

**JACK L. SNITZER, DO**

**INTERNAL MEDICINE BOARD REVIEW COURSE**

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# JACK L. SNITZER, D.O.

Peninsula Regional Endocrinology

1415 S. Division Street

Salisbury, MD 21804

Phone:410-572-8848

Fax:410-572-6890

E-Mail: DSNITZER1@COMCAST.NET

# DISCLOSURES

- Speaker bureau for:

NovoNordisk

Sanofi

BI-Lilly

Abbott

Janssen

# PITUITARY

## -Anterior

- | Thyroid Stimulating Hormone (TSH)
- | Prolactin (PRL)
- | Growth Hormone (GH)
- | Corticotropin (ACTH)
- | Luteinizing Hormone (LH)
- | Follicle Stimulating Hormone (FSH)

## -Posterior (hormones made in the hypothalamus and stored in pituitary)

- | Vasopressin
- | Oxytocin

# PITUITARY TUMORS

- Tumors-usually benign adenomas
  - Common tumors, 70-80% are functional
  - Microadenoma:<1cm; macroadenoma:1+ cm
  - can classically cause
    - | bitemporal hemianopsia
    - | hypopituitarism
    - | headaches
    - | amenorrhea
    - | galactorrhea
    - | growth/puberty delay
    - | infertility
    - | decreased libido/erectile dysfunction

# PITUTARY TUMORS

- If suspected or being followed,  
order MRI of head attn: sella  
with and without contrast

Note: CT scans might miss pituitary tumors;  
general head MRI's that are not specifically  
ordered with pituitary (sella) protocol might  
miss small pituitary tumors.

# PITUITARY TUMORS

All pituitary tumors require testing for hormonal hyper-secretion and pituitary insufficiency.

Visual fields must be checked if tumor is large and follow-up MRI obtained. Surgery usually recommended if visual field defects (impingement of the tumor on the optic chiasm) or significant growth of a large tumor.

# NON-SECRETORY PITUITARY TUMORS

- Non-secretory tumors
  - Can be incidental microadenomas.
  - Can be large and might cause partial or full hypopituitarism and visual field defects. Symptoms of pituitary insufficiency might be present or might be minimal or absent, until the patient is under stress, when severe adrenal insufficiency might occur.



# PROLACTINOMA

## -Prolactinoma

- galactorrhea, infertility, amenorrhea, decreased libido; can cause hypogonadism in females or males.

(note: prolactin elevation is generally proportional to size of tumor)

# PROLACTINOMA

## – Treatment

- Cabergoline (Dostinex) twice weekly (more effective than bromocriptine and better tolerated generally); side effects: nausea, dizzy; long-term at high doses: pulmonary fibrosis.
- Bromocriptine (Parlodel) nightly; side effects: nausea, dizzy.
- rarely surgery

# PROLACTIN ELEVATION

- Other Causes of mildly elevated prolactin
  - Dopamine antagonists
    - metoclopramide
    - many anti-psychotics (haldol, risperidone)
    - pituitary stalk compression from pituitary macroadenomas or non-pituitary tumors
  - Nipple stimulation
  - Caffeine

# ACROMEGALY

- Acromegaly: growth hormone (GH) excess
  - Signs/Symptoms: doughy and large hands, increasing hand and foot size, large tongue, frontal bossing, prominent chin, increased cardiovascular mortality.
  - Lab: high IGF-1 level (and GH level although don't need to check GH level); might have deficits of other pituitary hormones

# ACROMEGALY

- Generally a large pituitary tumor
- Check IGF-1 level (Insulin-like Growth Factor-1)

## – TREATMENT

1. Surgery;
2. possibly octreotide or pegvisomant;
3. possibly radiation therapy



# ACROMEGALY



# TSH secreting tumor

TSH secreting tumor- rare (central hyperthyroidism).

-elevated TSH and free T4 and often hyperthyroid symptoms.

(note: in a patient with chronic poorly treated hypothyroidism, there might be significant pituitary thyrotroph hyperplasia noted on MRI. However, the TSH in this case will be high and the free T4 usually very low and the thyrotroph hyperplasia often resolves with adequate thyroxine treatment)



# CUSHING'S DISEASE

- Cushing's Disease-ACTH secretion (ACTH dependent).
  - obesity, striae, ecchymoses, hyperglycemia, atherosclerosis, thin skin, fatigue, fat pads (especially supraclavicular), hyperpigmentation, infections

# CUSHING'S DISEASE

- Diagnosis
  - 24 hour urine free cortisol.
  - dexamethasone suppression test
  - Salivary cortisol between 11 pm and midnight
- Treatment
  - surgery, might then need radiation



# CUSHING'S DISEASE



# Dexamethasone suppression testing

- Low dose overnight:

1 mg dexamethasone at 11 pm. Fasting cortisol the next AM at 8AM. Normal result is suppression of cortisol to <2-3 mcg/dl. (<2 is more definitive)

If abnormal, indicates possibility of cortisol excess and further testing is needed.

Note: obtaining a baseline ACTH level (without suppression) at some point might be helpful in patients who end up having abnormal low dose suppression testing. This can help us differentiate ACTH dependent vs. ACTH independent Cushing's.

# Dexamethasone suppression testing

- High dose overnight suppression testing:
    - Obtain baseline cortisol level and ACTH.
    - Give 8 mg dexamethasone at 11 pm.
    - Fasting cortisol level the next AM at 8 AM.
- Normal is a >50% reduction in cortisol.

