• 1
• 2
• 3
• 4
• 5
• 6
• 7
• 8
• 9

A 65-year-old man with a history of urinary tract infections presents to his physician complaining of having to get up five to six times per night to urinate. He also mentions that it is becoming more difficult to start urination. In the past, he received pharmacologic treatment that improved his urinary symptoms but was discontinued because he experienced hypotension. Biopsy of the prostate shows enlargement and dilation of the prostatic glands but no dysplasia. He is given an appropriate pharmacologic treatment for his symptoms. His physician states symptomatic improvement may take 6–12 months with this therapy.

Which of the following is a common side effect from the pharmacological treatment for this patient?

**A.** Acne

**B.** Decreased bone mass

**C.** Decreased libido

**D.** Hypertension

**E.** Loss of blue-green color vision

1
2
3
4
5
6
7
8
9

**The correct answer is C. 68% chose this.**

Although $\alpha_1$-antagonists such as tamsulosin are considered first-line therapy for mild to moderate symptoms of benign prostatic hyperplasia (BPH), 5-α-Reductase inhibitors, such as finasteride, are appropriate as an alternative treatment choice for BPH in patients who cannot tolerate $\alpha_1$-antagonists. BPH is a common condition in men >50 years old and increases in prevalence with increasing age. Pathophysiologically, estradiol levels increase with age and they are thought to sensitize the prostate to the effects of dihydrotestosterone (DHT), causing the prostatic cells to grow. 5-α-Reductase inhibitors inhibit the conversion of testosterone to DHT, therefore preventing further growth of the prostate. It typically requires 6–12 months before achieving symptomatic improvement. The decreased synthesis of DHT can lead to side effects such as decreased libido and erectile and ejaculatory dysfunction.

Benign prostatic hyperplasia Finasteride Tamsulosin Dihydrotestosterone Libido Testosterone Estradiol Hyperplasia Prostate cancer Prostate Anejaculation Benign tumor Side effect

**A is not correct. 6% chose this.**

Drugs such as the synthetic androgen danazol, glucocorticoids, and oral contraceptive pill may cause acne. Acne is not associated with finasteride use.

Danazol Finasteride Androgen Acne vulgaris Glucocorticoid Oral contraceptive pill Combined oral contraceptive pill Birth control

**B is not correct. 10% chose this.**

Osteoporosis is less common in men, but the prevalence increases with age. There have been concerns about drugs that affect the metabolism of sex steroids as they play a role in acquisition of peak bone density and age-related bone loss. However, studies have not found an association between finasteride and decreased bone density. Drug-induced osteoporosis is an adverse reaction of long-term glucocorticoid use, antiepileptic drugs, methotrexate, and heparin, to name a few.

Finasteride Methotrexate Glucocorticoid Osteoporosis Heparin Bone density Anticonvulsant Steroid Anabolic steroid Adverse drug reaction Metabolism Adverse effect Bone Sex steroid

**D is not correct. 9% chose this.**

$\alpha_1$-Agonists can be used to raise blood pressure, but are not used to treat benign prostatic hyperplasia (BPH). However, $\alpha_1$-antagonists (eg, terazosin, tamsulosin) are commonly the first-line treatment option for BPH. A common side effect of $\alpha_1$-antagonists is orthostatic hypotension.

Benign prostatic hyperplasia Orthostatic hypotension Terazosin Tamsulosin Hypotension Side effect Blood pressure Hyperplasia Adverse effect

**E is not correct. 7% chose this.**

Loss of blue-green color vision is a possible side effect of sildenafil and vardenafil, which are used to treat erectile dysfunction by inhibiting cGMP phosphodiesterase, leading to an increase in cGMP levels. They are not appropriate treatments for this patient.

Vardenafil Erectile dysfunction Sildenafil Cyclic guanosine monophosphate Phosphodiesterase Adverse effect Color vision Side effect

1
2
3
4
5
6
7
8
9

$\alpha_1$-Agonists can be used to raise blood pressure, but are not used to treat benign prostatic hyperplasia (BPH). However, $\alpha_1$-antagonists (eg, terazosin, tamsulosin) are commonly the first-line treatment option for BPH. A common side effect of $\alpha_1$-antagonists is orthostatic hypotension.

Benign prostatic hyperplasia Orthostatic hypotension Terazosin Tamsulosin Hypotension Side effect Blood pressure Hyperplasia Adverse effect

**E is not correct. 7% chose this.**

Loss of blue-green color vision is a possible side effect of sildenafil and vardenafil, which are used to treat erectile dysfunction by inhibiting cGMP phosphodiesterase, leading to an increase in cGMP levels. They are not appropriate treatments for this patient.

Vardenafil Erectile dysfunction Sildenafil Cyclic guanosine monophosphate Phosphodiesterase Adverse effect Color vision Side effect

**Bottom Line:**

Benign prostatic hyperplasia manifests with increased frequency of urination, nocturia, problems with starting/stopping urination, and sometimes dysuria. Once a biopsy rules out cancer, 5α-reductase inhibitor (finasteride) is an alternative for patients who cannot tolerate $\alpha_1$-antagonists. Side effects of finasteride include decreased libido and erectile and ejaculatory dysfunction.

Benign prostatic hyperplasia Finasteride Dysuria Nocturia Libido Biopsy Hyperplasia Urination Benignity Cancer Side effect Enzyme inhibitor

FIRST AID FIRST AID FACTS for year: 2017

FA17 p 623.2

## Antiandrogens

| | | |
|---|---|---|
| **Finasteride** | 5α-reductase inhibitor (↓ conversion of testosterone to DHT). Used for BPH and male-pattern baldness. | Testosterone $\xrightarrow{5\alpha\text{-reductase}}$ DHT (more potent). |
| **Flutamide** | Nonsteroidal competitive inhibitor at androgen receptors. Used for prostate carcinoma. | |

| | | |
|---|---|---|
| | receptors. Used for prostate carcinoma. | |
| **Ketoconazole** | Inhibits steroid synthesis (inhibits 17,20 desmolase/17α-hydroxylase). | Used in PCOS to reduce androgenic symptoms. Both can cause gynecomastia and amenorrhea. |
| **Spironolactone** | Inhibits steroid binding, 17,20 desmolase/17α-hydroxylase. | |

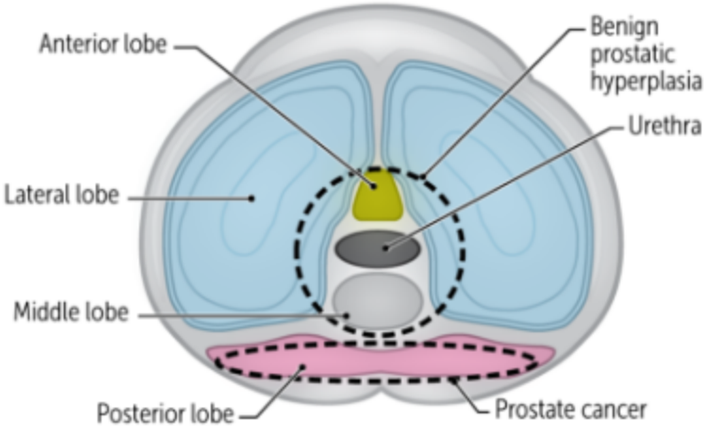
FA17 p 619.2

## Benign prostatic hyperplasia

Common in men > 50 years old. Characterized by smooth, elastic, firm nodular enlargement (hyperplasia not hypertrophy) of periurethral (lateral and middle) lobes, which compress the urethra into a vertical slit. Not premalignant.

Often presents with ↑ frequency of urination, nocturia, difficulty starting and stopping urine stream, dysuria. May lead to distention and hypertrophy of bladder, hydronephrosis, UTIs. ↑ free prostate-specific antigen (PSA).

Treatment: $\alpha_1$-antagonists (terazosin, tamsulosin), which cause relaxation of smooth muscle; 5α-reductase inhibitors (eg, finasteride); PDE-5 inhibitors (eg, tadalafil); surgical resection (eg, TURP, ablation).



• 1
• 2
• 3
• 4
• 5
• 6
• 7
• 8
• 9

A 14-year-old girl presents with 2-month history of increased urination, thirst, and appetite along with a 4.5-kg (10-lb) weight loss. Blood tests and urinalysis are all within normal limits except for a positive urine glucose dipstick.

What HLA association is most likely in this patient?

**A.** HLA-A3

**B.** HLA-B27

**C.** HLA-DQ2

**D.** HLA-DR2

**E.** HLA-DR3

1
2
3
4
5
6
7
8
9

**The correct answer is E. 69% chose this.**

This patient is suffering from type 1 diabetes mellitus, which classically manifests at a younger age, with the triad of polyuria, polydipsia, and weight loss despite increased appetite. It can lead to ketoacidosis, coma, and death. Disease is due to a failure of insulin synthesis by β cells of the pancreatic islets. It is thought that it may be caused by autoimmune inflammation of islets triggered by a viral infection or environmental factors. Type 1 diabetes mellitus is associated with HLA-DR3 as well as HLA-DR4.

Diabetes mellitus Polyuria Diabetes mellitus type 1 Polydipsia Ketoacidosis Insulin Autoimmunity Pancreatic islets Autoimmune disease Weight loss Coma HLA-DR4 Inflammation Polyphagia Virus

**A is not correct. 4% chose this.**

HLA-A3 is associated with hemochromatosis.

HLA-A3 Iron overload Human leukocyte antigen

**B is not correct. 6% chose this.**

HLA-B27 is associated with **P**soriasis, **A**nkylosing spondylitis, **I**nflammatory bowel disease, and **R**eactive arthritis. (Remember: **PAIR**).

Reactive arthritis HLA-B27 Spondylitis Arthritis Gastrointestinal tract

**C is not correct. 9% chose this.**

HLA-DQ2 and HLA-DQ8 are associated with celiac disase.

HLA-DQ2 HLA-DQ8

**D is not correct. 12% chose this.**

HLA-DR2 is associated with multiple sclerosis, hay fever, SLE, and Goodpasture syndrome.

Multiple sclerosis HLA-DR2 Allergic rhinitis Goodpasture syndrome Systemic lupus erythematosus Fever

**Bottom Line:**

The association between HLA subtypes and major diseases are commonly tested. Especially remember **PAIR** (**P**soriasis, **A**nkylosing spondylitis, **I**nflammatory bowel disease, and **R**eactive arthritis) for B27, and DR3, and DR4 for type 1 diabetes mellitus.

