The Curious Case of the Toothy Ovary

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Anatomic Pathology & Clinical Pathology

Anatomic Pathology

- Anatomic pathology generally deals with “tissue”

Clinical Pathology

- Lab medicine generally deals with blood and fluids

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Anatomic Pathology

- **Surgical Pathology**
  - The examination of tissues removed from a patient
    - Small biopsies
    - Entire organs
- **Cytology**
  - The examination of fluid specimens
- **Autopsies**
  - Determining the cause of death
  - Forensic autopsy vs. hospital autopsy

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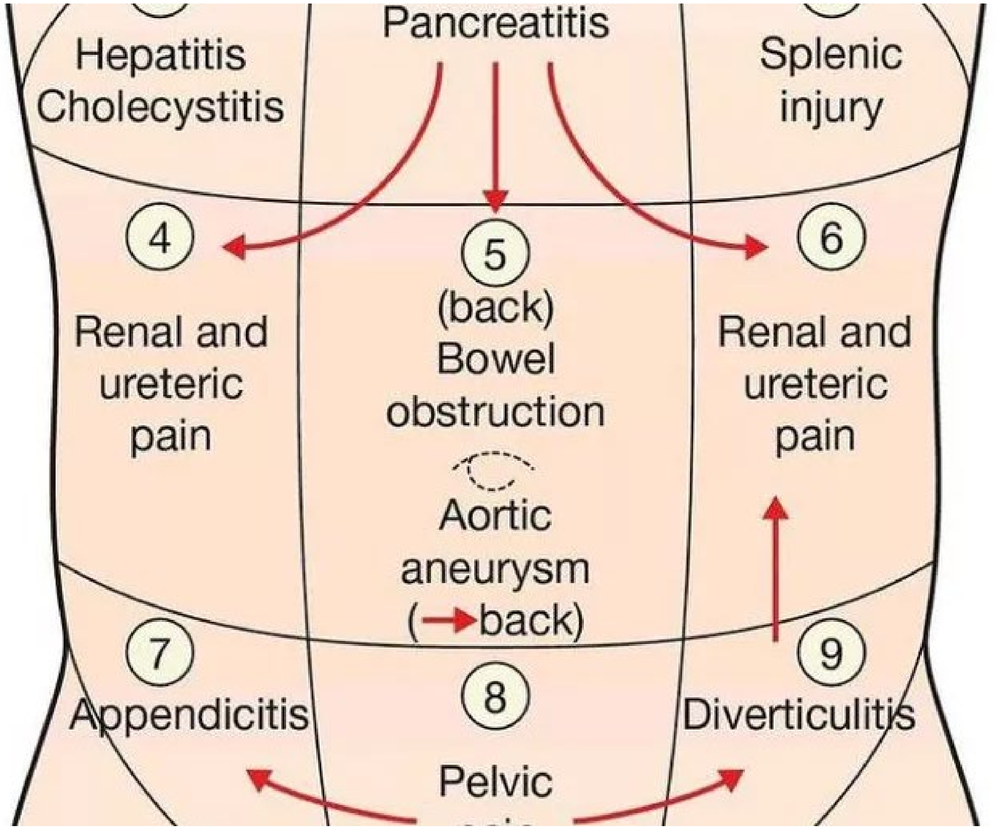
Clinical Pathology

- **CHEMISTRY:**
  - Sodium, potassium, calcium
- **HEMATOLOGY:**
  - Hemoglobin, hematocrit
- **TRANSFUSION MEDICINE**
  - Red cells, platelets
- **MICROBIOLOGY**
  - Culturing blood, urine, tissues
- **MOLECULAR DIAGNOSTICS**
  - Hepatitis, HPV

Case Presentation

- 28-year-old woman with right lower quadrant abdominal pain, a “dull ache”
- NO nausea or vomiting
- Physical Exam:
  - Vital Signs
    - Blood pressure: 125/72
    - Temperature: 98.7°
    - Pulse: 72
  - Abdominal Exam:
    - No significant tenderness
    - NOT an “acute abdomen”



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Laboratory Findings

- White Blood Cell Count
  - 5,700 (4,500 – 11,000/ul)
- Pregnancy Test
  - Negative
- Hemoglobin
  - 12.2 g/dl (11.6 – 15 g/dl)

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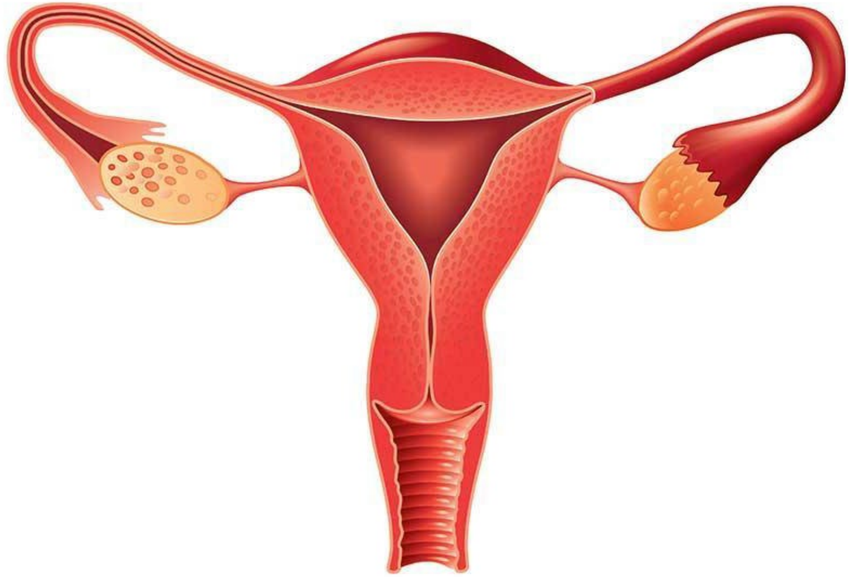
How do the lab findings change the differential diagnosis?

- Appendicitis is less likely
  - No abdominal tenderness
  - No nausea or vomiting
  - No elevated white blood cell count
- Rupture ectopic pregnancy is very unlikely
  - Pregnancy test is negative
- What other organ could be the culprit?!



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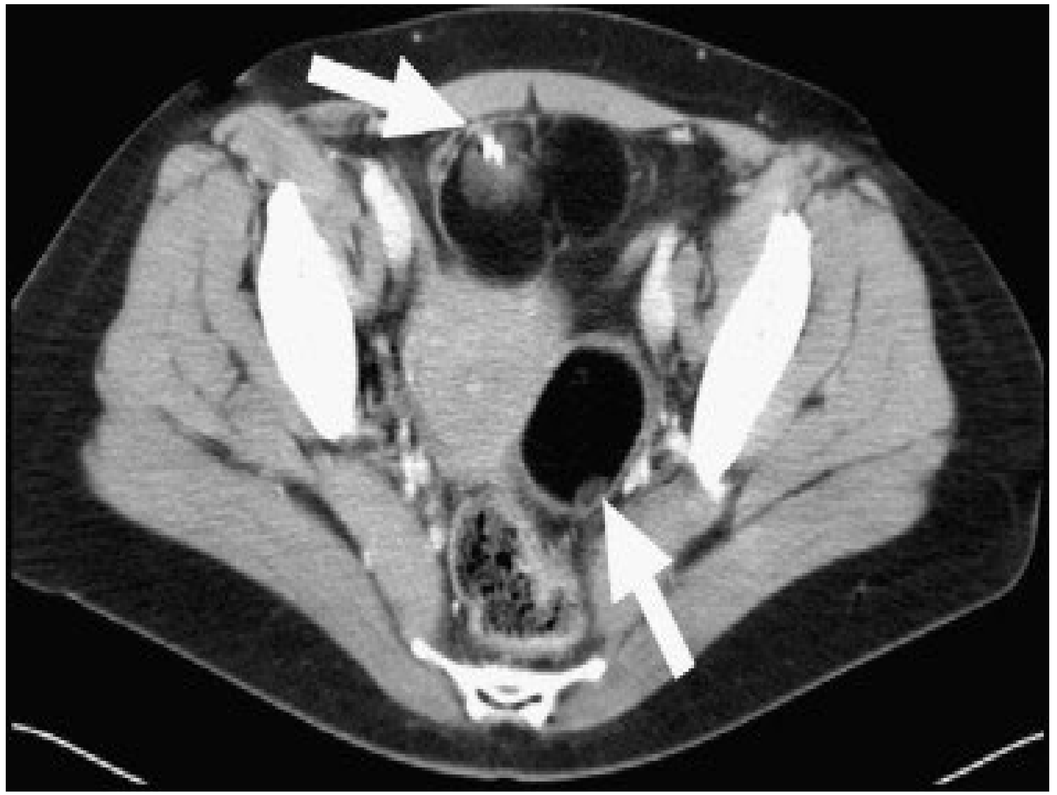
Pelvic CT Scan

- The ovary has a cystic mass
- There are bright white spots that have the density of bone
- These represent teeth!
- Why does an ovary have teeth??
- This strongly suggests a diagnosis of: **Teratoma**
- **Teratoma:** A tumor derived from germ cells of the ovary which can give rise to any type of tissue



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Surgery: Oophorectomy

- Surgery is for a benign ovarian mass
  - The uterus is left in place
  - No lymph nodes are removed
- 98% chance this tumor is benign
- Fertility is preserved
  - There is another ovary!

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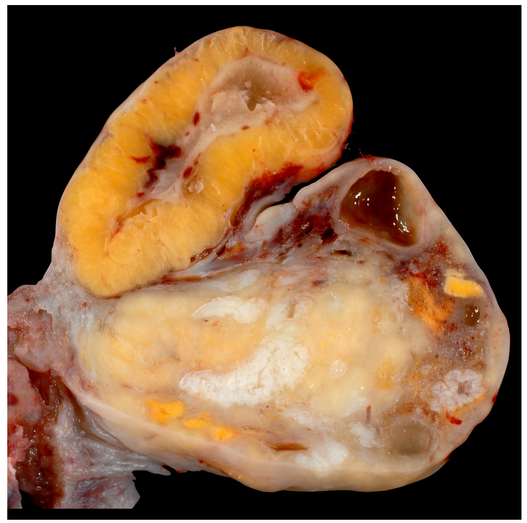
Gross Anatomy – Ovary

Normal



What was received

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Gross Description - Overview

Received fresh labeled " AO, MRN, and right fallopian tube and ovary" is a 636.3 g, smooth to scabrous dusky tan-pink 13.0 x 12.0 x 5.2 cm fluctuant cystic structure in keeping with ovary within associated 6.8 cm in length, 0.5 cm in diameter fimbriated pink-purple fallopian tube along 1 aspect. A 0.5 cm defect is noted along 1 aspect which exudes turbid bright yellow-green-gray fluid. On opening an abundant amount of said fluid is present, in addition to a copious amount of dark hair admixed with grumous greasy yellow debris. A 6.8 x 3.6 x 6.0 cm rubbery to focally calcified tubercle is tethered to multiple aspects of the inner surface of the cystic structure by rubbery bands of tissue. A well-formed hard white tooth in keeping with incisor is noted along 1 aspect of the tubercle. The inner lining of the cystic structure is smooth to slightly bosselated dusky gray-pink-red, without papillations. Sectioning through the center of the tubercle reveals a 3 cm smooth-lined serous fluid-filled cystic structure surrounded by a scant amount of pale red-brown tissue in keeping with muscle. A scant amount of presumptive residual pale-tan ovarian stroma is noted along 1 aspect, including a 0.5 cm smooth-lined serous fluid-filled cystic structure (see block 7) 8. The tubal lumen is pinpoint and stellate on sectioning.

Summary: 1 through 3–serous fluid-filled cystic structure to adjacent cyst wall 4–serous fluid-filled cystic structure to tubercle, 5 and 6–additional sections to include edges of tubercle and random cyst wall, 7–possible residual ovarian stroma and random cyst wall, 8–fallopian tube

A Zoom in – External View

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A Zoom In – Inner Contents

On opening an abundant amount of said fluid is present, in addition to a copious amount of **dark hair admixed with grumous greasy yellow debris**. A 6.8 x 3.6 x 6.0 cm rubbery to focally calcified **tubercle** is tethered to multiple aspects of the inner surface of the cystic structure by rubbery bands of tissue.

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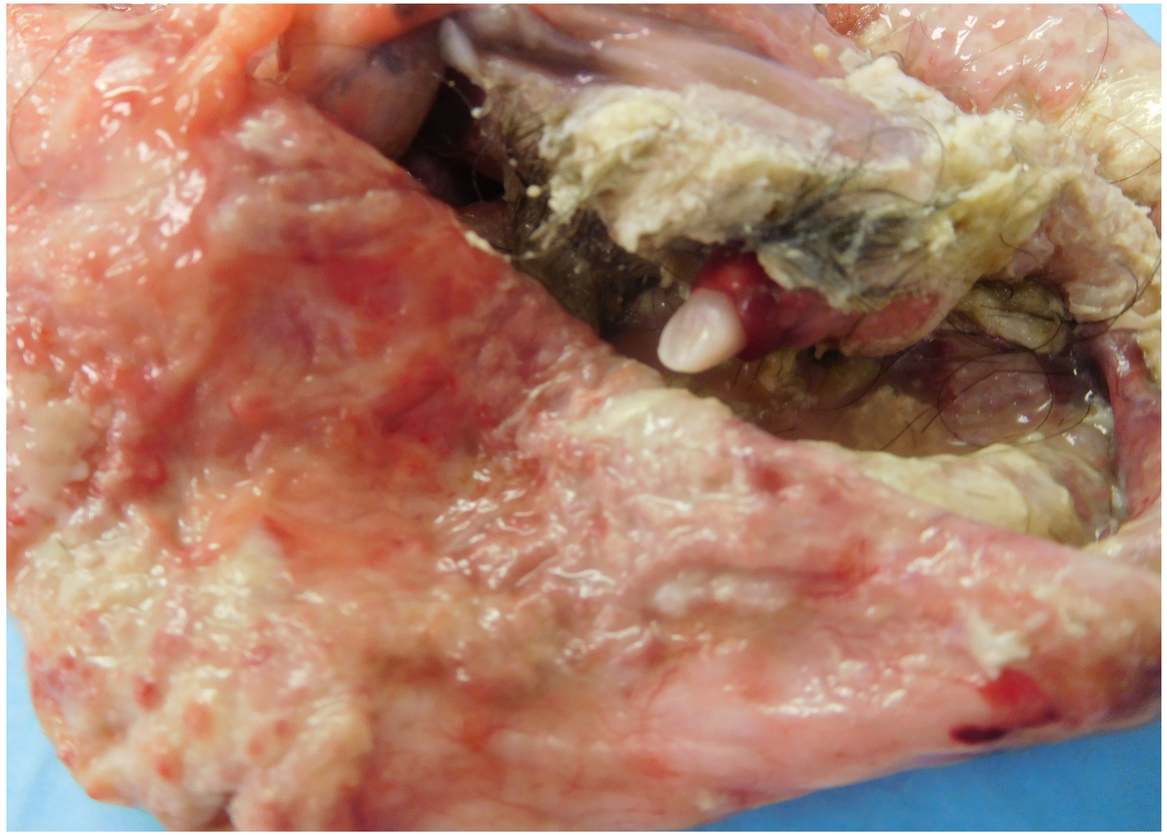
A Zoom In – A Tooth!



A **well-formed hard white tooth in keeping with incisor** is noted along 1 aspect of the tubercle. The inner lining of the cystic structure is smooth to slightly bosselated dusky gray-pink-red, without papillations.

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A Zoom In - Muscle

Sectioning through the center of the tubercle reveals a 3 cm smooth-lined serous fluid-filled cystic structure surrounded by a scant amount of **pale red-brown tissue in keeping with muscle**.

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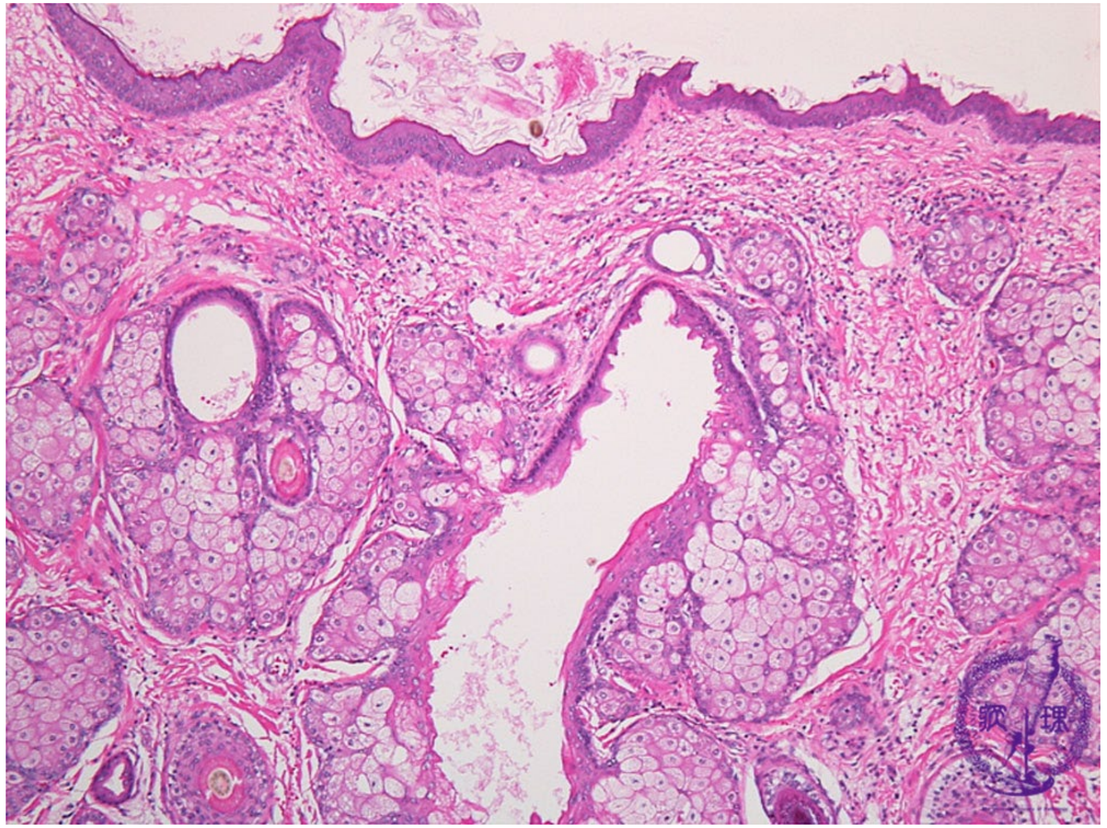
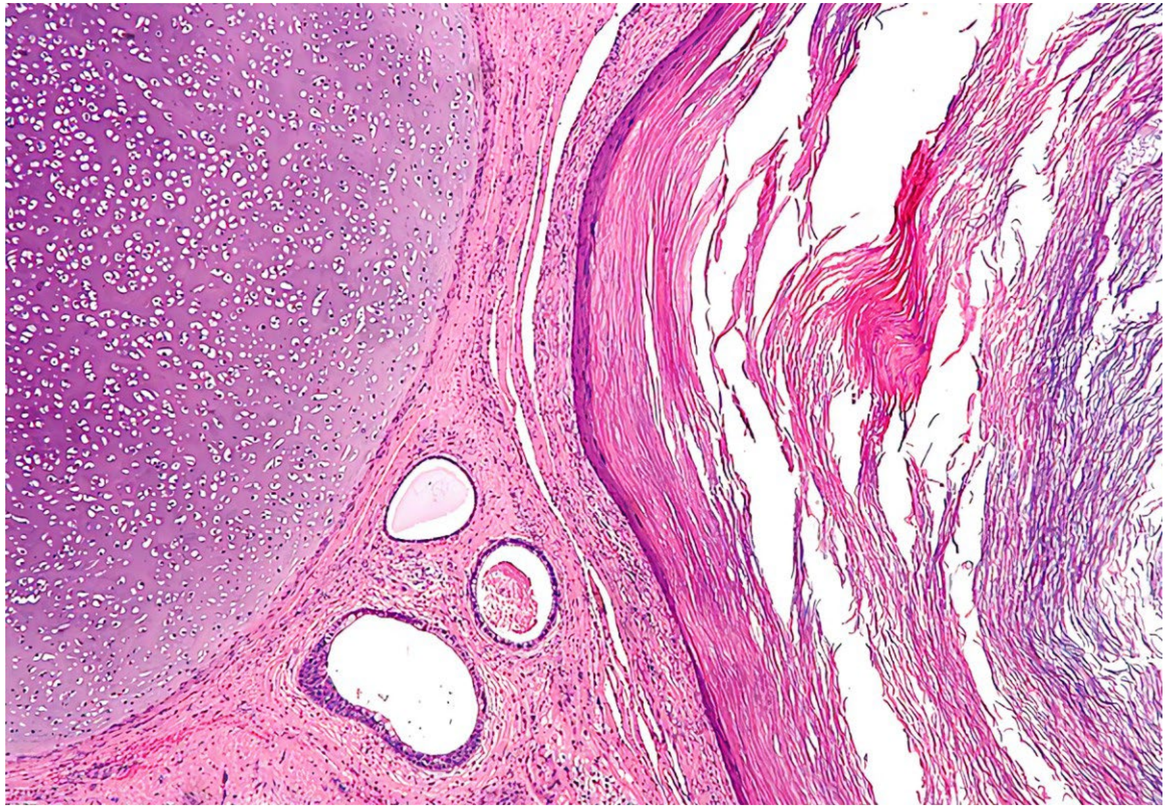
Benign Teratoma Histology: Skin





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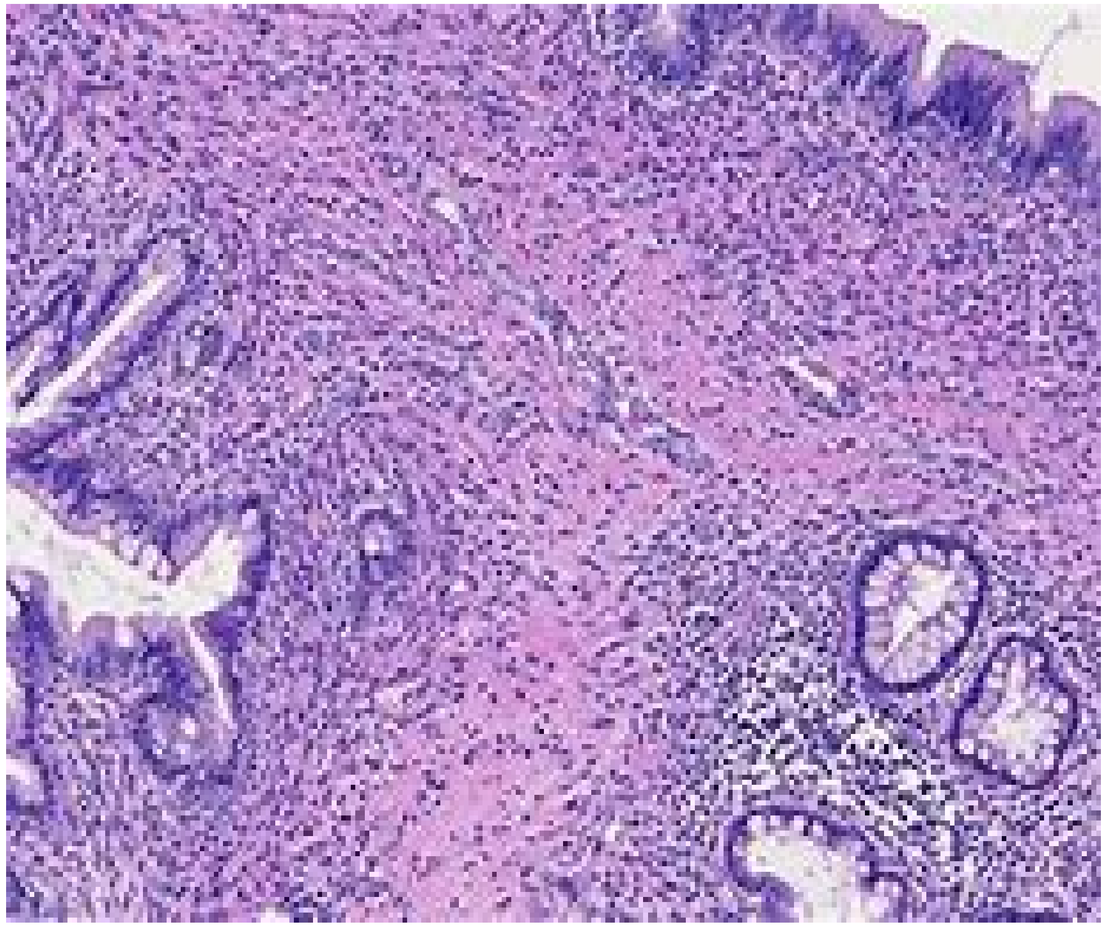
Benign Teratoma: Intestinal Epithelium



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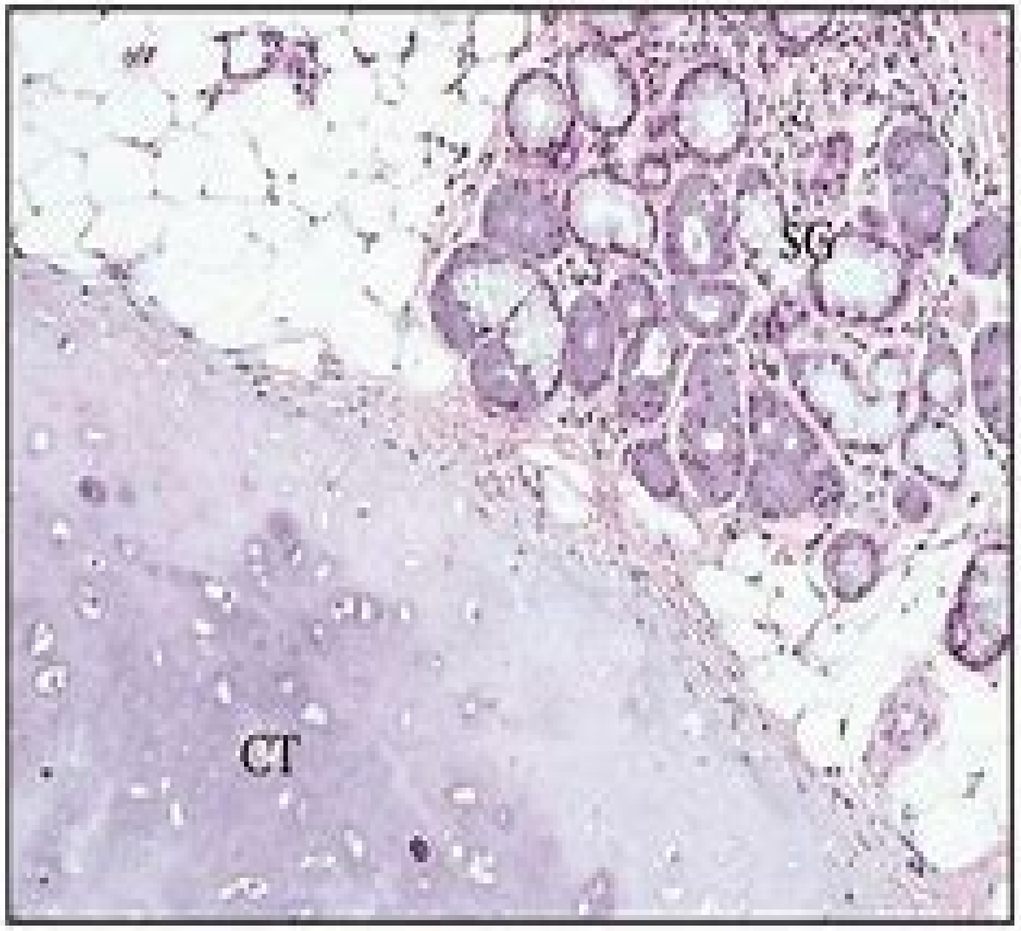
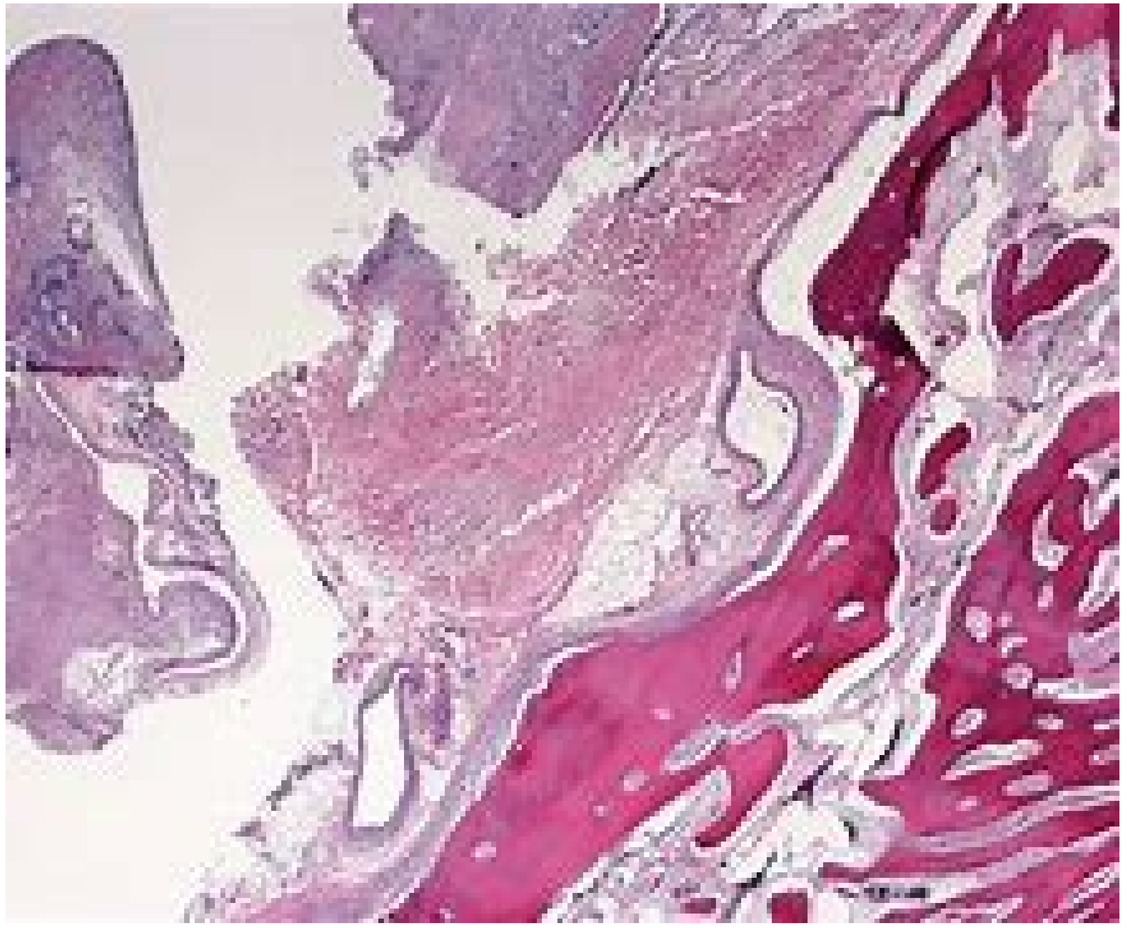
Benign Teratoma: Cartilage & Bone





