

Thyroid

SESSION OBJECTIVES:

Use these session objectives to test your knowledge of the important concepts presented in this chapter and as study topics to return to prior to your exams.

1. Describe histology of normal thyroid tissue
2. Recognize pathologic features of papillary thyroid cancer, follicular thyroid cancer, anaplastic thyroid cancer, and medullary thyroid cancer
3. Describe the pathologic features of Graves disease and lymphocytic thyroiditis

OPTIONAL PRE-CLASS MATERIALS FOR THIS SESSION:

- Skim the **section titles, bolded terms, and image captions** from Robbin's & Kumar 11th edition, [Chapter 18](#) to fill in any knowledge gaps you need.
- In class exercise: [PathPresenter](#)

OVERVIEW:

The thyroid gland is a butterfly-shaped organ located in the neck that plays a central role in metabolism, growth, and development through the production of thyroid hormones. This chapter reviews normal thyroid histology and common pathological conditions affecting the thyroid gland, including both benign and malignant neoplasms.

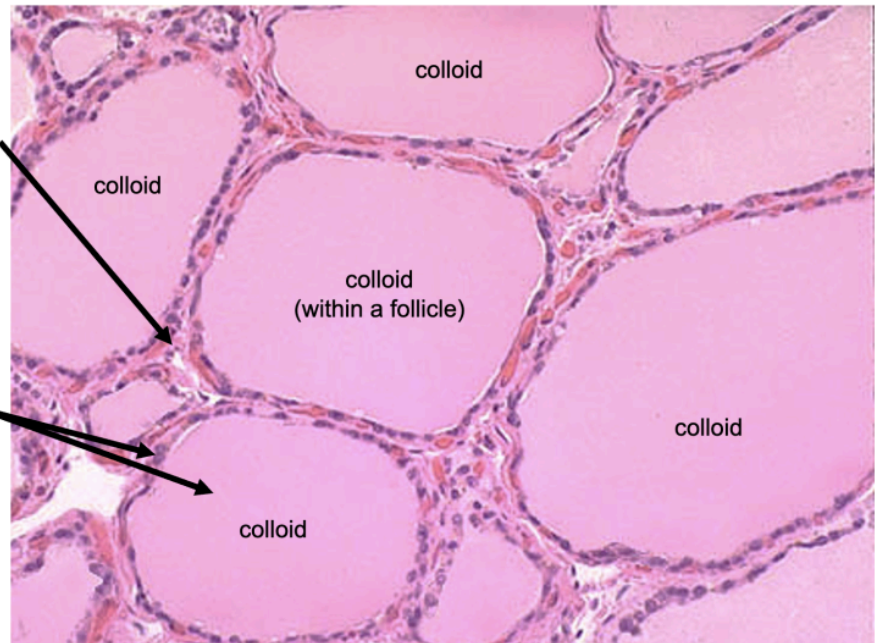
NORMAL HISTOLOGY OF THE THYROID:

The thyroid gland is made up of numerous spherical structures called **follicles**. Each follicle is lined with **follicular cells** that secrete **thyroglobulin**, the precursor to thyroid hormones. The follicular cells surround a central cavity filled with **colloid**, a substance containing stored thyroid hormones. (*NOTE: Thyroid hormone synthesis is beyond the scope of this histopathology text; please refer to the thyroid endocrinology lecture for detailed information*).

