

## Lab 9: THE ENDOCRINE AND REPRODUCTIVE SYSTEMS

The focus of this week's lab will be pathology of the endocrine and reproductive systems. There are a bunch of tissues and topics that can be covered in these systems, but we will focus on some of the more common pathological conditions of the breast and prostates for the reproductive system and of the pituitary, thyroid and adrenal glands for the endocrine system.

The adrenal gland has a cortex and a medulla. The cortex is composed of three layers the glomerulosa, the fasciculata, and the reticularis which produce mineralocorticoids, glucocorticoid, and sex steroids respectively. The medulla is the site of catecholamine synthesis. Keep this in mind when examining adrenal pathology as the clinical symptoms are linked to dysregulation of production of these compounds.

The thyroid gland is responsible for synthesis and release of  $T_3$  and  $T_4$  which are synthesized from iodine and tyrosine. The thyroid also makes calcitonin which is important in regulating serum calcium levels particularly in decreasing increased serum calcium levels.

The pituitary gland is composed of two parts the anterior pituitary (adenohypophysis) and the posterior pituitary (neurohypophysis). The posterior pituitary is composed of neural tissue and embryonically is derived from neuroectoderm. The anterior pituitary is derived from Rathke's pouch (an invagination of oral ectoderm). The posterior pituitary releases ADH (released from paraventricular nucleus of hypothalamus) and oxytocin (released from supraoptic nucleus of hypothalamus). The anterior pituitary produces GH and prolactin (from acidophils) and FSH, LH, TSH, and ACTH (from basophils).

The breast and prostate are the most common sites of cancer in woman and men respectively. Understanding breast and prostate histology is critical for understanding more about the pathology of benign and malignant conditions of these tissues.

The cases we will cover are:

- A. Pheochromocytoma
- B. Grave's Disease
- C. Prolactinoma
- D. Benign Prostatic Hyperplasia

Pathology slides include:

p171 - thyroid hyperplasia

<https://med-vmicro.med.illinois.edu/v/475/>

p34 - prostate hyperplasia

<https://med-vmicro.med.illinois.edu/v/476/>

p37 – pituitary adenoma

<https://med-vmicro.med.illinois.edu/v/478/>

### A. PHEOCHROMOCYTOMA

There is no virtual slide for this case.

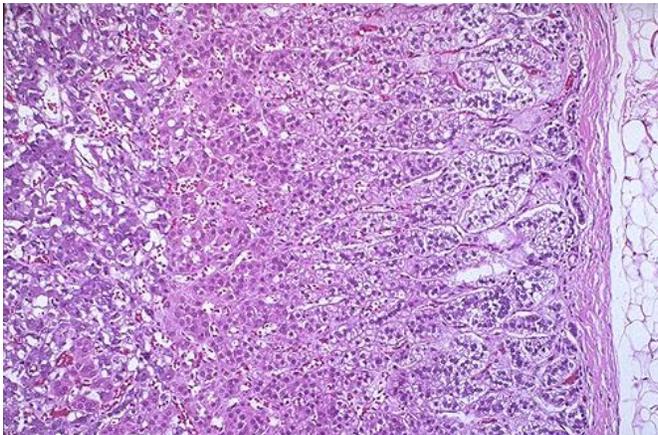
**CC/HPI:** A 42 year old male visits his doctor for evaluation of paroxysmal attacks of headache, diaphoresis, and anxiety. The attacks occur most frequently with exercise, emotional stress, postural changes and occasionally with urination. He has experienced very high blood pressure at the time of his previous paroxysms. He has no prior history of hypertension and his blood pressure recorded between paroxysms is 120/80. The patient has had no history of renal disease or diabetes.

**PE:** On physical exam, the patient's blood pressure measures 180/120. He also has hypertensive retinopathy changes on fundoscopic exam.

**Labs/Imaging:** Hyperglycemia. Electrolytes normal. Increased 24 hour urinary free catecholamines and vanillylmandelic acid (VMA) levels. CT imaging shows 3 cm left adrenal mass.

