

Pituitary Adenoma

A Case Study

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Pituitary Gland

Pituitary gland is small-sized (weighing 0.5-0.7 grams only) and rests in sella turcica of the sphenoid bone. The gland is divided into two lobes: The Adenohypophysis (anterior lobe) and Neuro hypophysis (post lobe). The Adenohypophysis is composed of glandular tissue of epithelial cells whereas Neurohypophysis is composed of Nerve cells; the extension of the nerve fibres from Hypothalamus.

The Adenohypophysis has two types of epithelial cells: acidophils and basophils. Acidophils secrete Growth/Somatotropin (GH/STH) and Prolactin. Basophils secrete four hormones i.e. Thyrotropic (T.H), Adrenocorticotropin (ACTH), Follicle stimulating hormones (FSH) and Luteinising hormones (LH). Neurohypophysis secrete two hormones i.e. Oxytocin and Antidiuretic Hormones (ADH). Both of these glands (Lobes) are bind together as one gland but structurally and functionally these are entirely independent.

Associated Organs of the Pituitary Gland

Superiorly the gland is covered by extension of duramater known as diaphragm Sellae. Pituitary stalk attaches the body with hypothalamus. The optic chiasma, cisterns and anterior cerebral arteries are placed at the lateral sides of the gland. The third, fourth, sixth and 1st division of 5th cranial nerve, the carotid artery and cavernous sinus are situated anteriorly. Sphenoid air sinuses are found at the base of the gland.

Pituitary Adenoma

Pituitary Adenoma is a benign tumour which develops from pituitary adenohypophyseal paranchymal cells both acidophils and basophils. The Pituitary Adenomas affect the body through disturbing its hormonal secretions and by causing compression of the surrounding tissues.

Mr. X., a 23-year old male was admitted in the Neurosurgical unit of Nehru Hospital attached to Postgraduate Institute of Medical Education and Research, Chandigarh on 3rd March, 1983. He was diagnosed as a case of pituitary adenoma showing symptoms of acromegaly and gigantism. The diagnosis was confirmed through various investigations subtotal removal of pituitary adenoma was done on 10th June, 1983. The patient was discharged on 22nd June.

Assessment of the Patient

Patient's complaints:

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- Headache and vomiting
- Diminished vision in right eye-ptosis and diplopia.
- Distorted physical appearance of the body.
- Hoarseness of voice.
- Intolerance to cold.
- Lethargy and fatiguability.
- Chronic constipation.
- Scanty beard and loss of body hair.

Past History

History taken from the brother of the patient indicated that his physical growth was rapid than normal since childhood. He had an extrovert personality and remained very active till the age of puberty, the child liked to play with his peer group. Gradually he became lethargic and lost interest in work and play. There was a chance in the grooming habits also. Family members, who were unaware of the problem maltreated the child.

After some time his physical appearance became distorted; he became introvert. Alongwith disfiguring of the body he started having complaints like headache, vomiting and decrease of vision in right eye. The family members became alert and he was brought to hospital for check-up.

Preoperative Assessment of the Patient

Physical examination of pathophysiological basis of symptomatology.

- Musculoskeletal (Physical appearance) and endocrine system.
- Ophthalmic manifestation.
- Cardiovascular system.
- Neuro radiology.
- Endocrinological studies.
- Routine blood and urine examination.

Headache and Vomiting (Pathophysiology)

Headache and vomiting is caused by raised intracranial tension; initially it is caused by stretching of the diaphragm sellae. Later on Gross tissue changes in the dura also give rise to headache. Headache is usually followed by ophthalmic manifestations. Pressure on 3rd and 4th cranial nerves is manifested by ptosis and diplopia and diminution of the vision. Proptosis indicates maximum spread of the Tumour affecting the involved structures. The close proximity of sella Turcica and diaphragm sellea (5-8 cm) to optic chiasma and optic tract make them vulnerable to pressure from outgrowing pituitary tumour. Pressure on chiasma and optic nerve fibres produce visual field defects. These changes may also appear

due to ischaemic changes with obliteration of arterial and venous capillaries; large tumour may elevate the optic chiasma and nerves and press them against the firm structures of the neighbourhood bony margin giving rise to varied ophthalmic manifestations.

