Common Pituitary Disorders
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Function of the Pituitary

- Growth
- Blood pressure
- Uterine contractions during childbirth
- Breast milk production
- Sex organ functions
- Thyroid gland function
- Water and osmolarity regulation in the body
- Temperature regulation

Function of the Pituitary

- Anterior Pituitary
  - Prolactin (PRL)
  - Thyroid Stimulating Hormone (TSH)
  - Follicle Stimulating Hormone (FSH)
  - Leutinizing Hormone (LH)
  - Adrenocorticotropin Hormone (ACTH)
  - Growth Hormone (GH)
  - Endorphins

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- **Posterior Pituitary**
  - Oxytocin
  - Antidiuretic Hormone (ADH)

When Things Go Wrong

- **Rule of "Too's"**
  - Too much
  - Too little
  - Too-mor (tumor)

Pituitary Mass

- Most pituitary masses are benign tumors that may or may not secrete excessive amount of a particular hormone

- Pituitary masses comprise 10% of all intracranial neoplasms

- Up to 25% of the general population have a small pituitary mass
  - Most are asymptomatic
Pituitary Mass

- Most significant physical complication is pressure on the optic chiasm
- This results in impairment of peripheral vision

Microadenoma - <1 cm diameter
Macroadenoma - > 1 cm diameter

Transphenoidal surgical resection is indicated if tumor is large enough to have obstructive effects (2)

Hyperprolactinemia

The majority of clinically identified pituitary adenomas are prolactinomas (3)

The most common cause of hyperprolactinemia is prescription medication use (4)
- Drugs with dopamine antagonistic action block dopamine’s suppression of prolactin
- Reglan, Anti-psychotics, Rozerem

Also can be triggered by CRF, Hypothyroidism, Sarcoidosis, or idiopathic hypothalamic-pituitary dysregulation

Symptoms
- Galactorrhea
- Breast enlargement
- Breast tenderness
- Anovulatory amenorrhea
- Irregular periods
- Decreased libido
- In men, can cause decreased libido, erectile dysfunction, and infertility
**Workup and Diagnosis**

- Bloodwork shows elevated prolactin levels
- Estradiol, FSH, LH, Progesterone, and Testosterone should be checked to rule out other hormonal imbalance
- Kidney and liver functions should be checked to rule out renal and hepatic etiologies
- Serum pregnancy test should be performed

**Pituitary MRI can identify a tumor and provide a baseline measurement of size**
- CT scan is not the study of choice
- Visual field testing should be performed during physical exam

**Treatment**

- Causative medications should be withdrawn (if possible)
- Dopamine agonists provide symptomatic relief and can shrink tumors
  - Bromocriptine is dosed nightly starting at 2.5 mg QHS
  - Cabergoline is dosed twice weekly (0.25 - 0.5 mg BIW) and tends to be more effective
- Followup MRIs allow monitoring of tumor regression
- Surgical resection may be necessary for macroadenomas with significant compressive symptoms

- Therapy should persist for 12 months and then withdrawn
  - If prolactin levels rise and symptoms return, therapy is restarted
  - After 24 more months, therapy is withdrawn again
  - If symptoms return, therapy is continued for life
- DeXA scan is warranted, since prolonged hypogonadism associated with hyperprolactinemia can lead to osteoporosis.
Growth Hormone Deficiency

• In children, growth hormone is responsible for the many processes in normal growth including lengthening of long bones

• In adults, growth hormone levels naturally decline significantly, but is still present
  • Functions in maintenance of muscle mass, regulation of muscle mass, and metabolic rates

Growth Hormone Deficiency

• Deficiency of growth hormone in children results in short stature and retention of child-like physical features
  • “Short Stature” is defined as height that is 2 standard deviations below the average height for a person’s age and gender. (7)

• Pituitary dwarfism is not the same as achondroplasia
  • Pituitary dwarfism results in proportionate growth retardation.

Growth Hormone Deficiency

• GH Deficiency in adults leads to non-specific symptoms:
  • Fatigue/decreased energy
  • Weight gain/difficulty losing weight
  • Decreased strength
  • Emotional lability
  • Decreased libido
  • Asymptomatic (8)
**Workup and Diagnosis**

- Growth Hormone and IGF-1 levels are low in children with GH deficiency.
- A hand X-ray for Bone Age determination helps predict responsiveness to therapy.
- Insulin tolerance test is the standard test in adults with presumed GH deficiency.

**Growth Hormone Deficiency**

- Treatment is growth hormone replacement
- Given as a daily injection
- Therapy is normally initiated and monitored by an endocrinologist
- Available medications include
  - Nutropin
  - Humatrope
  - Genotropin
  - Norditropin
  - Tev-Tropin
  - Saizen

- Growth hormone and IGF-1 must be monitored periodically throughout treatment
  - Insufficient levels will result in no improvement, excessive levels can increase the possibility of side effects including Slipped Capital Femoral Epiphysis, Pseudotumor Cerebri, and some cancers
- In children, treatment continues until epiphyses close and growth stops.

**Acromegaly**

- Caused by excessively high Growth Hormone
- Usually caused by a GH-producing pituitary adenoma
- Physical manifestations usually develop slowly in 30s and 40s, so the disease can be hard to diagnose in its early stages
- Can cause gigantism, but usually causes characteristically large hands, brow ridge, and square jaw
Acromegaly

- Treatment usually consists of surgical removal of the tumor
- Medication is used thereafter if GH levels remain elevated from residual tissue
  - Octreotide (Sandostatin) - injected every other week
  - Lanreotide (Somatuline) - injected every other week
  - Dopamine agonists (Bromocriptine or Cabergoline) (9)
- Radiation to the pituitary can be used in patients who are not candidates for surgery

Diagnosis is made by checking GH levels one hour after 1 hour glucose tolerance test

- GH levels >1 ug/L meets diagnostic criteria (normally GH would be suppressed below 1 ug/L)

Complications include
- Headache
- Visual Disturbances from tumor
- Cardiomegaly & Heart Failure
- Hypertension
- Arthritis
- Diabetes
- Kidney Failure

Cushing's Disease

- The pituitary over-secretes ACTH, prompting the adrenals to over-secrete cortisol. (10)
- Most commonly (80%) caused by an adenoma in the anterior pituitary.
- Causes classic Cushing Syndrome symptoms:
  - Weight gain
  - Moon face
  - Buffalo hump
  - Abdominal striae
  - Hirsutism
  - Amenorrhea
  - Thinning skin
  - Hypertension (7,11)
Cushing's Disease

Workup

- 24-hour urine cortisol level can be used for determination of Cushing Syndrome.

- Dexamethasone Suppression Test assists in determination of the etiology.

  - In Cushing's Disease, ACTH levels remain elevated even after exposure to high-dose dexamethasone. (12)

- Pituitary MRI may visualize an adenoma.

Cushing's Disease

Treatment

- Treatment usually involves transphenoidal resection of the tumor. (13)

References

2. Wu, J. Transsphenoidal pituitary macroadenomas resection guided by PoleStar N20 low-field intraoperative magnetic resonance imaging; comparison with early postoperative high-field magnetic resonance imaging. Neurosurgery. 2009; 65(1):63-70; discussion 70-1