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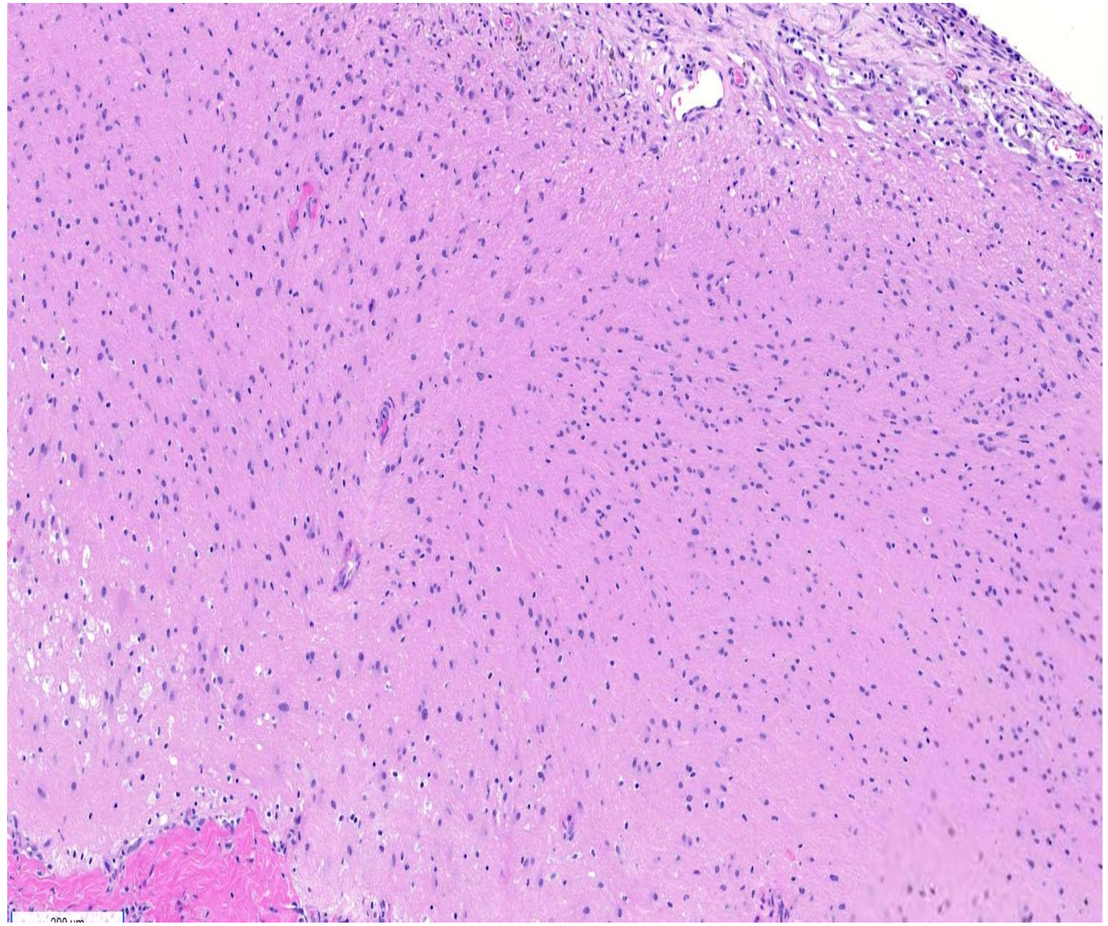
Benign Teratoma: Neural & Thyroid Tissue



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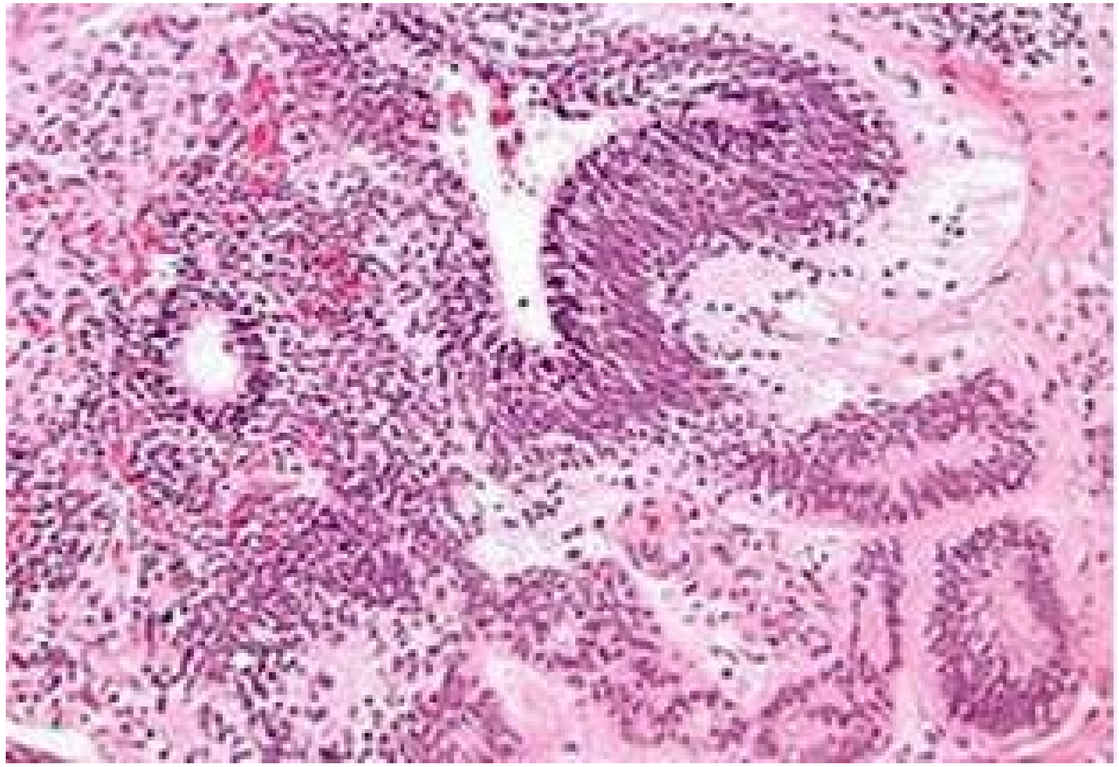
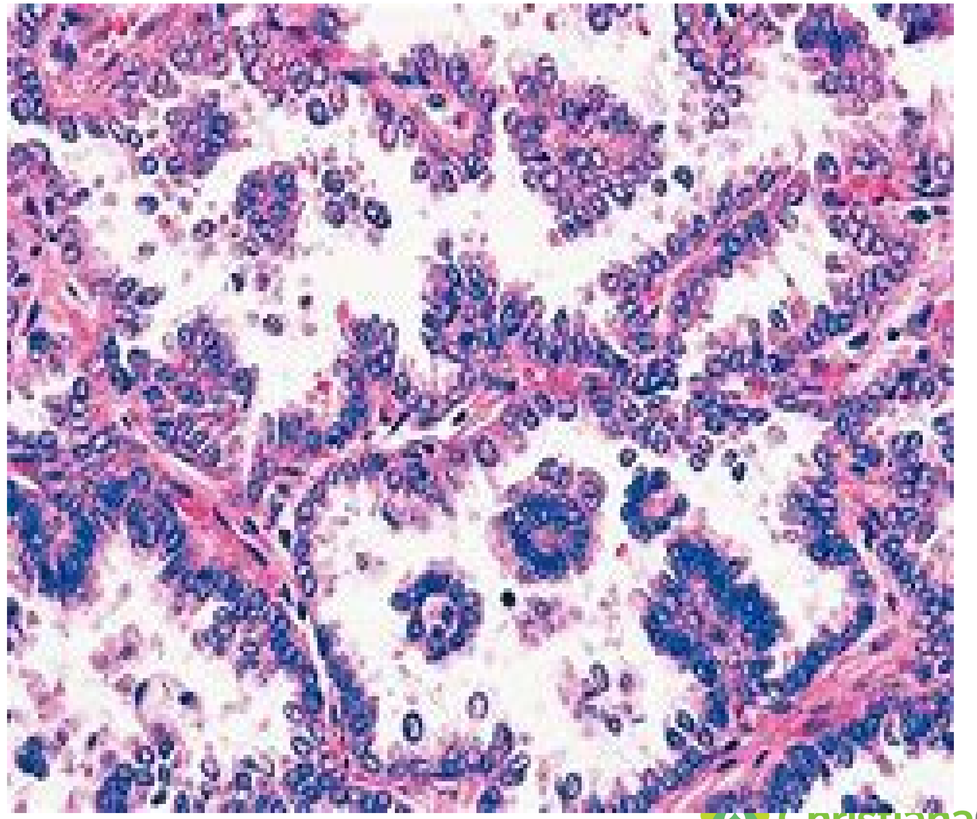
Can Teratomas be Malignant? Yes!

Immature Teratoma (tissue resembles tissue from an embryo)



Malignant transformation of benign elements



Potpourri of Pathology

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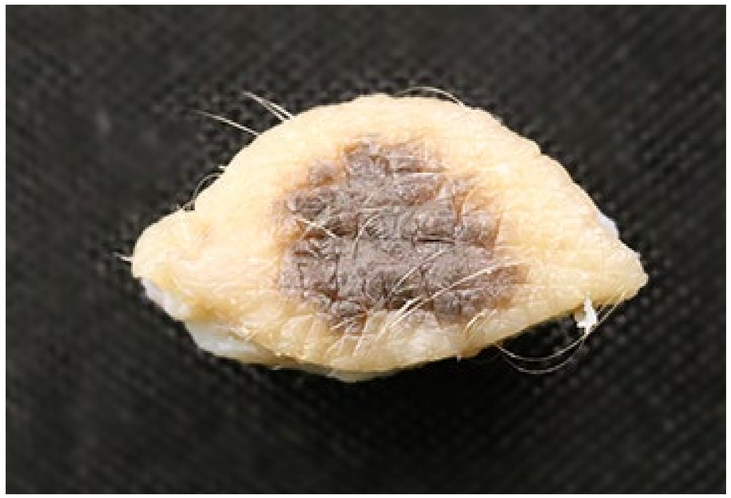
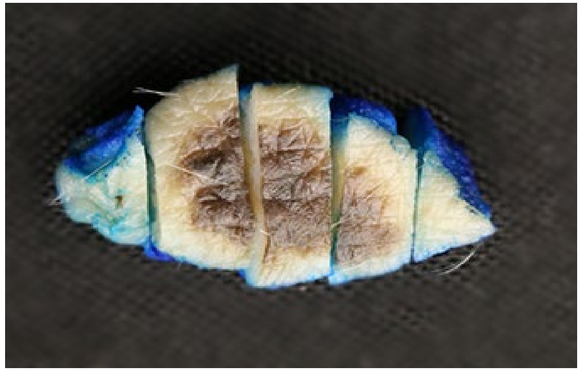
Skin – Gross





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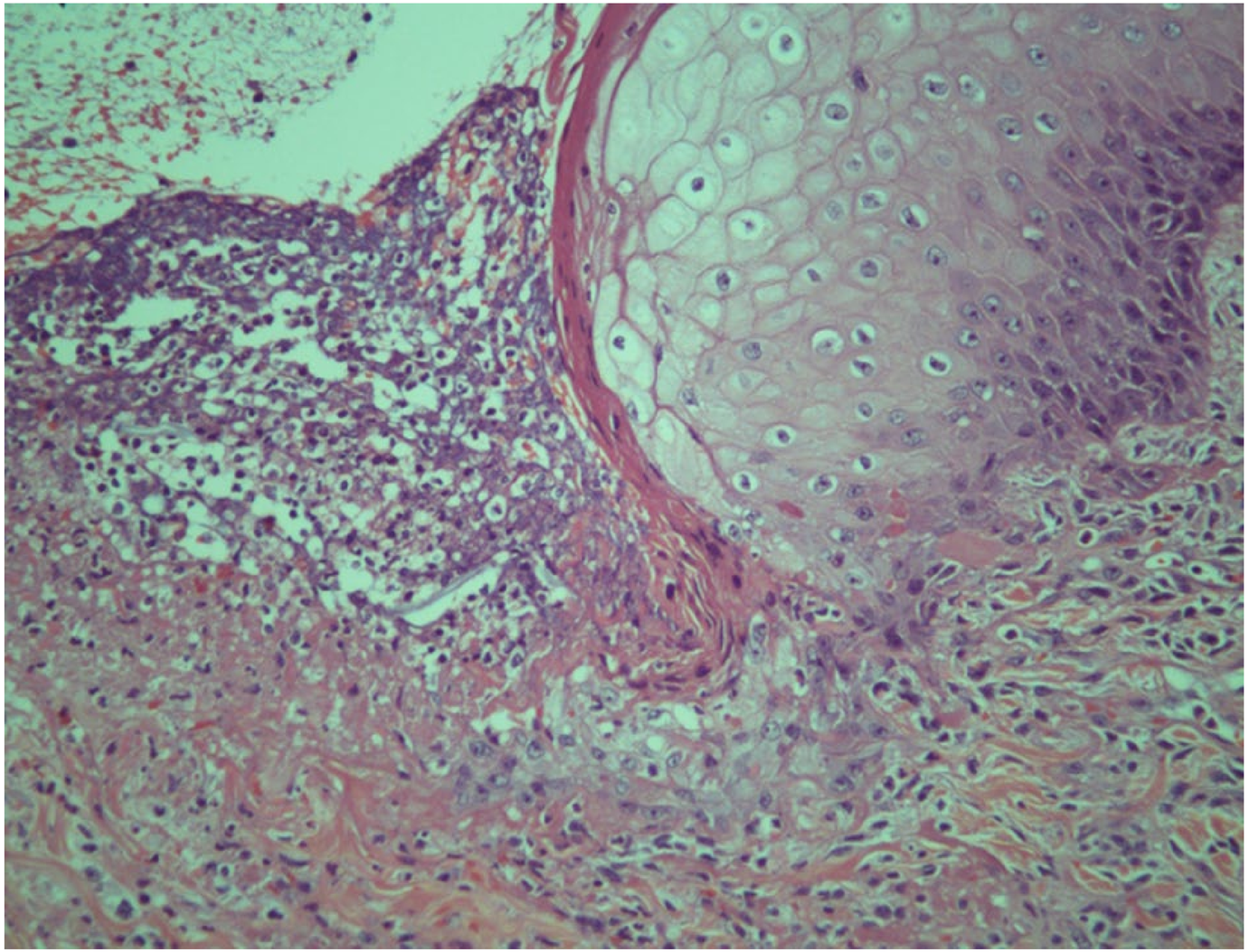
Skin – Acute Inflammation

Acute inflammation is mediated by neutrophils and are commonly due to bacterial infection



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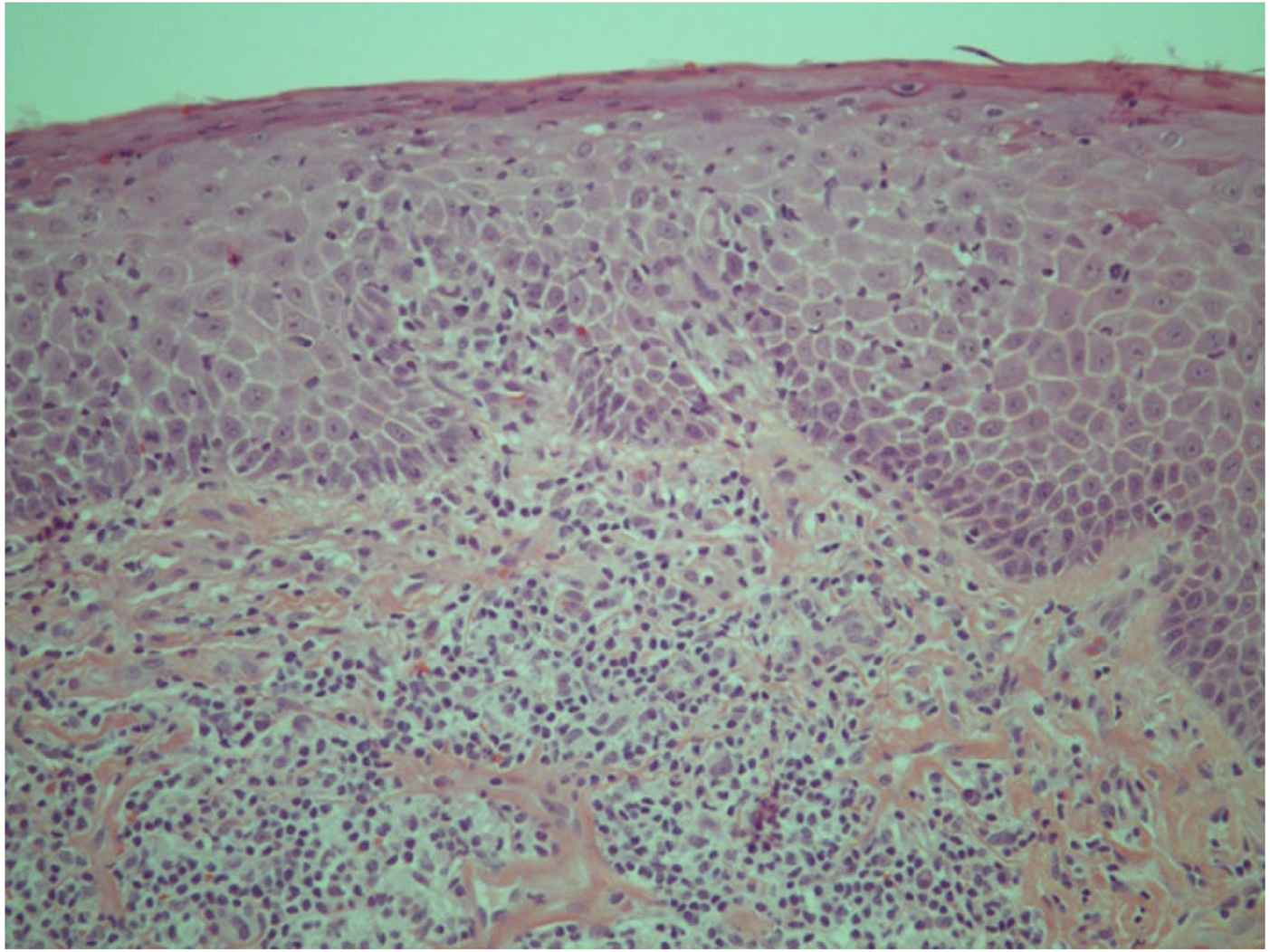
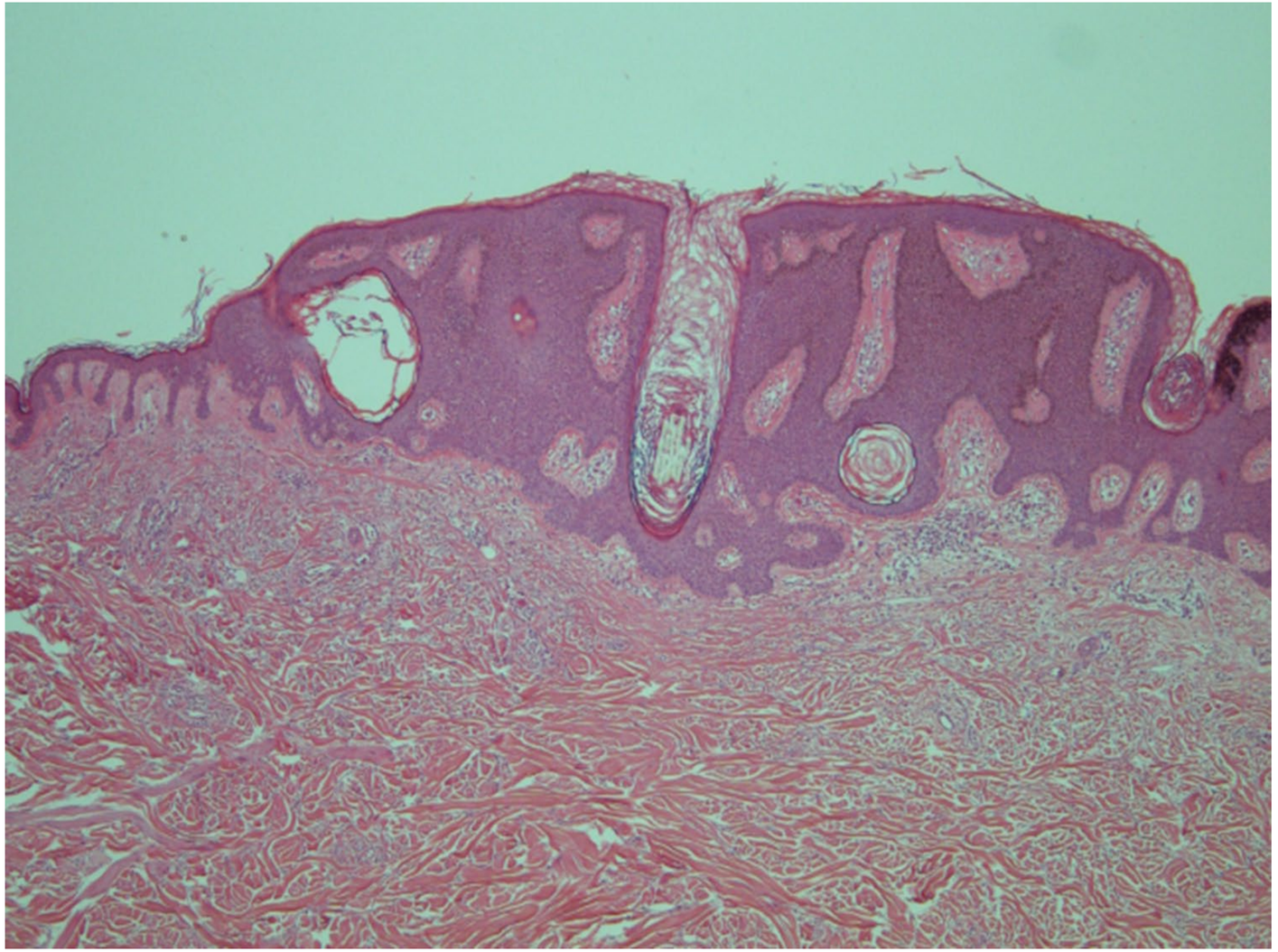
Skin – Chronic Inflammation

Chronic inflammation is mediated by lymphocytes and commonly due to viruses or “idiopathic”