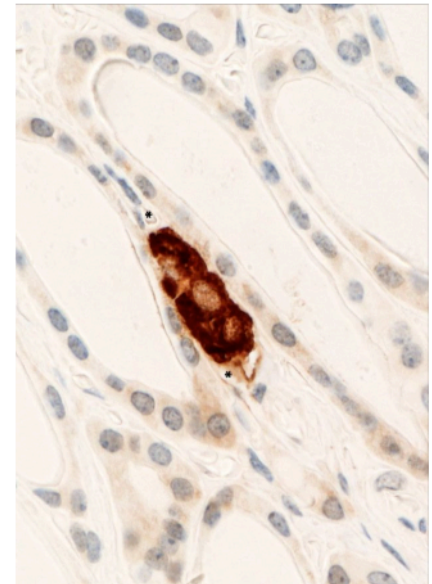
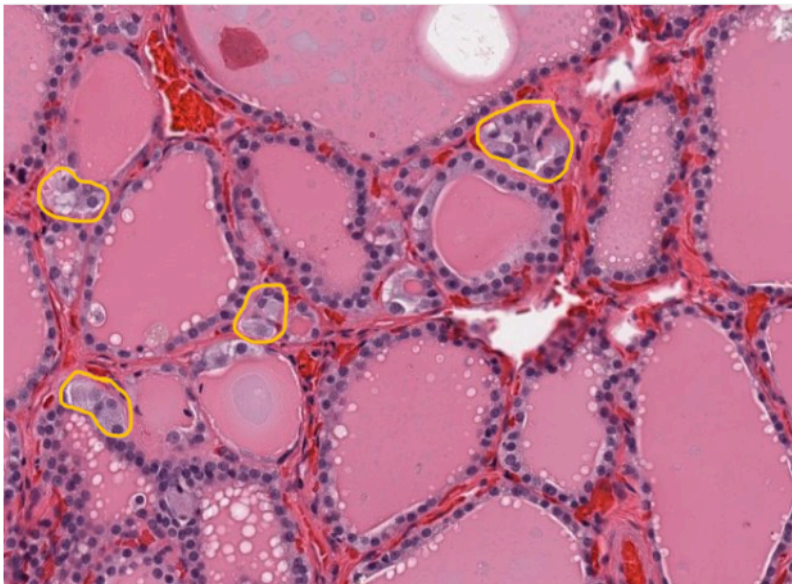
- **Follicular Cells:** Cuboidal cells that become flattened when the gland is inactive and more columnar when the gland is active in hormone production.
- **Colloid:** The storage form of thyroid hormones within the follicles.
- **Parafollicular Cells (C cells):** Found between the follicles, these cells produce **calcitonin**, a hormone involved in calcium homeostasis.

Notice the prominent vasculature, characteristic of endocrine organs

Thyroid hormones are made in the follicular cells and stored in the colloid, until released as T3 and T4.



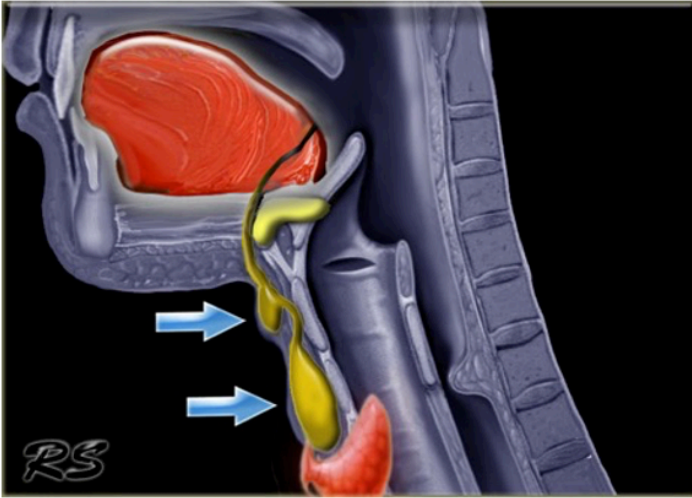
Parafollicular cells (aka "C cells") make calcitonin



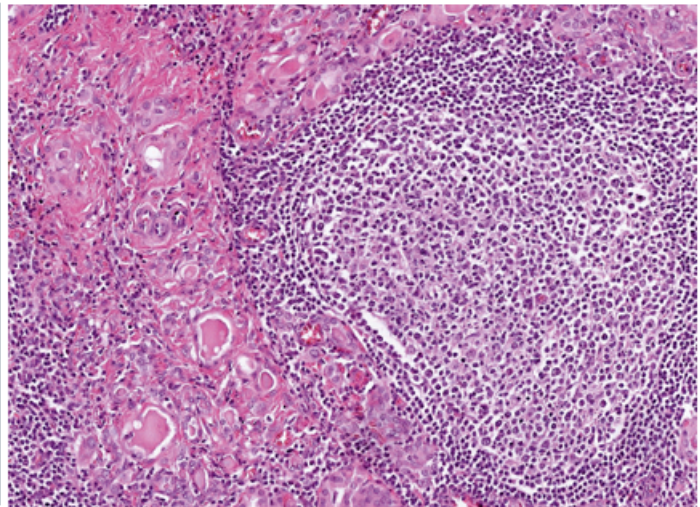
Brown staining= calcitonin antibody

NON-NEOPLASTIC THYROID PATHOLOGY:

- **Thyroglossal Duct Cyst:** A congenital anomaly resulting from the persistence of the thyroglossal duct, a structure involved in the development of the thyroid gland. It often presents as a midline neck mass and can become infected or require surgical removal.