Muscle Skeletal and Endocrine System (Physical Appearance)

Physical appearance and some of the patient complaints have been discussed in relation to the hormonal disturbances in the patient. Hyper or hypo secretions of these hormones cause physical and physiological changes in body. Signs and symptoms of the patient are related with hypersecretion of growth and prolactin hormones and hyposecretion of the Thyrotropin and Gonadotropin hormones.

Growth Hormones/STH : On admission, the patient was 6'11" tall and weighted about 109 kg which was consistent with Gigantism and acromegaly. The other symptoms i.e. enlargement of the jaws and cheeks (Prognathism), elephantine feet and hyper extension of the fingers were also observed. Hyper extension of the fingers can be caused by softness of the bones. The patient develops hoarseness of voice since 5 years, which is caused by the increase in the mass of vocal cords and larynx. 75% of patients present signs and symptoms of diabetes mellitus i.e. polyphagia and polydipsia with moderately rise in blood sugar. These symptoms can also be caused by hypothalamic disturbance. Patient under study did not have these symptoms.

Over secretions of growth hormones from pituitary give rise to two main types of metabolic disturbances i.e. of protein and fat/glucose.

Protein Metabolism : Increased secretion of Growth Hormones promotes bodily growth, indirectly accelerating amino acid transport into cells. Faster the entrance of amino acid into cells, anabolism of aminoacids to form tissue protein also accelerates. This in turn promotes growth of both bone and soft tissues giving rise to gigantism and acromegaly during growth years.

Fat/Glucose Metabolism : In addition to the stimulating effect on protein anabolism, growth hormones also influence fat metabolism and hereby affect carbohydrate metabolism. Growth hormone accelerates both the mobilisation of fat from adipose tissue and their catabolism by other tissues. In other words catabolism of glucose is replaced by fat for supply of energy. It results in high blood sugar—resulting in diabetes mellitus. Growth hormone may also alter the sensitivity to insulin.

Prolactin Hormone

Though the prolactin hormone was tremendously high, yet no physical/physiological signs were observed in the patient. Dopamine which is released from the stalk of pituitary acts as an inhibitory factor to the secretions of prolactin. Tumours of pituitary or hypophysectomy give rise to permanent increase in prolactin level.

Thyrotropin or T.S.H. Hormones

Signs and symptoms of decreased secretion of Thyrotropin were observed in the patient, intolerance to cold was observed as the patient could not use fan, even during summer season. There was marked increase in body weight lethargy and fatigability was also observed. Patient had Brady-Cardia and Chronic Constipation, waxy and sallow skin.

Gonadotropin

Decrease of the gonadotropin hormone was evident of loss of libido and impotence since last 4 years, scanty beard and loss of body hair was also observed on the patient, which can also be caused with decreased secretion of adrenocorticotrophic hormone.

Ophthalmic Manifestations

Patient had proptosis of the right eye along with complaints of diplopia. These symptoms may appear due to paralysis of extra ocular muscles of the eye. It indicates the involvement of 3rd cranial nerve. Pressure can also produce proptosis which is indicative of maximum spread of the tumour. Seventy five percent of pressure was observed in the right eye and 25% in left. The following visual areas were examined in detail.

(a) **Eye Sight :** Eye sight in the right eye was markedly decreased, patient could count only finger near nose through projection rays. Visual acuity in the left eye was normal, i.e. 6/6 was observed.

(b) **Pupils :** Pupil of the left eye was normal in size and had brisk reaction to light, right pupil was normal in size but sluggish in reaction.

(c) **Fundus :** Fundus of the right eye showed primary optic atrophy. Disc was chalky, Shallow cupping with clear border margins. All the arterial and venous capillaries were normal. Disc of the left eye was normal.

(d) **Visual Field :** Visual fielding of the right eye was not done because atleast 30 cm distance is required for fielding but the patient could count only one finger near nose. Visual field of the left eye was done with 30 mm white object. It was observed that patient had upper and lower temporal hemianopia, which was extending towards the nose. Visual field defect of the left eye and its extension anti-clockwise is typical in pituitary tumours.

The close proximity of sella turcica and diaphragm sella (5-8 cm) to optic chiasma tract and optic nerve make them vulnerable to pressure from out-growing pituitary tumours. Pressure on the chiasma and optic nerve fibres produce visual field defects. These may also be produced by ischaemic changes as the result of obliteration of arterial and venous capillaries. Large tumours may elevate the optic chiasma and nerve and press them against the firm structures of the neighbourhood bony margins, giving rise to varied ophthalmic manifestation.