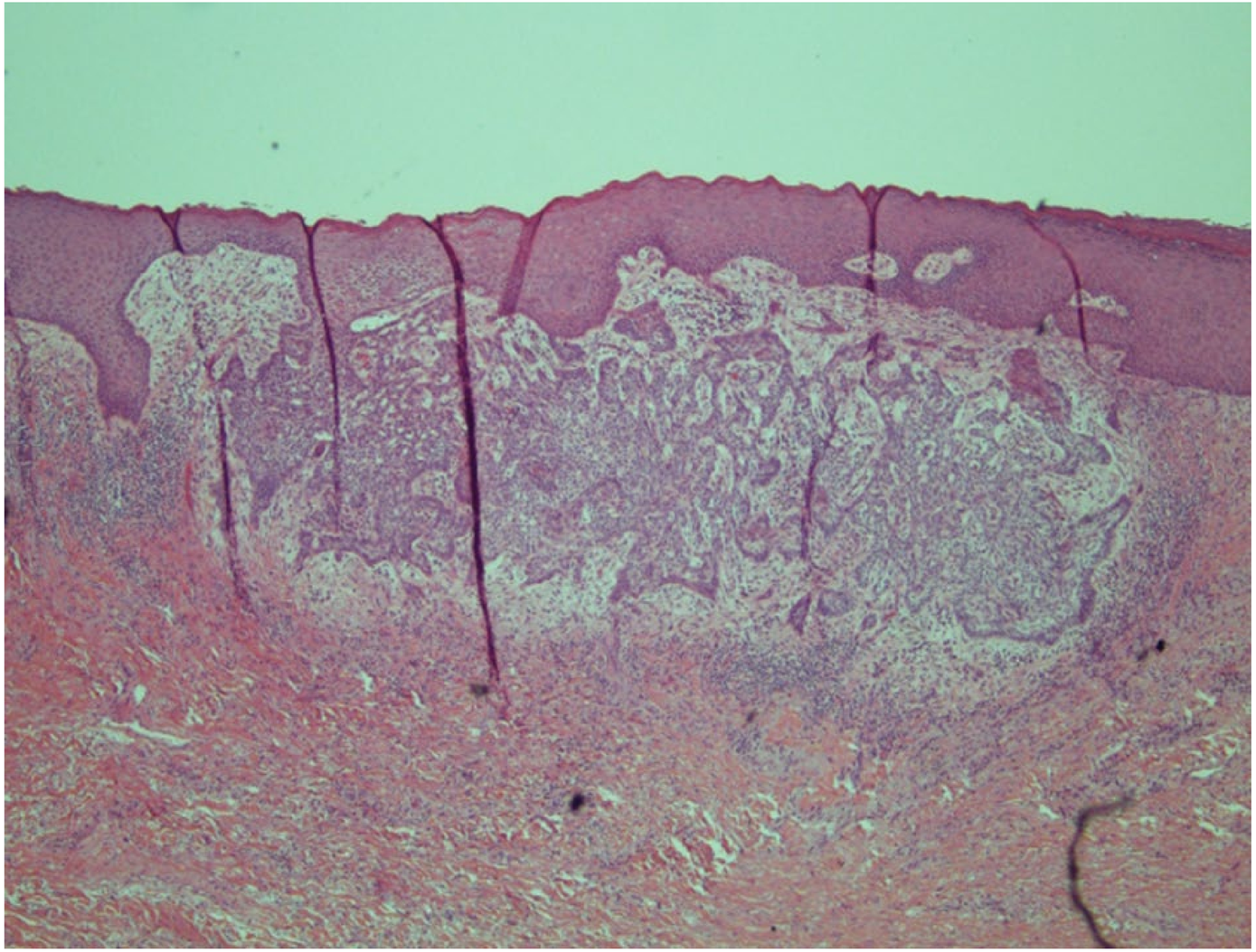
Skin - Benign tumor

This is the most common benign skin tumor called seborrheic keratosis



Skin – Cancer

Cancers of epithelial cell origin are called carcinomas



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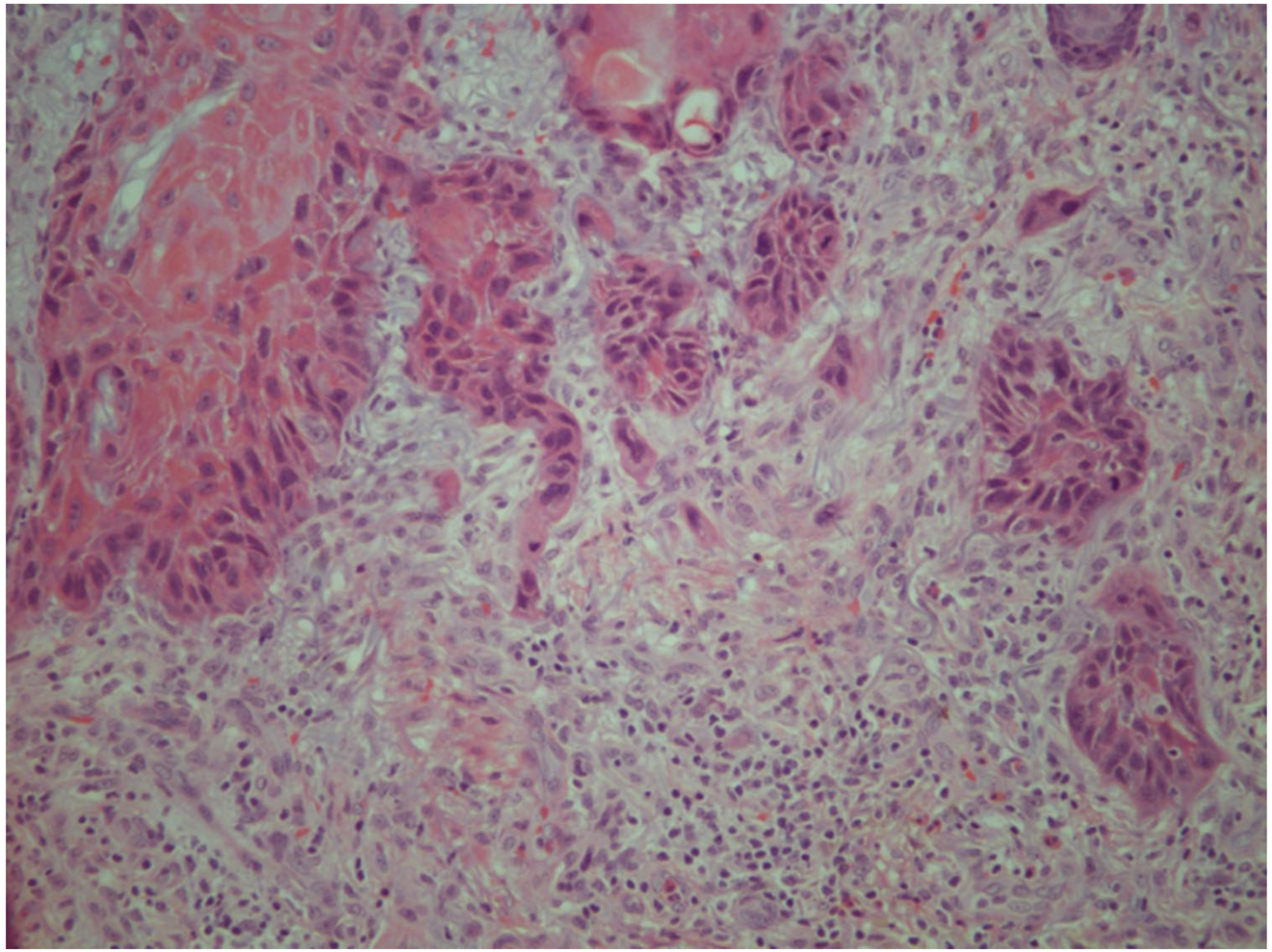
Skin – Cancer

This is a type of skin cancer called squamous cell carcinoma



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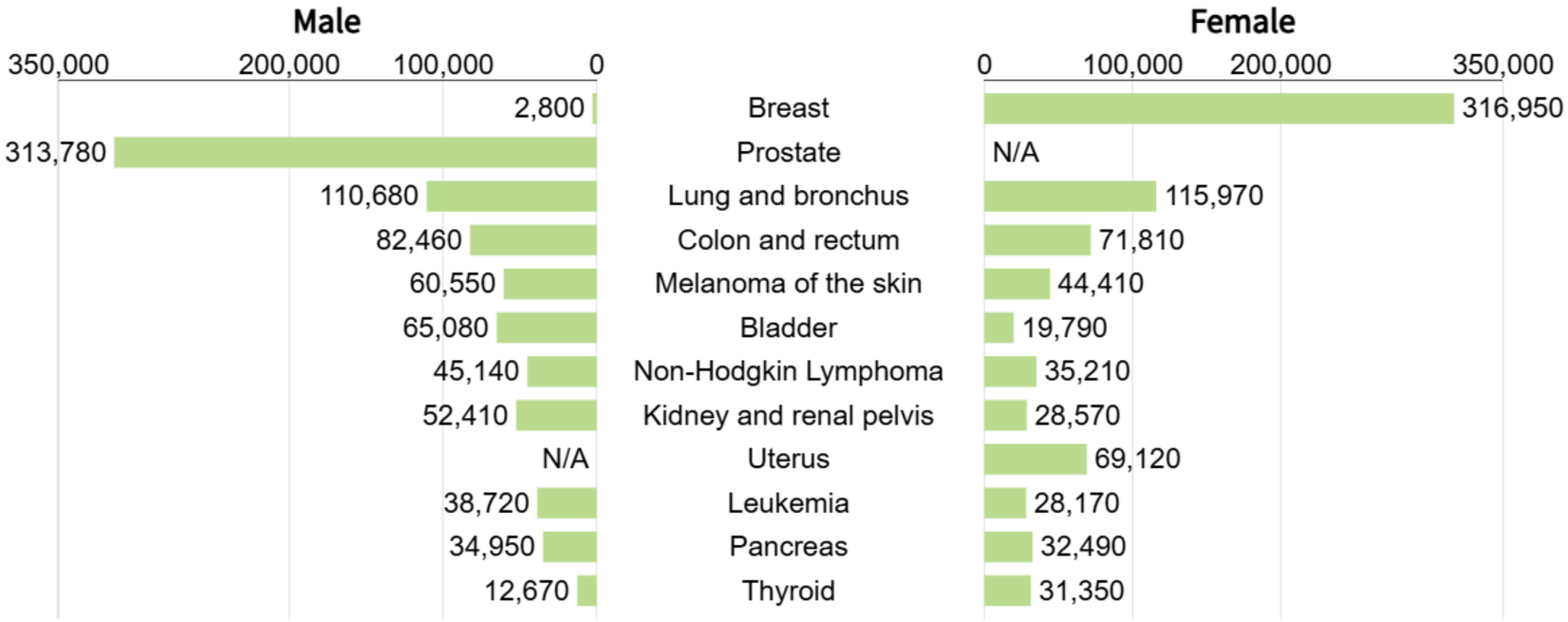
Most common cancer sites



Source: Cancer Facts & Figures 2025, American Cancer Society (ACS), Atlanta, Georgia, 2025.

***Excluding 5,400,000 non -melanoma skin cancers in the U.S. per year

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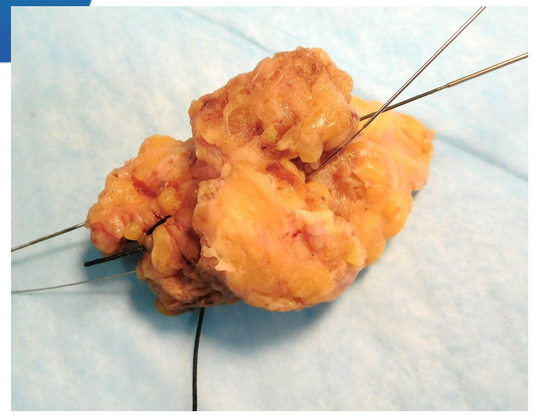
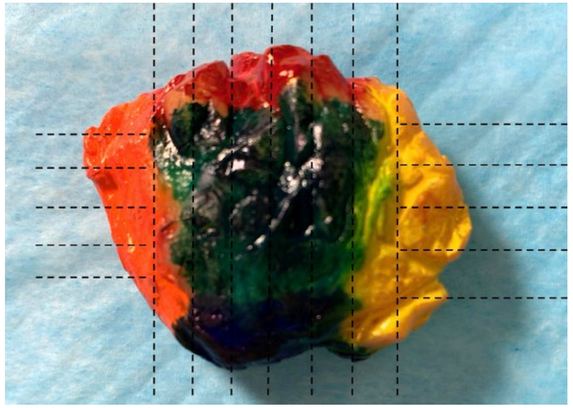
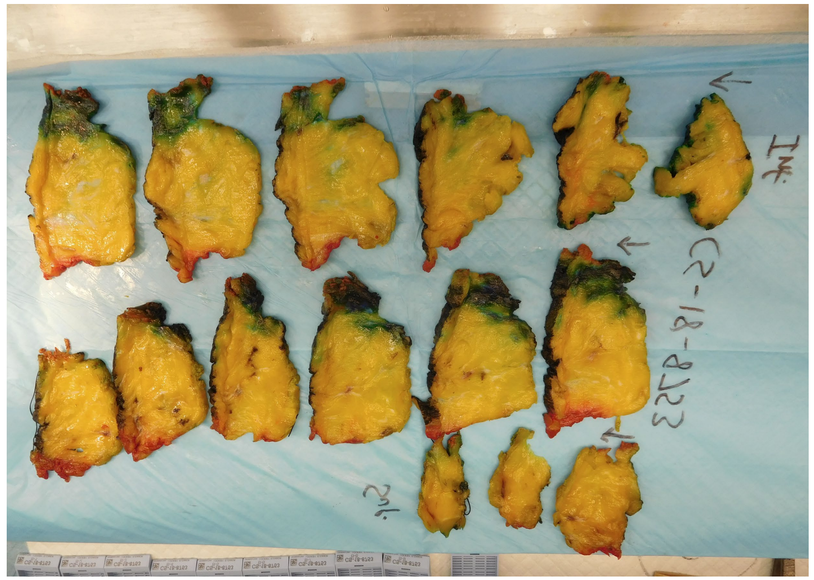
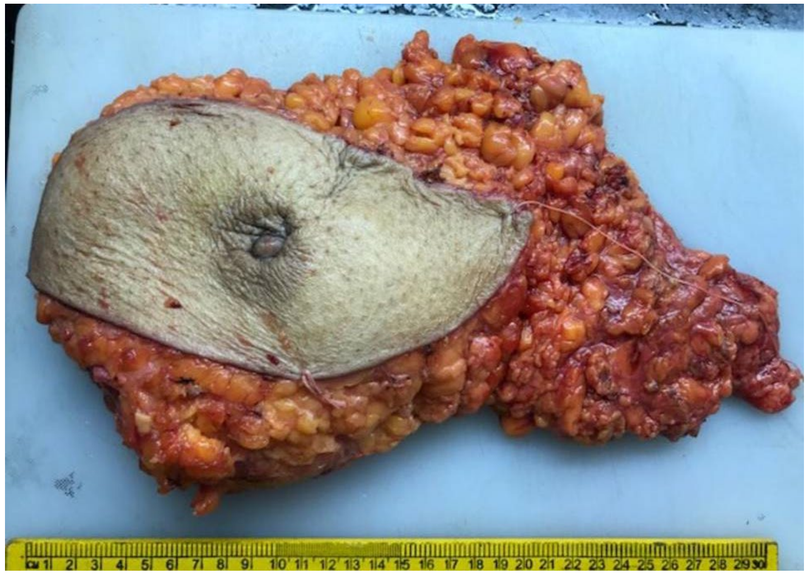
Breast - Gross









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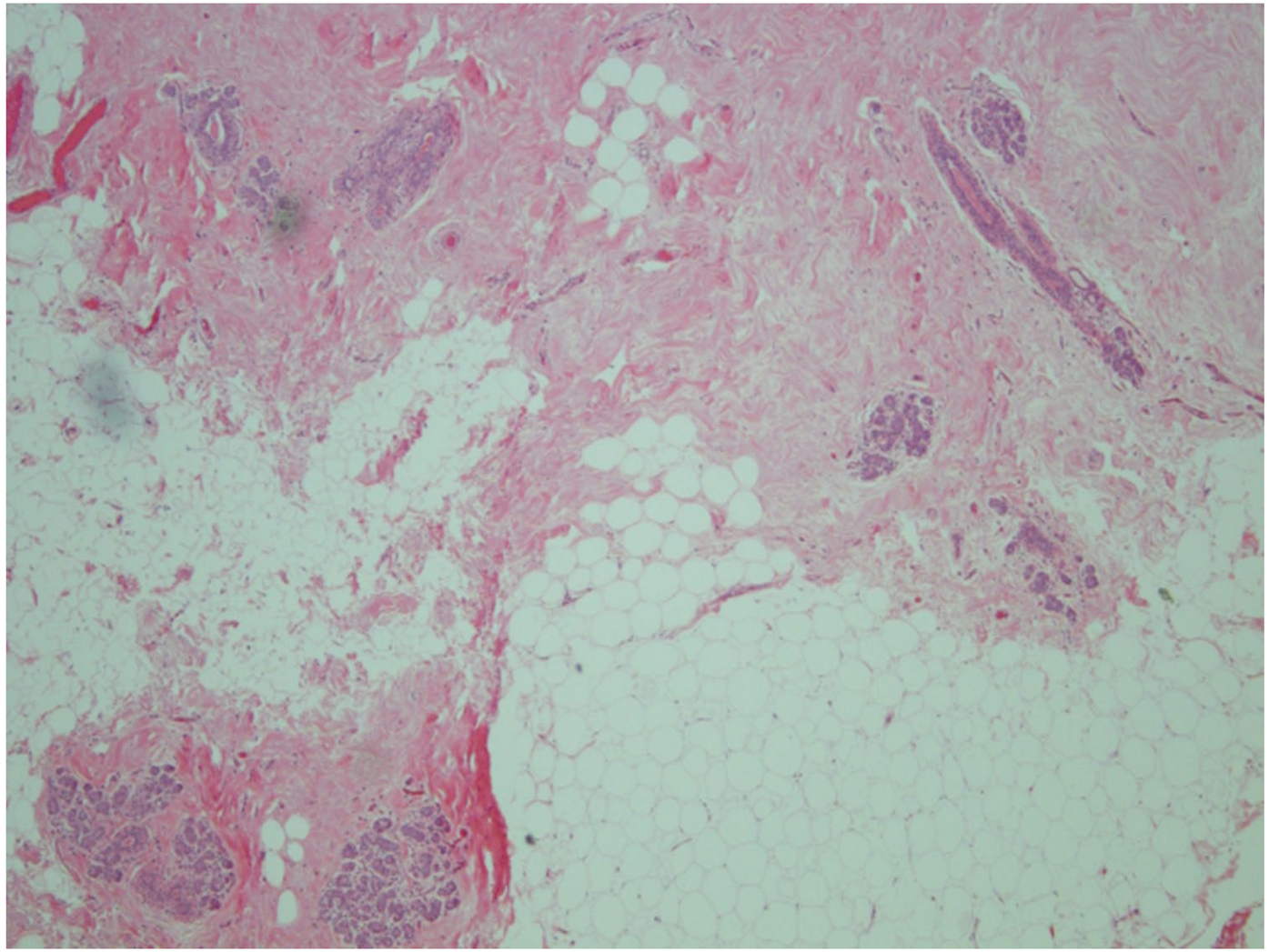
Breast - Histology

Breast tissue contains ducts, lobules, fat cells, and connective tissue



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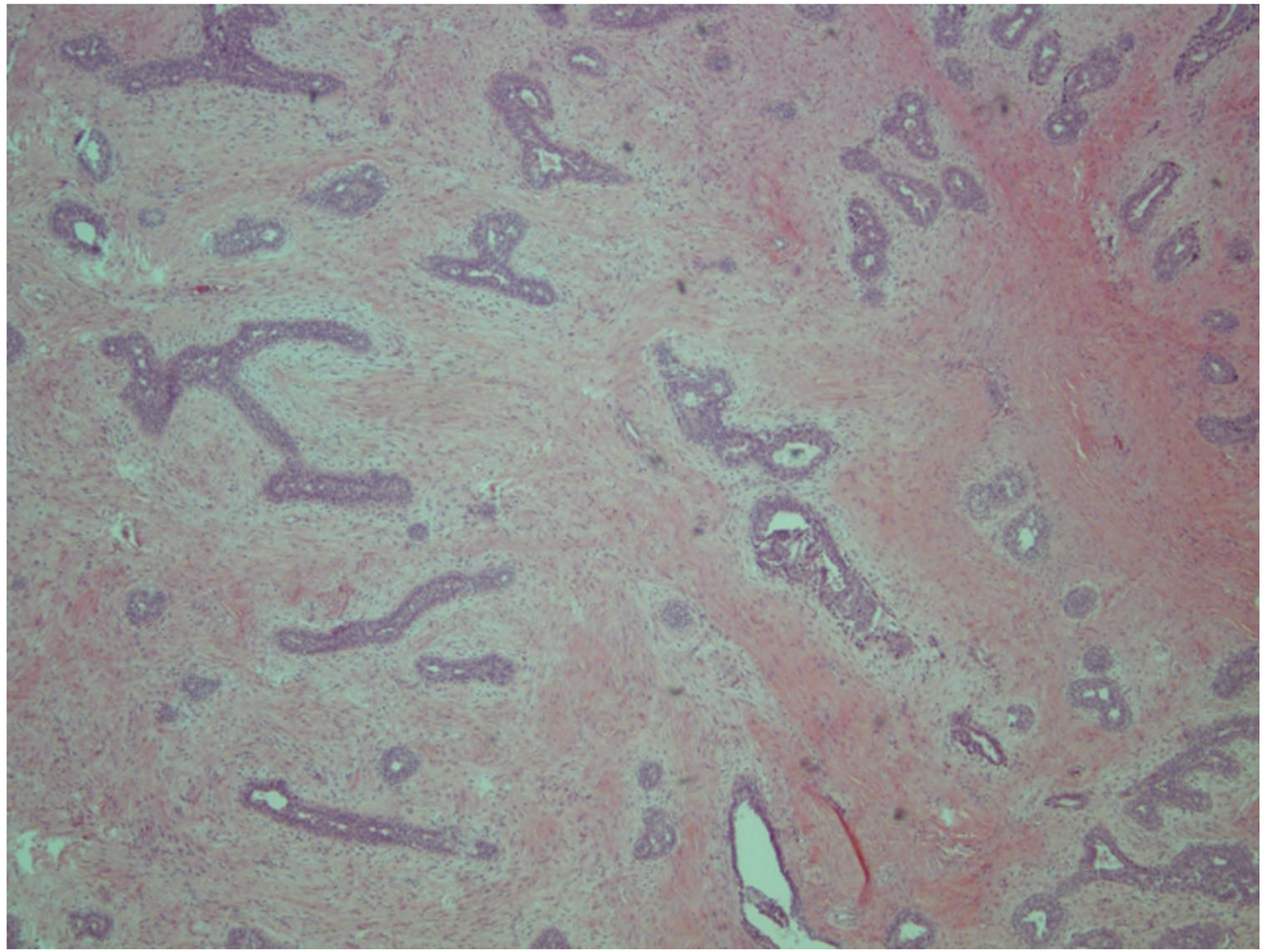
Breast - Benign tumor

Fibroadenoma is the most common breast tumor in female



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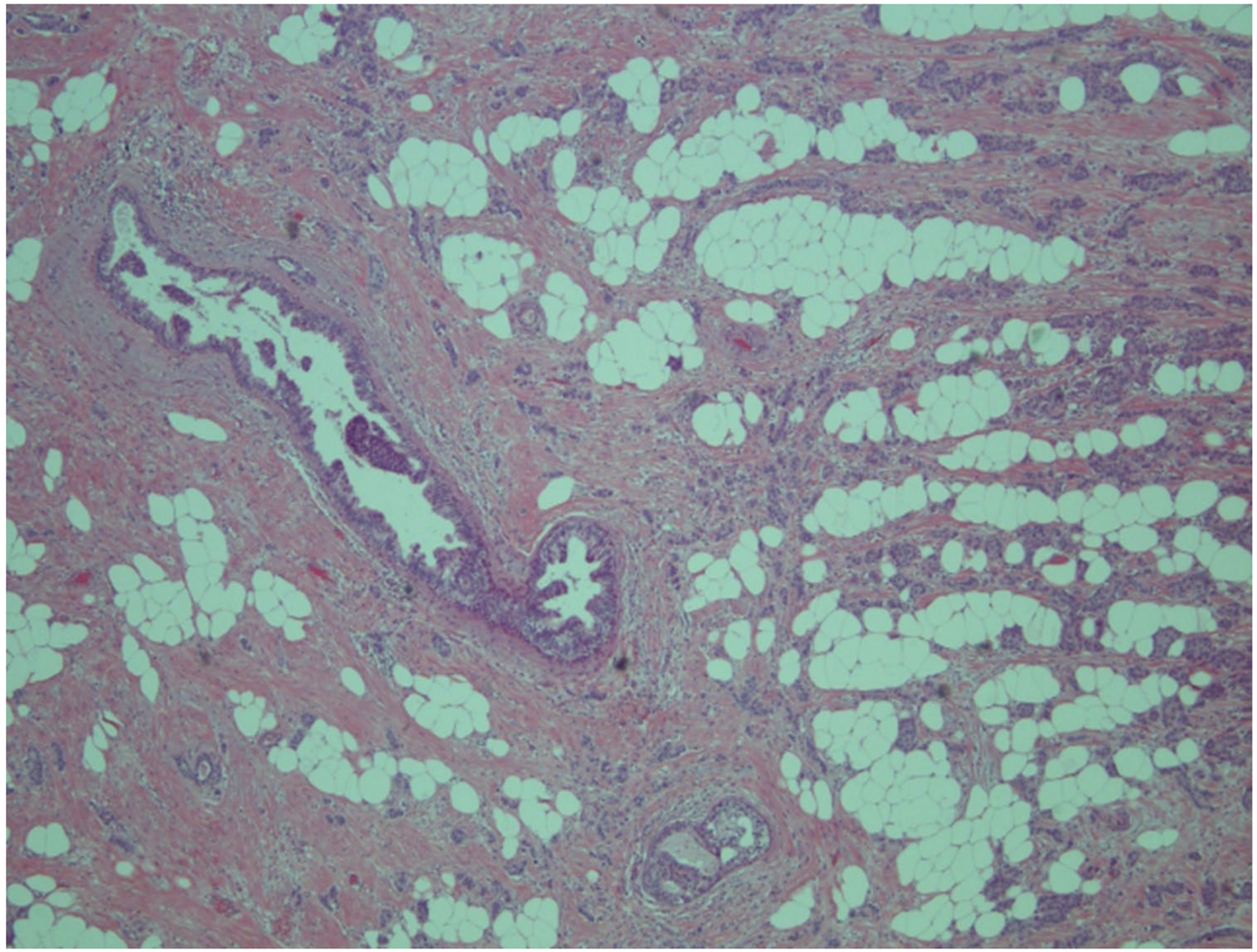
Breast - Cancer

Breast cancer is the most common cancer in female



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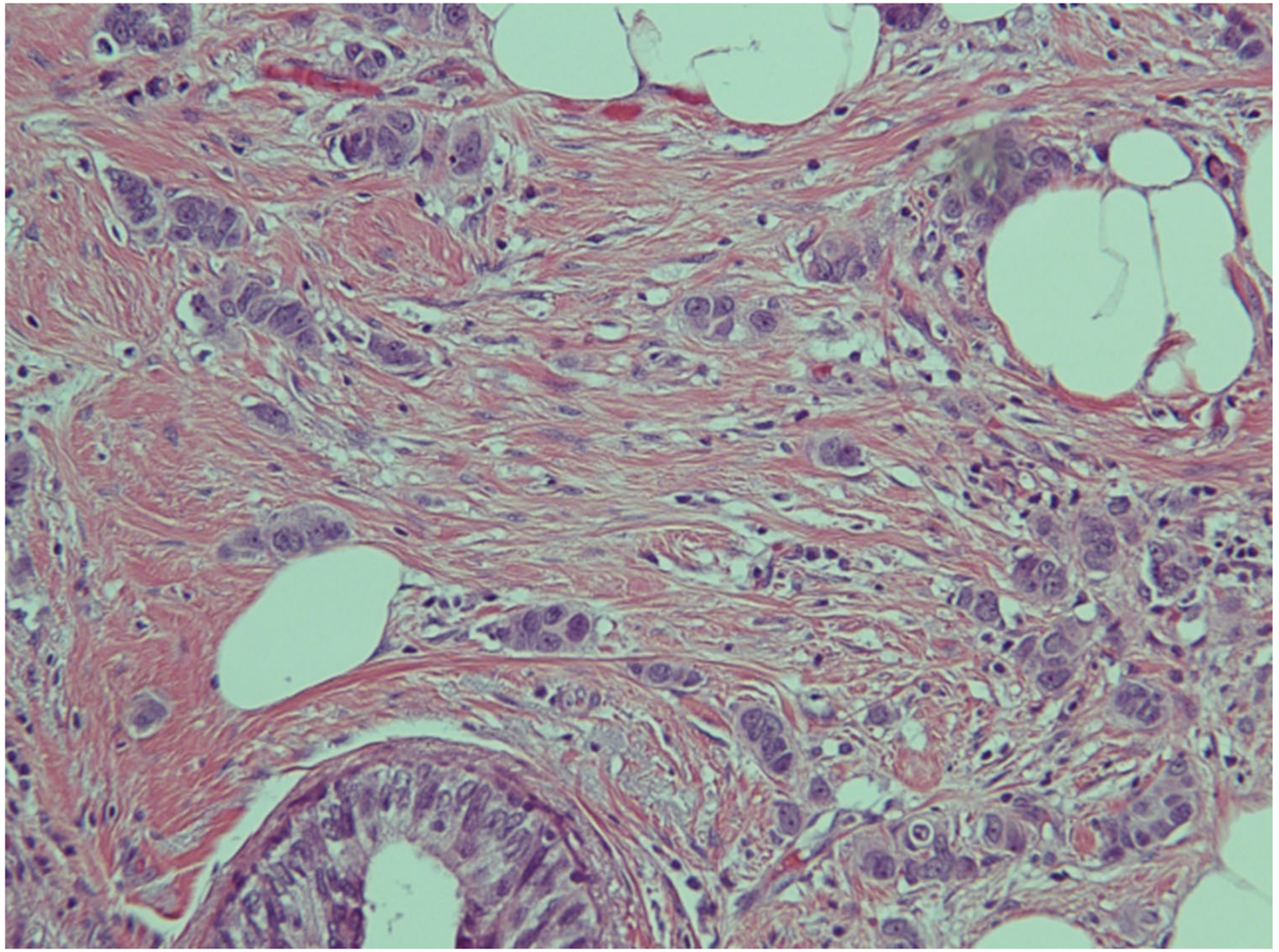
Breast - Cancer