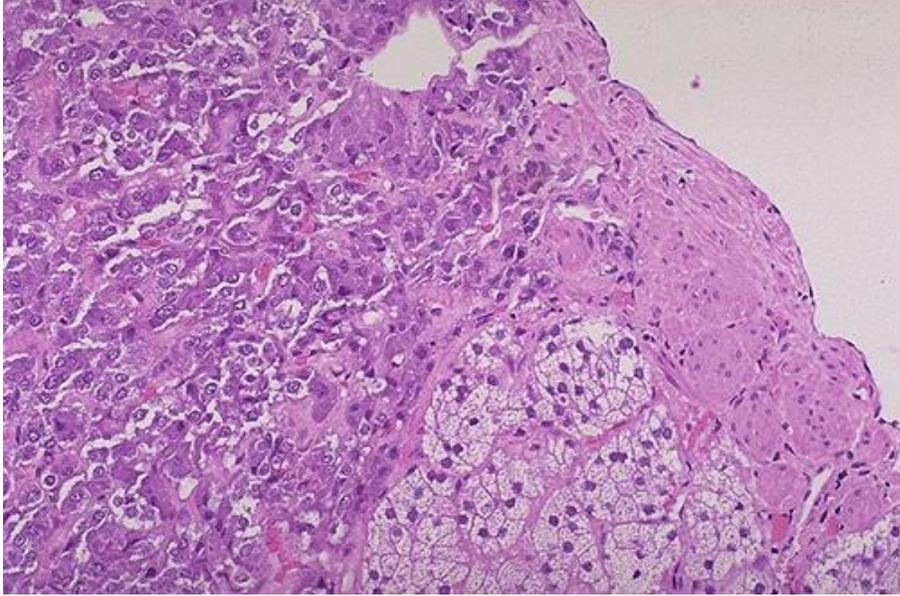
**What is the significance of the increased 24 hour urinary free catecholamines and vanillylmandelic acid (VMA) levels?**

**Pathology:** A normal adrenal sample (stained with H and E) is shown below:



**There are four major parts of the adrenal gland. What are they and what do they make?**

**Pathology:** An adrenal biopsy is taken from the patient and the following image is observed:



**What parts of the adrenal gland appears to be proliferating and entering the cortex?**

**How does this proliferation explain the patient's symptoms?**

## **B. GRAVE'S DISEASE**

p171 - thyroid hyperplasia

<https://med-vmicro.med.illinois.edu/v/475/>

**CC/HPI:** A 32 year old woman presents complaining of anxiety, palpitations, heat intolerance, nervousness with trembling hands, and weight loss without change in appetite. She is concerned about increasing protrusion of her eye.

**PE:** On physical exam the patient is tachycardic with BP: 150/80. She has a wide pulse pressure, sweaty palms, warm skin and exophthalmos. She has diffuse goiter with bruit. She also has nodular lesions over the anterior aspect of her lower legs (pretibial myxedema).

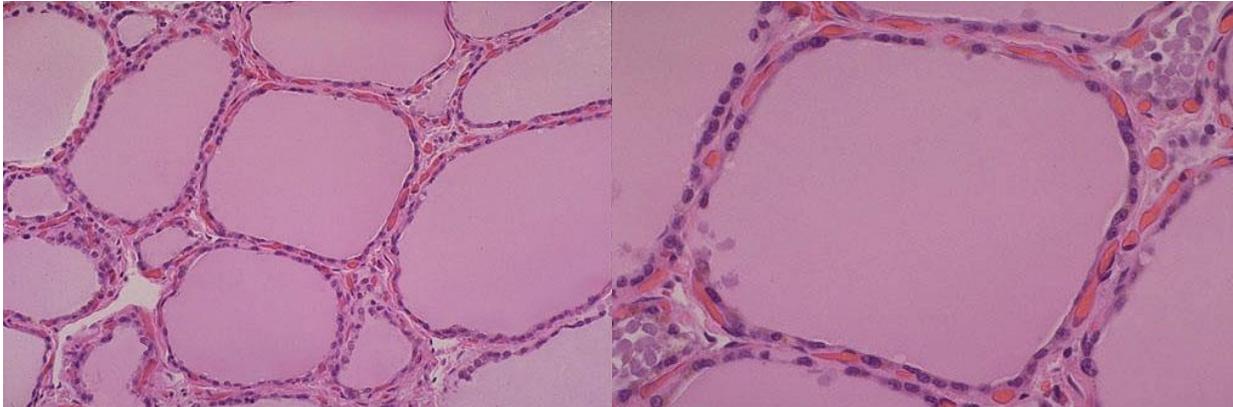
**Labs:** Markedly decreased TSH; increased T<sub>3</sub>, T<sub>4</sub>, and free T<sub>4</sub> index; positive thyroid-stimulating antibodies; positive antithyroglobulin and antiperoxidase antibodies; hypercalcemia. CBC: anemia.

