TUTORIAL IN ENDOCRINOLOGY:
PITUITARY

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DEPARTMENT OF MEDICINE
FACULTY OF MEDICINE SIRIRAJ HOSPITAL
PITUITARY

Stalk: prolactin, ADH

Triglycerides

Anterior pituitary

GH
FSH, LH
ACTH
TRH

Posterior pituitary

Hypophyseal fossa in sella turcica of sphenoid bone

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Anterior clinoid process

Posterior clinoid process

Floor of sella
APPROACH PITUITARY DISORDER

- Functioning vs. non-functioning?
- Effect to near by structure
- Cause of the pituitary disorder
HYPOTHALAMIC-PITUITARY AXIS CHANGE FOLLOWING PITUITARY LESION
APPROACH PITUITARY DISORDER

**Functioning?**
- Functioning
  - Prolactinoma
  - Acromegaly
  - Cushing’s disease
  - TSHoma
- Non-functioning

**Effect to nearby structure**
- Hypopituitarism
- Visual field defect

**Sellar lesion**
- MASS
  - Pituitary
  - Non-pituitary
- NON MASS
  - Stalk thickening?
  - Ischemia
Pituitary vs. Non-pituitary tumor
ENLARGED SELLA TURCICA

- CT/MRI
- Basic lab chemistries
  - CBC
  - Urine analysis
  - Blood glucose, Electrolytes
- Basal hormone assay
  - Cortisol, TFT, Prolactin, (FSH, LH)
- Activation test
  - ITT, ACTH stimulation test
Miss T

A 23-year-old woman presented with secondary amenorrhea for 7 months. She had no other complaints. Physical examination revealed few drops of milk discharge on squeezing. Otherwise were within normal limit.
# CAUSES OF GALACTORRHEA

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Mechanism</th>
<th>Prolactin level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drugs</td>
<td>- Effects on dopamine level-function</td>
<td>↑_→↑↑</td>
</tr>
<tr>
<td>Pituitary, stalk, hypothalamic</td>
<td>- ↑Production &lt;br&gt;- ↓Prolactin inhibitory factor</td>
<td>↑_→↑↑↑</td>
</tr>
<tr>
<td>Thyroid disease</td>
<td>- Hypo → ↑TRH &lt;br&gt;- Hyper → ↑free estrogen</td>
<td>↑</td>
</tr>
<tr>
<td>CKD</td>
<td>- ↓Renal clearance &lt;br&gt;- Medication: methyldopa</td>
<td>↑</td>
</tr>
<tr>
<td>Neurologic cause</td>
<td>- Nipple or breast stimuli &lt;br&gt;- Chest wall irritation → intercostal N. → Post column → Hypothalamus → ↓PIF</td>
<td>↑</td>
</tr>
<tr>
<td>Idiopathic</td>
<td>- ↑Sensitivity to prolactin levels &lt;br&gt;- More bioactivity, low immunoactivity</td>
<td>↔</td>
</tr>
</tbody>
</table>
## DRUG-INDUCED GALACTORRHEA

<table>
<thead>
<tr>
<th>MECHANISM</th>
<th>DRUGS</th>
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<tbody>
<tr>
<td>Dopamine-receptor blockade</td>
<td>Metoclopramide, Phenothiazines, Risperidone, SSRI: fluoxetine, setraline, Tricyclic antidepressants</td>
</tr>
<tr>
<td>Dopamine-depleting agents</td>
<td>Methyldopa, Reserpine</td>
</tr>
<tr>
<td>Inhibition of dopamine release</td>
<td>Heroin, Morphine</td>
</tr>
<tr>
<td>Histamine-receptor blockade</td>
<td>Cimetidine</td>
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<tr>
<td>Stimulation of lactotrophs</td>
<td>Oral contraceptives, Verapamil</td>
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</table>
APPROACH TO GALACTORRHEA

HISTORY

Identify Cause
- Drug use
- Pituitary function
- VF and VA
- Hypothyroidism
- CKD

Assess need to treatment
- Menstruation
- Amount of galactorrhea

PHYSICAL EXAMINATION

- Galactorrhea?
- Signs of hypothyroidism
- Signs of hypopituitarism
- VF and VA
Galactorrhea