Reactive arthritis Diabetes mellitus type 1 Diabetes mellitus Human leukocyte antigen Arthritis HLA-DR4 Gastrointestinal tract

1
2
3
4
5
6
7
8
9

HLA-DR2 is associated with multiple sclerosis, hay fever, SLE, and Goodpasture syndrome.
Multiple sclerosis HLA-DR2 Allergic rhinitis Goodpasture syndrome Systemic lupus erythematosus Fever

**Bottom Line:**

The association between HLA subtypes and major diseases are commonly tested. Especially remember **PAIR** (**P**soriasis, **A**nkylosing spondylitis, **I**nflammatory bowel disease, and **R**eactive arthritis) for B27, and DR3, and DR4 for type 1 diabetes mellitus.
Reactive arthritis Diabetes mellitus type 1 Diabetes mellitus Human leukocyte antigen Arthritis HLA-DR4 Gastrointestinal tract

FIRST AID FIRST AID FACTS for year: 2017

FA17 p 336.1

## Diabetes mellitus

| | |
|---|---|
| ACUTE MANIFESTATIONS | Polydipsia, polyuria, polyphagia, weight loss, DKA (type 1), hyperosmolar coma (type 2). Rarely, can be caused by unopposed secretion of GH and epinephrine. Also seen in patients on glucocorticoid therapy (steroid diabetes). |
| CHRONIC COMPLICATIONS | Nonenzymatic glycation:<br>▪ Small vessel disease (diffuse thickening of basement membrane) → retinopathy (hemorrhage, exudates, microaneurysms, vessel proliferation), glaucoma, neuropathy, nephropathy (nodular glomerulosclerosis, aka Kimmelstiel-Wilson nodules → progressive proteinuria [initially microalbuminuria; ACE inhibitors are renoprotective] and arteriolosclerosis → hypertension; both lead to chronic renal failure).<br>▪ Large vessel atherosclerosis, CAD, peripheral vascular occlusive disease, gangrene → limb loss, cerebrovascular disease, MI most common cause of death |

1
2
3
4
5
6
7
8
9

↓ tissue perfusion

↓

Coma/death

FA17 p 337.1

## Type 1 vs type 2 diabetes mellitus

| Variable | Type 1 | Type 2 |
|---|---|---|
| 1° DEFECT | Autoimmune destruction of β cells (eg, due to glutamic acid decarboxylase antibodies) | ↑ resistance to insulin, progressive pancreatic β-cell failure |
| INSULIN NECESSARY IN TREATMENT | Always | Sometimes |
| AGE (EXCEPTIONS COMMONLY OCCUR) | < 30 yr | > 40 yr |
| ASSOCIATION WITH OBESITY | No | Yes |
| GENETIC PREDISPOSITION | Relatively weak (50% concordance in identical twins), polygenic | Relatively strong (90% concordance in identical twins), polygenic |
| ASSOCIATION WITH HLA SYSTEM | Yes (HLA-DR3 and -DR4) | No |
| GLUCOSE INTOLERANCE | Severe | Mild to moderate |
| INSULIN SENSITIVITY | High | Low |
| KETOACIDOSIS | Common | Rare |
| β-CELL NUMBERS IN THE ISLETS | ↓ | Variable (with amyloid deposits) |
| SERUM INSULIN LEVEL | ↓ | Variable |

1
2
3
4
5
6
7
8
9

| | | |
|---|---|---|
| CLASSIC SYMPTOMS OF POLYURIA, POLYDIPSIA, POLYPHAGIA, WEIGHT LOSS | Common | Sometimes |
| HISTOLOGY | Islet leukocytic infiltrate | Islet amyloid polypeptide (IAPP) deposits |

FA17 p 96.2

## HLA subtypes associated with diseases

| | | |
|---|---|---|
| A3 | Hemochromatosis | |
| B8 | Addison disease, myasthenia gravis, Graves disease | |
| B27 | Psoriatic arthritis, Ankylosing spondylitis, IBD-associated arthritis, Reactive arthritis | PAIR. Also known as seronegative arthropathies. |
| DQ2/DQ8 | Celiac disease | I ate (8) too (2) much gluten at Dairy Queen. |
| DR2 | Multiple sclerosis, hay fever, SLE, Goodpasture syndrome | Multiple hay pastures have dirt. |
| DR3 | Diabetes mellitus type 1, SLE, Graves disease, Hashimoto thyroiditis, Addison disease | 2-3, S-L-E |
| DR4 | Rheumatoid arthritis, diabetes mellitus type 1, Addison disease | There are 4 walls in a "rheum" (room). |
| DR5 | Pernicious anemia → vitamin $B_{12}$ deficiency, Hashimoto thyroiditis | |

1
2
• 3
• 4
• 5
• 6
• 7
• 8
• 9

A 30-year-old woman comes to the physician complaining that her blood pressure was high when she measured it on a machine at a local drug store. She has no significant medical history. Resting blood pressure is 170/110 mm Hg. Laboratory studies show:

$Na^+$: 160 mEq/L
$K^+$: 2.3 mEq/L
$Ca^{2+}$: 9.1 mEq/L
Fasting glucose: within normal limits
pH: 7.5

Which of the following areas of the adrenal gland produces the hormone that is causing this patient's symptoms?

**A.** Chromaffin cells
**B.** Medulla
**C.** Zona fasciculata
**D.** Zona glomerulosa
**E.** Zona reticularis

1
2
3
4
5
6
7
8
9

**The correct answer is D. 80% chose this.**

Hypernatremia, hypokalemia, and metabolic alkalosis are symptoms of primary aldosteronism (Conn's syndrome), which is due to increased aldosterone secretion by the zona glomerulosa of the adrenals. As a consequence of the increased aldosterone activity in the principal cells of the collecting duct, an increase in sodium reuptake is accompanied by a concurrent increase in potassium excretion. Also, water is passively reabsorbed along with sodium, resulting in hypervolemia and higher blood pressures. **SSS** and **GFR** are useful for remembering the hormones secreted by the adrenal cortex and their location from the outside to the inside: aldosterone (**S**alt) from the zona **G**lomerulosa, cortisol (**S**ugar) from the zona **F**asciculata, and androgens (**S**ex) from the zona **R**eticularis.

Primary aldosteronism Zona glomerulosa Metabolic alkalosis Hypokalemia Hypervolemia Hypernatremia Cortisol Aldosterone Adrenal cortex Collecting duct system Alkalosis Sodium Potassium Androgen Metabolism Hormone Secretion Hyperaldosteronism

**A is not correct. 5% chose this.**

Chromaffin cells are located within the adrenal medulla and are responsible for producing catecholamines (norepinephrine and epinephrine). Excess catecholamines can result in hypertension, but not in the electrolyte disturbances that are seen in this case.

Adrenal medulla Epinephrine Norepinephrine Electrolyte Chromaffin cell Catecholamine Hypertension Medulla oblongata Adrenal gland

**B is not correct. 5% chose this.**

The adrenal medulla produces catecholamines (norepinephrine and epinephrine). Excess catecholamines would affect blood pressure but would not result in the sodium retention and potassium wasting seen here.

Adrenal medulla Epinephrine Norepinephrine Catecholamine Blood pressure Medulla oblongata Sodium Adrenal gland Potassium

**C is not correct. 8% chose this.**

The zona fasciculata produces cortisol. Excess cortisol, as seen in Cushing's syndrome, would lead to truncal obesity, striae, hyperglycemia, and hypertension.

Zona fasciculata Cushing's syndrome Cortisol Hyperglycemia Obesity Hypertension

**E is not correct. 2% chose this.**

The zona reticularis produces lipids and androgens. Excess androgens would lead to acne, hirsutism, and possible virilization.

Hirsutism Zona reticularis Virilization Acne vulgaris Androgen Lipid

**Bottom Line:**

1
2
3
4
5
6
7
8
9

**E is not correct. 2% chose this.**

The zona reticularis produces lipids and androgens. Excess androgens would lead to acne, hirsutism, and possible virilization.

Hirsutism Zona reticularis Virilization Acne vulgaris Androgen Lipid

**Bottom Line:**

High levels of aldosterone, which is secreted by the zona glomerulosa of the adrenal glands, causes hypernatremia, hypokalemia, hypervolemia, and metabolic alkalosis.

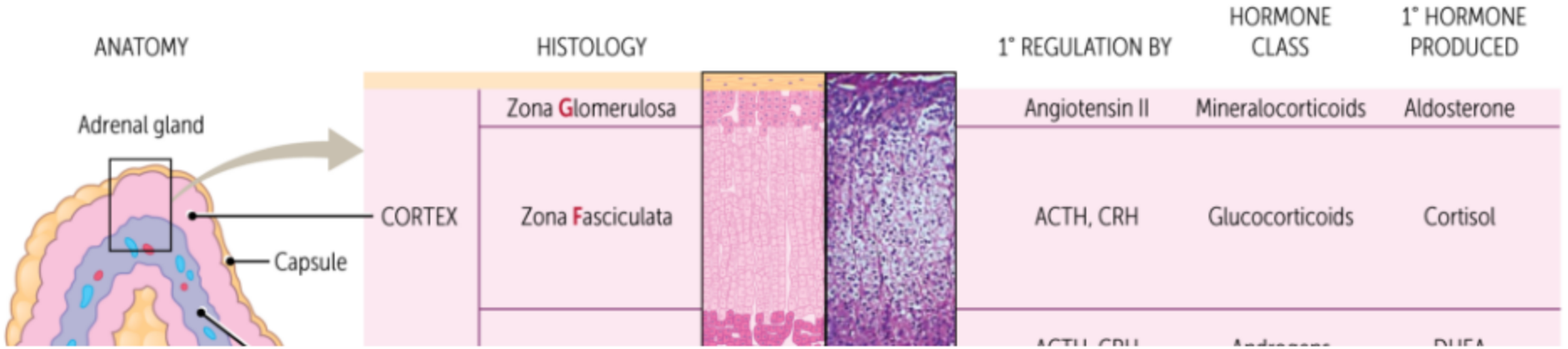
Zona glomerulosa Hypokalemia Hypervolemia Hypernatremia Aldosterone Metabolic alkalosis Alkalosis Adrenal gland Metabolism

FIRST AID FIRST AID FACTS for year: 2017

FA17 p 312.2

**Adrenal cortex and medulla**

Adrenal cortex (derived from mesoderm) and medulla (derived from neural crest).



1
2
3
▪ 4
▪ 5
▪ 6
▪ 7
▪ 8
▪ 9

During a routine visit to his primary care physician, a 55-year-old man with a history of radiation to his neck for lymphoma as a young man is found to have a singular thyroid nodule. Work-up suggests the nodule to be neoplastic. A section of resected tissue is shown in the image.

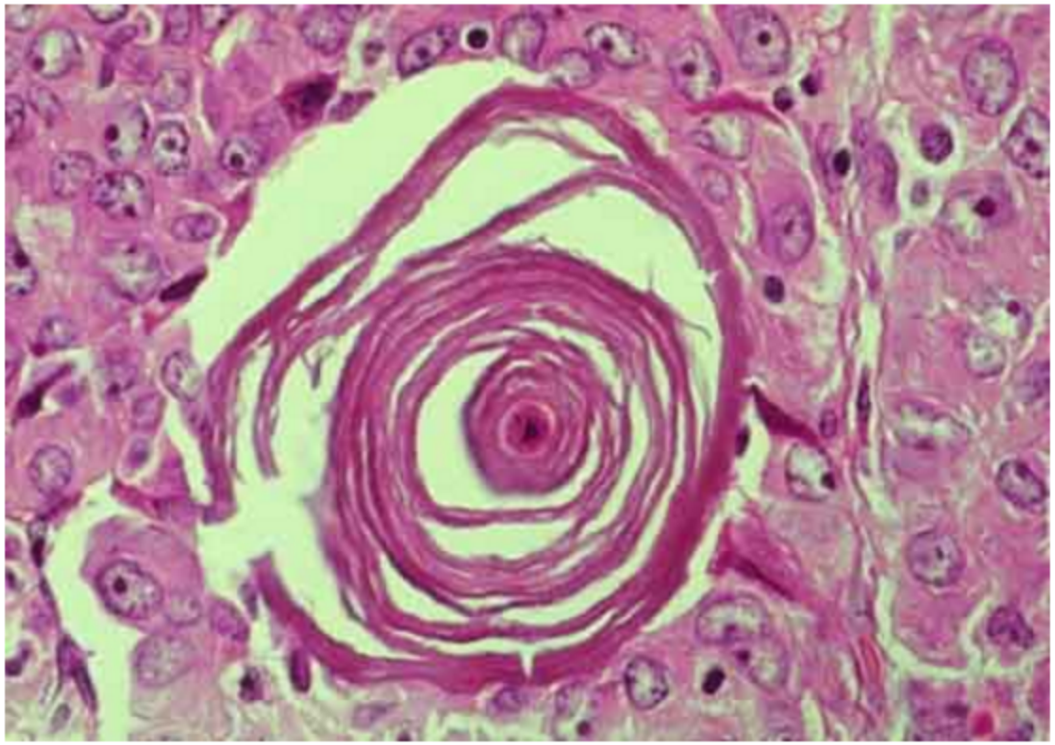


*Image courtesy of the Armed Forces Institute of Pathology*

What type of thyroid malignancy has this patient developed?