**Why is TSH low?**

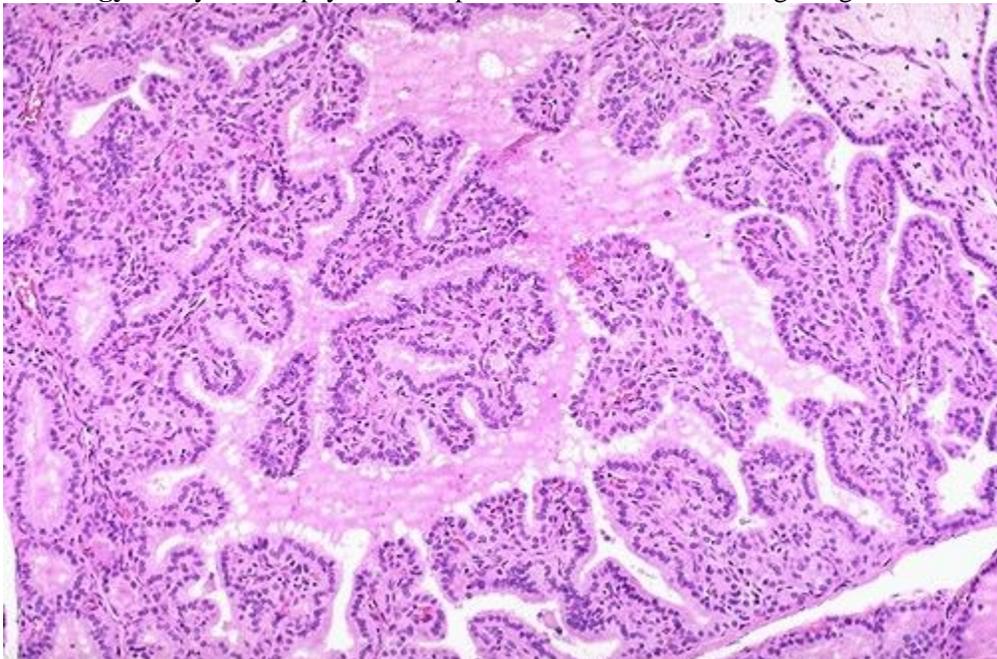
**Why are this patient's T<sub>3</sub> and T<sub>4</sub> levels increased? Briefly explain the pathophysiology of this disease.**