# Dexamethasone suppression testing

- INTERPRETATION

Adrenal Cushing's syndrome: failure to suppress cortisol with low dose dexamethasone testing and low ACTH level at baseline. Usually don't need high dose dexamethasone test.

# Dexamethasone suppression testing

- INTERPRETATION

Pituitary Cushing's disease: failure to suppress cortisol with low dose dexamethasone test.

Adequate suppression with high dose dexamethasone test generally.

Elevated or normal ACTH level at baseline.



# Dexamethasone suppression testing

- INTERPRETATION

Ectopic ACTH:

Failure to suppress cortisol with low dose and high dose dexamethasone suppression.

High baseline ACTH level.

Often metabolic alkalosis and hypokalemia.

# EMPTY SELLA

Fairly common.

Often asymptomatic but can have partial or pan-hypopituitarism.

Might be due to invagination of CSF into the sella, compressing the sella; pituitary infarction; etc.

# Sellar extension of non-pituitary tumors

- Sellar extension of non-pituitary tumors
  - might cause elevated prolactin;
  - Might cause diabetes insipidus by stalk compression;
  - might cause visual field defects;
  - might cause pituitary insufficiency.

# DIABETES INSIPIDUS

- loss of vasopressin secretion (central DI)
- Complete or Partial DI
- Inability to concentrate urine
- Hypernatremia, dehydration, elevated serum osmolality (note: some patients with partial DI and intact thirst mechanisms can drink enough fluid to maintain normal sodium levels)
- urine osmolality less than 290 with elevated serum osmolality
- Generally have frequent urination

# DIABETES INSIPIDUS

- Confirmation if needed:  
Water deprivation test (cautiously)

# DIABETES INSIPIDUS

## -Diabetes Insipidus (cont)

### - Treatment

- Replete fluids to correct serum sodium
- DDAVP (desmopressin) - IV, SQ, Nasal spray, oral: initiate when sodium level is rising or in the 140 range or higher.

Note: treatment with DDAVP might be needed based on hypernatremia and/or to improve urinary frequency; fluid intake will have to be adjusted based on the effect of the DDAVP

# DIABETES INSIPIDUS

- Must adjust the fluid intake and DDAVP together to avoid excessive fluid retention from DDAVP (and resultant hyponatremia), especially in a head trauma patient with cerebral edema. Also important in a patient with lack of thirst mechanism.
- The maintenance dose of DDAVP will likely depend on the sodium level and convenience of frequency of urination and amount of fluid a patient can take in.

# OTHER PITUITARY ISSUES

-Head irradiation

- can cause hypopituitarism years later

-Sheehan's Syndrome

- post-partum pituitary necrosis; usually due to infarction of a pituitary adenoma during a difficult delivery with hypotension.

-Hemorrhage

-Hypothalamic Dysfunction

-Infiltrative Disease

-Autoimmune hypophysitis



# HYPOPITUITARISM

## -Hypopituitarism

- Flu-like symptoms
  - Urgent diagnosis
  - Glucocorticoid replacement (Hydrocortisone 10-20 mg in am and 5-10 mg in pm with food, prednisone 5-7.5 mg daily, or equivalent)
  - Consider testosterone/estrogen replacement
  - levothyroxine replacement (TSH level not useful in determining dose since pituitary can't make TSH adequately)
  - might need DDAVP, growth hormone

# HYPOPITUITARISM

- HYPOPITUITARISM

Dx:

- Symptoms (flu-like: nausea, dizziness, achiness, etc.)
- Low FSH in post-menopausal woman not on estrogen
- Low total and free testosterone and LH
- Low sodium possibly
- possibly low morning cortisol (not a sensitive test) or and abnormal ACTH stimulation test (unless it is recent pituitary insufficiency)
- low TSH and low free T4; or low free T4 and inappropriately normal TSH.

# CASE 1

- 35 year old, recent post-partum female. Treated with clomiphene for infertility. Hypotensive during delivery. Orthostatic, hyponatremia, hyperkalemia. Past history of oligomenorrhea, galactorrhea.

# CASE 1

- Sheehan syndrome.

She likely had a pituitary adenoma (possibly a prolactinoma, which grew during pregnancy and infarcted when she became hypotensive during delivery)

## CASE 2

-60 year old centrally obese patient, 80 pound weight increase in one year. Type 2 diabetes mellitus for 3 years. Tanned skin. Leg weakness. Violaceous new stretch marks.

# CASE 2

- Type 2 diabetes mellitus versus Cushing's syndrome. Obtain overnight 1 mg dexamethasone suppression test and/or 24 hour urine free cortisol (and/or midnight salivary cortisol)

# CASE 3

-34 year old head trauma victim. Polyuria while IV fluids infusing. On dexamethasone. Serum sodium:168. Confused.

# CASE 3

Needs DDAVP since has DI and sodium level is high.

Notes:

IV fluids can cause polyuria as can post-operative diuresis.

Dexamethasone can exacerbate diabetes insipidus.



- What if this patient's sodium level was 135?

Then wouldn't give DDAVP since this would cause fluid retention and hyponatremia. Adjust fluids to urine output and hold off on DDAVP until sodium level is perhaps in the low 140's, then can start DDAVP. Adjust fluids and DDAVP to prevent fluid overload and to maintain serum sodium level in the normal range. This patient might not even have DI.