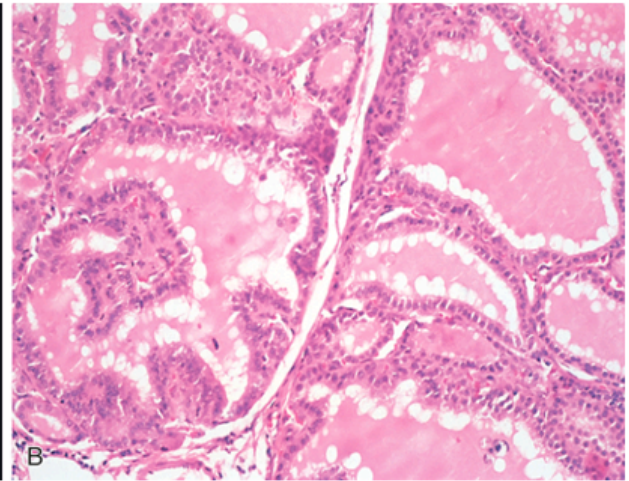
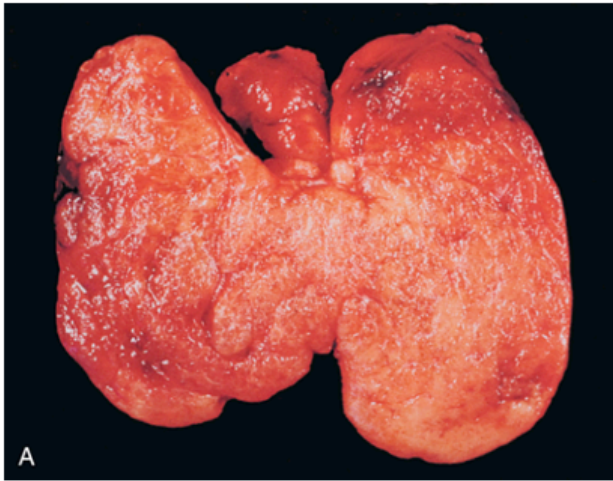


- **Hashimoto's Thyroiditis:** An autoimmune disorder where the body's immune system attacks the thyroid gland. Patients typically develop **hypothyroidism** due to the destruction of thyroid tissue. Histologically, the thyroid is infiltrated with lymphocytes and plasma cells, with the formation of **germinal centers** and **Hürthle cell** changes in the thyroid epithelium.



Robbins (11th ed): 18-5

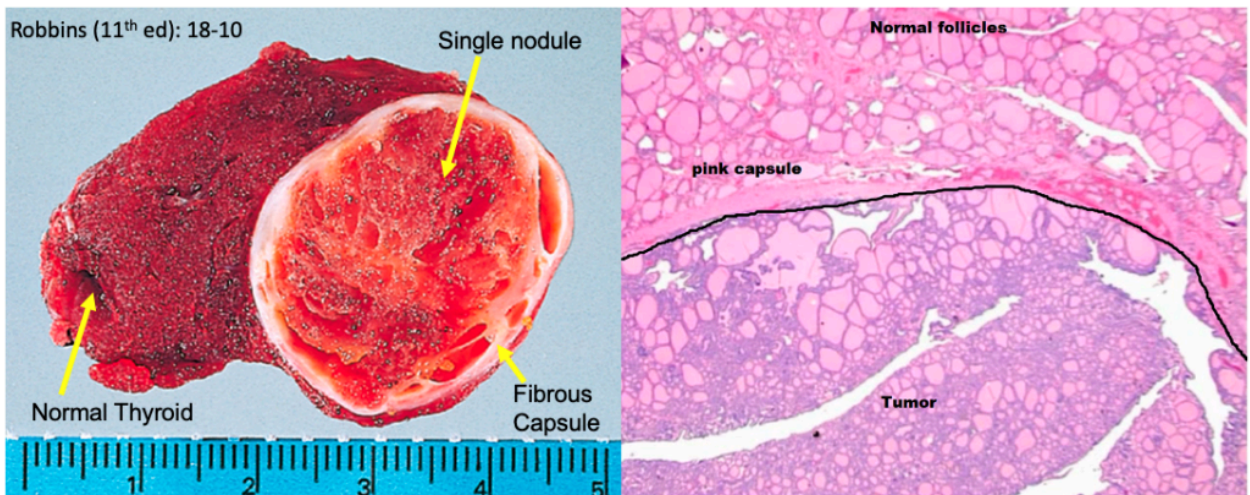
- **Graves' Disease:** An autoimmune disorder characterized by **hyperthyroidism** due to antibodies stimulating the **TSH receptor** on follicular cells, leading to overproduction of thyroid hormones. Histologically, the thyroid gland is enlarged, with hyperplasia of the follicular cells and **scalloped colloid** due to increased hormone release.