This is a type of breast cancer called invasive ductal carcinoma



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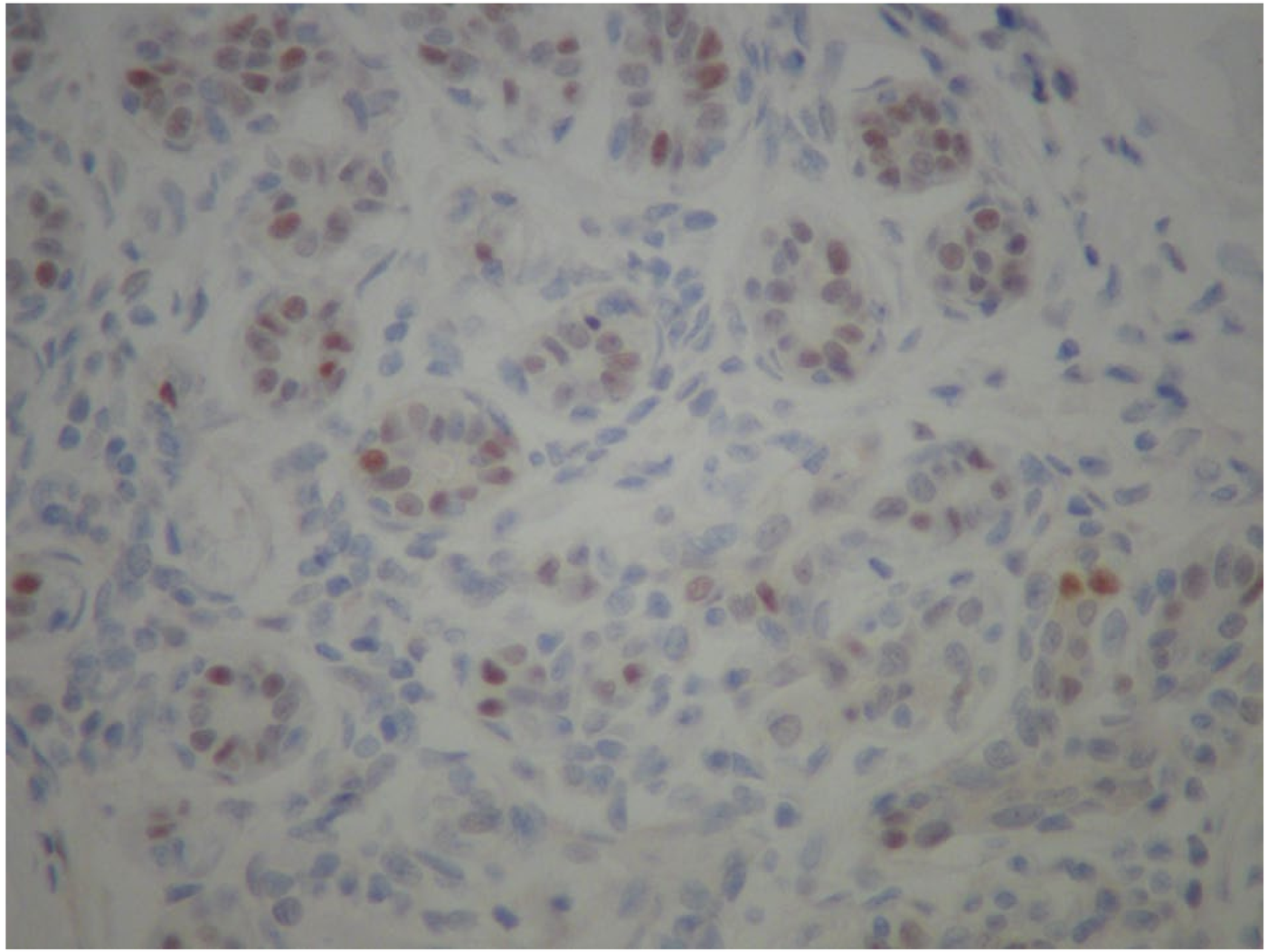
Breast – Estrogen Receptor (Normal)

Normal breast tissue express estrogen receptor and grows in response to the hormone estrogen



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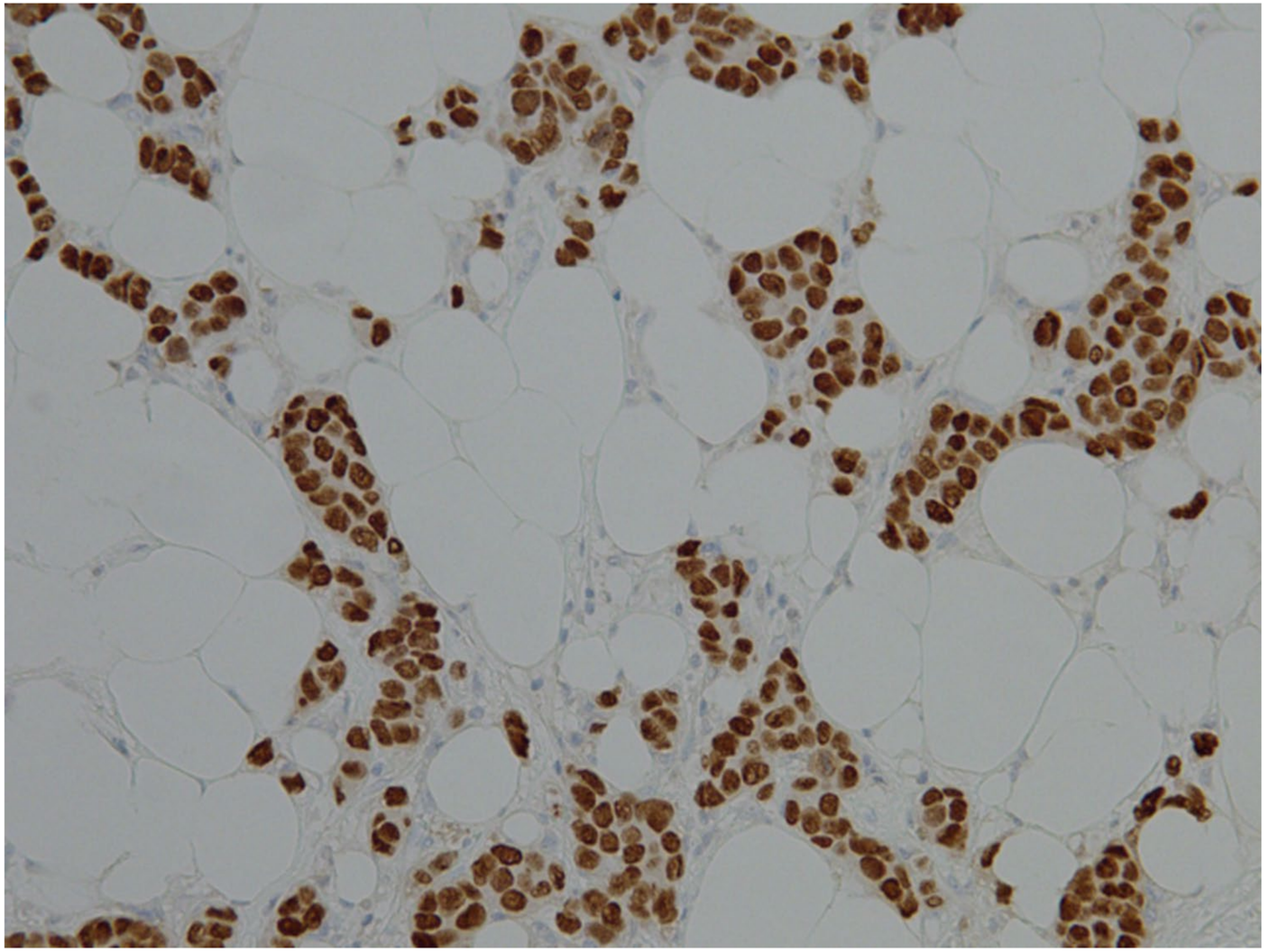
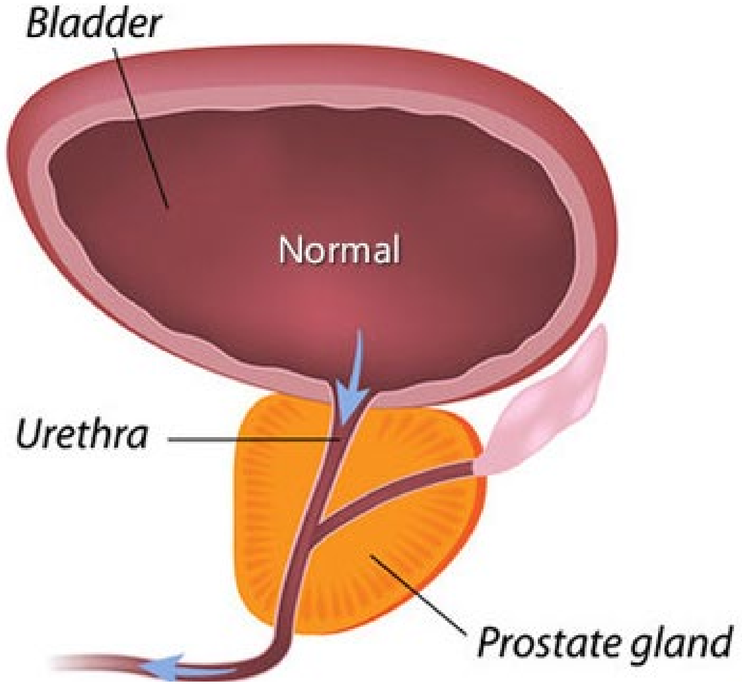
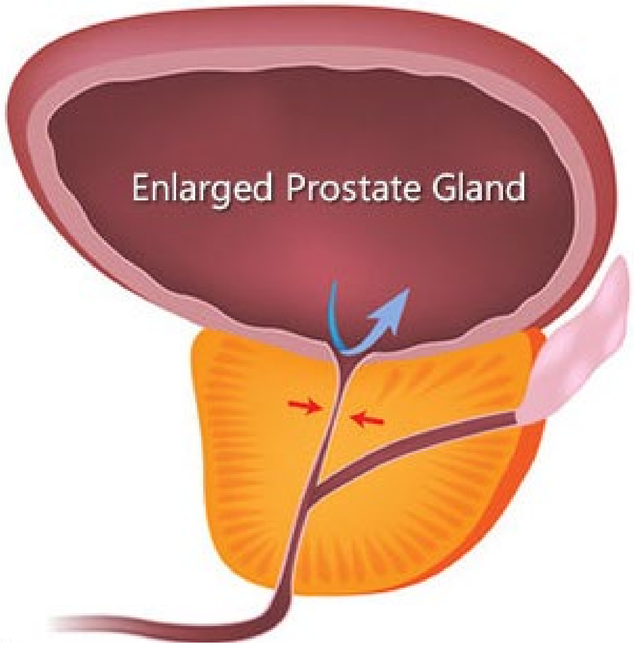
Breast – Estrogen Receptor (Cancer)

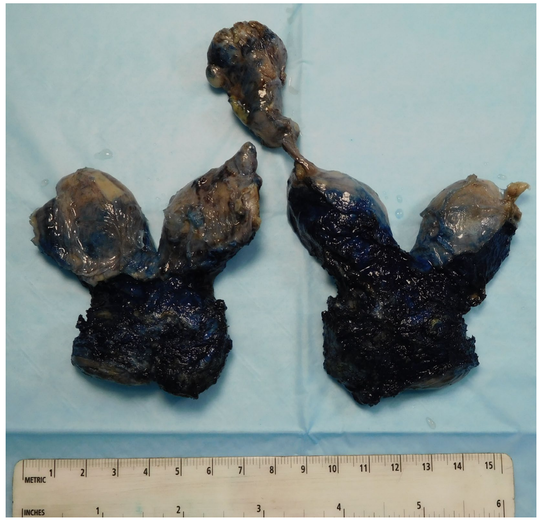
Breast cancer overexpressing estrogen receptor will grow even in a low estrogen environment (postmenopause)



Prostate – Gross







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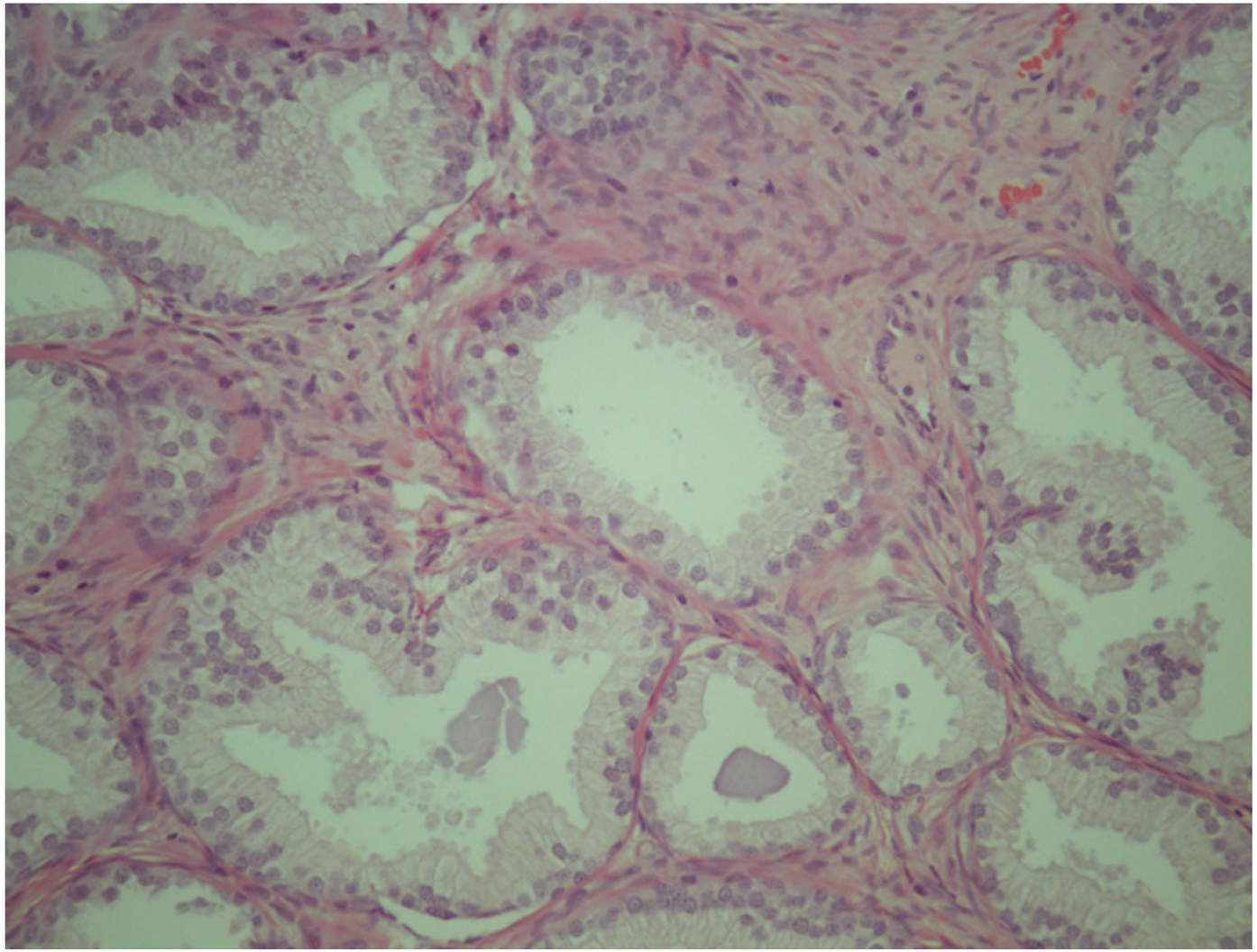
Prostate – Normal

Prostate is a male gland that secretes the fluid semen



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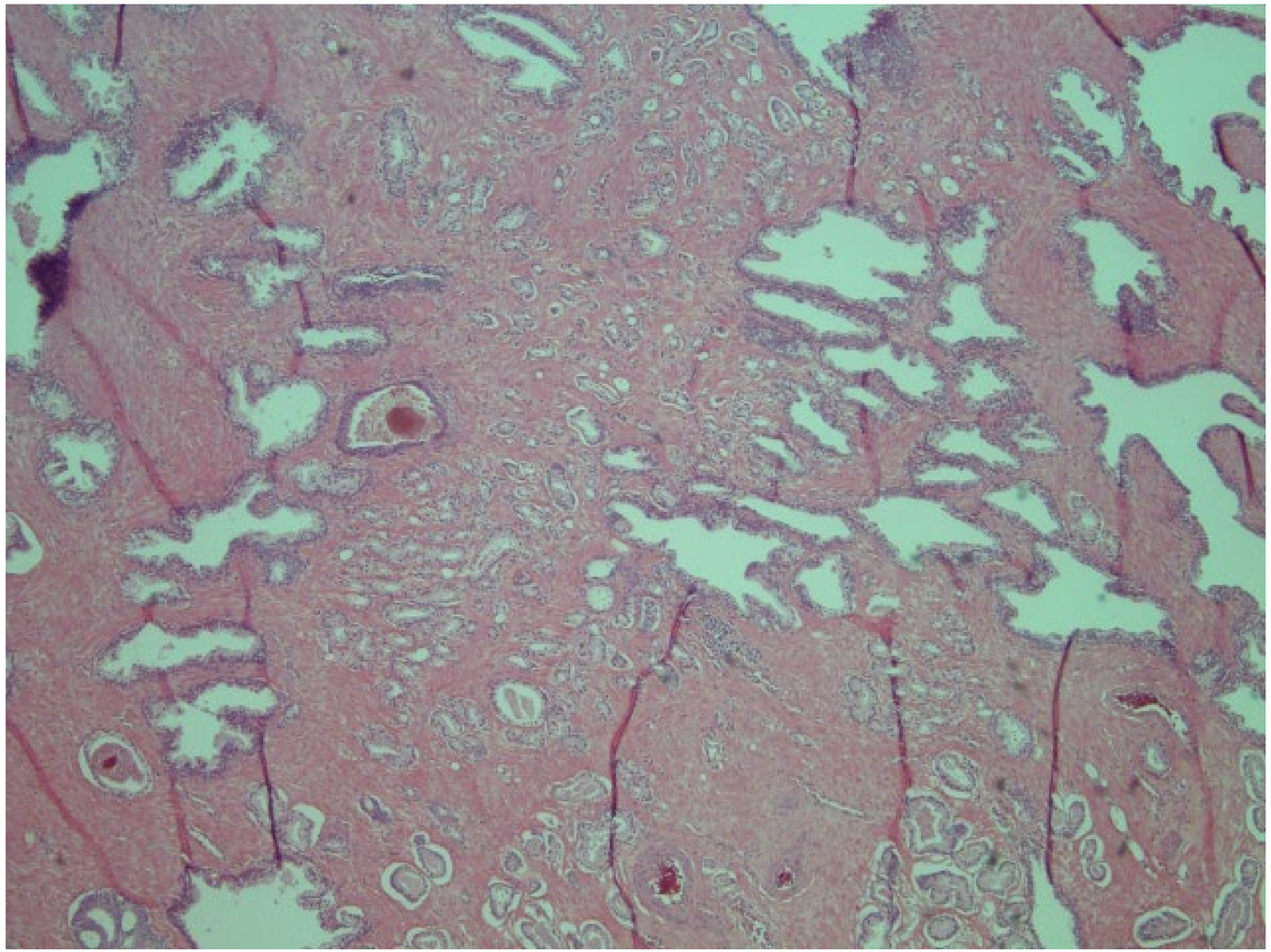
Prostate – Cancer

Prostate cancer is the most common cancer in male



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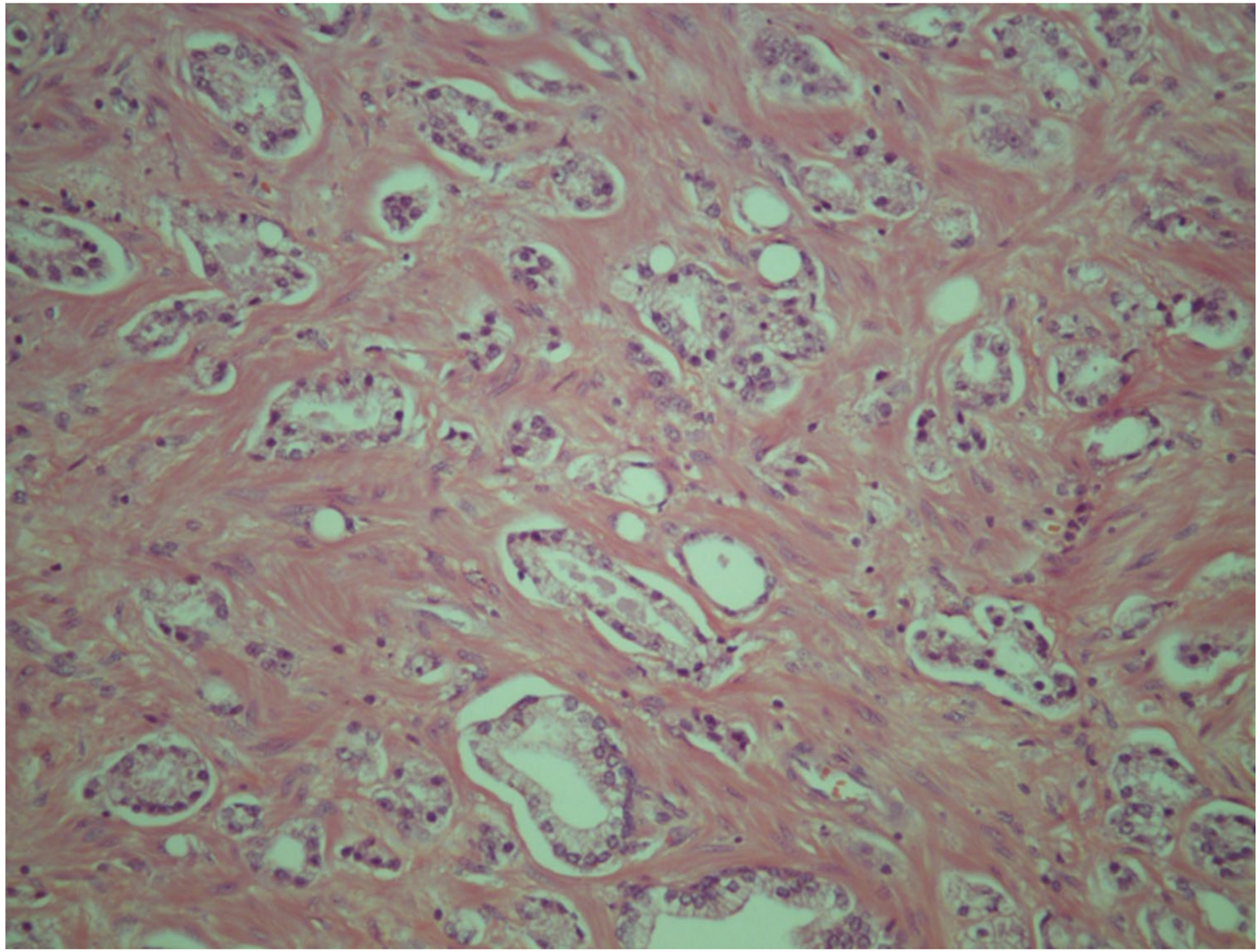
Prostate – Cancer

Prostate cancer is also a hormone - sensitive cancer and responds to the hormone testosterone



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What causes cancer?

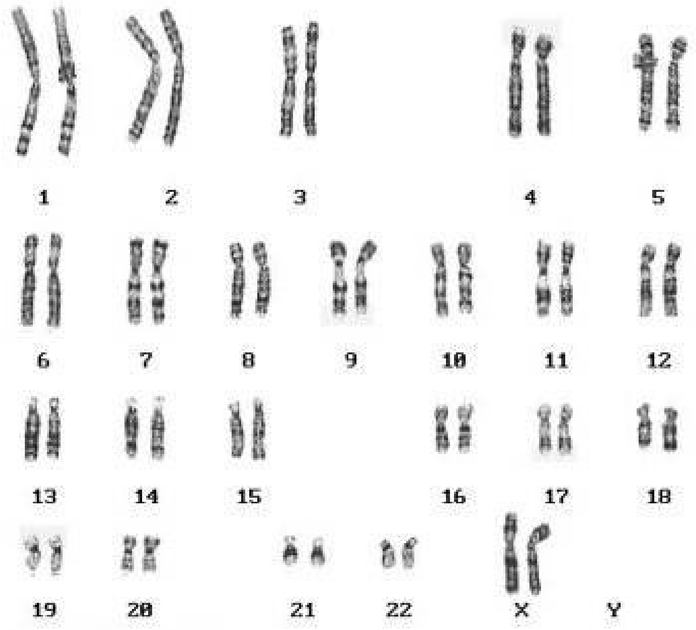
- Cancer is caused by changes in genes that lead to abnormal cell growth and spread.

- Cancer-related genetic changes can be hereditary, caused by environmental agents, or random due to cell division.

- Environmental causes can be physical (ultraviolet light), chemical (smoking, alcohol), or biological (HPV, EBV).

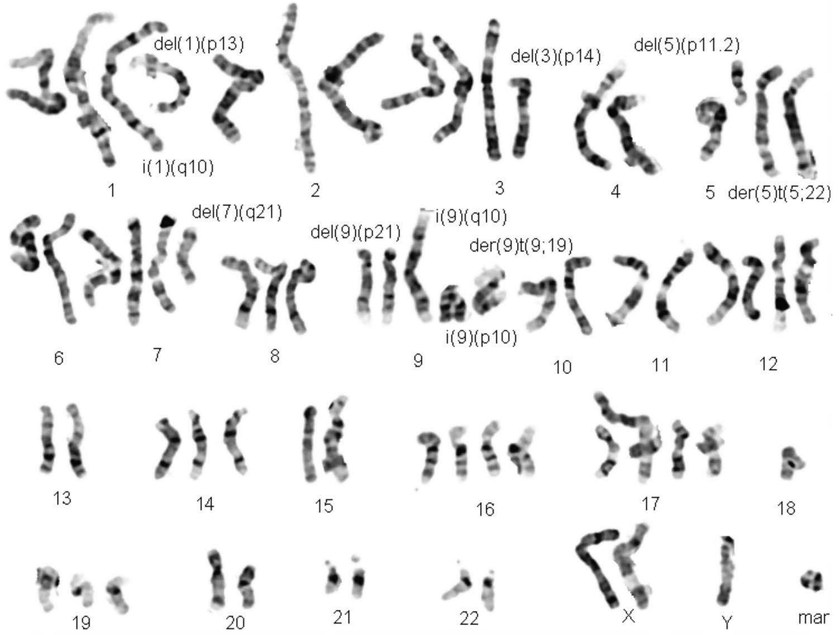
Chromosomal changes in cancer

Normal



From: Center for Human Genetics

Cancer



From Int. J. Mol. Sci. 2019, *20*(19), 4711

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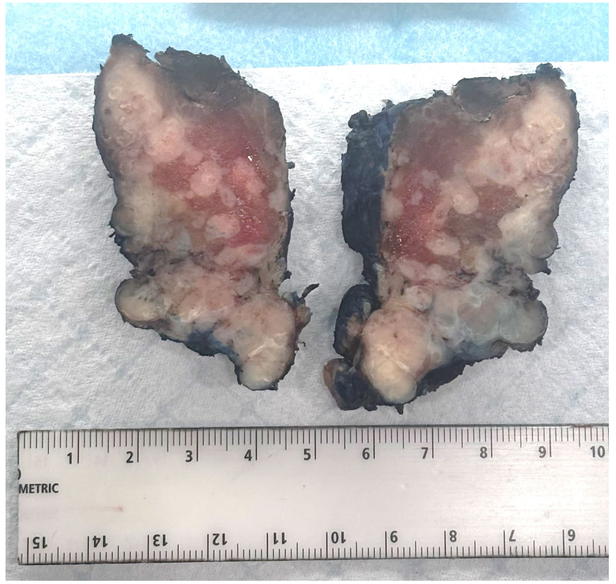
Thyroid– Gross



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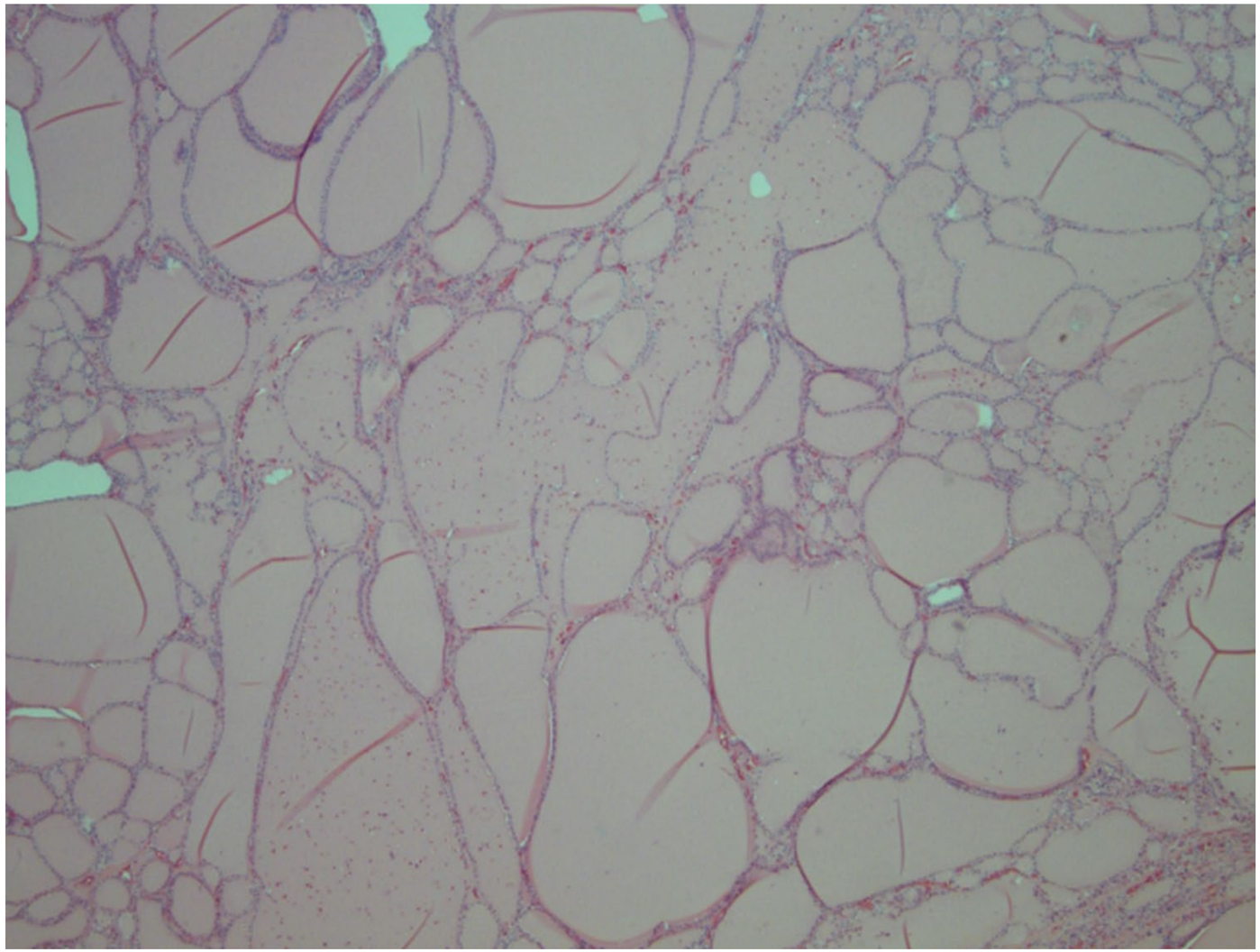
Thyroid - Goiter