Cardiovascular Manifestations

Young acromegalic are prone to have hypertension with sodium retention which leads to heart failure and myocardial infarction. None of these problems was noted in the patient. His blood pressure was 110/80 mm Hg. Pulse 50/mt regular. X-rays Chest showed normal heart shadow, E.C.G. rhythm was also normal.

Neuro-Radiology : The following investigations were done for confirmation of diagnosis.

- X-rays skull (A/P and lateral view)
- CT Scan
- Carotid Arteriography
- X-rays knee joint
- X-rays heel pad.

X-rays Skull : Lateral and A/P view of X-rays skull was done for sellar evaluation. Enlarged Sella was evident of intra sellar mass.

CAT Scan : Plain and enhanced scan was done on 24th May, 1983. The report indicated that the vault was thick and big in size. Large size paranasal sinuses and mastoid cells were seen. Sella was enlarged in size. A big mass was extending anteriorly into sub frontal location and beyond midline more to the left side. Ventricular system was displaced posteriorly. It was finally diagnosed as a case of pituitary adenoma extending in suprasellar direction and in subfrontal region.

Carotid Arteriography : Left and right carotid arteriography was done with Conray 420. Blood supply from both carotid arteries was disrupted. Right carotid artery was not filling and left showed subfrontal extension.

X-rays Knee Joint : Soft tissue thickness was markedly increased and knee joint space was widened. Both the tibial spines were flattened.

X-rays Heel Pad : Heel pad thickness was 37 mm against the normal thickness of 22 mm (Seasamoid index was 36 mm, Calcaneus irregularity was observed). Diagnosis was consistent with acromegaly.

Slight osteoporosis on the bones was also seen on X-rays which is usually caused by decreased bone substance. Lack of anabolic hormones in hyperthyroidism, Diabetes Mellitus Acromegaly and cushing disease give rise to negative nitrogen balance resulting in osteoporosis of the bones. Lack of oestrogen permit resorption of bones at increased rate.

Endocrinology

The pituitary dysfunction can be detected by the measurements of hormones in plasma or in urine. The hormonal assessment of the patient was as below :

Growth Hormone : For testing growth hormone reserve, there is no peripheral target organ hormone to determine the effect of negative feedback relationship, Blood glucose to some extent serves this purpose, since the low blood sugar stimulates growth hormone and high sugar inhibits it.

Glucose tolerance test with 100 gm of glucose was done to assess the oppressability of the growth hormone of the patient. The findings were recorded every half hourly for the period of two hours. The values were recorded as below :

Time in mts.	Blood sugar mgm%	GH ng/ml
0 minute	40	340
0 -30	65	360
30-60	50	370
60-90	90	260
90-120	95	280

Growth hormone level remained abnormally high against the normal value 0-5 ng/ml. The surges of Growth Hormone up to 20-40 ng/ml have been normally recorded during growth years.

Thyrotropin : Assessment of the thyroid hormones was done as the patient showed symptoms of hypothyroidism. The findings were as below :

	Normal value
T ₃ = 0.7 Ng/ml	(0.6-1.2)
T ₄ = 68 „ „	(60-130)
T ₄ ... UD (undetected)	(0-57)

Results of the thyroid hormones were at the lower margins of normal values.

Prolactin

Value of the prolactin hormone was tremendously high. 2500 milli international units, per litre were recorded against the normal value of 750.

Cortisol

	Normal
8 AM = 180 m mole/L	(450-750)
8 PM = „ „ „	(250-450)

Cortisol testing was done twice during the day time. Levels remained abnormally low in each recording.

Management

Management of the patient was done under four different headings i.e. :

- Medical
- Surgical
- Nursing Intervention
- Radiation therapy.

Medical Management : The drugs as mentioned below administered, for the relief of symptoms of raised intracranial tension, to make up the hormonal deficiency and to relieve severe headache. These were :

- Inj. Efcorlin 100 mgm × 6 hourly.
- Inj. Dexamethasone 4 mgm × 6 hourly.
- Alludrox Gel. 1 ounce 6 hourly.
- Tab. Eltroxin 0.1 mg OD.