**A.** Anaplastic carcinoma

**B.** Follicular carcinoma of the thyroid

**C.** Medullary carcinoma of the thyroid

1
2
3
4
5
6
7
8
9

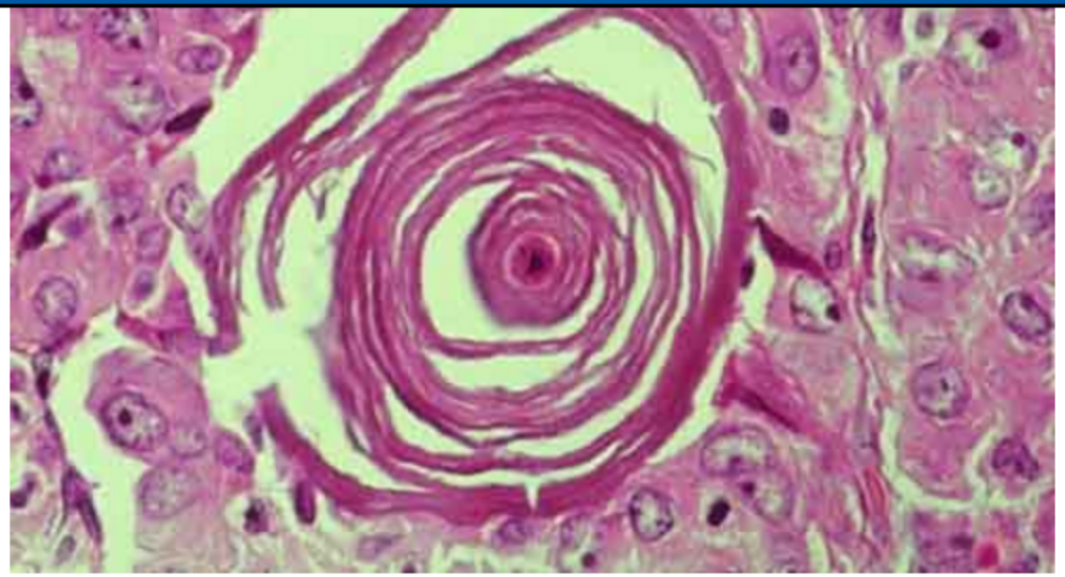


*Image courtesy of the Armed Forces Institute of Pathology*

What type of thyroid malignancy has this patient developed?

- **A.** Anaplastic carcinoma
- **B.** Follicular carcinoma of the thyroid
- **C.** Medullary carcinoma of the thyroid
- **D.** Papillary carcinoma
- **E.** Thyroid lymphoma

1
2
3
4
5
6
7
8
9

**The correct answer is D. 61% chose this.**

The patient has papillary adenocarcinoma of the thyroid, which accounts for approximately 80% of thyroid carcinomas. Papillary thyroid carcinoma usually can be cured by resection of the primary tumor. Diagnosis is often made by fine-needle biopsy. The histologic finding in the image is a psammoma body (a concentrically laminated, calcified structure), which is found in approximately 50% of papillary adenocarcinomas of the thyroid. Psammoma bodies are also found in serous papillary cystadenocarcinomas of the ovary, meningiomas, and malignant mesotheliomas.

Psammoma body Papillary thyroid cancer Meningioma Biopsy Ovary Segmental resection Malignancy Adenocarcinoma Carcinoma Neoplasm Histology Primary tumor Serous fluid Cancer Calcification Thyroid neoplasm Thyroid

**A is not correct. 7% chose this.**

Anaplastic carcinoma is a poorly differentiated and aggressive type of thyroid cancer with a poor prognosis. Psammoma bodies are not seen.

Psammoma body Thyroid cancer Carcinoma Prognosis Anaplasia Cancer Anaplastic carcinoma

**B is not correct. 13% chose this.**

Follicular carcinomas of the thyroid are less common but more malignant than papillary carcinomas of the thyroid. Unlike papillary carcinoma, in which hematogenous metastasis is rare, follicular carcinomas commonly metastasize via the blood to lungs or bones. Histologically, follicular carcinomas tend to form acini or follicles lined with cells that are larger than those found in normal thyroid. Psammoma bodies are not found in follicular carcinoma.

Psammoma body Metastasis Malignancy Follicular thyroid cancer Thyroid Papillary thyroid cancer Histology Cancer Carcinoma Lung

**C is not correct. 16% chose this.**

Medullary carcinoma of the thyroid arises from the C cells of the thyroid, which produce calcitonin. It is a rare cancer of the thyroid and can be associated with multiple endocrine neoplasia (MEN) types 2A and 2B. Histologic examination of a medullary carcinoma would reveal sheets of tumor cells in an amyloid stroma. Psammoma bodies are not found in these tumors.

Psammoma body Medullary thyroid cancer Calcitonin Stroma (animal tissue) Multiple endocrine neoplasia Amyloid Thyroid cancer Thyroid Histology Carcinoma Neoplasm Endocrine system Cancer Stromal cell

**E is not correct. 3% chose this.**

Thyroid lymphomas often arise in the setting of Hashimoto thyroiditis, but would not have a psammoma body.

Hashimoto's thyroiditis Thyroid Lymphoma Thyroiditis

**Bottom Line:**

Remember **PS**a**MM**oma bodies: **P**apillary thyroid, **S**erous ovary, **M**eningioma, and **M**esothelioma.

1
2
3
4
5
6
7
8
9

with multiple endocrine neoplasia (MEN) types 2A and 2B. Histologic examination of a medullary carcinoma would reveal sheets of tumor cells in an amyloid stroma. Psammoma bodies are not found in these tumors.

Psammoma body Medullary thyroid cancer Calcitonin Stroma (animal tissue) Multiple endocrine neoplasia Amyloid Thyroid cancer Thyroid Histology Carcinoma Neoplasm Endocrine system Cancer Stromal cell

**E is not correct. 3% chose this.**

Thyroid lymphomas often arise in the setting of Hashimoto thyroiditis, but would not have a psammoma body.

Hashimoto's thyroiditis Thyroid Lymphoma Thyroiditis

**Bottom Line:**

Remember **PS**a**MM**oma bodies: **P**apillary thyroid, **S**erous ovary, **M**eningioma, and **M**esothelioma.

Ovary

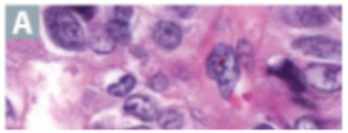
FIRST AID FIRST AID FACTS for year: 2017

FA17 p 330.2

**Thyroid cancer**

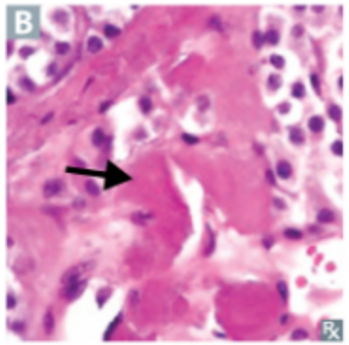
Typically diagnosed with fine needle aspiration; treated with thyroidectomy. Complications of surgery include hoarseness (due to recurrent laryngeal nerve damage), hypocalcemia (due to removal of parathyroid glands), and transection of recurrent and superior laryngeal nerves (during ligation of inferior thyroid artery and superior laryngeal artery, respectively).

**Papillary carcinoma**



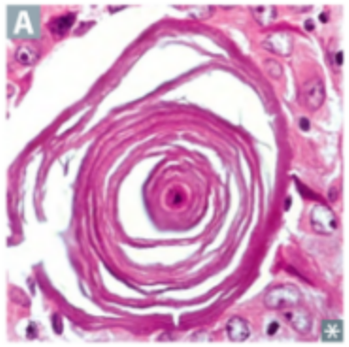

Most common, excellent prognosis. Empty-appearing nuclei with central clearing ("Orphan Annie" eyes) A, psamMoma bodies, nuclear grooves (Papi and Moma adopted Orphan Annie). ↑ risk with *RET* and *BRAF* mutations, childhood irradiation.

1
2
3
4
5
6
7
8
9

| | |
|---|---|
| **Medullary carcinoma**  | From parafollicular "C cells"; produces calcitonin, sheets of cells in an amyloid stroma (stains with Congo red B). Associated with MEN 2A and 2B (*RET* mutations). |
| **Undifferentiated/ anaplastic carcinoma** | Older patients; invades local structures, very poor prognosis. |
| **Lymphoma** | Associated with Hashimoto thyroiditis. |

FA17 p 220.1

**Psammoma bodies**

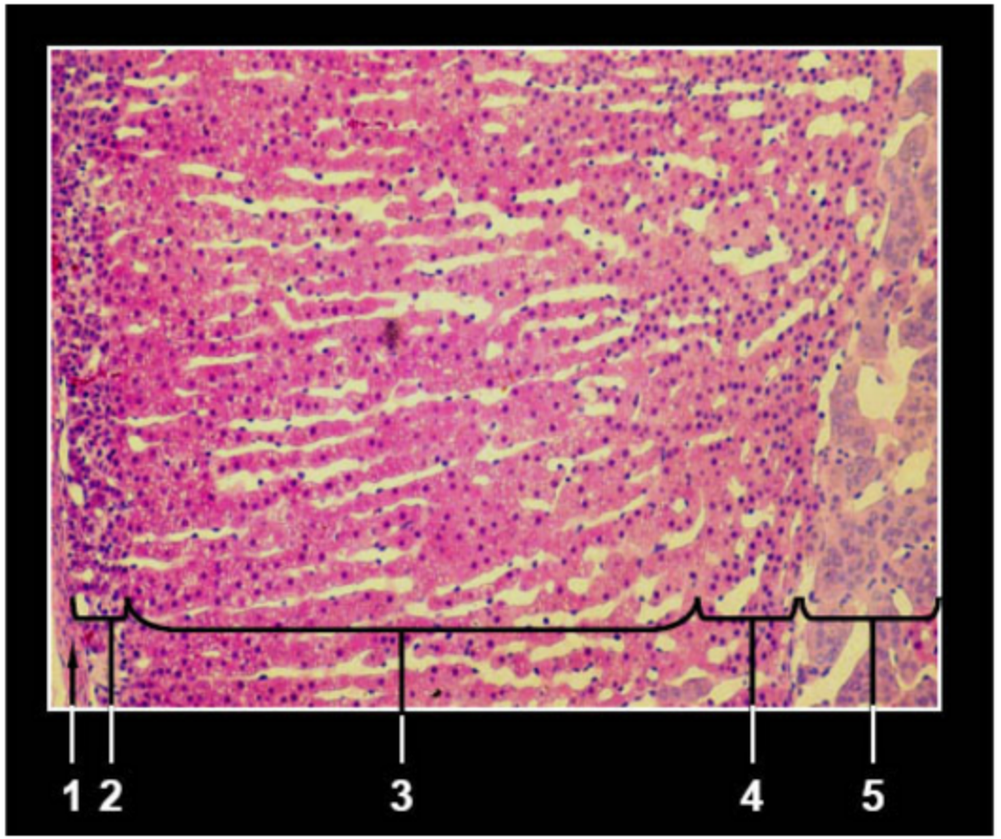


Laminated, concentric spherules with dystrophic calcification A, PSaMMoma bodies are seen in:

- Papillary carcinoma of thyroid
- Serous papillary cystadenocarcinoma of ovary
- Meningioma
- Malignant Mesothelioma

1
2
3
4
5
6
7
8
9

A 16-year-old girl comes to the physician concerned that she has not yet begun menstruating. Her blood pressure is 160/100 mm Hg. Physical examination reveals anatomically normal female genitals but a lack of any secondary sexual development including breast buds or pubic hair.

