the action of LH and enhance the release of estrogen induced by LH.
- In male, it stimulates seminal tubules and testicular growth and play an important role in early stages of spermatogenesis.

- LH—In female it stimulates final maturation of the graffian follicle. Ovulation and the development of corpora lutea. Both estrogen and progesterone secretion are stimulated.
- In male, LH stimulates testosterone production by the testis and influence the development of accessory sex organ such as vas deference, prostrate and seminal vesicle.
- **PROLACTIN—**It stimulates the corpus luteum to continue progesterone production.
- It increases during pregnancy and may stimulate mammary development.
- **3.THYROTROPHIC HORMONE OR TSH —**
- It is glycoprotein of about 10000 mol.wt and consists α and β subunits; the biological specifity of thyrotrophin lies in β subunits.
- Thyrotrophin rapidly increases each phase of thyroxine metabolism including iodine uptake,organification and finally the breakdown of thyroglobulin with the consequent release of thyroid hormone.
- Less secretion of TSH causes HYPOTHYROIDISM reflected through goiter, slow metabolism and BMR.
- HYPERTHYROIDISM OR more secretion of TSH causes Grave disease. With protruded eyes and high BMR.

4.CORTICOTROPHIN OR ACTH—

- It is a straight chain polypeptide. It increases the synthesis and release of corticosterol by the adrenal gland.
- ACTH stimulation results in an increase in mineralocorticoids, glucocorticoids and androgens.
- ACTH is used as a non disease specific treatment of hypersensivity and inflammatory reaction.It is also used in the treatment of chronic cases of "ASTHMA".Its deficiency causes Addison's disease and oversecretion causes Cushing's syndrome.

HORMONE OF MIDDLE LOBE OF PITUITARY—

- Melanocyte stimulating hormone orMSH increase the deposition of melanin by the melanocytes of the skin.
- Both the hydrocortisone and cortisone inhibit the secreation of MSH.

HORMONES OF POSTERIOR PITUITARY (NEUROHYPOPHYSIS)—

- Vasopressin raises blood pressure. Its action on kidney is anti diuretic hence it is also called Antidiuretic hormone or ADH.
- It promotes facultative reabsorption of water.
- Vasopressin is an effective inhibitor of the gonadotrophic hormones especially LH.
- OXYTOCIN is increased during labor in female.
- It causes uterine contraction and contraction of smooth muscles in the mammary gland resulting in milk secreation.

HYPOPHYSECTOMY— Removal of pituitary or hypophysectomy results in following complications ---

1. Retarded growth

2.Degenerated gonads.

3.Atrophy of adrenal cortex.

4. Atrophy of thyroid.

5.Complete alternation of the carbohydrate, lipid and protein metabolism.

6. Pigmentation changes.

In man atumor of the pituitary is called Simmond' disease.