Thyroid gland needs iodine to make thyroid hormone and enlarges in iodine deficiency



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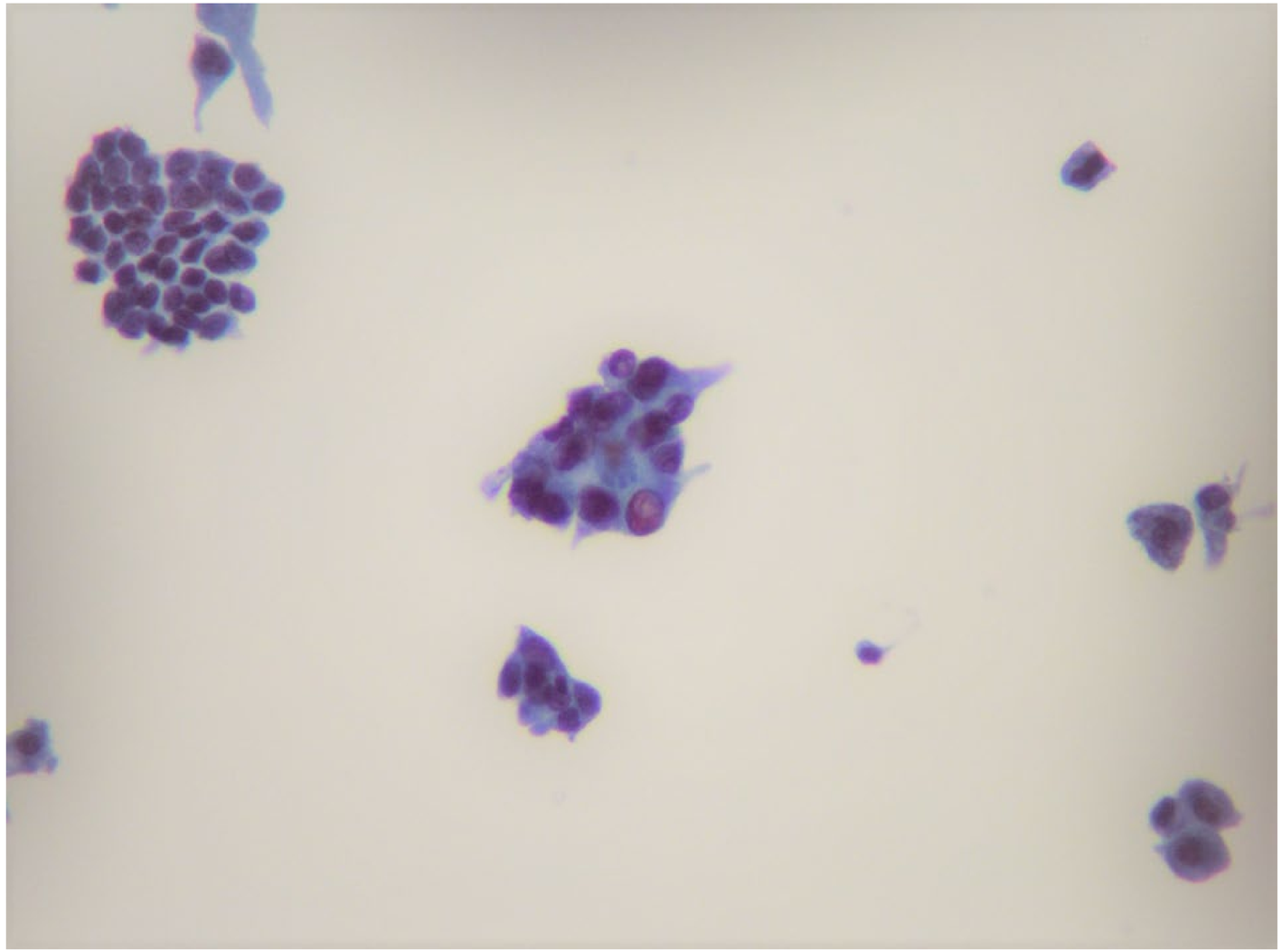
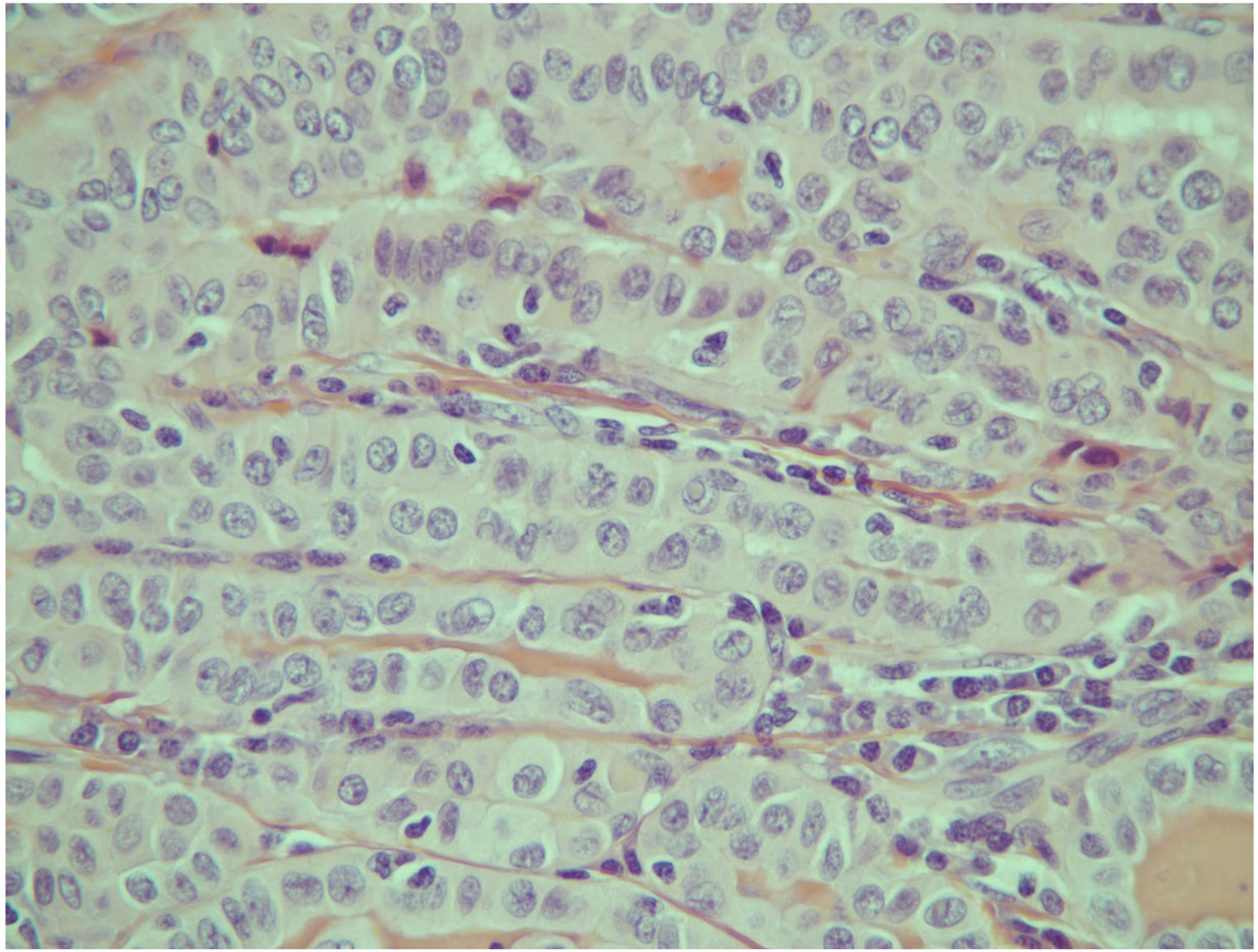
Thyroid - Cancer

Fine needle aspiration is a minimally invasive technique used to diagnose various lumps and bumps



Thyroid - Cancer

Thyroid cancer is strongly linked to radiation exposure (nuclear bomb and accidents)



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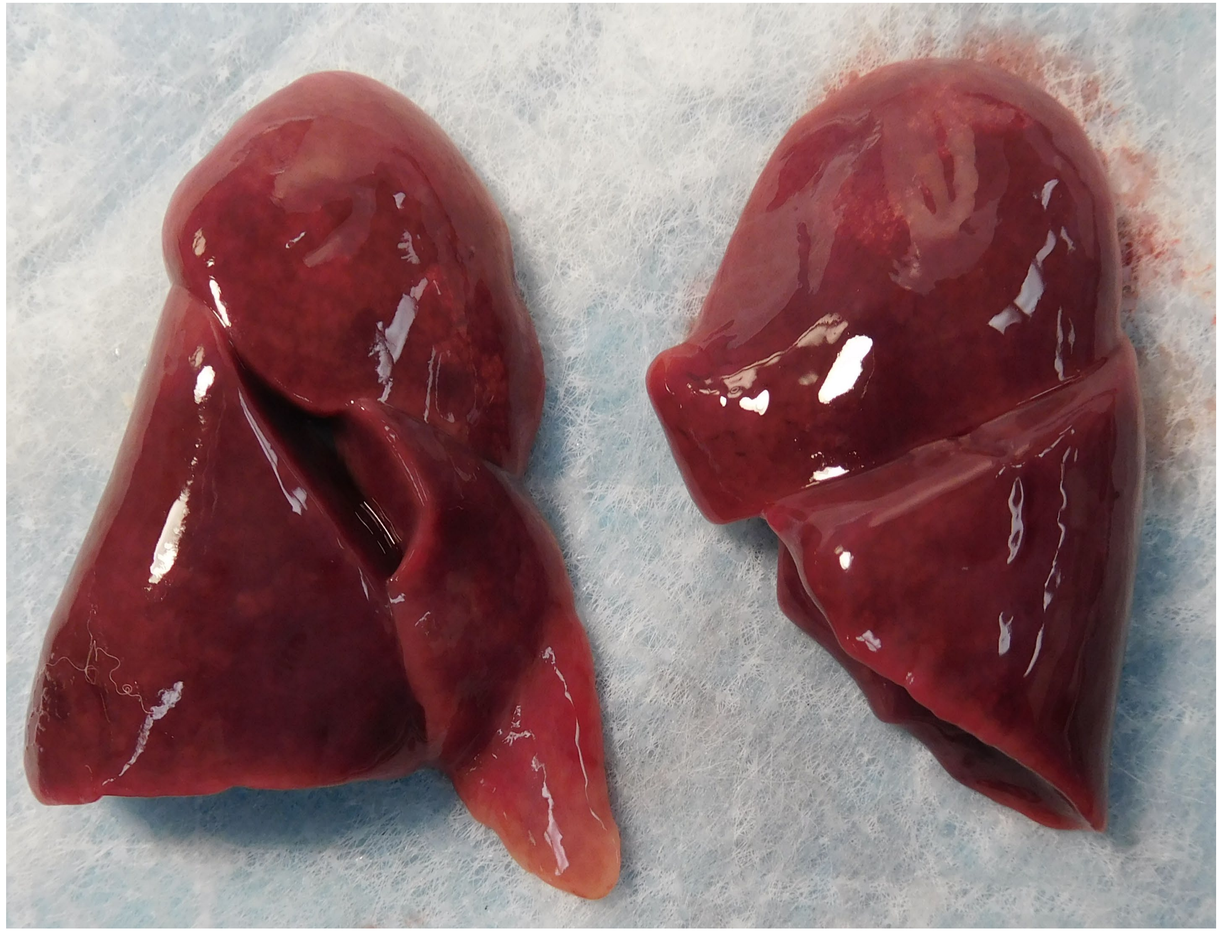
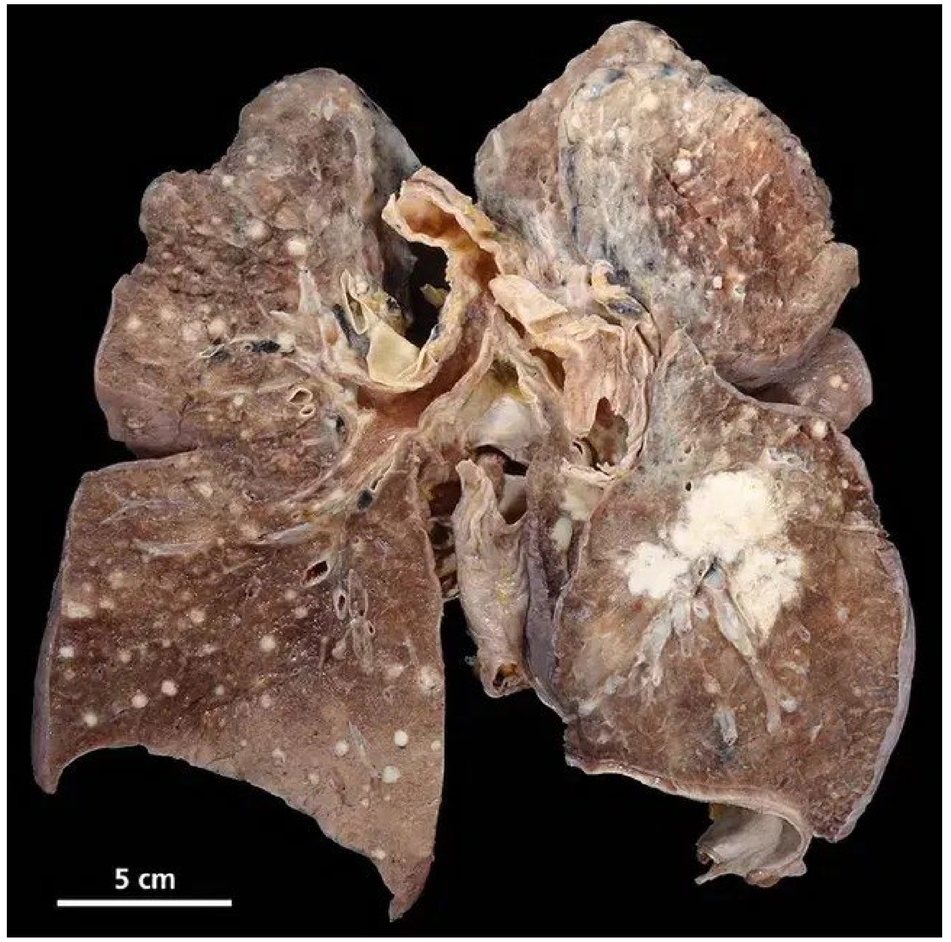
Lung– Gross





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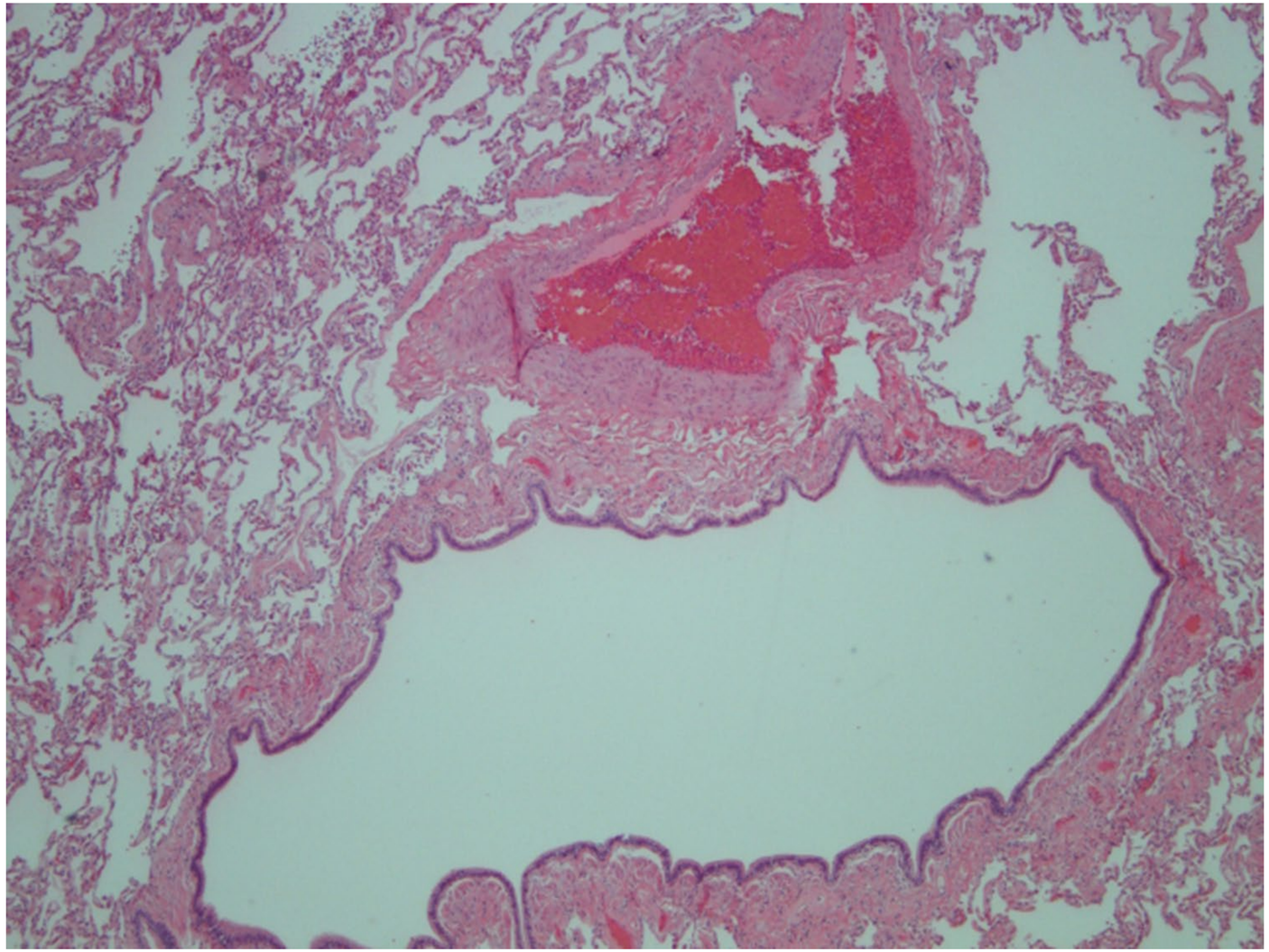
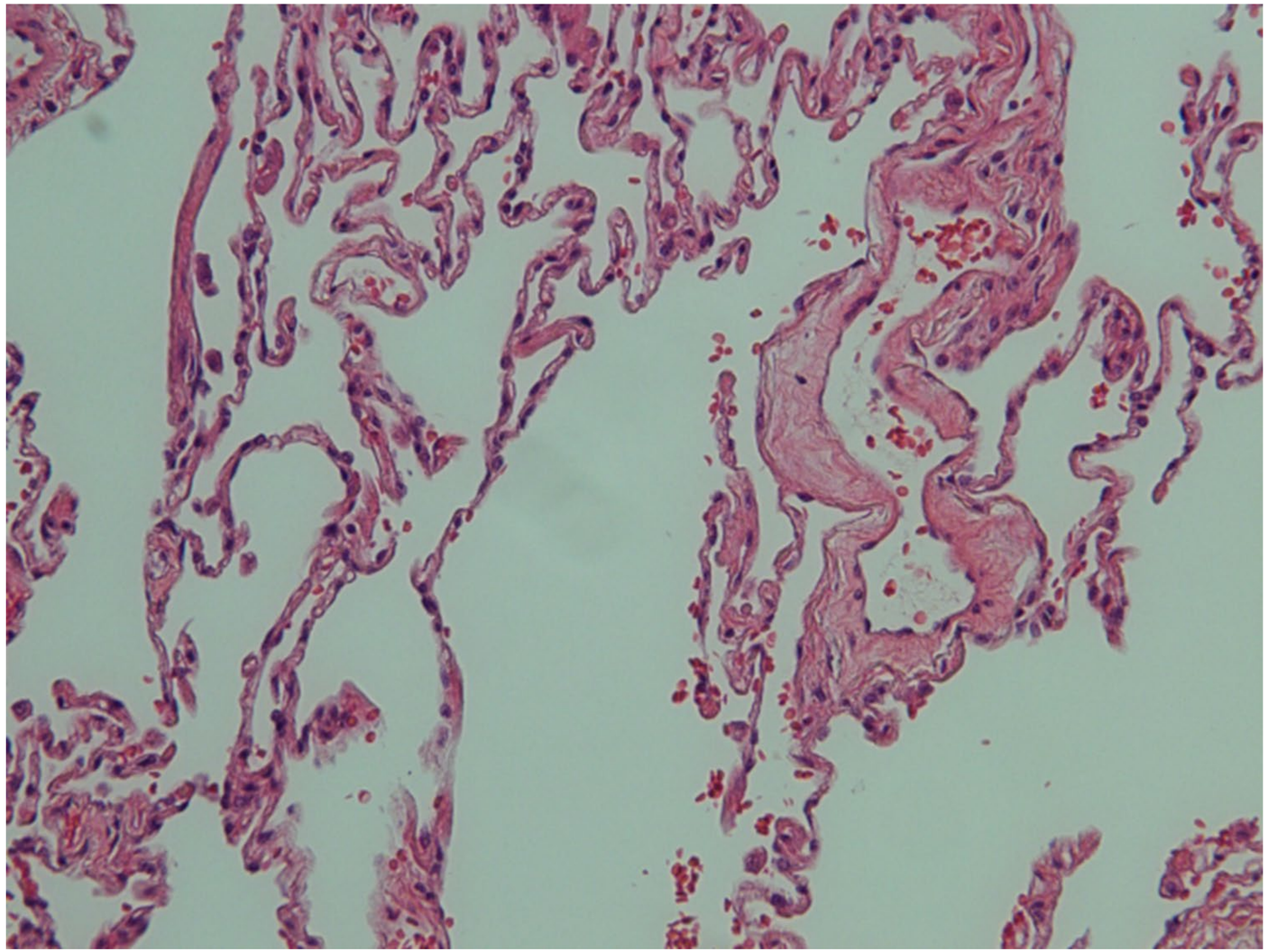
Lung - Normal

Lung tissue is made of branching airways, blood vessels, and alveolar sacs



Lung - Normal

Lung enriches blood with oxygen during inspiration and removes carbon dioxide during expiration



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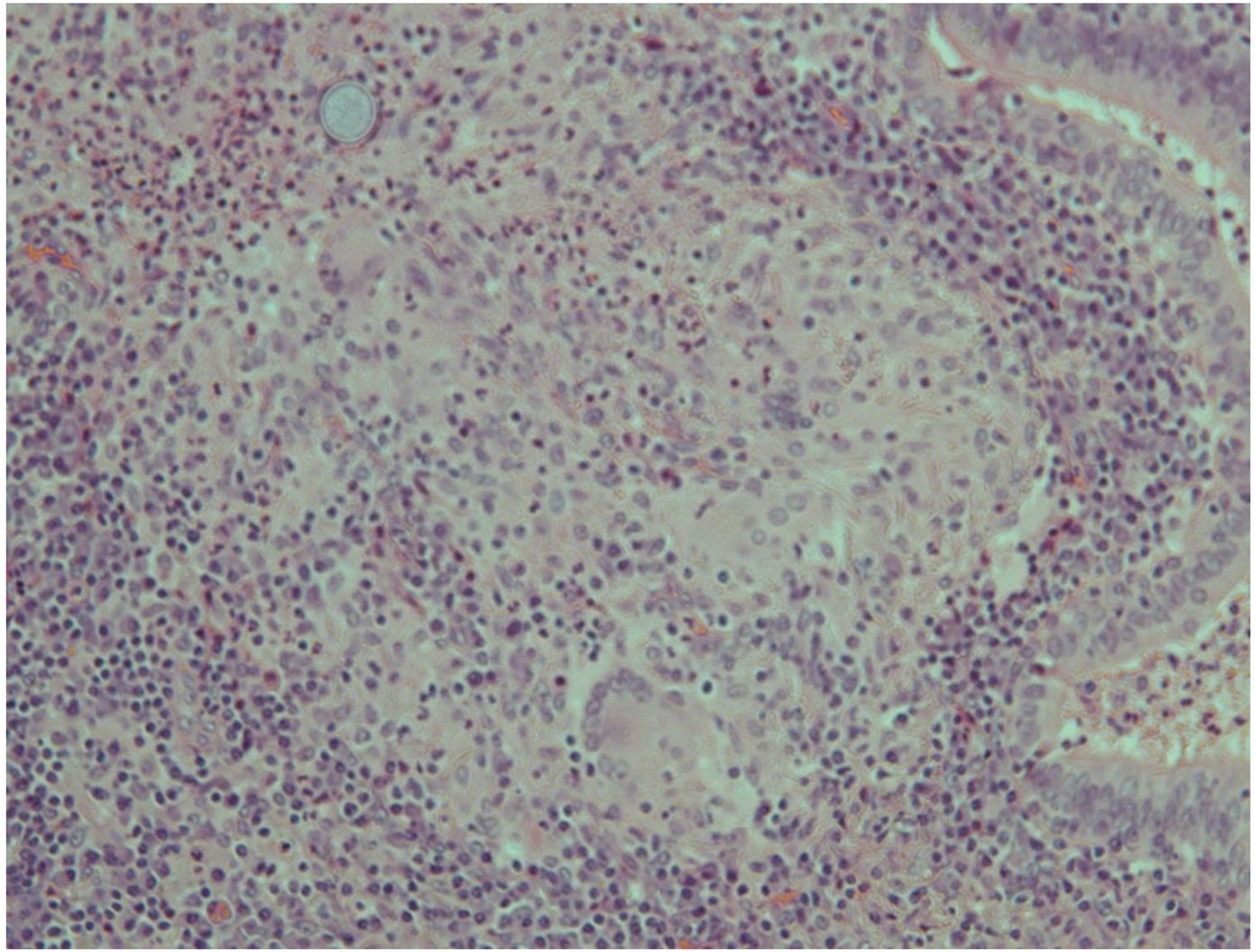
Lung - Infection