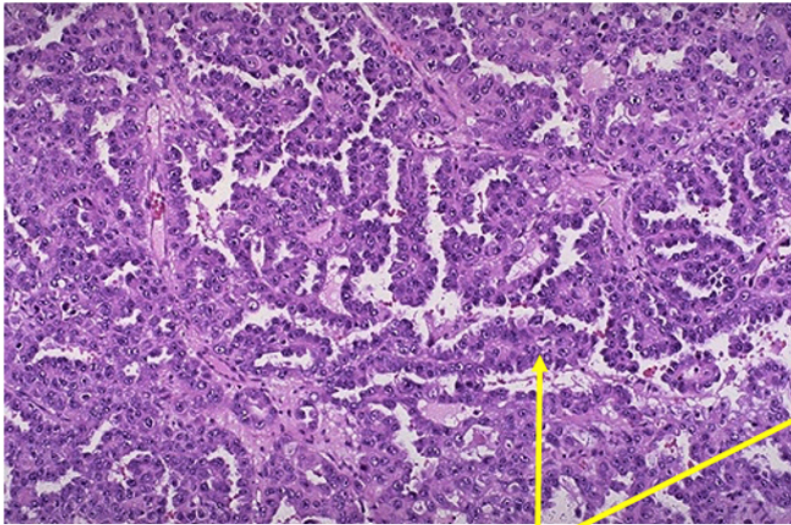
Robbins (11th ed): 18-7

NEOPLASTIC PATHOLOGY OF THE THYROID:

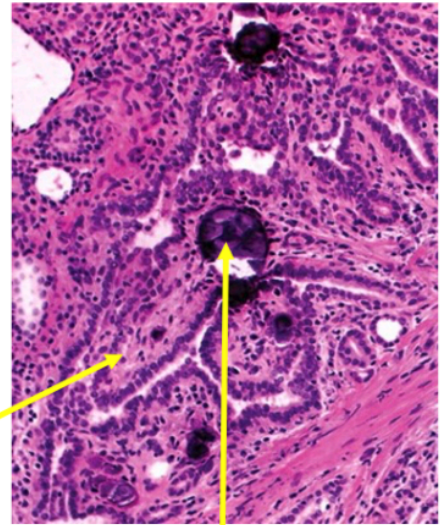
- **Follicular Adenoma:** A benign tumor of the thyroid that presents as a single “cold” nodule on a radioactive iodine scan. The lesion is encapsulated, with no invasion into surrounding tissue. Histologically, the tumor resembles normal thyroid tissue but is confined within a fibrous capsule.



- **Papillary Thyroid Carcinoma:** The most common type of thyroid cancer, often associated with exposure to ionizing radiation. It tends to spread via the lymphatics, and histologically shows characteristic **Orphan Annie eye nuclei** and **psammoma bodies**. It has an excellent prognosis.