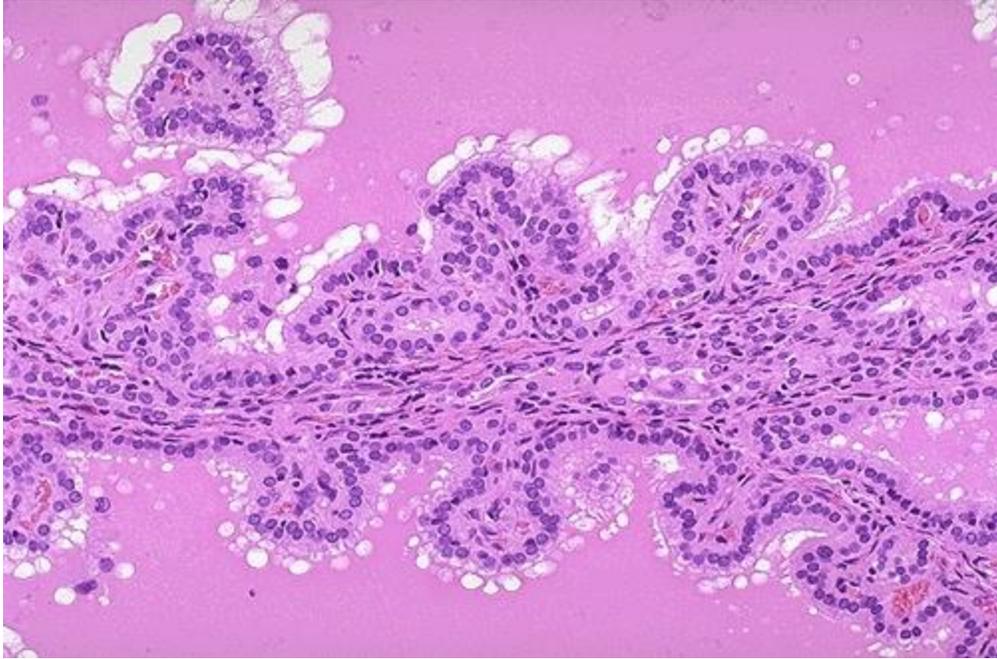
How does the increase in T<sub>3</sub> and T<sub>4</sub> explain her symptoms?

**Pathology:** A normal thyroid sample (stained with H and E) is shown below:



**Pathology:** A thyroid biopsy from the patient reveals the following image:





**What structures appear abnormal in this tissue?**

### **C. PROLACTINOMA**

p37 – pituitary adenoma

<https://med-vmicro.med.illinois.edu/v/478/>

**CC/HPI:** A 33 year old white woman presents with menstrual cycle irregularity with oligomenorrhea and then amenorrhea. She has also experienced galactorrhea. She and her partner have been trying to conceive but without success.

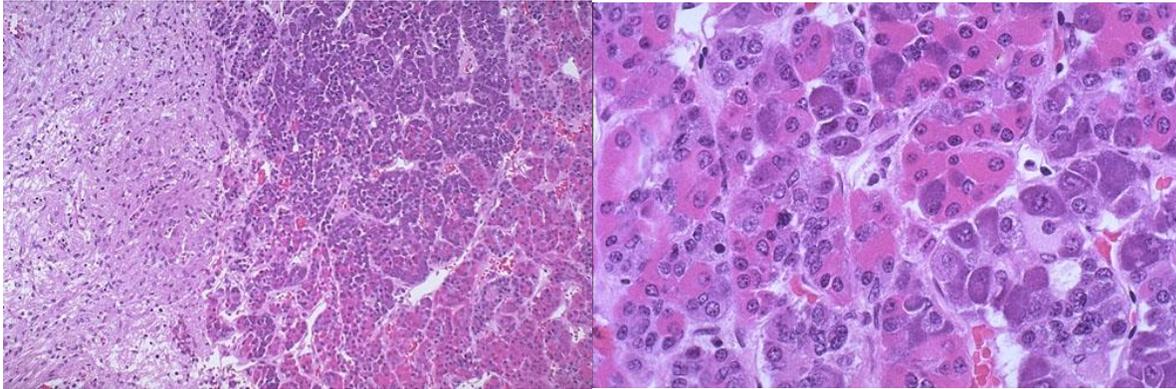
**PE:** BP is normal, no gynecologic masses palpable; pelvic exam normal. Visual exam reveals visual field defect of bilateral temporal hemianopsia.