This lung tumor called a granuloma is an inflammatory response to lung infection



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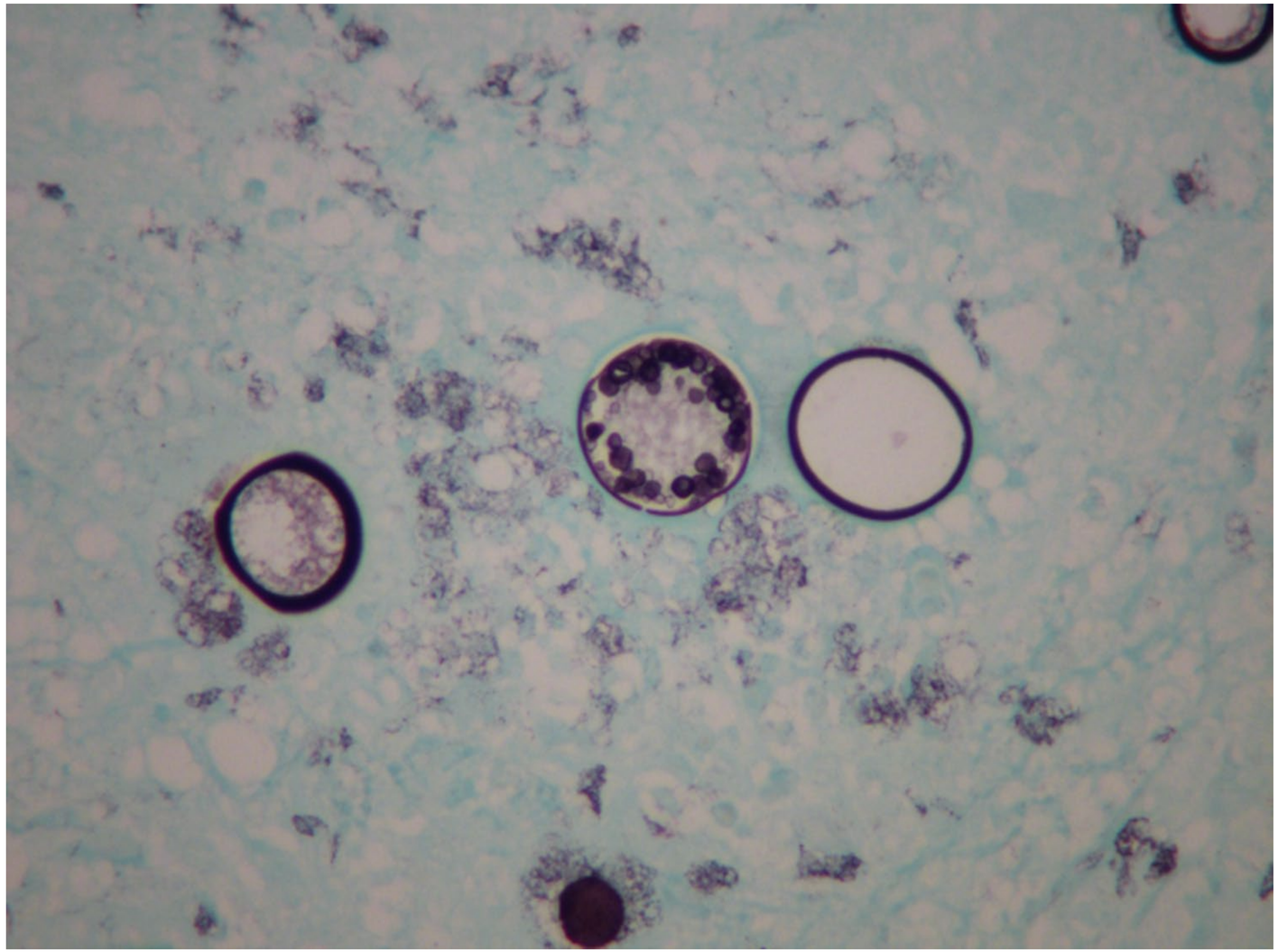
Lung – Infection

This case is caused by a fugus called Coccidioides



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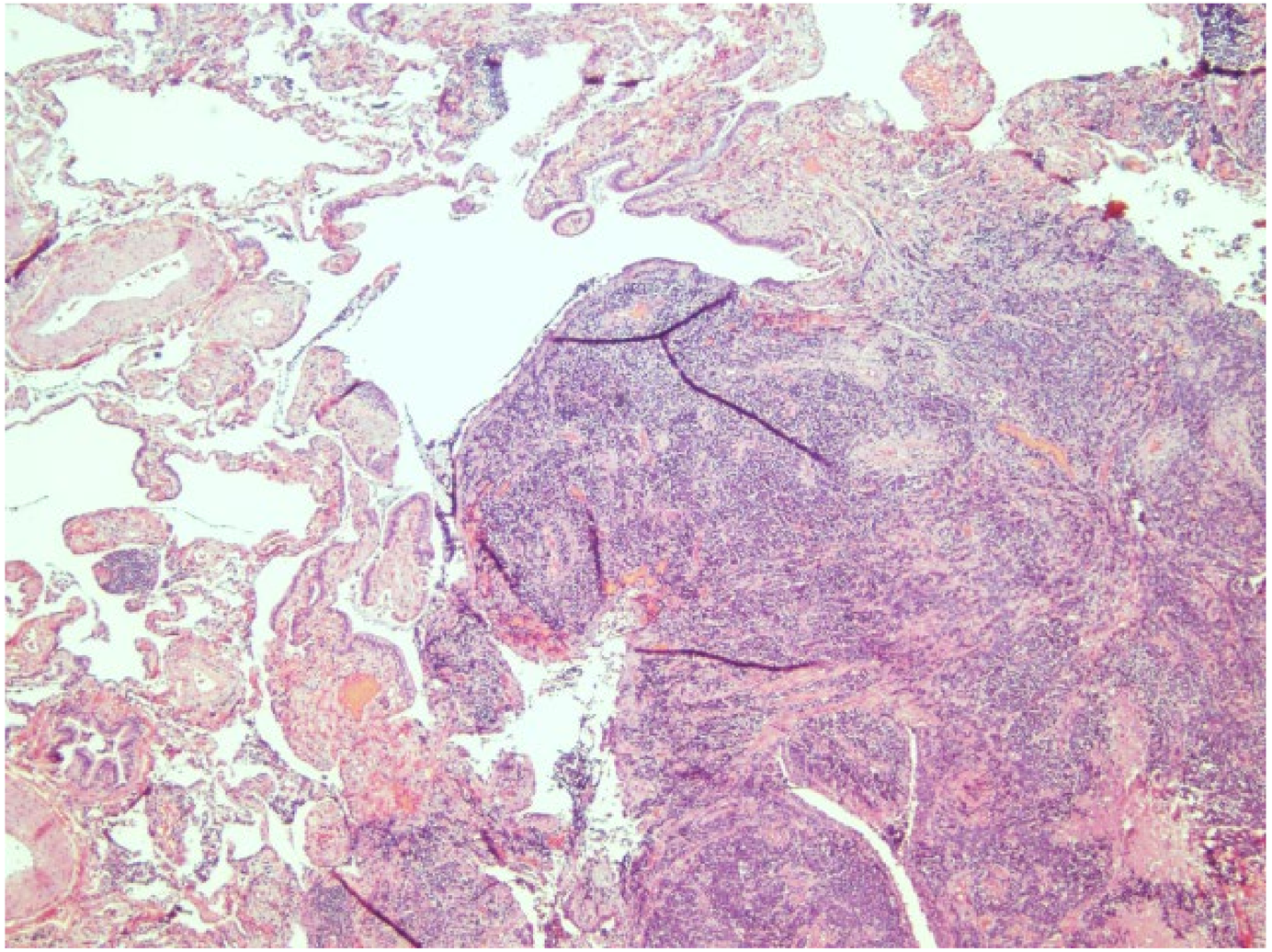
Lung - Cancer

Lung cancer is the deadliest cancer for both men and women and is strongly linked to tobacco smoking



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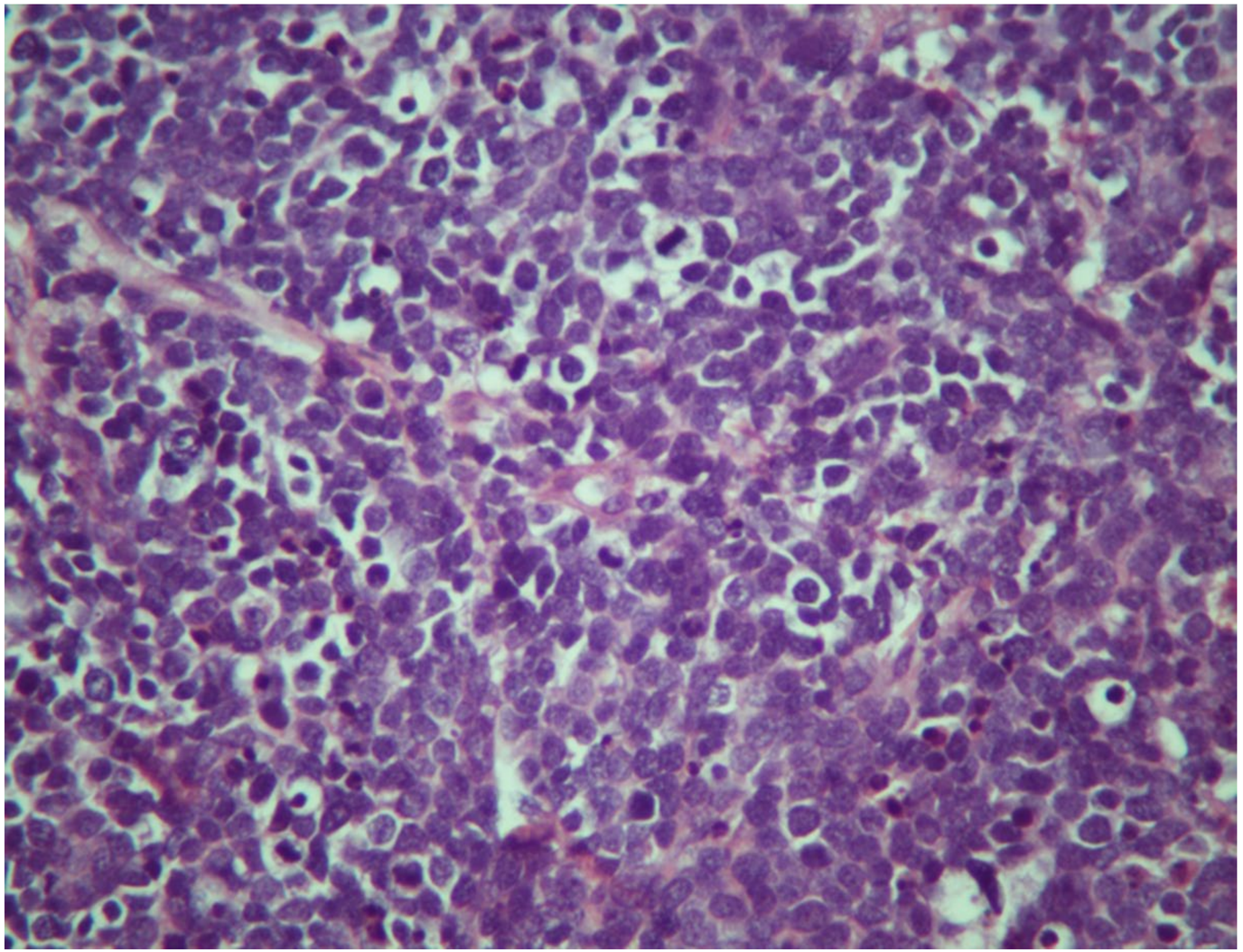
Lung - Cancer

This is a poorly differentiated lung cancer called small cell carcinoma



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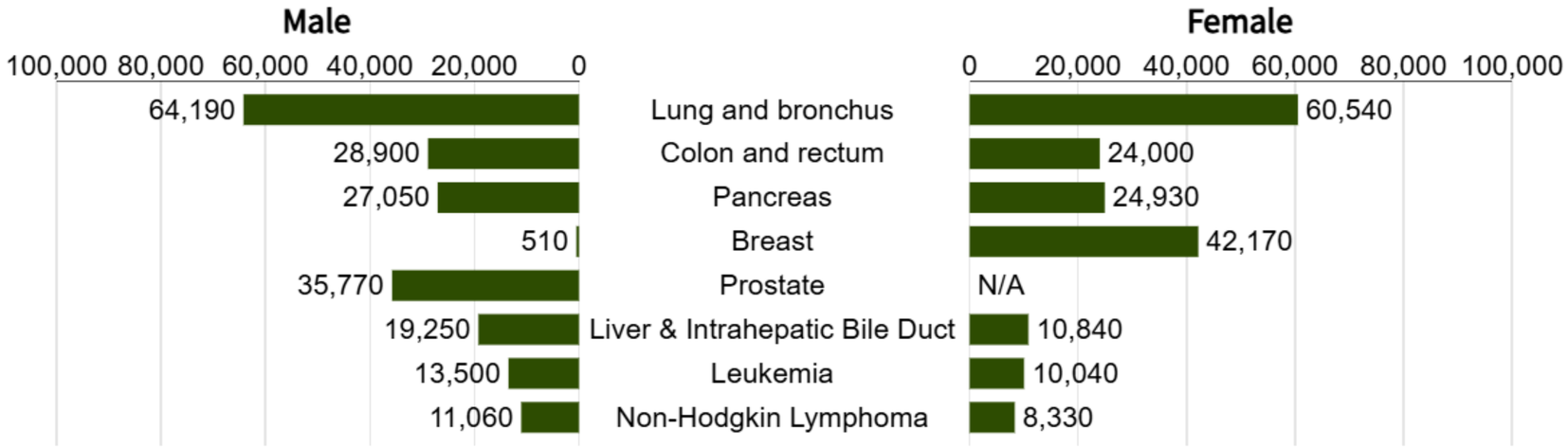
Most common sites of cancer death



Source: Cancer Facts & Figures 2025, American Cancer Society (ACS), Atlanta, Georgia, 2025.

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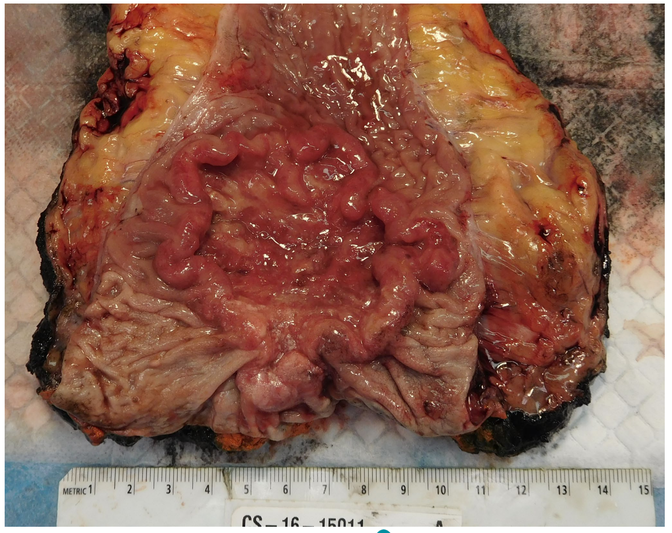
Colon– Gross



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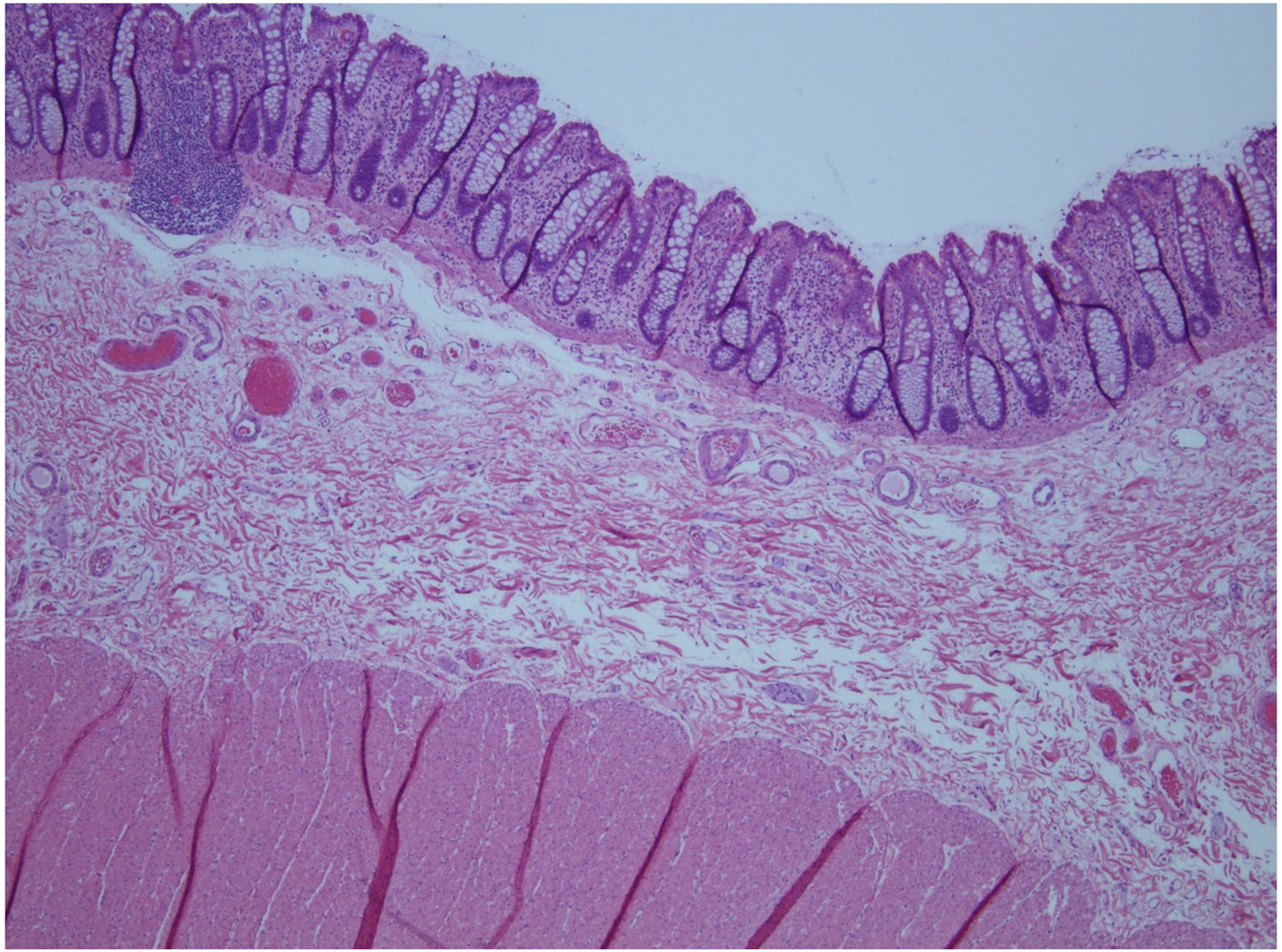
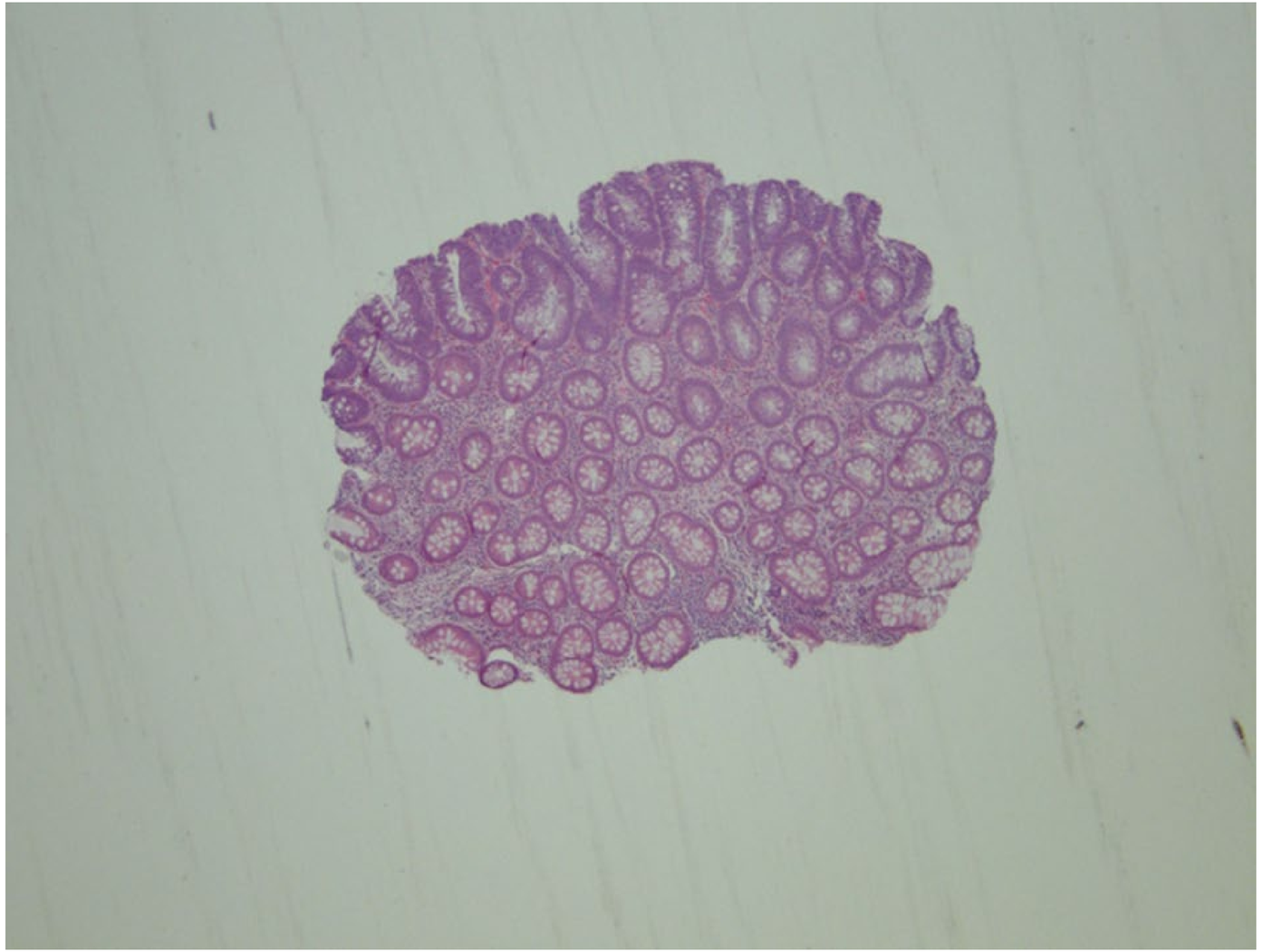
Colon - Normal

The large intestine absorbs water, electrolytes, and some vitamins



Colon - Polyp

Colon cancer screening allows for removal of precancerous polyps before they become malignant



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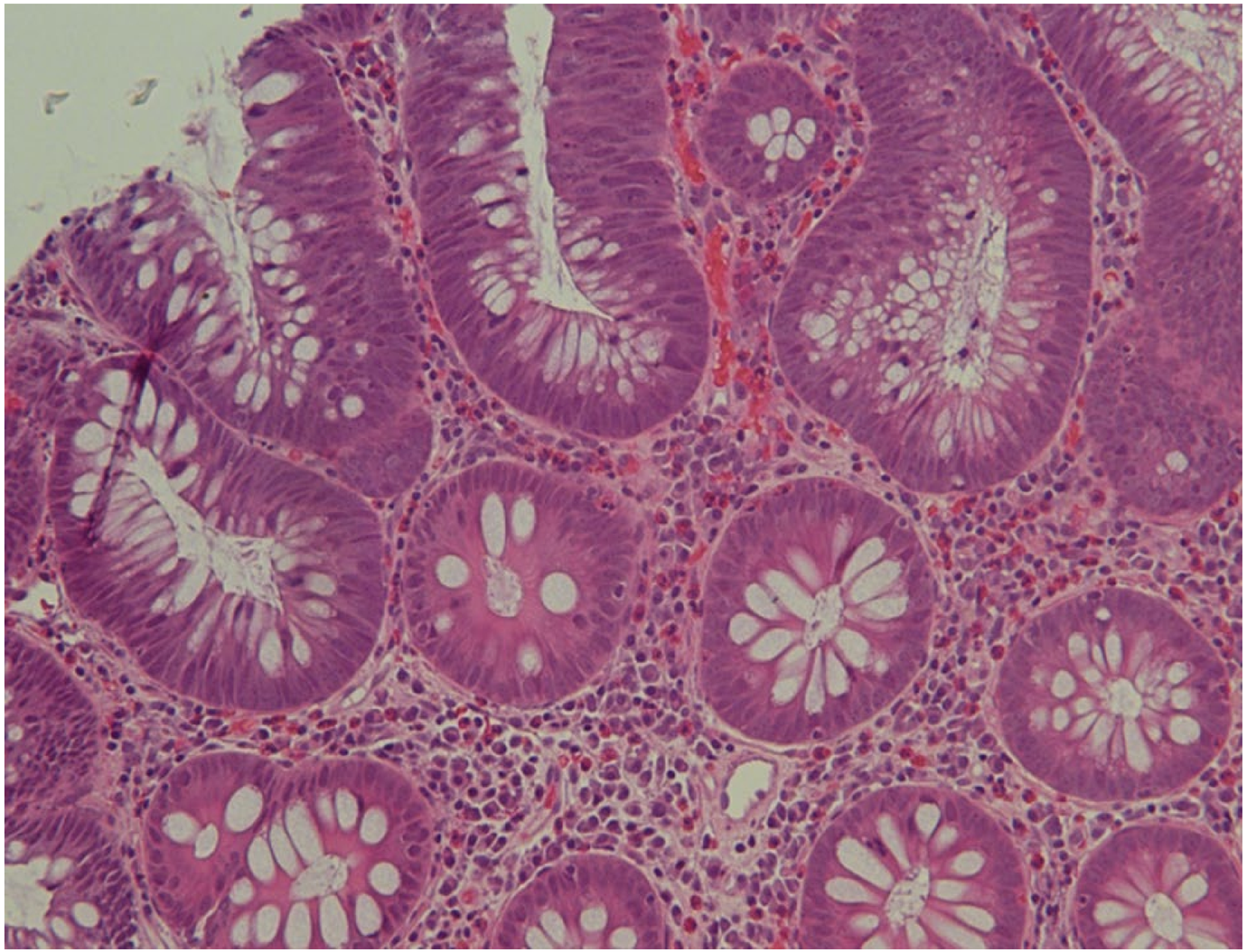
Colon - Polyp

This is a type of precancerous polyp called tubular adenoma



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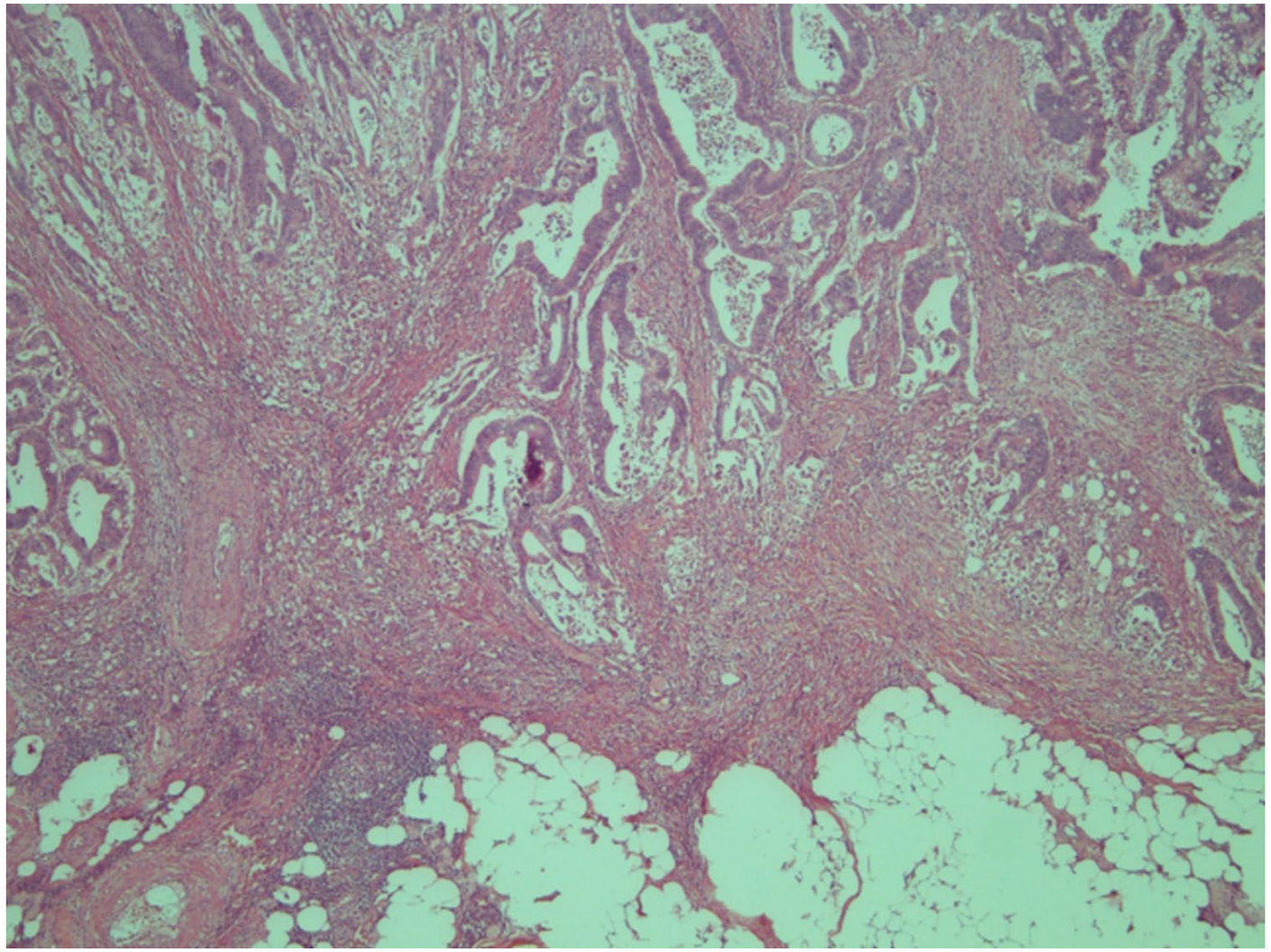
Colon - Cancer

This colon cancer has invaded into the muscle wall



What is cancer staging?