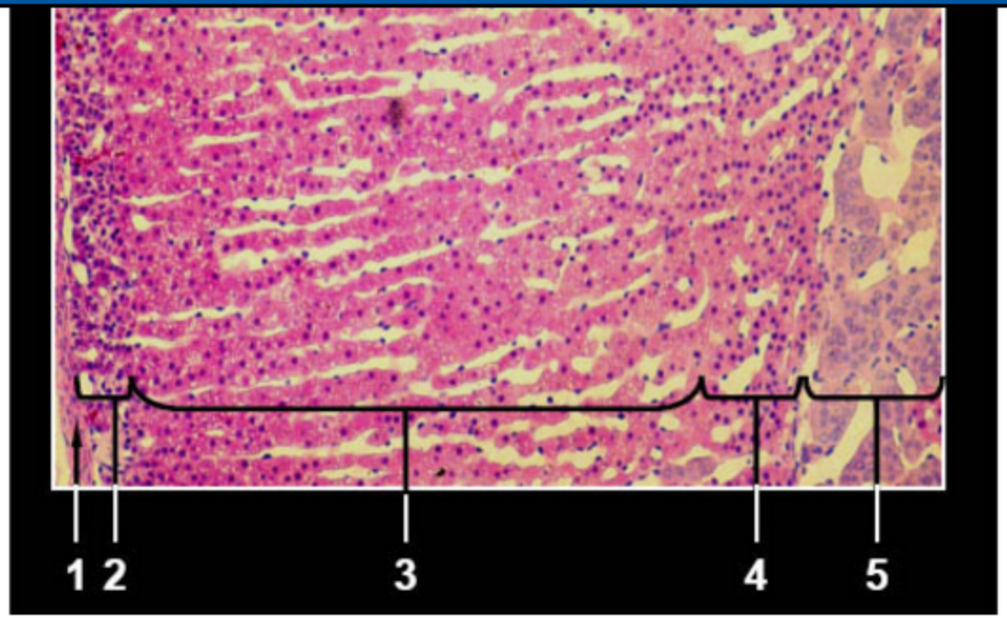



In this patient, hormones normally produced in which layer of the adrenal gland are overexpressed?

**A.** 1

**B.** 2

1
2
3
4
▪ 5
▪ 6
▪ 7
▪ 8
▪ 9




In this patient, hormones normally produced in which layer of the adrenal gland are overexpressed?

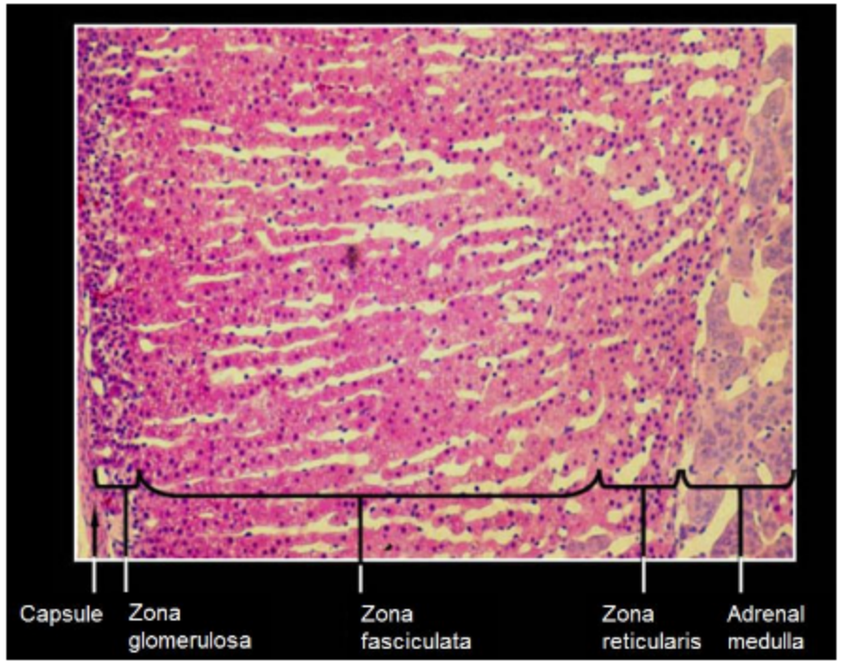
- **A.** 1
- **B.** 2
- **C.** 3
- **D.** 4
- **E.** 5

1
2
3
4
5
6
7
8
9

**The correct answer is B. 45% chose this.**

This patient suffers from 17α-hydroxylase deficiency, a rare form of congenital adrenal hyperplasia. This patient is unable to move steroid synthesis into normal glucocorticoid and androgen production without 17α-OHase. This deficiency results in mass ACTH stimulation and production of aldosterone precursor proteins, including deoxycorticosterone and corticosterone, which at high levels have both mineralocorticoid and weak glucocorticoid activities. This allows for prevention of adrenal crisis, but results in hypertension and hypokalemia from the overstimulation of the mineralocorticoid receptor. The hypertension and hypokalemia suppress production of renin, angiotensin, and aldosterone. Mineralocorticoids are normally synthesized in the zona glomerulosa which corresponds to 2 on the above image. The image shows the labeled anatomy of the adrenal gland.

Adrenal gland Zona glomerulosa Mineralocorticoid receptor Glucocorticoid Hypokalemia Congenital adrenal hyperplasia Corticosterone Aldosterone Mineralocorticoid 11-Deoxycorticosterone Hypertension Renin Androgen Adrenal crisis Adrenocorticotropic hormone Steroid Steroidogenesis Hyperplasia Angiotensin Congenital disorder Protein Receptor (biochemistry)




**A is not correct. 8% chose this.**

The capsule is the first histologic layer seen on cross-section of the adrenal gland. This layer is not biosynthetically active.

Adrenal gland Biosynthesis Histology Gland

**C is not correct. 15% chose this.**

The zona fasciculata is the third histologic layer seen on cross-section of the adrenal gland and produces glucocorticoids such as cortisol. Congenital adrenal hyperplasia results from defective cortisol production, a condition that leads to increased ACTH release and subsequent hyperplasia of the adrenal gland.

Adrenal gland Zona fasciculata Congenital adrenal hyperplasia Cortisol Hyperplasia Adrenocorticotropic hormone Glucocorticoid Histology Congenital disorder Gland

**D is not correct. 25% chose this.**

1
2
3
4
5
6
7
8
9

The zona fasciculata is the third histologic layer seen on cross-section of the adrenal gland and produces glucocorticoids such as cortisol. Congenital adrenal hyperplasia results from defective cortisol production, a condition that leads to increased ACTH release and subsequent hyperplasia of the adrenal gland.

Adrenal gland Zona fasciculata Congenital adrenal hyperplasia Cortisol Hyperplasia Adrenocorticotropic hormone Glucocorticoid Histology Congenital disorder Gland

**D is not correct. 25% chose this.**

The zona reticularis is the fourth histologic layer seen on cross-section of the adrenal gland, and it produces androgens, such as dehydroepiandrosterone (DHEA); these are underproduced as a result of 17α-hydroxylase deficiency. However, the more common form of congenital adrenal hyperplasia caused by 21β-hydroxylase deficiency leads to overproduction of androgens from the zona reticularis.

Adrenal gland Zona reticularis Dehydroepiandrosterone Congenital adrenal hyperplasia Androgen Hyperplasia Histology Congenital disorder

**E is not correct. 7% chose this.**

The histologic layer farthest from the capsule is the adrenal medulla. The medulla is responsible for secretion of catecholamines (eg, epinephrine) into the systemic circulation and is composed of chromaffin cells of neural crest origin.

Epinephrine Adrenal medulla Neural crest Chromaffin cell Catecholamine Circulatory system Medulla oblongata Histology Adrenal gland

**Bottom Line:**

Delayed puberty in girls can be caused by 17α-hydroxylase deficiency, which leads to overproduction of mineralocorticoids including DOC and corticosterone.

Corticosterone Delayed puberty Mineralocorticoid Puberty

FIRST AID FIRST AID FACTS for year: 2017

FA17 p 312.2

**Adrenal cortex and**

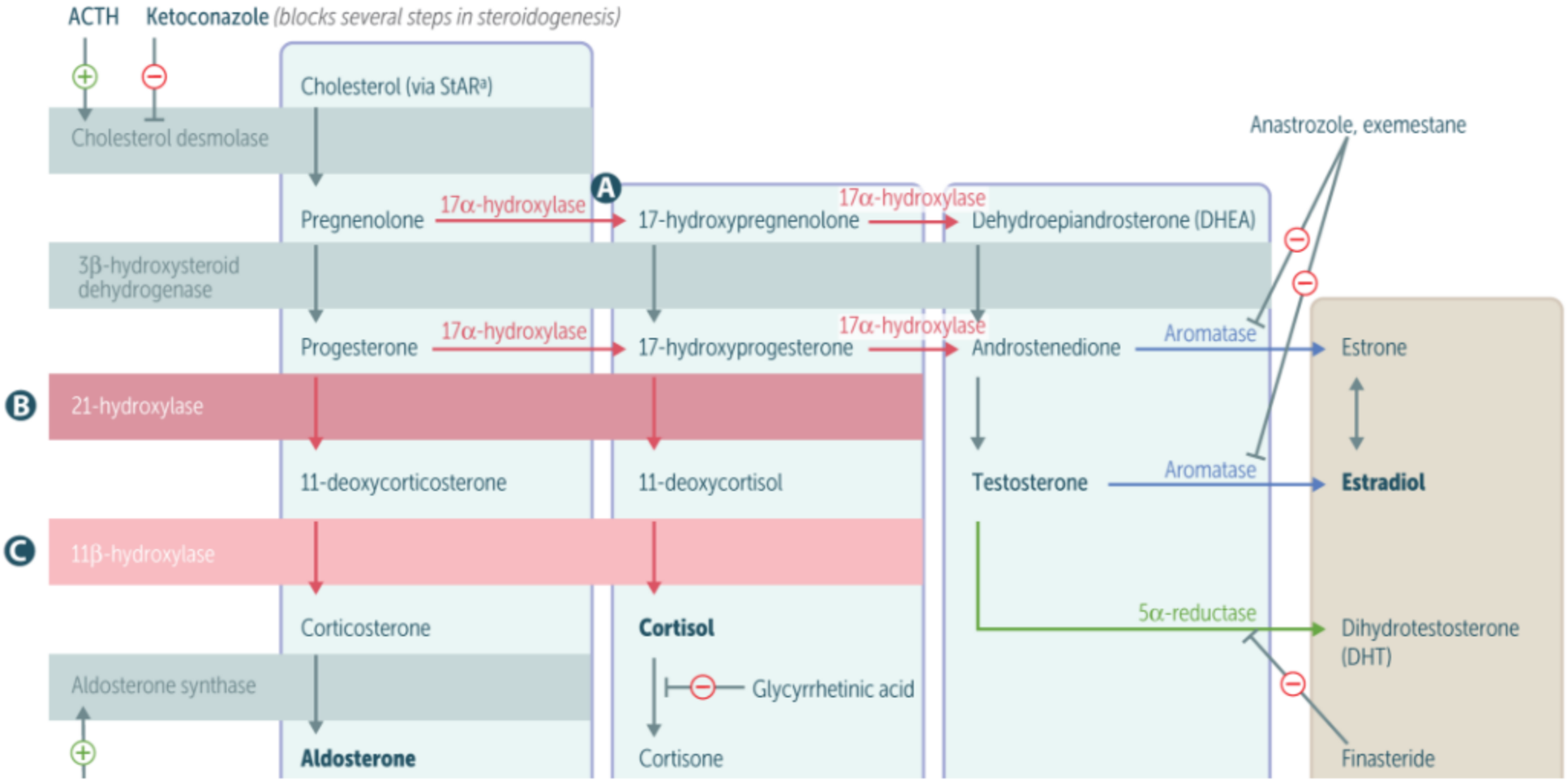
Adrenal cortex (derived from mesoderm) and medulla (derived from neural crest).

1
2
3
4
5
6
7
8
9

"The deeper you go, the sweeter it gets."