**Why does the patient have visual impairment? (Hint: Where is the pituitary in proximity to the optic chiasm?)**

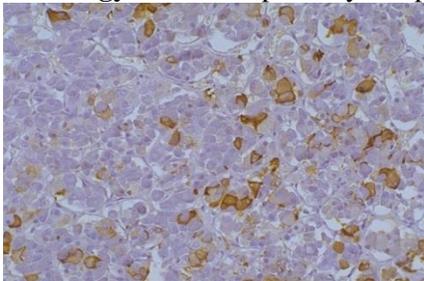
**Labs/Imaging:** Hyperprolactinemia; reduced LH and estradiol. MRI shows enhancing pituitary microadenoma (>10 mm); with deviation of the pituitary stalk.

**This adenoma is producing prolactin. How does this explain the patient's symptoms?**

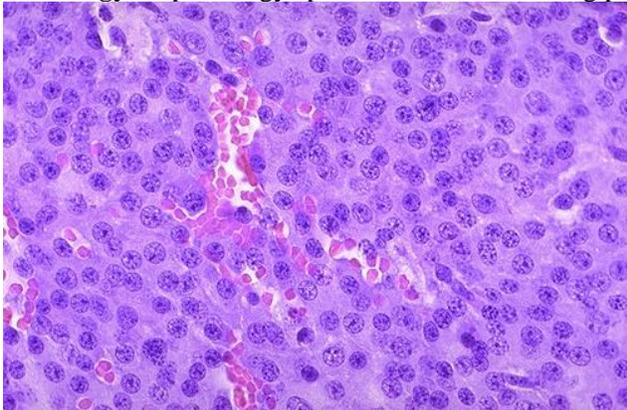
**Pathology:** A normal pituitary sample (stained with H and E) is shown below:



**Pathology:** A normal pituitary sample (stained for prolactin) is shown below:



**Pathology:** A pathology specimen obtained during pituitectomy reveals an adenohypophyseal adenoma:



**What looks abnormal about the appearance of these cells?**

#### **D. BENIGN PROSTATIC HYPERPLASIA**

p34 - prostate hyperplasia

<https://med-vmicro.med.illinois.edu/v/476/>

**CC/HPI:** A 56 year old man complains of urinary frequency and interruption of the urinary stream over the past six months. He also complains of nocturia. The patient's history includes one episode of acute urinary retention one month ago that was relieved by catheterization. He denies hematuria or back pain. He also admits to having a reduced caliber of urine stream and terminal dribbling as well as urinary hesitancy.

**PE:** Digital rectal exam reveals smooth enlargement of the prostate protruding into the rectum; overlying rectal mucosa is mobile; bladder percussible up to umbilicus.

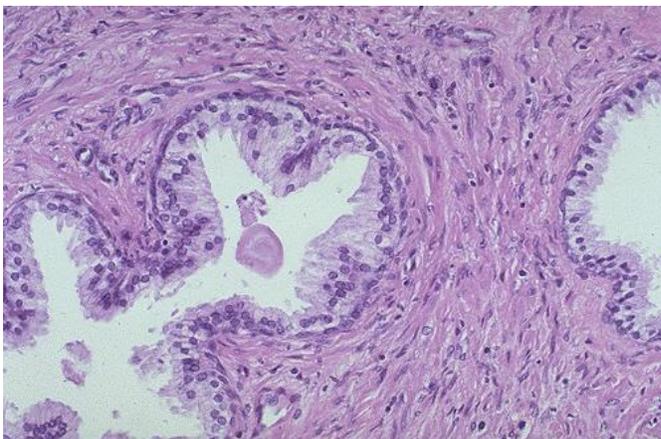
**Labs/Imaging:** Urinalysis reveals 2+ bacteria; positive nitrite and leukocytes esterase. PSA levels normal; urodynamic studies demonstrate bladder neck obstruction with increased residual volume; mildly elevated serum creatinine and BUN. Ultrasound demonstrates benign appearing enlargement of median lobe of prostate.