- Cancer staging is the process of finding out how much cancer is in a person's body and where it's located.

- The most common cancer staging system is the TNM system (Tumor, Lymph node, Metastasis).

- Cancer staging helps tailor treatment options because many have serious side effects.

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Lymph Node– Gross

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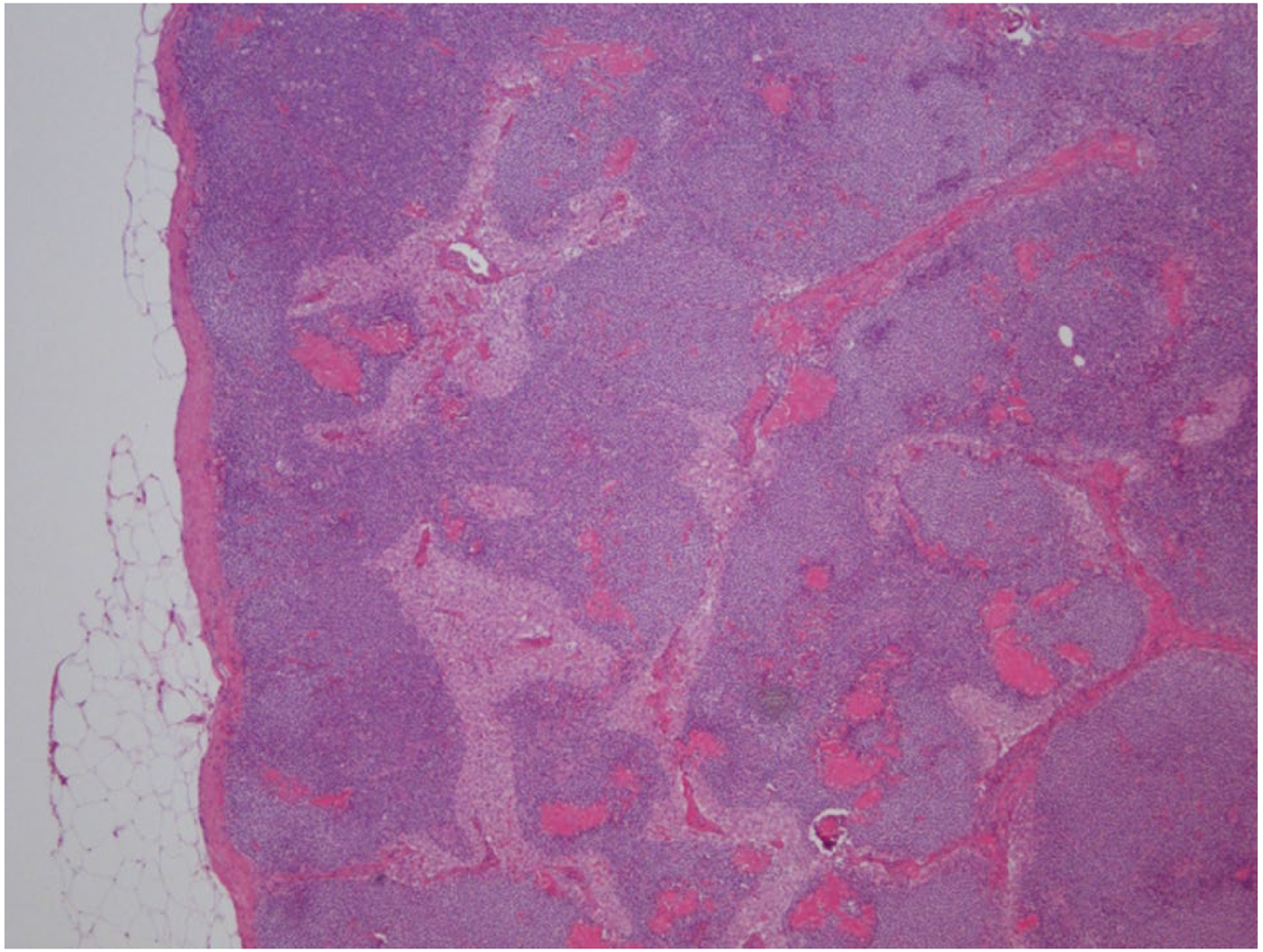
Lymph Node - Normal

Lymph nodes are analogous to police stations and hundreds of them exist throughout the body



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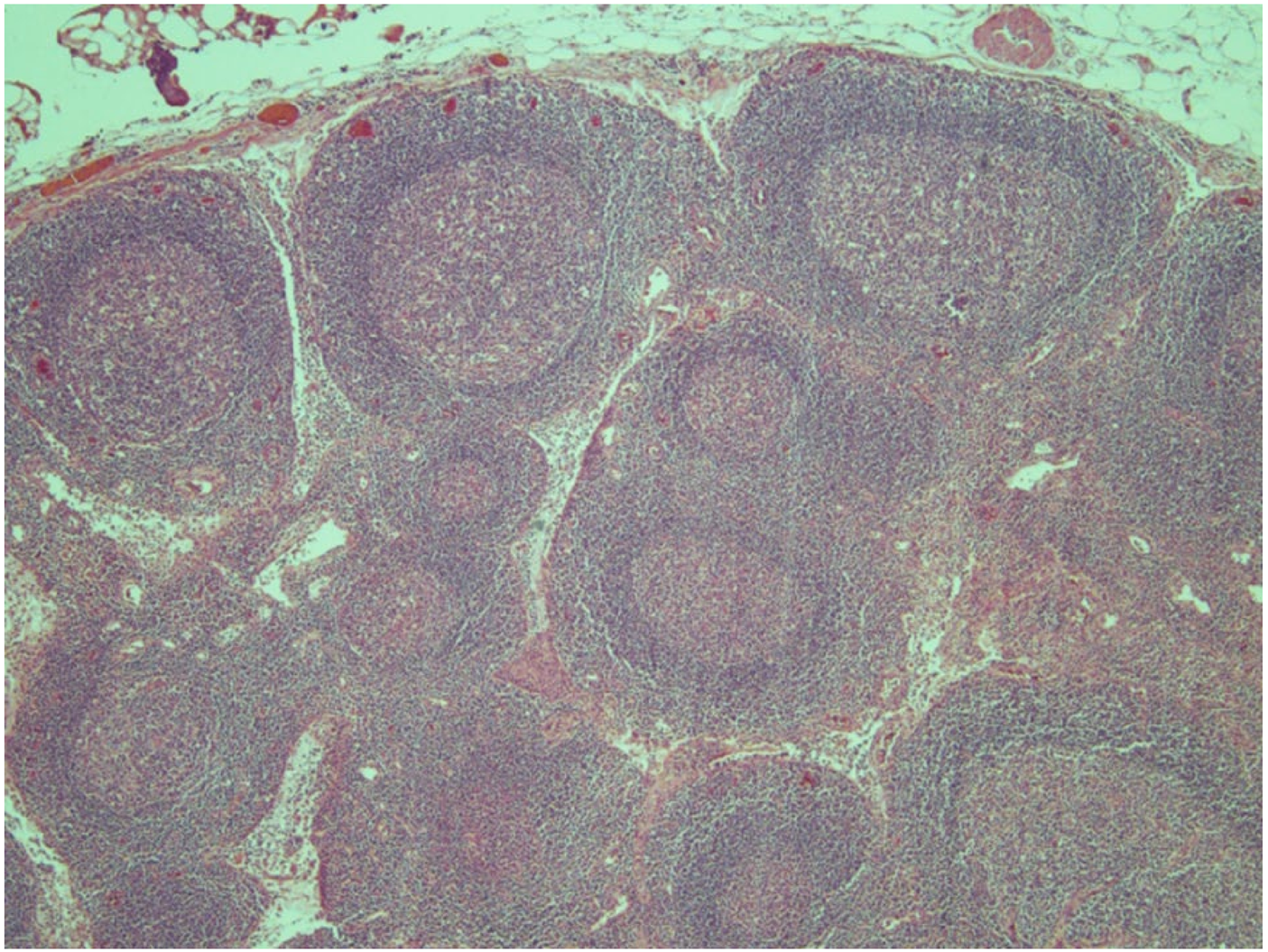
Lymph Node - Reactive

Lymph nodes will grow and enlarge in the setting of an infection



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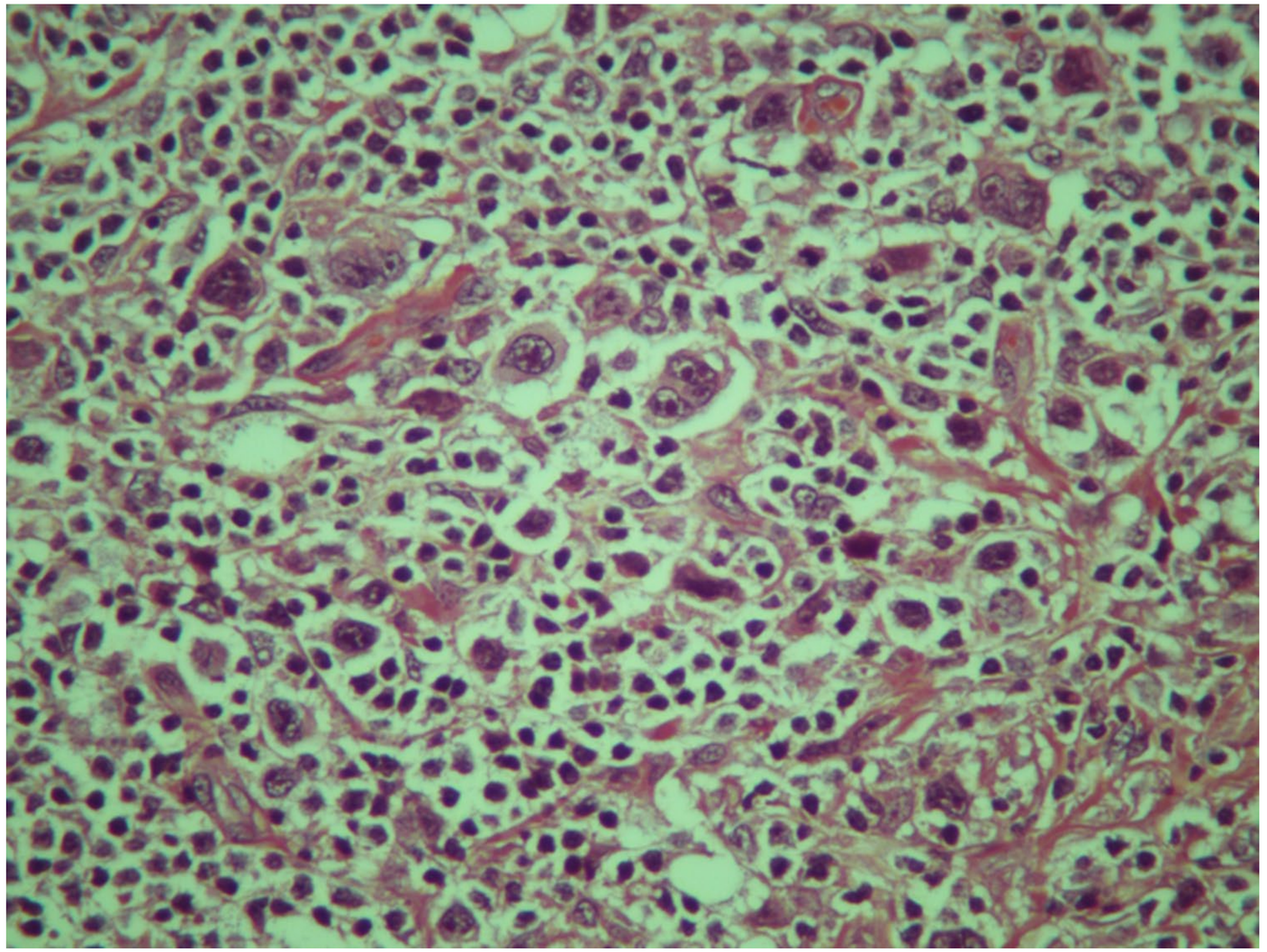
Lymph Node – Cancer

This is a type of lymph node cancer called Hodgkin lymphoma



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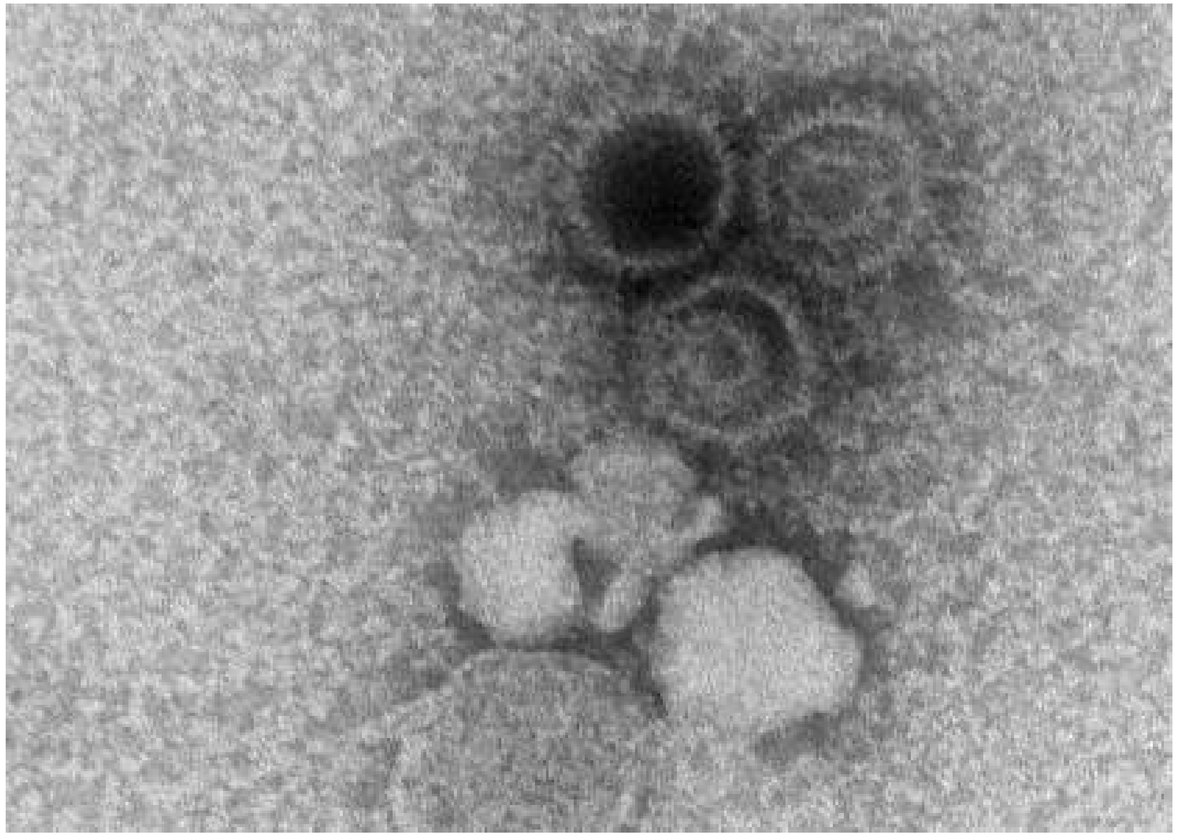
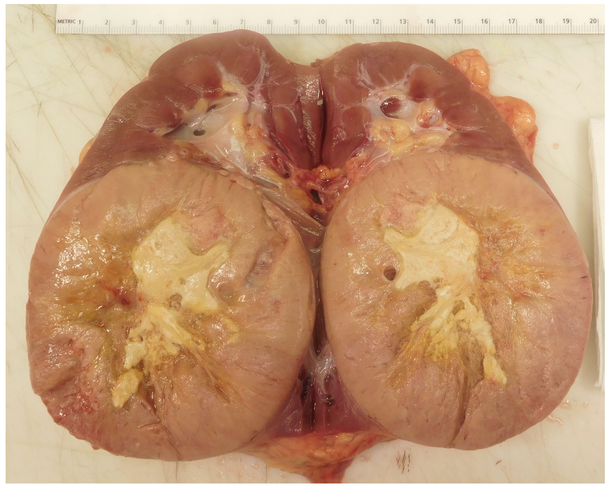
Lymph Node – Cancer

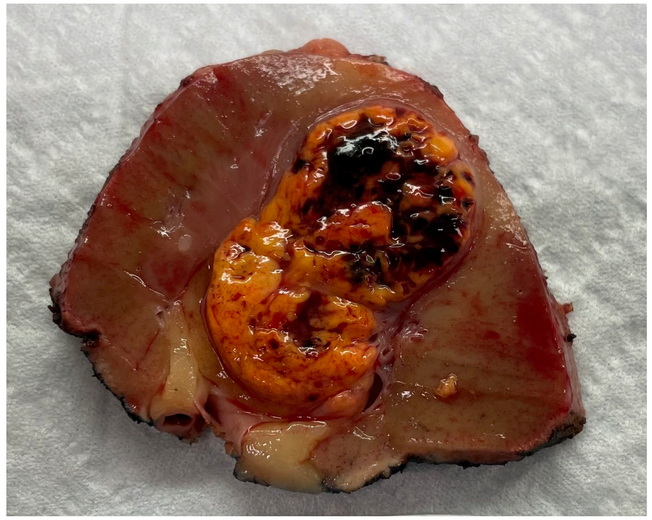
Epistein -Barr virus (EBV) infection has been linked to Hodgkin lymphoma and several other cancers



From: National Institutes of Health

Kidney– Gross





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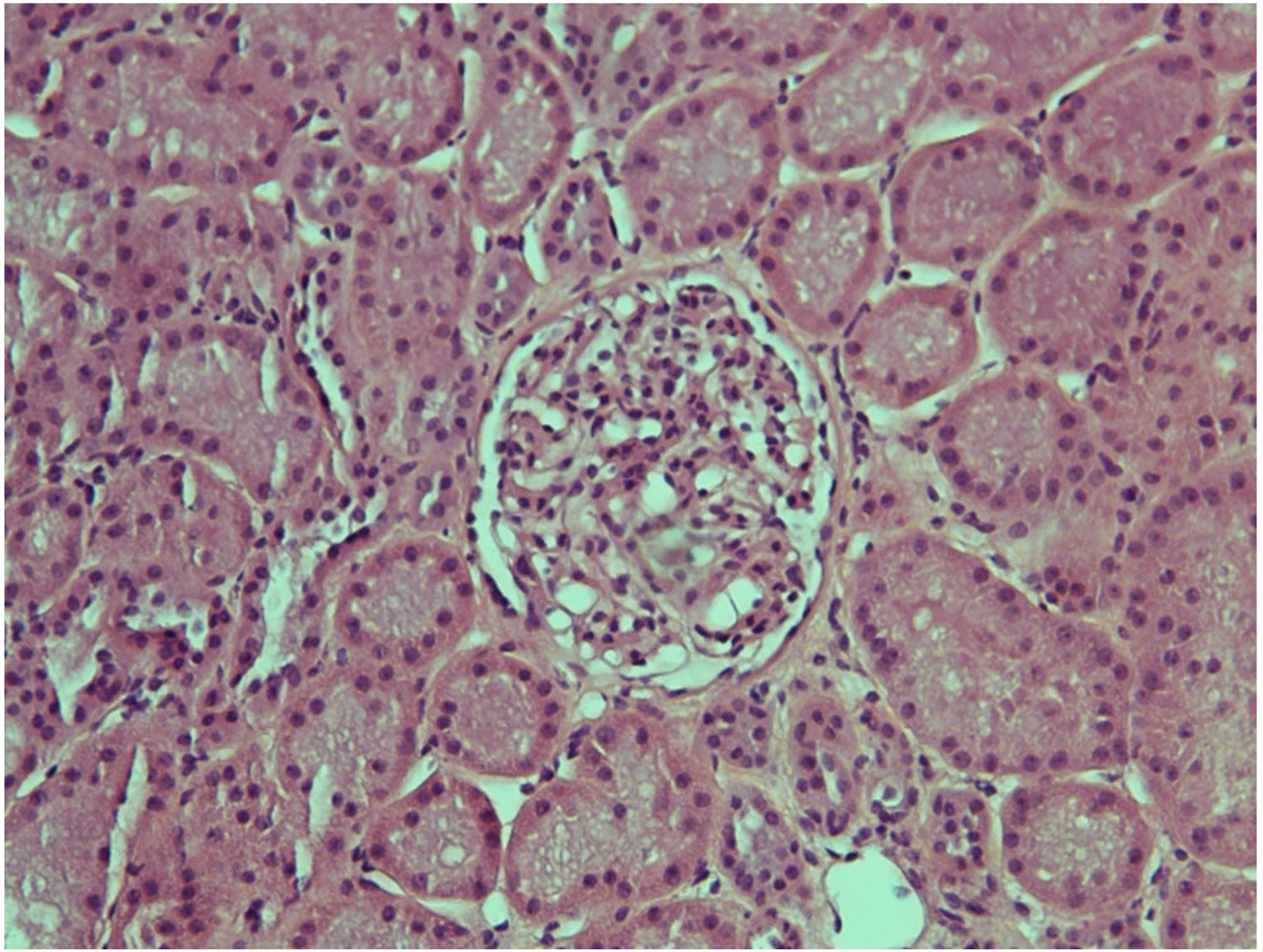
Kidney - Normal

Each kidney has ~1 million glomeruli that filter blood and remove waste



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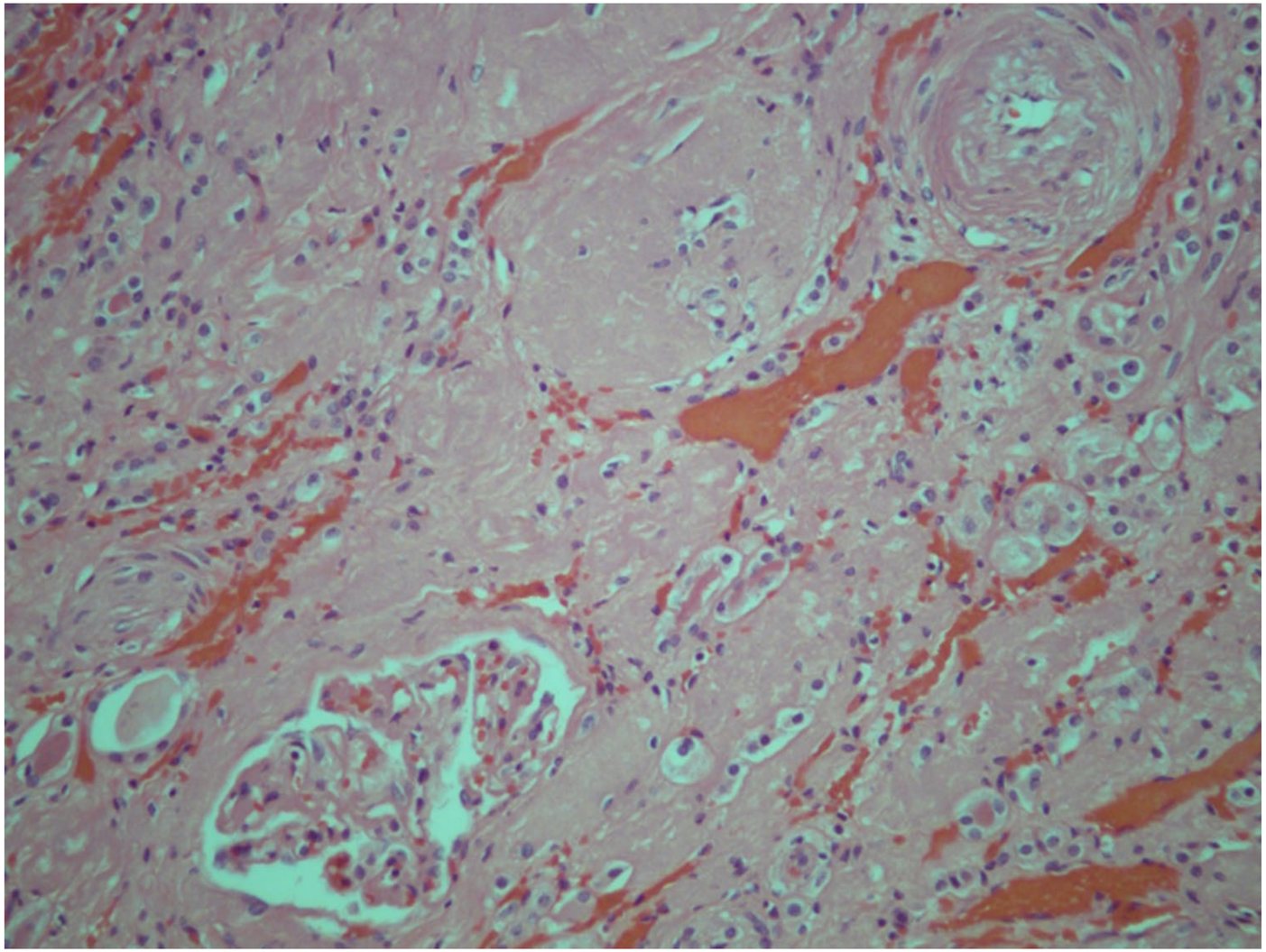
Kidney – Renal failure

Diabetes and hypertension are the most common causes of renal failure



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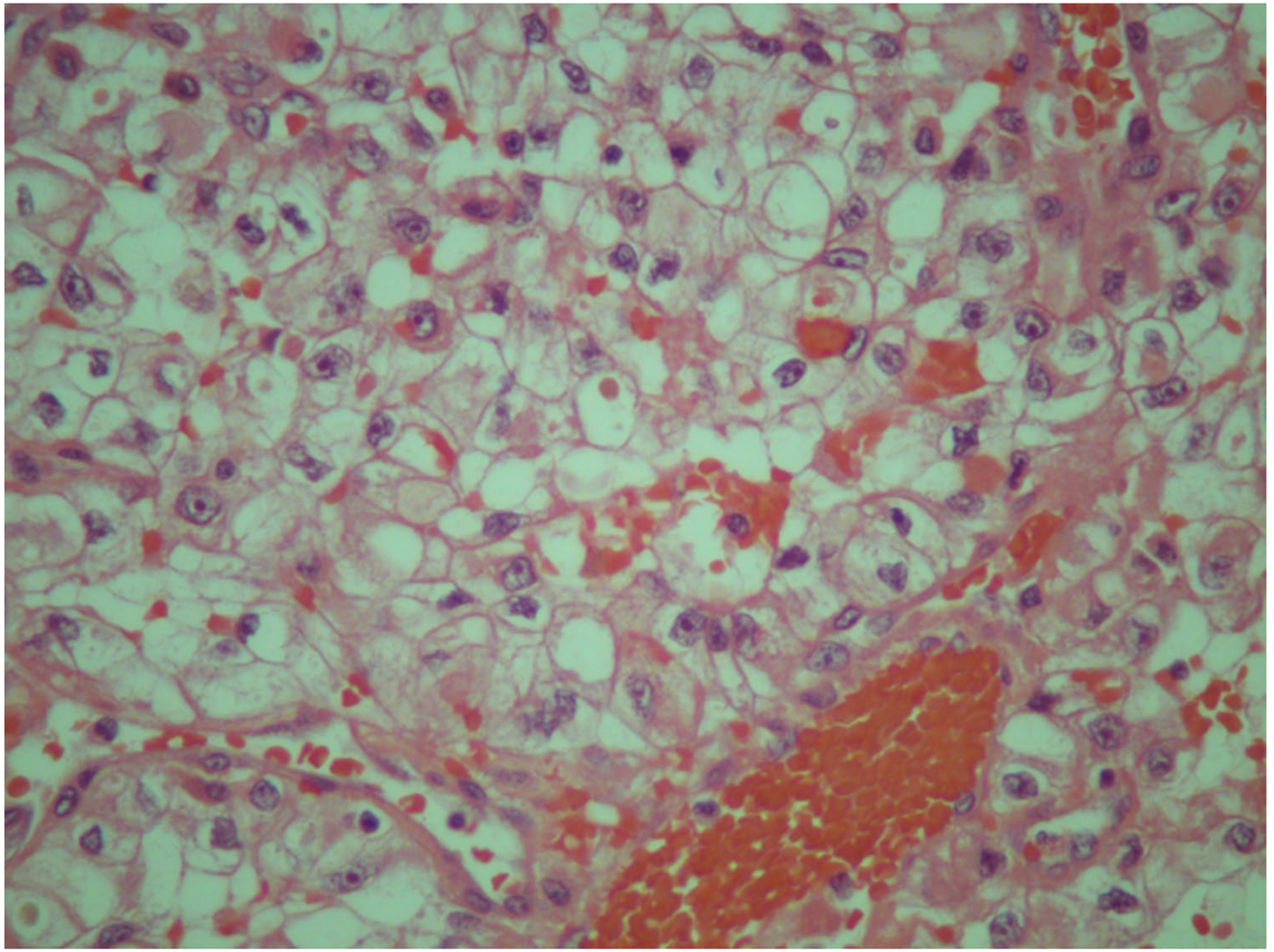
Kidney - Cancer