FA17 p 318.1

## Adrenal steroids and congenital adrenal hyperplasias



1
2
3
4
5
• 6
• 7
• 8
• 9

A 47-year-old woman presents to her physician complaining of weight gain, fatigue, and lethargy. Her appetite has decreased recently and she has been constipated. Physical examination reveals an enlarged, symmetric, and firm thyroid. A thyroid biopsy is significant for a lymphocytic and plasma cell infiltrate with occasional germinal center formation. The follicles contain little colloid, and the follicular epithelial lining shows enlarged epithelial cells containing acidophilic cytoplasm.

Which of the following antibodies is most likely to be found in this patient?

**A.** Anti-smooth muscle

**B.** Anti-U1 RNP

**C.** Anticentromere

**D.** Antimitochondrial

**E.** Antithyroid peroxidase antibodies

1
2
3
4
5
6
7
8
9

**The correct answer is E. 84% chose this.**

The patient is suffering from Hashimoto thyroiditis, an autoimmune disorder that is a common cause of hypothyroidism. Other classic signs and symptoms of hypothyroidism include cold intolerance, hypoactivity, weakness, diminished reflexes, dry and cool skin, and coarse hair. In Hashimoto disease, and in other primary causes of hypothyroidism, laboratory studies reveal increased thyroid-stimulating hormone levels (the most sensitive laboratory test for primary hypothyroidism) and decreased total triiodothyronine and thyroxine levels. In patients with Hashimoto thyroiditis, the thyroid gland is usually goitrous and firm, and histology reveals a significant lymphocyte and plasma cell infiltrate (as shown in the image) with germinal center formation, colloid-sparse follicles, and Hürthle cells (the acidophilic cells described in the vignette). Patients with Hashimoto thyroiditis frequently have a personal or family history of autoimmune disease, and there is an increased incidence of the disease among individuals with HLA-DR5 and -B5 haplotypes. Antithyroid peroxidase antibodies are associated with Hashimoto thyroiditis. Antithyroglobulin antibodies may also be seen.

Hashimoto's thyroiditis Plasma cell Anti-thyroid autoantibodies Thyroid-stimulating hormone Hypothyroidism Autoimmune disease Thyroid hormone Triiodothyronine HLA-DR Germinal center Lymphocyte Antibody Histology Thyroid Autoimmunity Blood plasma Peroxidase Thyroiditis Hormone Antithyroid agent

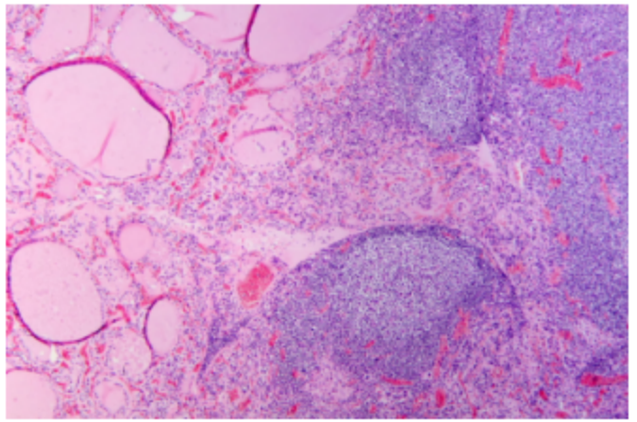


*Image courtesy of Wikimedia Commons*

**A is not correct. 3% chose this.**

Anti-smooth muscle antibodies may be seen in the setting of autoimmune hepatitis. Patients with autoimmune hepatitis present with elevated liver enzymes (AST, ALT), jaundice, and right upper quadrant pain. It is more common in young to middle-aged women.

Autoimmune hepatitis Anti-smooth muscle antibody Jaundice Quadrant (abdomen) Antibody Hepatitis Liver Aspartate transaminase Autoimmune disease Autoimmunity

**B is not correct. 3% chose this.**

Anti-U1 RNP antibodies are associated with mixed connective tissue disease. Mixed connective tissue disease manifests as an overlap syndrome or a combination of multiple connective diseases. It manifests with signs and symptoms found in lupus, rheumatoid arthritis, dermatomyositis, and scleroderma.

U1 spliceosomal RNA Mixed connective tissue disease Rheumatoid arthritis Dermatomyositis Scleroderma Connective tissue disease Antibody Systemic lupus erythematosus Lupus erythematosus Arthritis Connective tissue Overlap syndrome

**C is not correct. 4% chose this.**

1
2
3
4
5
6
7
8
9

**C is not correct. 4% chose this.**

Anticentromere antibodies are associated with CREST syndrome. This mnemonic can be used to remember how the disease manifests. **CREST** syndrome manifests with **C**alcinosis (localized dystrophic calcification deposition on the skin, which manifests as subcutaneous pink to white granules), **R**aynaud phenomenon, **E**sophageal dysmotility, **S**clerodactyly (fibrosis of the fingers distal to the metacropophlangeal joints, resulting in a shiny appearance of the skin and flexion contracture and joint pain), and **T**elangiectasias (small dilated blood vessels within the skin and mucous membranes).

CREST syndrome Anti-centromere antibodies Antibody Arthralgia Fibrosis Calcification

**D is not correct. 6% chose this.**

Antimitochondrial antibodies are associated with primary biliary cirrhosis. Primary biliary cirrhosis is the most common cause of ductopenia in adults and is more common in middle-aged women. It is due to autoimmune destruction of intrahepatic medium-sized bile ducts, which leads to cholestasis. It manifests insidiously, and patients complain of mild abdominal discomfort, pruritus (due to deposition of bilirubin in the tissues), and fatigue. Patients may also complain of dark urine (increased bilirubin in the urine due to obstruction of intrahepatic bile ducts) and pale stools. On physical examination, look for evidence of scratch marks and xanthomatous lesions.

Anti-mitochondrial antibody Primary biliary cirrhosis Bilirubin Cirrhosis Cholestasis Itch Antibody Bile Bile duct Autoimmune disease Urine Fatigue (medical) Autoimmunity Intrahepatic bile ducts Physical examination

**Bottom Line:**

Hashimoto thyroiditis is an autoimmune cause of hypothyroidism in which there may be elaboration of antithyroid peroxidase antibodies (anti-TPO) and/or antithyroglobulin antibodies.

Hashimoto's thyroiditis Anti-thyroid autoantibodies Hypothyroidism Antibody Autoimmune disease Thyroiditis Autoimmunity Peroxidase Antithyroid agent

FIRST AID FIRST AID FACTS for year: 2017

FA17 p 328.1

## Hypothyroidism

Hashimoto thyroiditis — Most common cause of hypothyroidism in iodine sufficient regions; an autoimmune disorder with

1
2
3
4
5
6
7
8
9



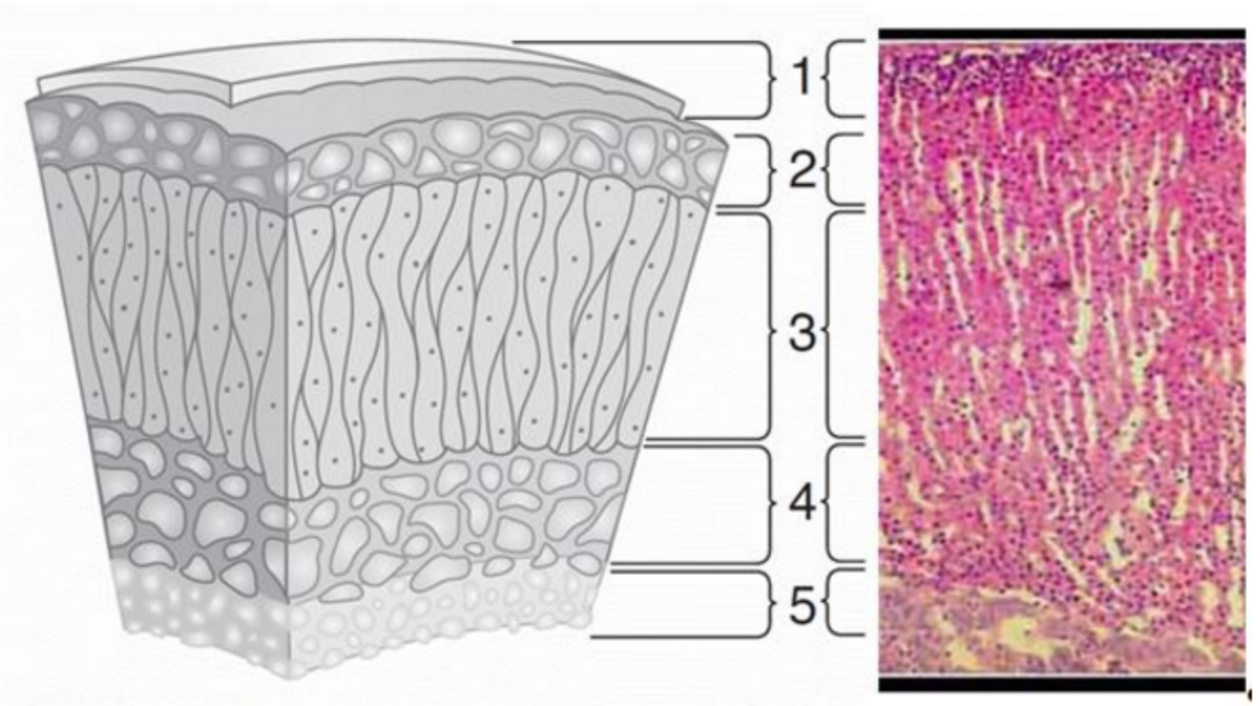
FA17 p 111.1

## Autoantibodies

| AUTOANTIBODY | ASSOCIATED DISORDER |
|---|---|
| Anti-ACh receptor | Myasthenia gravis |
| Anti-glomerular basement membrane | Goodpasture syndrome |
| Anti-$\beta_2$ glycoprotein | Antiphospholipid syndrome |
| Anticardiolipin, lupus anticoagulant | SLE, antiphospholipid syndrome |
| Anticentromere | Limited scleroderma (CREST syndrome) |
| Anti-desmoglein (anti-desmosome) | Pemphigus vulgaris |
| Anti-glutamic acid decarboxylase, islet cell cytoplasmic antibodies | Type 1 diabetes mellitus |
| Anti-hemidesmosome | Bullous pemphigoid |
| Antisynthetase (eg, anti-Jo-1), anti-SRP, anti-helicase (anti-Mi-2) | Polymyositis, dermatomyositis |
| Antimicrosomal, antithyroglobulin, anti-thyroid peroxidase | Hashimoto thyroiditis |
| Antimitochondrial | 1° biliary cirrhosis |
| Antiparietal cell, anti-intrinsic factor | Pernicious anemia |
| Antiphospholipase $A_2$ receptor | 1° membranous nephropathy |

1
2
3
4
5
6
7
8
9

The predominant cells in zone 5 from the adrenal gland shown in the schematic/photomicrograph secrete which of the following hormones into the bloodstream?