Hx and PE

In case, Hx of drug: stop medication for 3 days

TFT, kidney function and prolactin level

Kidney ✓
Thyroid X
Prolactin ↑

Thyroid disease

Kidney X
Thyroid ✓
Prolactin ↑

Chronic kidney disease

Kidney ✓
Thyroid ✓
Prolactin ↑

MRI pituitary

Hypothalamus-stalk effect

Kidney ✓
Thyroid ✓
Prolactin ✓

Idiopathic galactorrhea

Prolactinoma
Miss T

A 23-year-old woman presented with secondary amenorrhea for 7 months. She had no other complaints. Physical examination revealed few drops of milk discharge on squeezing. Otherwise were within normal limit. Her serum prolactin is 104 ng/mL, serum TSH 1.0 mIU/L. MRI of pituitary gland showed pituitary tumor size 0.8 cm.
Serum PRL in all patients

- >141.5
- 94.3-141.5
- <94.3

Serum PRL in patients not taking drugs

- 99.5% (n = 184)
- 0.9% (n = 2)
- 0.4% (n = 1)

Karavitaki N. Clinical Endocrinology 2006;65:524-529.
Miss T

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DIAGNOSIS: Microprolactinoma
TREATMENT:
Hypothalamus-stalk effect

- MRI pituitary
  - Hypothalamus-stalk effect
  - Prolactinoma

Thyroid disease

Chronic kidney disease

- MRI pituitary
- Hypothalamus-stalk effect

Idiopathic galactorrhea

- Prolactinoma

Macroprolactinoma

- Always need treatment
  - Medication: Dopamine agonist
  - Surgery: in case of non-responsive or worsening of VA, VF, or apoplexy

Microprolactinoma

- Evaluate need for treatment
  - Massive galactorrhea
  - Amenorrhea
  - Infertile
  - Medication: Dopamine agonist
  - Surgery: no indication
Miss T

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**DIAGNOSIS:** Microprolactinoma

**TREATMENT:** Bromocriptine
A 25-year-old woman presented with polyuria. She had no other symptom. PE were within normal limit.
Polyuria = > 3 L/D or 40 cc/kg/D or 2.5-3 cc/kg/h
Water diuresis: urine sp.gr.<1.005 or urine Osm <150

Hx Thirst?
Serum Osm or Serum Na

High
Diabetes Insipidus

Low
Primary polydipsia

water deprivation

Central DI  Nephrogenic DI
• Familial
• Acquired: CRF, HypoK, HyperCa, Drug: lithium, demeclocycline
A 25-year-old woman presented with polyuria. She had no other symptom. PE were within normal limit. Her 24 h urine output was 7 liters. Her laboratory results revealed water diuresis with a urine specific gravity of 1.001 and hypernatremia.

**DIAGNOSIS**: Water diuresis, most likely DI

**MANAGEMENT:**
A 25-year-old woman presented with polyuria. She had no other symptom. PE were within normal limit. Her 24 h urine output was 7 liters. Her laboratory results revealed water diuresis with a urine specific gravity of 1.001 and hypernatremia. She is admitted to the hospital for a water deprivation test. No fluids are given after 12PM.
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<th>Times</th>
<th>Body weight (kg.)</th>
<th>Urine volume (cc.)</th>
<th>Urine osmolality (mOsmol/kg H20)</th>
<th>Serum sodium (mmol/L)</th>
<th>Serum osmolality (mOsmol/kg H20)</th>
<th>management</th>
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<tbody>
<tr>
<td>baseline</td>
<td>39.5</td>
<td>720</td>
<td>108</td>
<td>138</td>
<td>310</td>
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<tr>
<td>5 hr</td>
<td>38.6</td>
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<td>290</td>
<td>DDAVP 0.1 cc intranasal</td>
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End point of water deprivation

- Urine osm increase < 30 mOs/L 3 times
- BW reduced 3-5%
- Plasma Osm > 290%
- % Change
  - > 10% central DI
  - < 10% normal, nephrogenic DI
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DIAGNOSIS: Complete Central DI
MANAGEMENT: MRI pituitary
Thickening of pituitary stalk