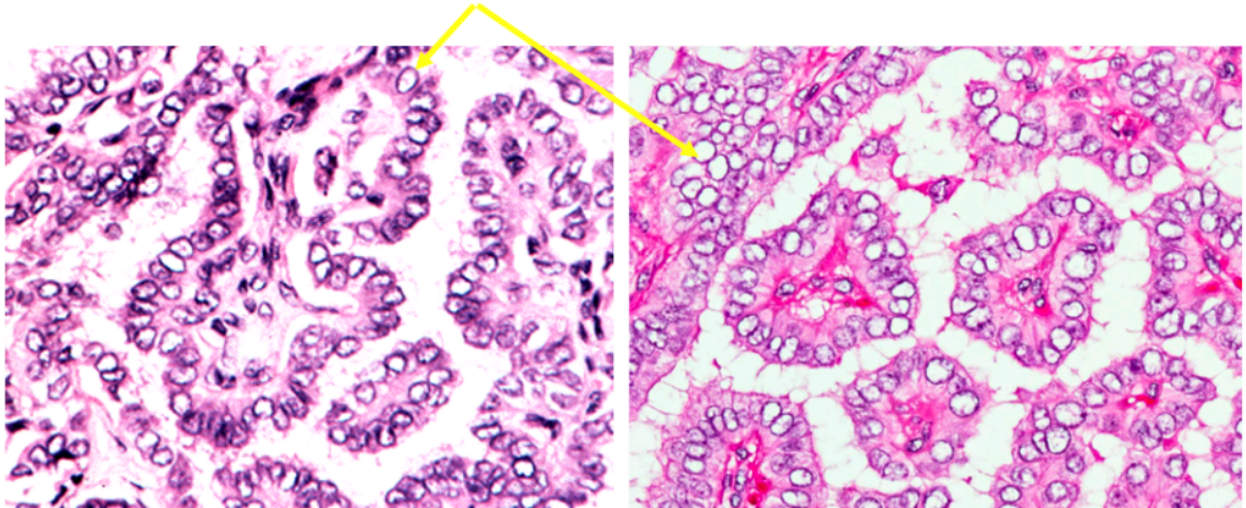


The fronds of tissue have thin fibrovascular cores.

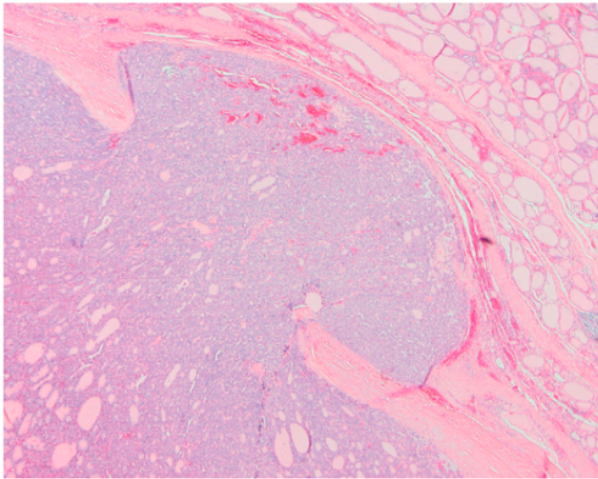


Psammoma bodies (calcium deposits)

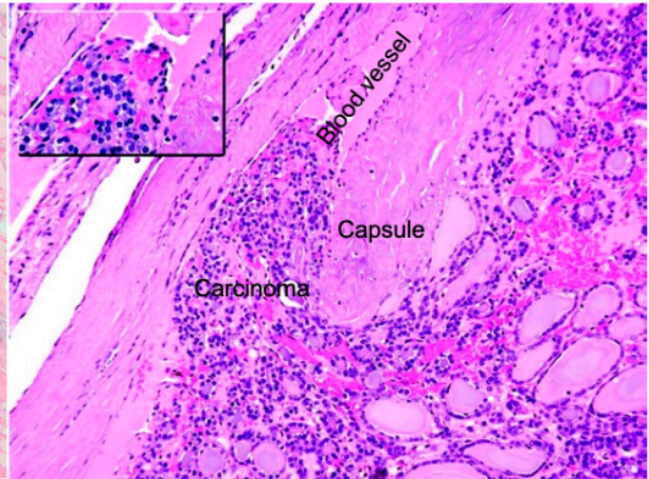
Orphan Annie Eye Nuclei



- **Follicular Thyroid Carcinoma:** This cancer often resembles a follicular adenoma but invades the capsule and blood vessels. It tends to spread hematogenously rather than through the lymphatics, which distinguishes it from papillary carcinoma.