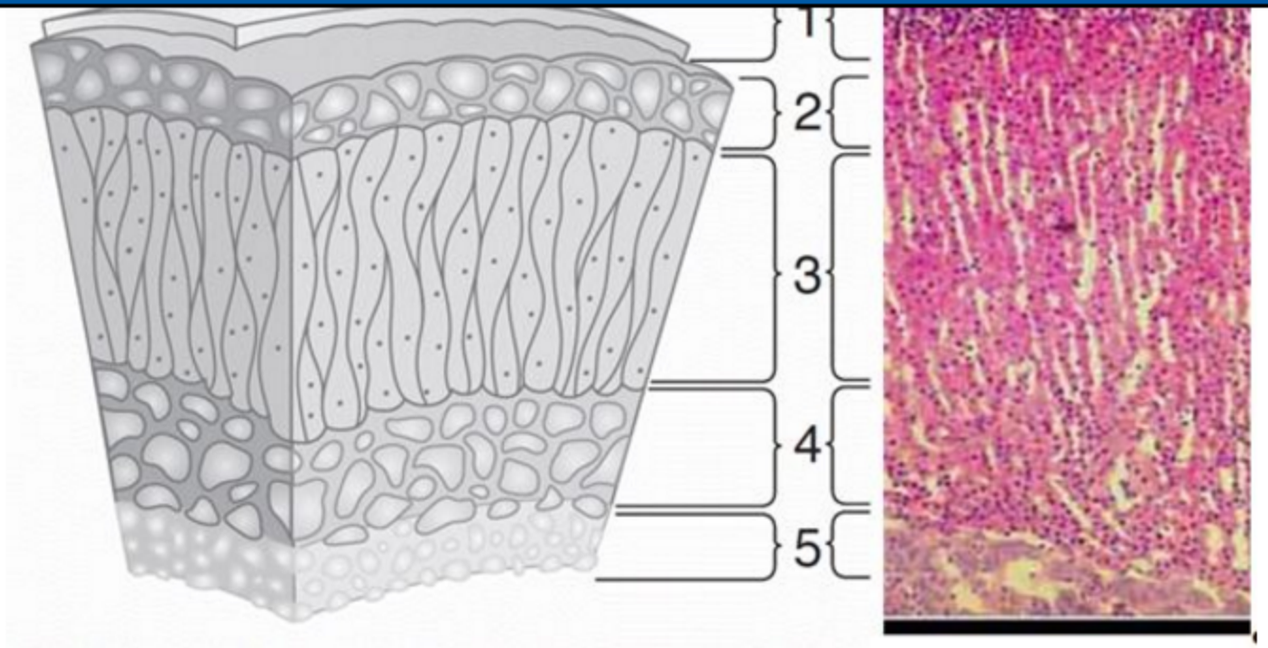

*Micrograph courtesy of the Uniformed Services University of the Health Sciences*

**A.** Aldosterone

**B.** Androgens

**C.** Cortisol

1
2
3
4
5
6
7
8
9




*Micrograph courtesy of the Uniformed Services University of the Health Sciences*

**A.** Aldosterone

**B.** Androgens

**C.** Cortisol

**D.** Norepinephrine

1
2
3
4
5
6
7
8
9

**The correct answer is D. 82% chose this.**

Chromaffin cells are neuroendocrine cells derived from the embryonic neural crest. They are found in the medulla of the adrenal gland (labelled 5 in image) and in sympathetic nervous system ganglia. Chromaffin cells of the adrenal medulla are innervated by the splanchnic nerve and secrete epinephrine, norepinephrine, and enkephalin into the bloodstream. They derive their name from their ability to be visualized by staining with chromium salts. These cells have large nuclei and are strongly basophilic, in contrast to the more eosinophilic zona reticularis cells. They contain little endoplasmic reticulum and no stored lipid. Norepinephrine-secreting cells are distinguished from epinephrine-secreting cells by virtue of having dense core granules and a more strongly positive chromaffin reaction.

Adrenal gland Enkephalin Zona reticularis Epinephrine Adrenal medulla Sympathetic nervous system Neural crest Endoplasmic reticulum Norepinephrine Splanchnic nerves Chromium Chromaffin cell Endocrine system Neuroendocrine cell Lipid Ganglion Nervous system Nucleus (neuroanatomy) Cell nucleus Medulla oblongata Gland

**A is not correct. 3% chose this.**

Aldosterone is secreted by zona glomerulosa cells (here labelled 2, which are arranged in irregular ovoid clusters. These cells have round, strongly stained nuclei and are found below the adrenal capsule (labelled 1 in image). The cytoplasm is acidophilic and contains abundant smooth endoplasmic reticulum and mitochondria. Glomerulosa cells contain less lipid and cytoplasm than cells of the zona fasciculata.

Zona fasciculata Zona glomerulosa Aldosterone Mitochondrion Endoplasmic reticulum Cytoplasm Lipid Cell nucleus Acidophile

**B is not correct. 11% chose this.**

Androgens are secreted by cells in the zona reticularis, the innermost zone of the adrenal cortex (here labelled 4). This zone is composed of an irregular network of branching cords and clusters of cells. There are few lipid droplets, and hematoxylin and eosin stains reveal the brown pigment lipofuscin.

Lipofuscin Adrenal cortex Zona reticularis Haematoxylin Lipid Androgen Pigment Eosin H&E stain Adrenal gland

**C is not correct. 4% chose this.**

Cortisol is secreted by cells of the zona fasciculata in the adrenal cortex (here labelled 3). This zone is the middle and the broadest of the three cortical zones. It is identified histologically by radially arranged cords of single cell width. These cells have abundant, poorly staining cytoplasm and are rich in mitochondria and lipid droplets.

Zona fasciculata Cortisol Mitochondrion Adrenal cortex Cytoplasm Lipid Histology Adrenal gland

**Bottom Line:**

The adrenal medulla contains chromaffin cells. Chromaffin cells in the adrenal medulla secrete epinephrine, norepinephrine, and enkephalin into the bloodstream.

1
2
3
4
5
6
7
8
9

mitochondria and lipid droplets.
Zona fasciculata Cortisol Mitochondrion Adrenal cortex Cytoplasm Lipid Histology Adrenal gland

**Bottom Line:**

The adrenal medulla contains chromaffin cells. Chromaffin cells in the adrenal medulla secrete epinephrine, norepinephrine, and enkephalin into the bloodstream.

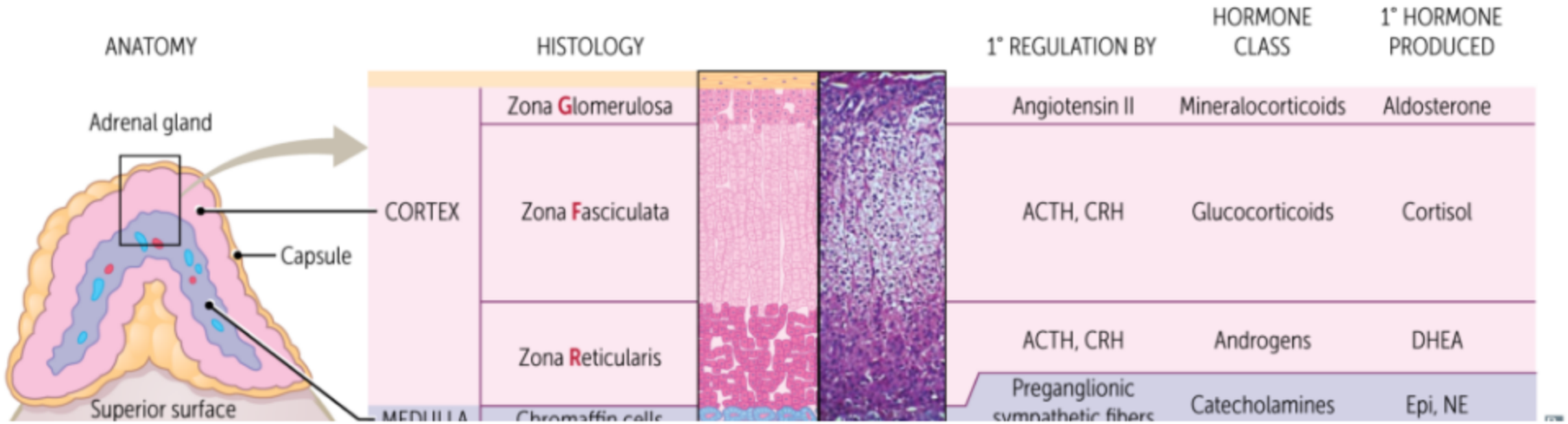
Enkephalin Adrenal medulla Epinephrine Norepinephrine Chromaffin cell Medulla oblongata Circulatory system

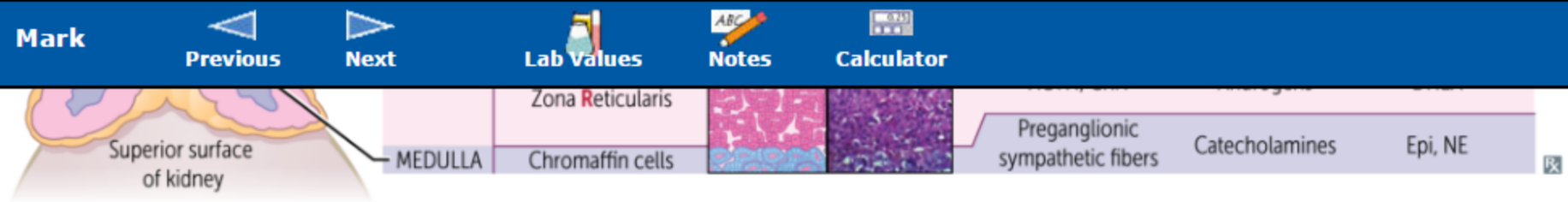
FIRST AID FIRST AID FACTS for year: 2017

FA17 p 312.2

## Adrenal cortex and medulla

Adrenal cortex (derived from mesoderm) and medulla (derived from neural crest).






GFR corresponds with Salt (mineralocorticoids), Sugar (glucocorticoids), and Sex (androgens). "The deeper you go, the sweeter it gets."

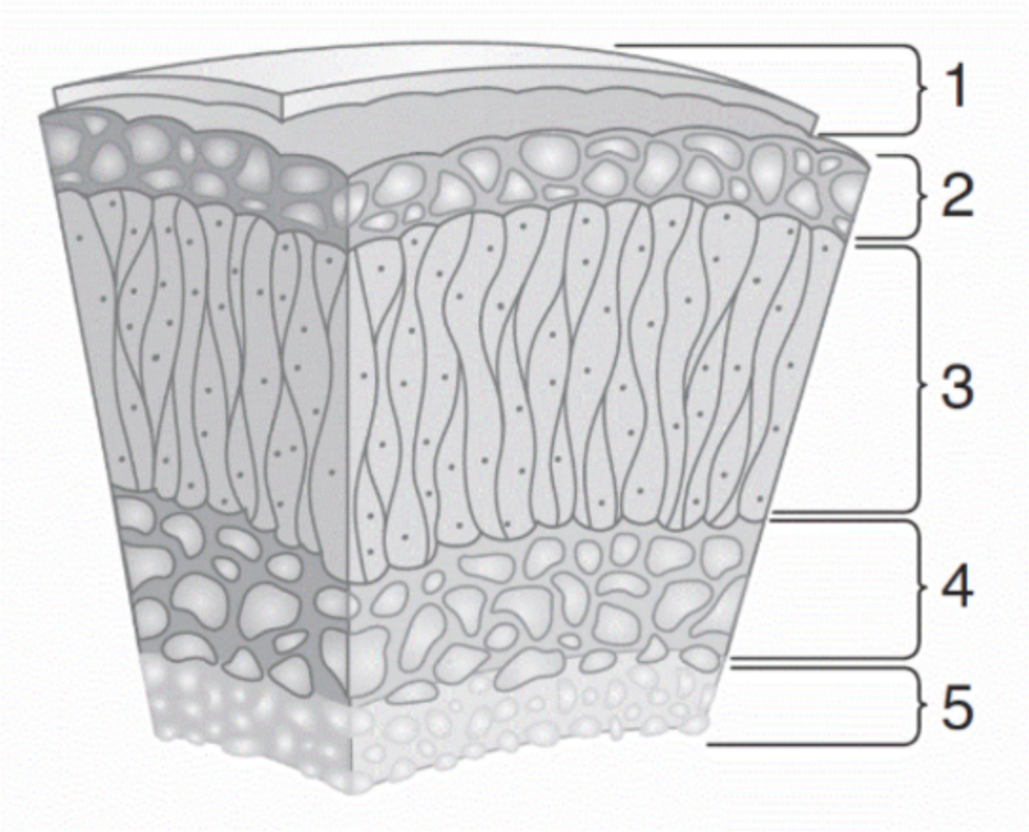
FA17 p 581.1

## Embryologic derivatives

| Ectoderm | | External/outer layer |
|---|---|---|
| Surface ectoderm | Epidermis; adenohypophysis (from Rathke pouch); lens of eye; epithelial linings of oral cavity, sensory organs of ear, and olfactory epithelium; anal canal below the pectinate line; parotid, sweat, mammary glands. | Craniopharyngioma—benign Rathke pouch tumor with cholesterol crystals, calcifications. |
| Neural tube | Brain (neurohypophysis, CNS neurons, oligodendrocytes, astrocytes, ependymal cells, pineal gland), retina, spinal cord. | Neuroectoderm—think CNS. |
| Neural crest | PNS (dorsal root ganglia, cranial nerves, autonomic ganglia, Schwann cells), melanocytes, chromaffin cells of adrenal medulla, parafollicular (C) cells of thyroid, pia and arachnoid, bones of the skull, odontoblasts, aorticopulmonary septum. | Neural crest—think PNS and non-neural structures nearby. |

1
2
3
4
5
6
7
8
9

A 55-year-old man has an endocrine condition that causes excess secretion of a certain hormone. He complains of headaches, weight gain, and depression. His capacious abdomen has hyperpigmented longitudinal marks, and his skin seems thinner than normal for someone his age.