1. Germinoma
2. Sarcoidosis
3. TB
4. Autoimmune hypophysitis
5. LCH
Mrs. W

A 55-year-old woman presented with nausea, vomiting and weight loss 5 kg in 1 year. She also complained of dizziness and fainting several times during the past few years. PE: BP 90/50 mmHg, BMI 19 kg/m2. Heart, lung and abdomen were within normal. Lab results revealed BS 65 mg/dl, Na 125, K 4, Cl 100, HCO3 25.
Suspected adrenal insufficiency:
- History taking and PE
- Symptoms of AI
- Causes of AI

1° Adrenal insufficiency
- Hx and PE showed hyperpigmentation
- Chronic fever
- Lab: Hyperkalemia

2° /3° Adrenal insufficiency
- Exogenous steroid use
- HPA lesion
- Hx of other hormone axis
- Hx labor
- Visual field evaluation

- Cortisol level, 250 ug ACTH stimulation test and ACTH level
Mrs. W

A 55-year-old woman presented with nausea, vomiting and weight loss 5 kg in 1 year. She also complaint dizziness and fainting several times during the past few years. PE: BP 90/50 mmHg, BMI 19 kg/m2. Heart, lung and abdomen were within normal. Lab results revealed BS 65 mg/dl, Na 125, K 4, Cl 100, HCO3 25.

She had amenorrhea after delivery 25 years ago. PE: no VF defect, scant axillary and pubic hair. Cortisol level were 0.8 ug/dl at 8am and 1 ug/dl, 40 min after ACTH 250 ug injection
APPROACH TO PATIENT SUSPECTED ADRENAL INSUFFICIENCY

- Suspected adrenal insufficiency:
  - History taking and PE
  - Symptoms of AI
  - Causes of AI

1° Adrenal insufficiency
- Hx and PE showed hyperpigmentation
- Chronic fever
- Lab: Hyperkalemia

CT adrenal gland

2° /3° Adrenal insufficiency
- Exogenous steroid use
- Hx of medication
  - PE: Cushingoid appearance

Stop exogenous steroid

- Cortisol level, 250 ug ACTH stimulation test and ACTH level
  - Pituitary hormone evaluations

HPA lesion
- Hx of other hormone axis
- Hx labor
- Visual field evaluation

MRI pituitary
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She had amenorrhea after delivery 25 years ago. PE: no VF defect, scant axillary and pubic hair. Cortisol level were 0.8 ug/dl at 8am and 1 ug/dl, 40 min after ACTH 250 ug injection. Other hormones: E2 <0.5, LH 1, FSH 1, FT4 0.5.
EMPTY SELLA SYNDROME
Infundibulum sign
MANAGEMENT

• Hormone replacement
  – Glucocorticoid
  – Thyroid
  – Sex hormone
  – $\pm$ GH

• Advice
  – Glucocorticoid before thyroid replacement
  – Glucocorticoid during stress
**PITUITARY INCIDENTALOMA**

- **Evaluation of Pituitary Functioning:**
  - History taking and PE
  - Prolactin, IGF-1, + Cortisol excess

- **Functioning tumor**
  - Prolactinoma
    - Dopamine agonist treatment
  - Others
    - Surgery

- **Nonfunctioning tumor**
  - < 1 cm.
    - Repeat MRI at 1 yr, yearly for 3 yrs then...
  - > 1 cm.
    - Visual field evaluation
    - Hormonal evaluation
    - Repeat MRI, pituitary function at 6th mo, yearly for 3 yrs then...
    - VF testing in patient with high risk of optic nerve compression

Freda PU. J Clin Endocrinol Metab 96: 894–904, 2011
Lateral radiograph of skull reveals

- Sella: enlarged sella with double flooring
- Skull: thickened skull vault
- Air sinus: dilatation of air sinus
- Mandible: Prognathism, separation of teeth
- Look for sign of hyperparathyroidism
AP radiograph of the hand shows
• ungal tufting
• widening of the bases of distal phalanges
• metacarpal osteophytes on radial aspect (metacarpal hooks)
• soft tissue hypertrophy.
Heel pad sign
• distance between the plantar aspect of the calcaneus and skin surface
• normal distance is 21 mm
Thank You