Chronic kidney disease increases the risk for kidney cancer



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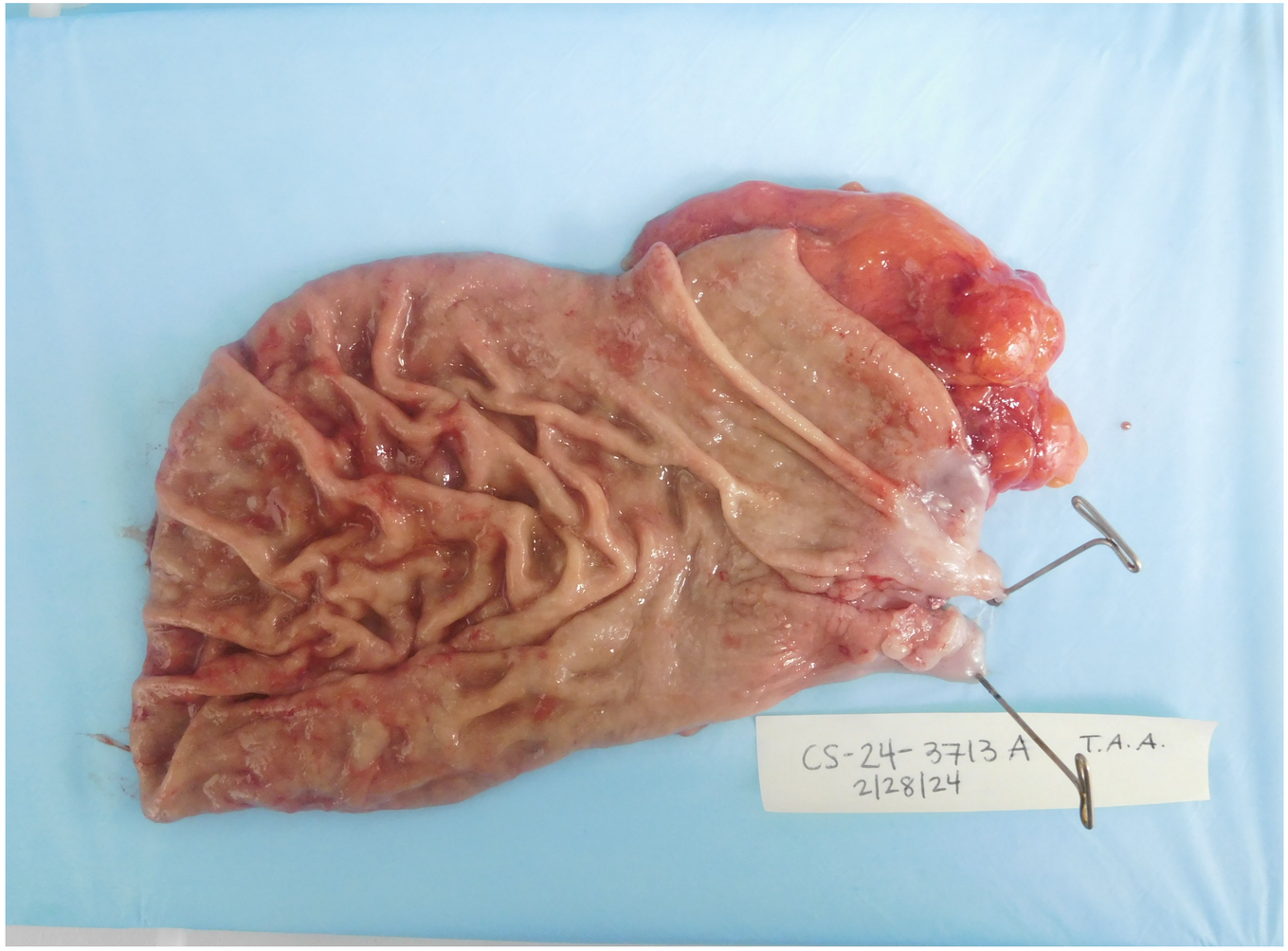
Stomach – Gross



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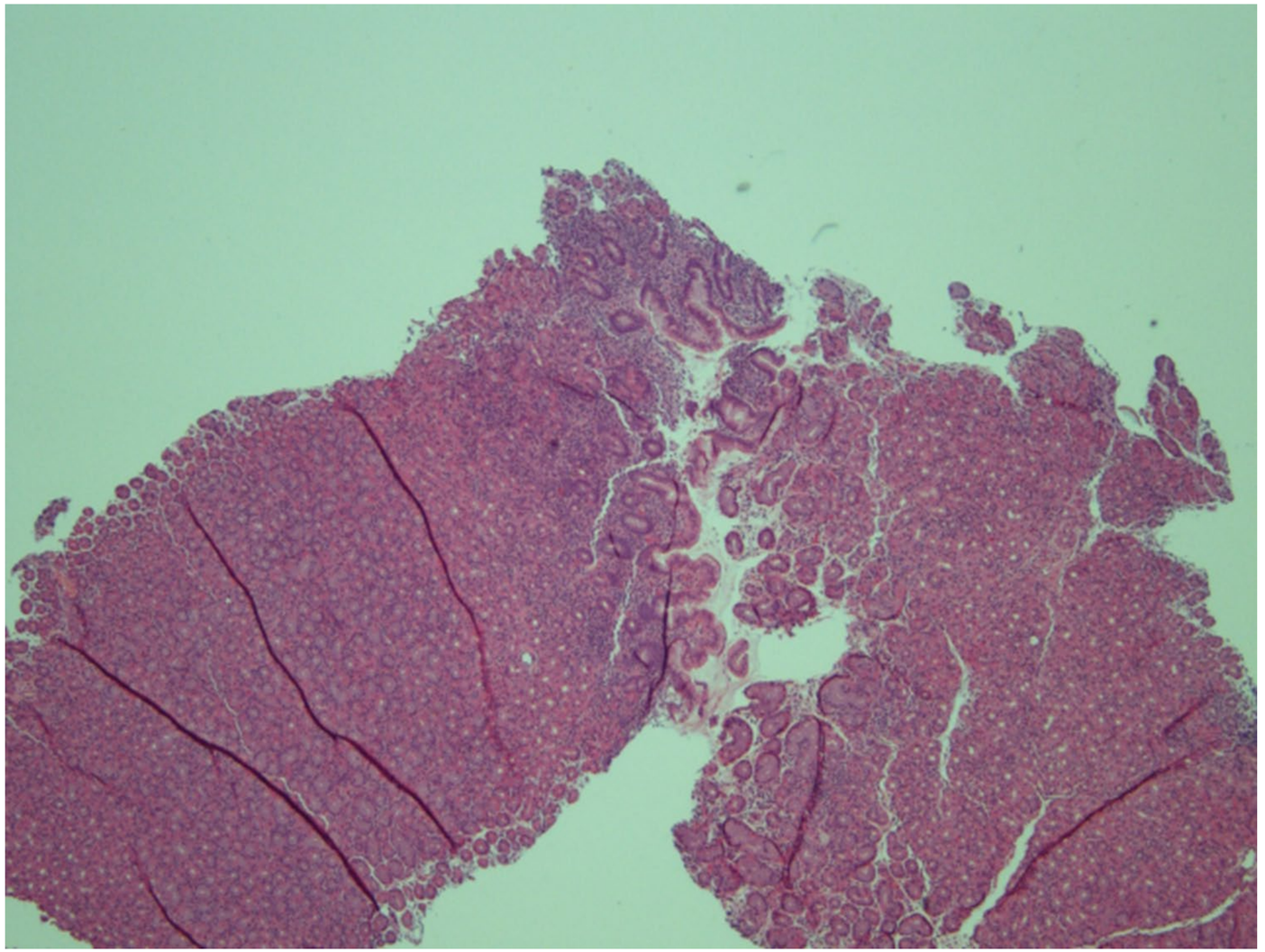
Stomach - Inflammation

This biopsy of the stomach contains the lining cells that produce hydrochloric acid



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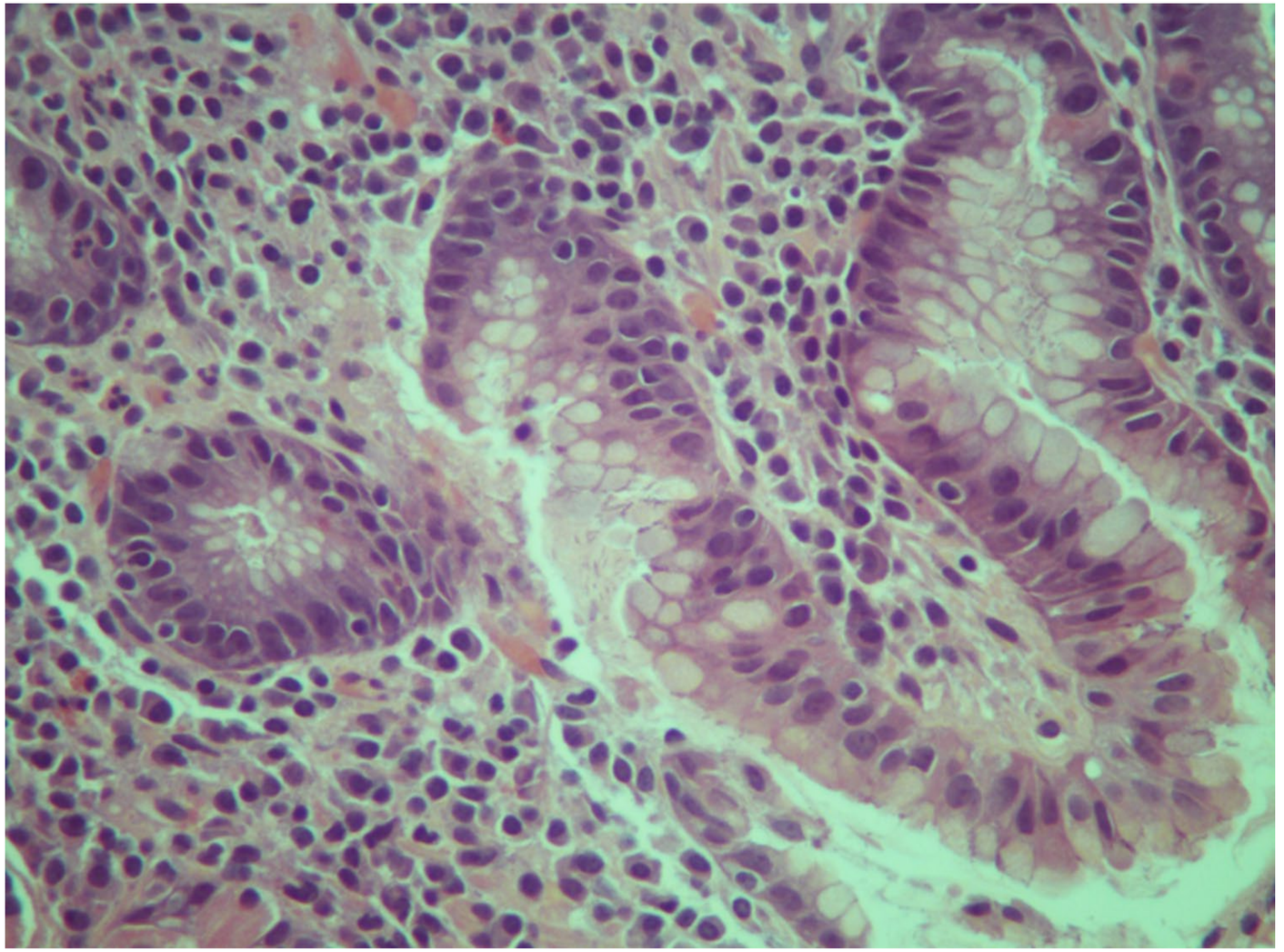
Stomach - Inflammation

Inflammation of the stomach is called gastritis and it is a common cause of abdominal pain



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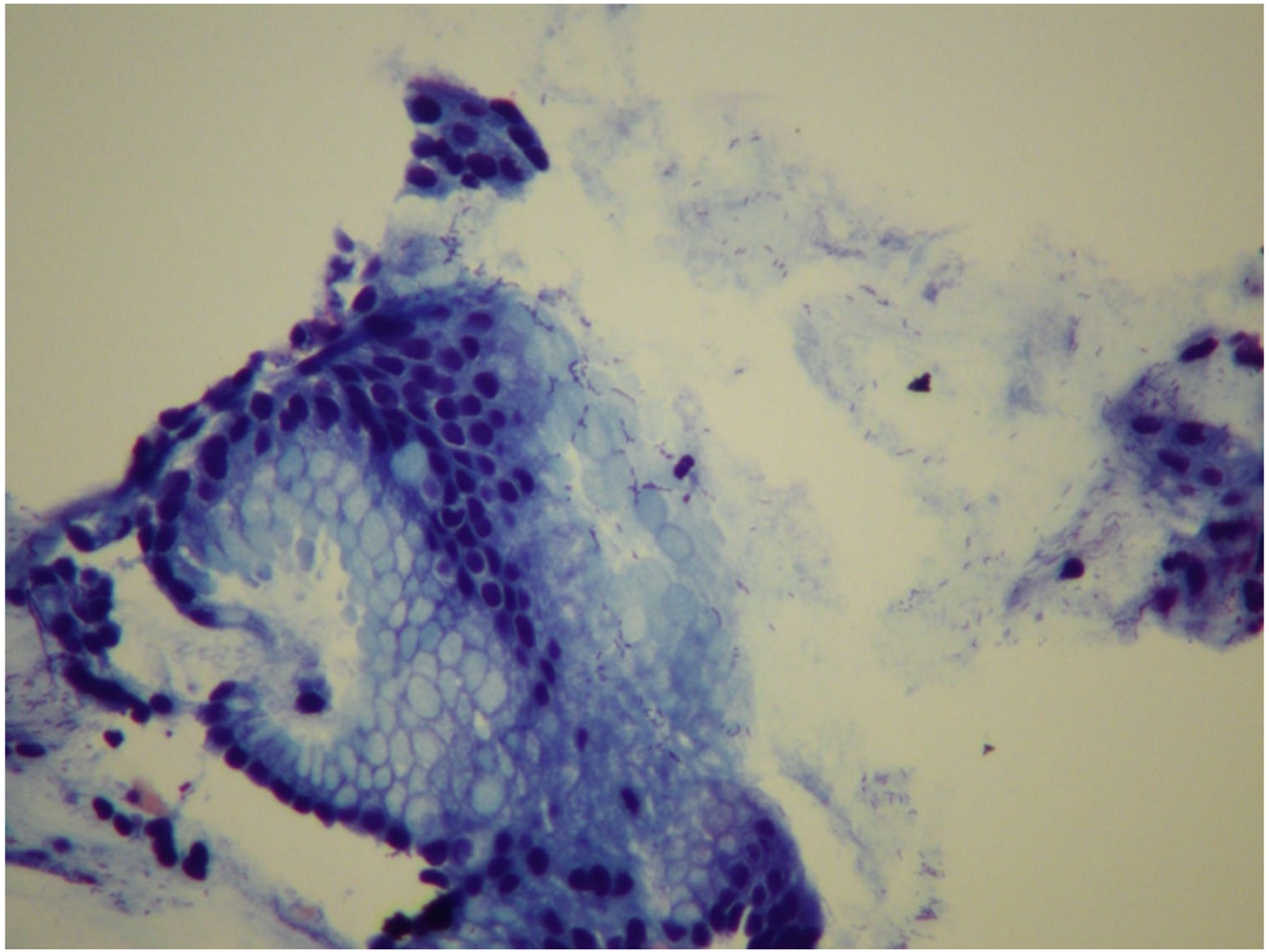
Stomach - Inflammation

Sometimes gastritis is due to an infection called H. pylori



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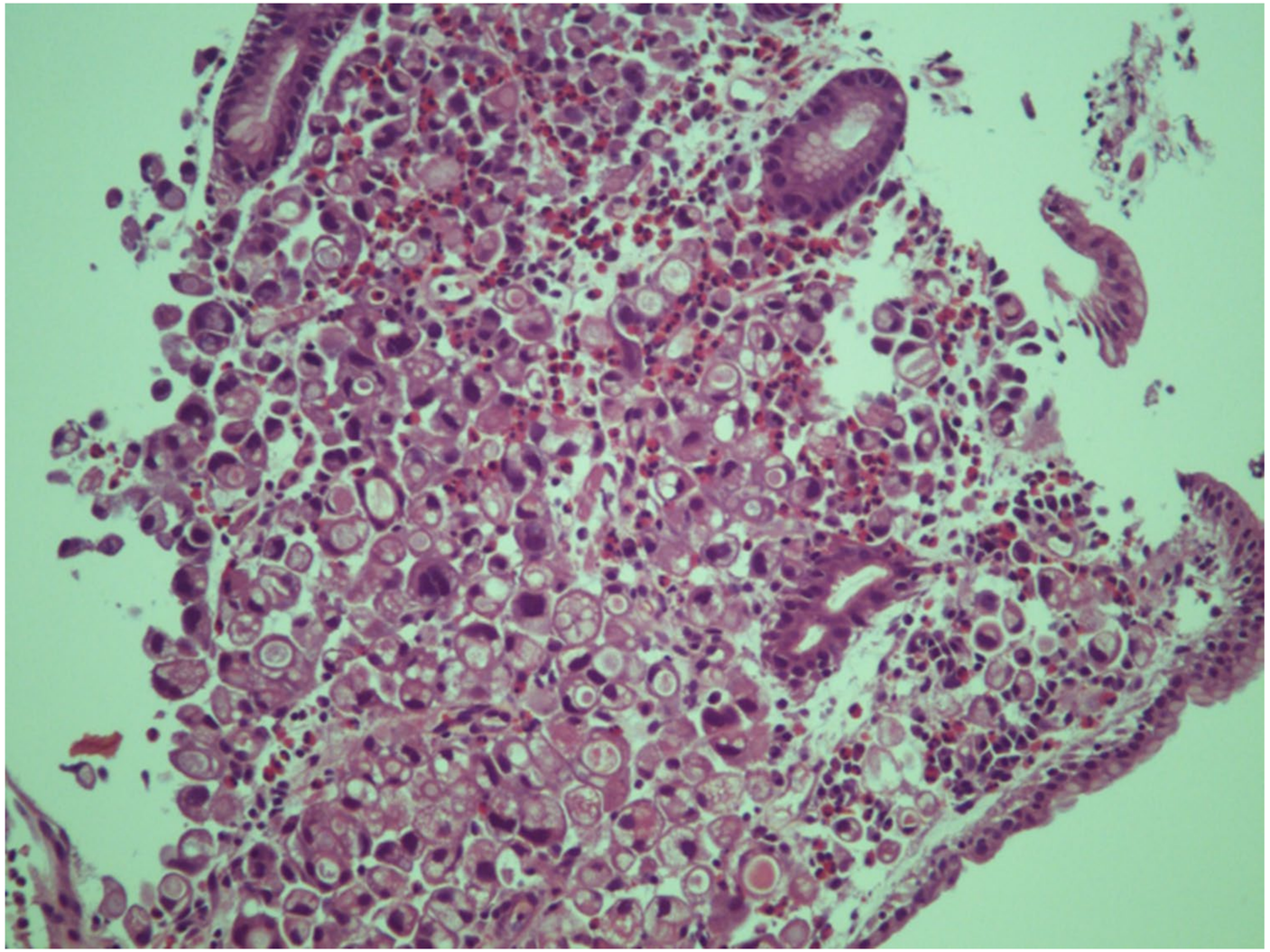
Stomach - Cancer

Chronic H. pylori infection increases the risk for stomach cancer



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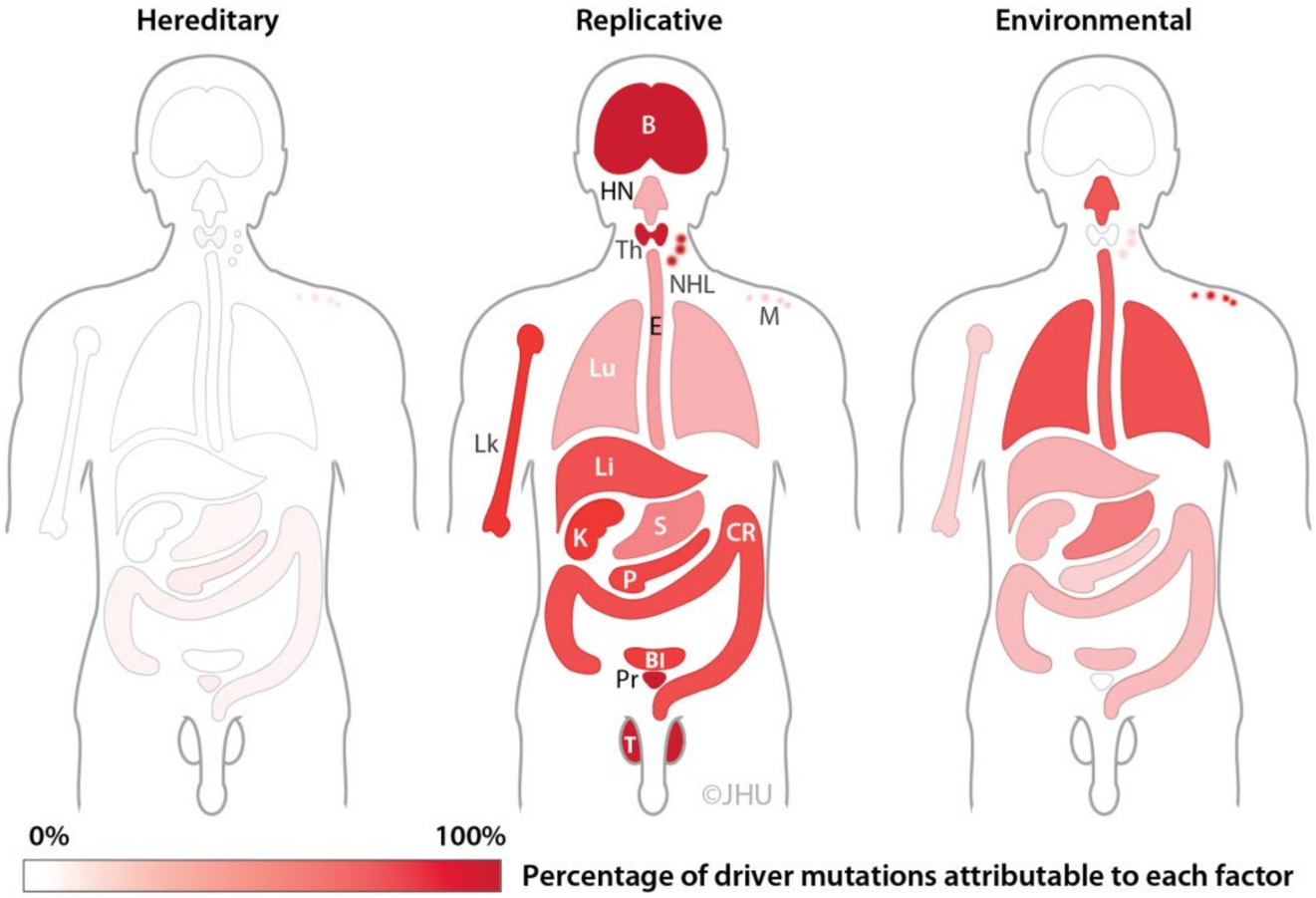
Cancer driver mutations in men



Science. 2017 March 24; 355(6331): 1330 –1334

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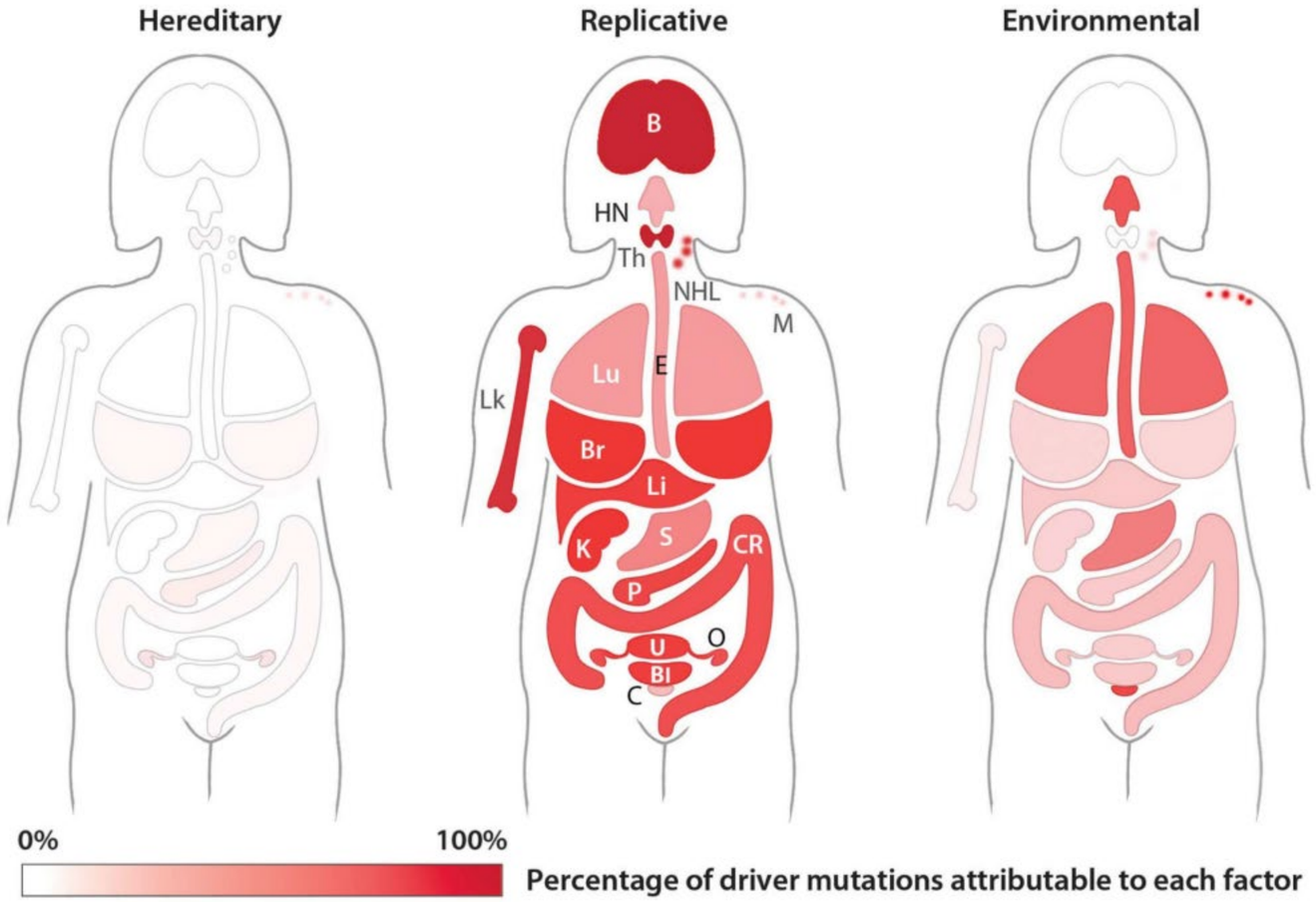
Cancer driver mutations in women



Science. 2017 March 24; 355(6331): 1330 –1334

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How to become a pathologist

Step 1: College Degree – 4 years

Step 2: Medical School Degree – 4 years

Step 3: Residency – 3 to 4 years

- Anatomic Pathology, Clinical Pathology, Combined Anatomic and Clinical Pathology

Step 4: Fellowship – 1 to 2 years

- Blood Banking/Transfusion Medicine, Chemical Pathology, Clinical Informatics, Cytopathology, Dermatopathology, Forensic pathology, Hematopathology, Medical Microbiology, Molecular Genetic Pathology, Neuropathology, Pediatric Pathology

Step 5: Medical licensure and board certification

- USMLE (pass 3 separate exams, first after second year of medical school, 2nd after third year of medical school, and last after first year of residency), American Board of Pathology Certification Exam

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