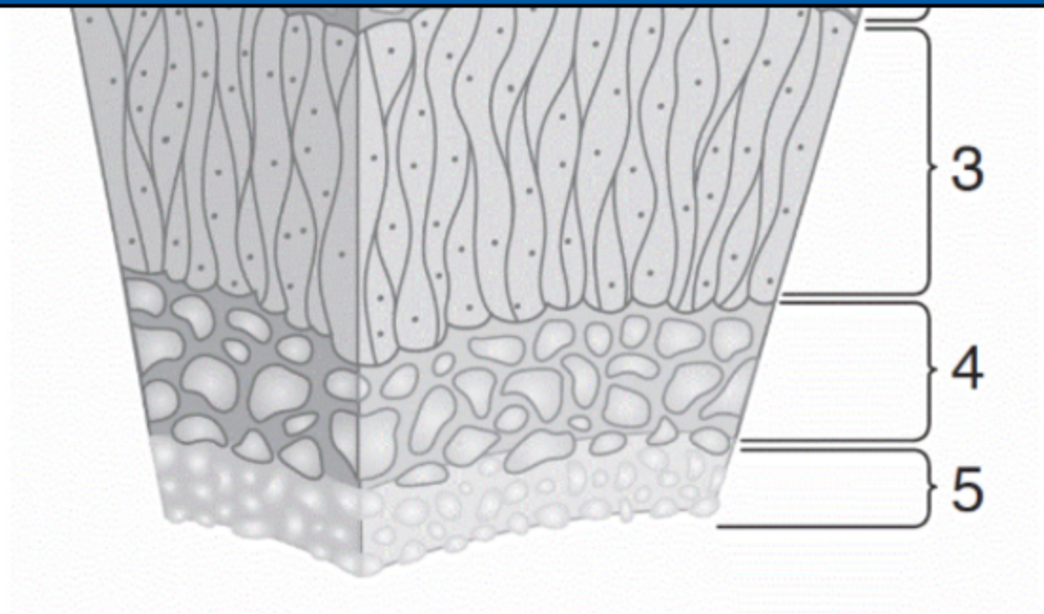



Which portion of the gland (numbered in the image) secretes the hormone causing this man's condition?

**A.** Label 1

**B.** Label 2

1
2
3
4
5
6
7
8
9




Which portion of the gland (numbered in the image) secretes the hormone causing this man's condition?

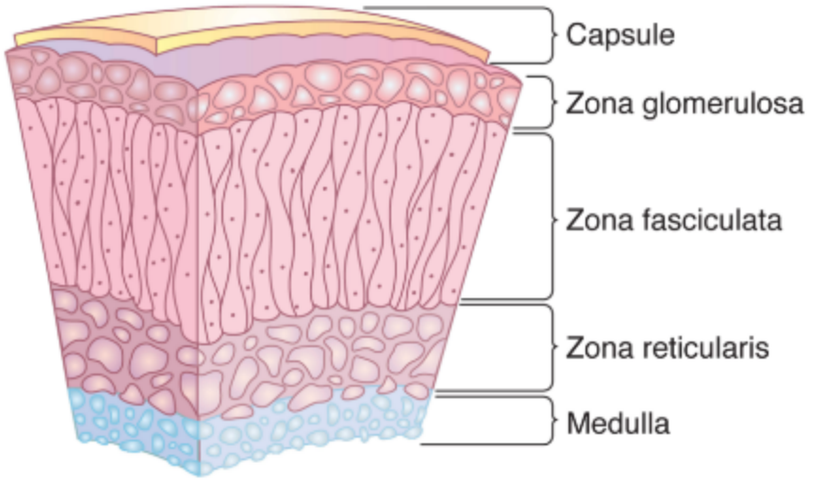
- **A.** Label 1
- **B.** Label 2
- **C.** Label 3
- **D.** Label 4
- **E.** Label 5

1
2
3
4
5
6
7
8
9

**The correct answer is C. 75% chose this.**

This patient is suffering from Cushing syndrome. This condition is the result of elevated cortisol levels, which can be of endogenous or, more commonly, exogenous origin. Symptoms include hypertension, truncal obesity with striae (stretch marks), skin thinning, hyperglycemia, and changes in mental status. A correctly labeled image of the adrenal gland is shown here. Label 3 corresponds to the zona fasciculata, where cortisol and some sex hormones are secreted. This zone is stimulated by ACTH, which can be hypersecreted by a pituitary neoplasm.

Adrenal gland Zona fasciculata Cortisol Cushing's syndrome Hyperglycemia Hypertension Obesity Adrenocorticotropic hormone Neoplasm Exogeny Pituitary gland Sex steroid Stretch marks Endogeny (biology) Hormone Gland




**A is not correct. 3% chose this.**

Label 1 corresponds to the capsule of the adrenal gland, which does not secrete hormones.

Adrenal gland Hormone Gland

**B is not correct. 12% chose this.**

Label 2 corresponds to the zona glomerulosa. Under the influence of the renin-angiotensin system, this zone secretes aldosterone.

Zona glomerulosa Aldosterone Renin-angiotensin system

**D is not correct. 7% chose this.**

Label 4 corresponds to the zona reticularis. Under the influence of pituitary hormones such as ACTH, this zone secretes sex hormones, particularly androgens.

Zona reticularis Adrenocorticotropic hormone Pituitary gland Sex steroid Androgen Hormone Hypothalamic-pituitary hormone

**E is not correct. 3% chose this.**

Label 5 corresponds to the medulla. Stimulated by pre-ganglionic sympathetic fibers, chromaffin cells in this area secrete catecholamines, such as epinephrine and norepinephrine.

1
2
3
4
5
6
7
8
9

Label 4 corresponds to the zona reticularis. Under the influence of pituitary hormones such as ACTH, this zone secretes sex hormones, particularly androgens.

Zona reticularis Adrenocorticotropic hormone Pituitary gland Sex steroid Androgen Hormone Hypothalamic-pituitary hormone

**E is not correct. 3% chose this.**

Label 5 corresponds to the medulla. Stimulated by pre-ganglionic sympathetic fibers, chromaffin cells in this area secrete catecholamines, such as epinephrine and norepinephrine.

Epinephrine Norepinephrine Chromaffin cell Catecholamine Preganglionic nerve fibers Medulla oblongata Sympathetic nervous system

**Bottom Line:**

Symptoms of Cushing syndrome (which results from elevated levels of cortisol secreted in the zona fasciculata, label 3 in the image) include hypertension, truncal obesity with striae, skin thinning, and changes in mental status.

Zona fasciculata Cortisol Cushing's syndrome Obesity Hypertension

FIRST AID FIRST AID FACTS for year: 2017

FA17 p 323.1

## Cushing syndrome

ETIOLOGY

↑ cortisol due to a variety of causes:

- Exogenous corticosteroids—result in ↓ ACTH, bilateral adrenal atrophy. Most common cause.
- Primary adrenal adenoma, hyperplasia, or carcinoma—result in ↓ ACTH, atrophy of uninvolved adrenal gland. Can also present with pseudohyperaldosteronism.
- ACTH-secreting pituitary adenoma (Cushing disease); paraneoplastic ACTH secretion (eg, small cell lung cancer, bronchial carcinoids)—result in ↑ ACTH, bilateral adrenal hyperplasia.

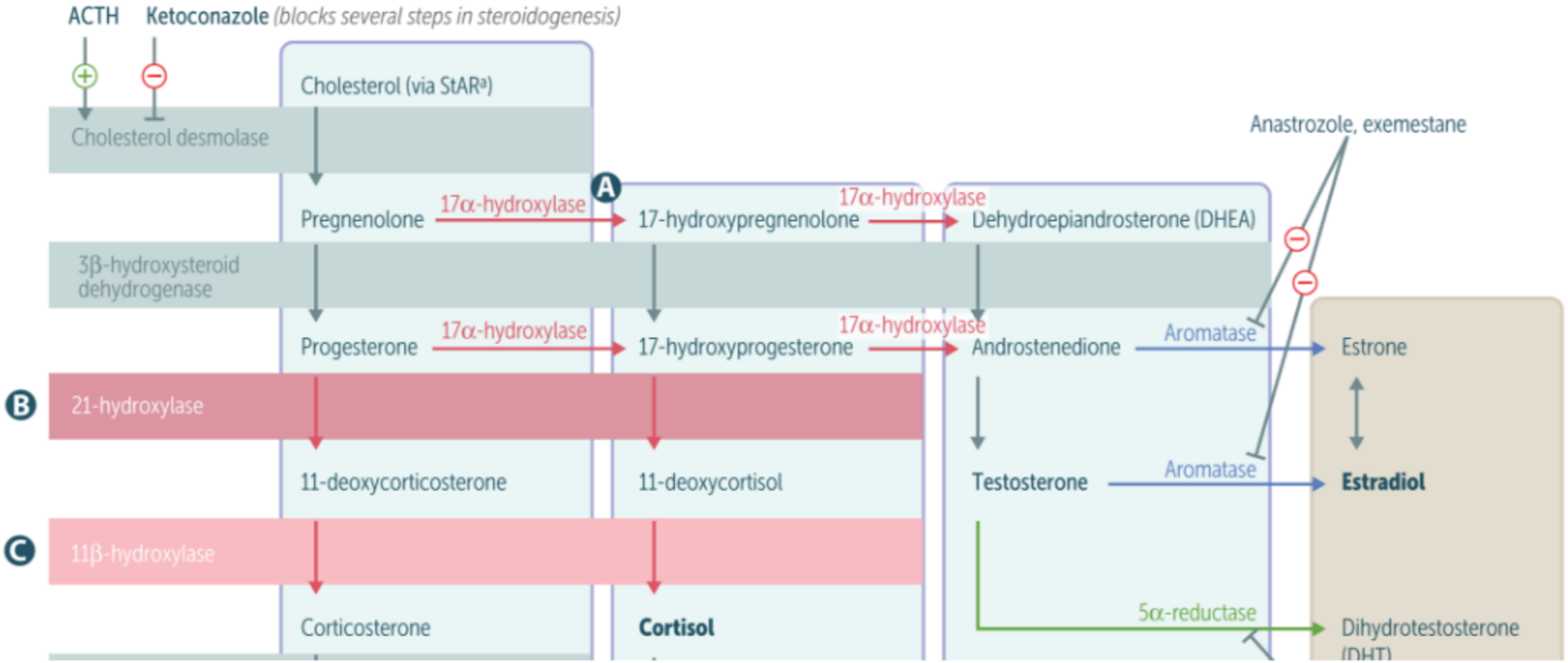
1
2
3
4
5
6
7
8
9

secretion

CT of the chest/abdomen/pelvis | MRI of the pituitary | CT of the chest/abdomen/pelvis