**Why are there bacteria in his urine?**

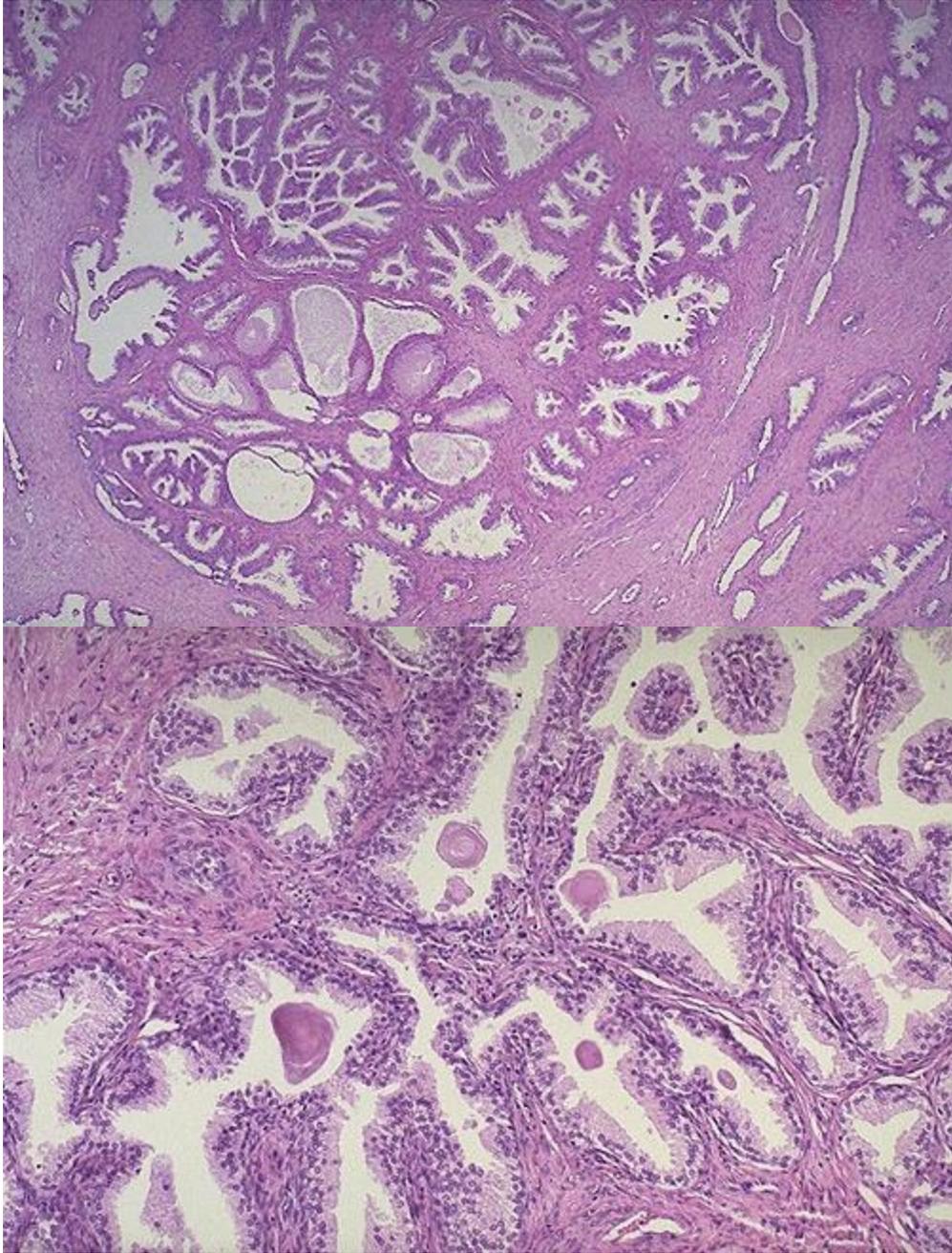
**Why are BUN and creatinine mildly elevated?**

**Finasteride is used to treat this condition. How does this drug work?**

**Pathology:** A normal prostate sample (stained with H and E) is shown below:



**Pathology:** A prostate biopsy from this patient reveals the following image:



**What structures appear altered in this tissue? Is this hypertrophy or hyperplasia?**