Surgical Management : Surgery for the patient was planned keeping in view the four major objectives, as below :

- (1) Relief of chiasmal compression.
- (2) To retard excessive production of hormones.
- (3) To relieve headache.
- (4) To reduce disfiguring features of acromegaly.

Pre-operative Preparation and Pre-medication : In addition to the routine preparation and pre-medication, Inj. Efcorlin 200 mgm and Inj. Dexamethasone 4 mgm were given to avoid adrenalin crisis during and after surgery. Tab. Eltroxin 0.1 mg was also given at 6 am on the day of surgery.

During surgery, 500 ml of 20% mannitol was infused to reduce intracranial tension in addition to i/v fluids and three units of blood. Steroids were also added from time to time as desired by the anaesthetist, according to the conditions of the patient.

Operation

Sub-total removal of the tumour was done on 10th June, 1983.

Procedure : Bifrontal bone flap was reflected through coronal scalp. Dura was opened on left side, sub frontal extension of 1 cm was removed. Intra sellar portion of the tumour was removed. Small right extra sellar extension was left behind. Dura was closed with continuous silk sutures through burrholes. Scalp was closed in two layers. Excised tumour was sent for histopathology examination.

Pathology

Microsection of the tumour showed abundant acidophilic cytoplasm and eccentric hyper chromatic nuclei. The cells in many areas showed perivascular arrangement. There was minimal infiltration of brain tissues by tumour cells. Brain cells were showing reactive astrogliosis. Diagnosis was consistent with pituitary Adenoma with minimal infiltration into frontal lobe.

Immediate Post-Operative Care : After surgery the patient was received in Recovery Room of Main Operation Theatre. He was in a semi-conscious condition with endotracheal tube in. Intravenous drip of 5% Dextrose was continued. Foleys Catheter was in for continuous urinary drainage. The blood pressure, pulse and respiration were within normal limits. After half an hour the patient was shifted to Intensive Care Unit for elective artificial ventilation (to hyperventilate.)

Nursing Intervention for the First 48 Hours After Surgery

Post Operative Nursing intervention was planned and implemented with six major objectives as below :

1. To ensure Oxygen supply to brain and body tissues.
2. To observe signs and symptoms of Adrenalin and Antidiuretic Hormone crisis.
3. To assess the level of patients responsiveness.

4. To assess the signs and symptoms of raised intracranial pressure.

5. To maintain normal temperature and to institute hypothermia measures when necessary.

6. To perform supportive nursing measures until patient was fit to help himself.

To Ensure Oxygen Supply to Brain and Body Tissues

- Side lying position to facilitate respiration and exchanges of gases.
- Endotracheal and oral suction to keep the air way patent.
- Patient was kept on elective artificial ventilation for 48 hours.
- Assessment of blood gases from time to time.
- Administration of prophylactic treatment for convulsions,
- Mouth wash four hourly.

To Observe Signs and Symptoms of Adrenalin and Antidiuretic Hormone Crisis

- Recording of blood pressure, pulse and respiration frequently.
- Observation of colour and palpation of skin frequently.
- Administration of I/V fluid as ordered.
- Accurate intake and output records.
- Recording of specific gravity of urine 4-6 hourly.

Accurate record of intake and output was maintained for the 1st seven days after surgery, urine output was very low on the 1st post-operative day. The patient went into diuresis i.e. 4800 ml/day (Diagram 2) by the 4th post operative day. The urine output came down to 2100 ml/day within a week.

Specific gravity of the urine was also recorded twice in a day after surgery. The reading was very high i.e. 1030 on the first post-operative day and gradually it came down to normal by the fifth post operative day (Diagram 3).

To Assess the Level of Patient's Responsiveness

- Observation of patient's behaviour.
- Used verbal and painful stimuli.
- Testing of orientation to time, place and person.
- Requested the patient to do simple manoeuvres i.e. moving of extremities.
- Recording of vital signs.

Evaluation of the Signs and Symptoms of Raised Intracranial Pressure

- Observed for change in sensorium.
- Observed weakness and paralysis of extremities.
- Observed for increasing headache and vomiting.
- Observed for disturbances in vision.
- Pupillary assessment.
- Watch for convulsions.
- Patient remained conscious and there was no convulsion during this period.

(To Be Continued)