FA17 p 318.1

## Adrenal steroids and congenital adrenal hyperplasias



1
2
3
4
5
6
7
8
9

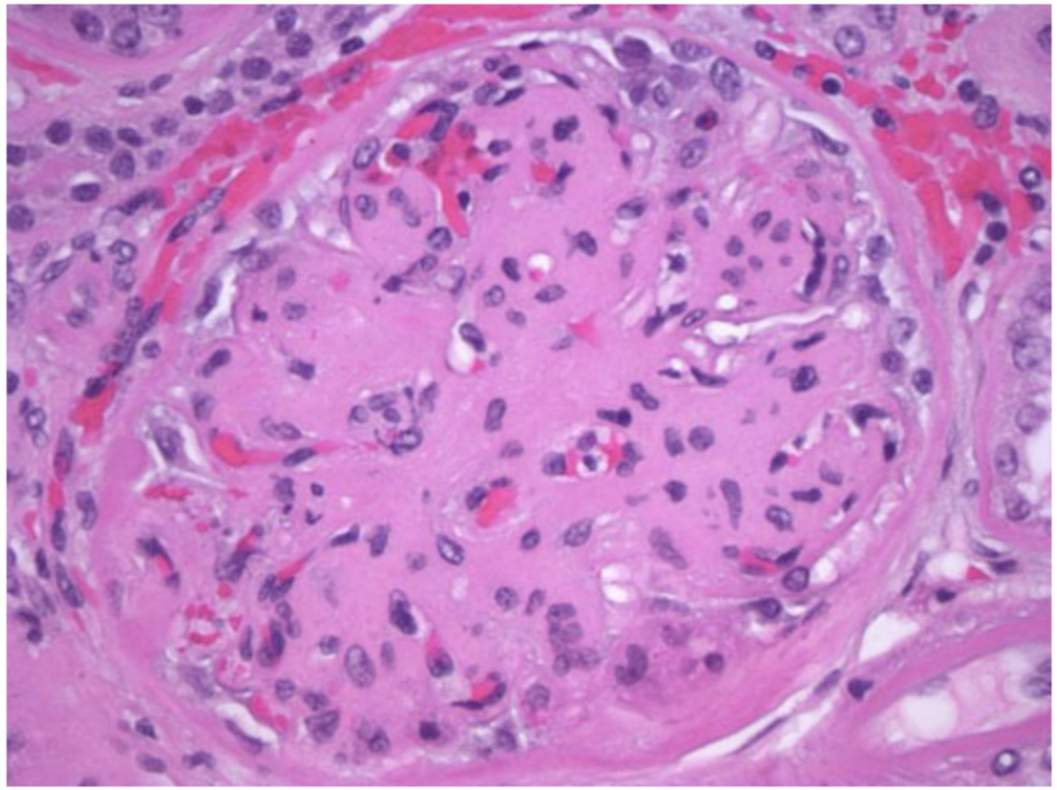
FA17 p 319.1

## Cortisol

| | | |
|---|---|---|
| SOURCE | Adrenal zona fasciculata. | Bound to corticosteroid-binding globulin. |
| FUNCTION | ↑ Appetite<br>↑ Blood pressure:<br>▪ Upregulates $\alpha_1$-receptors on arterioles → ↑ sensitivity to norepinephrine and epinephrine (permissive action)<br>▪ At high concentrations, can bind to mineralocorticoid (aldosterone) receptors<br>↑ Insulin resistance (diabetogenic)<br>↑ Gluconeogenesis, lipolysis, and proteolysis (↓ glucose utilization)<br>↓ Fibroblast activity (poor wound healing, ↓ collagen synthesis, ↑ striae)<br>↓ Inflammatory and Immune responses:<br>▪ Inhibits production of leukotrienes and prostaglandins<br>▪ Inhibits WBC adhesion → neutrophilia<br>▪ Blocks histamine release from mast cells<br>▪ Eosinopenia, lymphopenia<br>▪ Blocks IL-2 production<br>↓ Bone formation (↓ osteoblast activity) | Cortisol is a A BIG FIB.<br>Exogenous corticosteroids can cause reactivation of TB and candidiasis (blocks IL-2 production). |

1
2
3
4
5
6
7
8
9

A 60-year-old patient with type 2 diabetes mellitus initially diagnosed at age 31 years presents to her primary care physician complaining of weight gain. The patient also reports worsening fatigue and two hospitalizations in the past 6 weeks for pneumonia and cellulitis. Vital signs show temperature 36.8°C (98.2°F), heart rate 88/min, and blood pressure 125/75 mm Hg. Urinalysis reveals 3+ proteinuria and RBCs 0-2 mL/kg. The result of a renal biopsy is shown in the image.

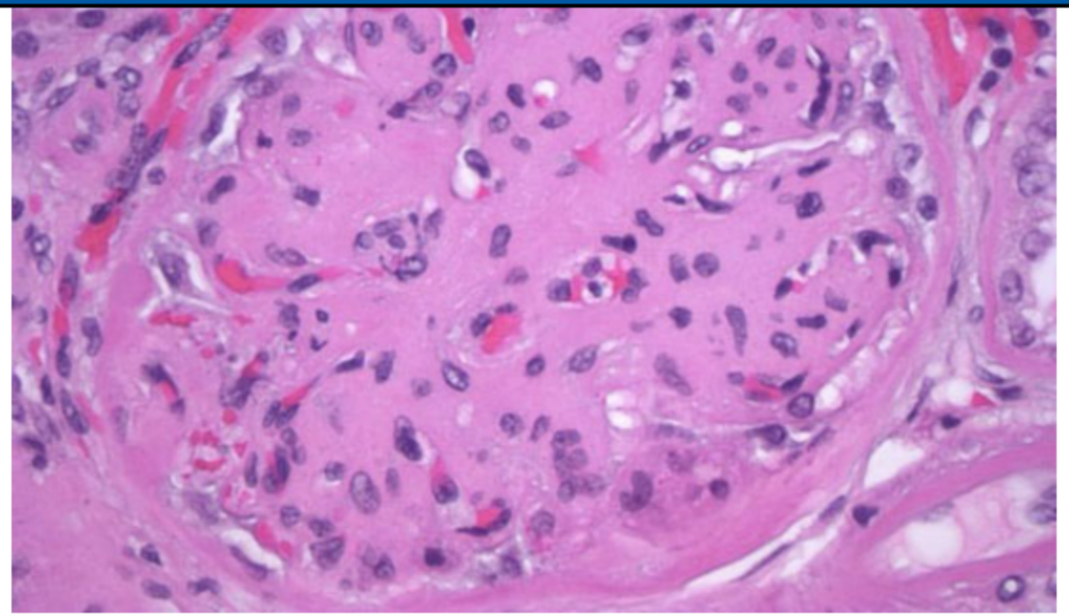


Which of the following histologic findings is apparent in the renal tissue image shown above?

**A.** Eosinophilic thickening of arteriolar walls

**B.** Leukocytic infiltration

1
2
3
4
5
6
7
8
9



Which of the following histologic findings is apparent in the renal tissue image shown above?

**A.** Eosinophilic thickening of arteriolar walls

**B.** Leukocytic infiltration

**C.** Mesangial expansion with glomerular basement membrane thickening

**D.** Proliferation of glomerular parietal cells with an infiltration of monocytes and macrophages

**E.** Subendothelial immune complex deposition

1
2
3
4
5
6
7
8
9

**The correct answer is C. 70% chose this.**

This patient is presenting with proteinuria and edema suggestive of nephrotic syndrome. Her history of recent infections may be due to renal immunoglobulin losses. Given her long history of diabetes, diabetic glomerulonephropathy is the most likely diagnosis. The image shows nodular glomerulosclerosis, also known as Kimmelstiel-Wilson glomerulosclerosis. This represents the accumulation of nodules in the mesangial matrix, which is pathognomonic for diabetes mellitus. Kidneys of patients with diabetes also show increased basement membrane thickness and diffuse mesangial matrix proliferation.

Nephrotic syndrome Diabetes mellitus Proteinuria Basement membrane Pathognomonic Edema Antibody Glomerulosclerosis Mesangium Kidney Mesangial cell

**A is not correct. 14% chose this.**

Hyaline arteriolosclerosis is a homogeneous, eosinophilic thickening of arteriolar walls resulting in a narrowed vessel lumen. It is a feature of benign nephrosclerosis often seen in long-standing hypertension, a common cause of chronic renal failure. Hyaline arteriolosclerosis can also be caused by diabetes, as a result of the accumulation of advanced glycosylation end products. However, on the basis of this patient's blood pressure, hypertension is unlikely to be the cause of her renal disease. Furthermore, though the patient may have hyaline arteriolosclerosis secondary to her long-standing diabetes, the image shown is of a glomerulus, not a renal arteriole.

Arteriole Arteriolosclerosis Glomerulus Hyaline Hyaline arteriolosclerosis Hypertension Diabetes mellitus Benign nephrosclerosis Hypertensive nephropathy Eosinophilic Lumen (anatomy) Kidney Blood pressure Kidney disease Glomerulus (kidney)

**B is not correct. 5% chose this.**

Leukocytic infiltration is characteristic of inflammatory diseases of the glomerulus; it is observed most often in poststreptococcal glomerulonephritis but also can be seen in membranoproliferative glomerulonephritis and rapidly progressive glomerulonephritis. This is not seen in this patient's biopsy.

Membranoproliferative glomerulonephritis Glomerulus (kidney) Glomerulus Glomerulonephritis Biopsy White blood cell Inflammation Streptococcus

**D is not correct. 7% chose this.**

Glomerular parietal cell proliferation with monocytic and macrophage infiltrate is seen in rapidly progressive (crescentic) glomerulonephritis. Crescent formation results from a proliferation of Bowman's capsule epithelial cells, which appear to "crowd out" the glomerular tufts. It is classically seen in nephritic syndromes and suggests a poor prognosis. This pathology is not evident in this patient's renal biopsy.

Parietal cell Macrophage Biopsy Glomerulonephritis Glomerulus Epithelium Nephron Cell growth Monocyte Pathology Glomerulus (kidney) Kidney Prognosis

**E is not correct. 4% chose this.**

Subendothelial immune complex deposition causes the wire-loop abnormality characteristic of type IV lupus nephropathy. This patient has no other

1
2
3
4
5
6
7
8
9

Glomerular parietal cell proliferation with monocytic and macrophage infiltrate is seen in rapidly progressive (crescentic) glomerulonephritis. Crescent formation results from a proliferation of Bowman's capsule epithelial cells, which appear to "crowd out" the glomerular tufts. It is classically seen in nephritic syndromes and suggests a poor prognosis. This pathology is not evident in this patient's renal biopsy.

Parietal cell Macrophage Biopsy Glomerulonephritis Glomerulus Epithelium Nephron Cell growth Monocyte Pathology Glomerulus (kidney) Kidney Prognosis

**E is not correct. 4% chose this.**

Subendothelial immune complex deposition causes the wire-loop abnormality characteristic of type IV lupus nephropathy. This patient has no other symptoms of lupus, making this cause very unlikely.

Immune complex Kidney disease Systemic lupus erythematosus Lupus erythematosus Endothelium

**Bottom Line:**

Nodular glomerulosclerosis is characterized by Kimmelstiel-Wilson nodules in the mesangial matrix. It can be seen in patients with long-standing, untreated diabetes mellitus.

Diabetic nephropathy Diabetes mellitus Glomerulosclerosis

FIRST AID FIRST AID FACTS for year: 2017

FA17 p 566.1

**Nephrotic syndrome**

NephrOtic syndrome—massive prOteinuria (> 3.5 g/day) with hypoalbuminemia, resulting edema, hyperlipidemia. Frothy urine with fatty casts. Due to podocyte damage disrupting glomerular filtration charge barrier. May be 1° (eg, direct sclerosis of podocytes) or 2° (systemic process [eg, diabetes] secondarily damages podocytes). Associated with hypercoagulable state (eg, thromboembolism) due to antithrombin (AT) III loss in urine and ↑ risk of infection (due to loss of immunoglobulins in urine and soft tissue compromise by edema).

Severe nephritic syndrome may present with nephrotic syndrome features (nephritic-nephrotic