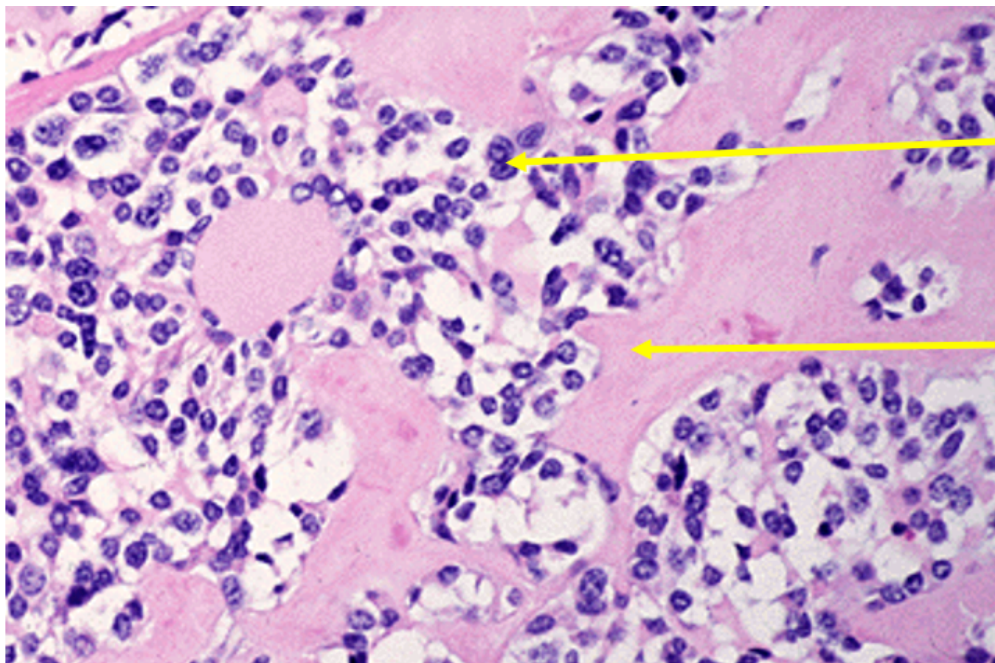


Robbins (11th ed): 18-14



Invading capsule and invading into blood vessel

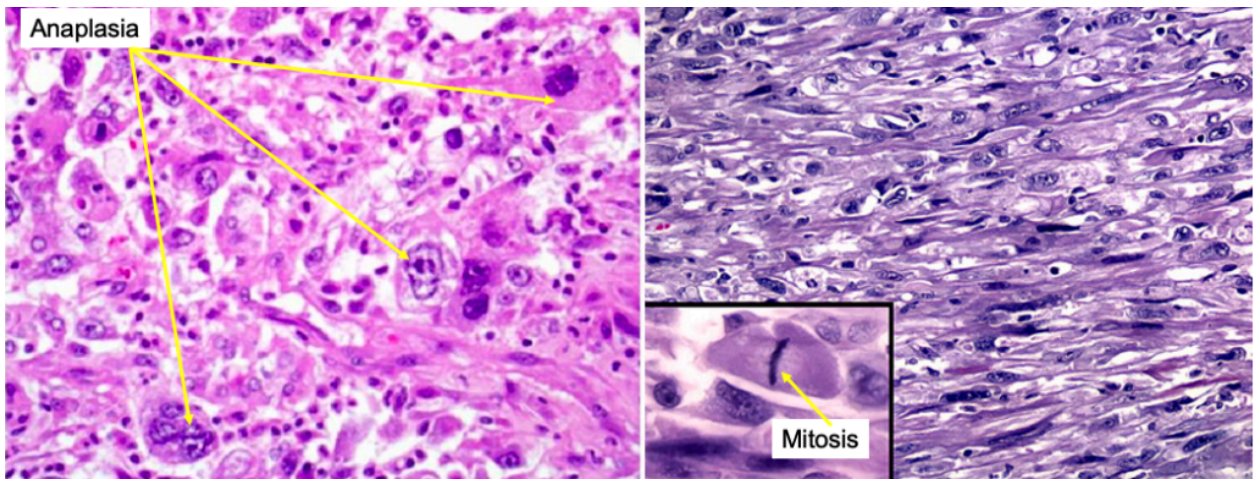
- **Medullary Thyroid Carcinoma:** A malignancy of the **C cells** that secrete calcitonin. Medullary carcinoma may be sporadic or associated with **Multiple Endocrine Neoplasia (MEN) syndromes**, particularly **MEN 2A and 2B**. Histologically, these tumors are often associated with **amyloid deposits** derived from misfolded calcitonin.



Malignant C (parafollicular) cells

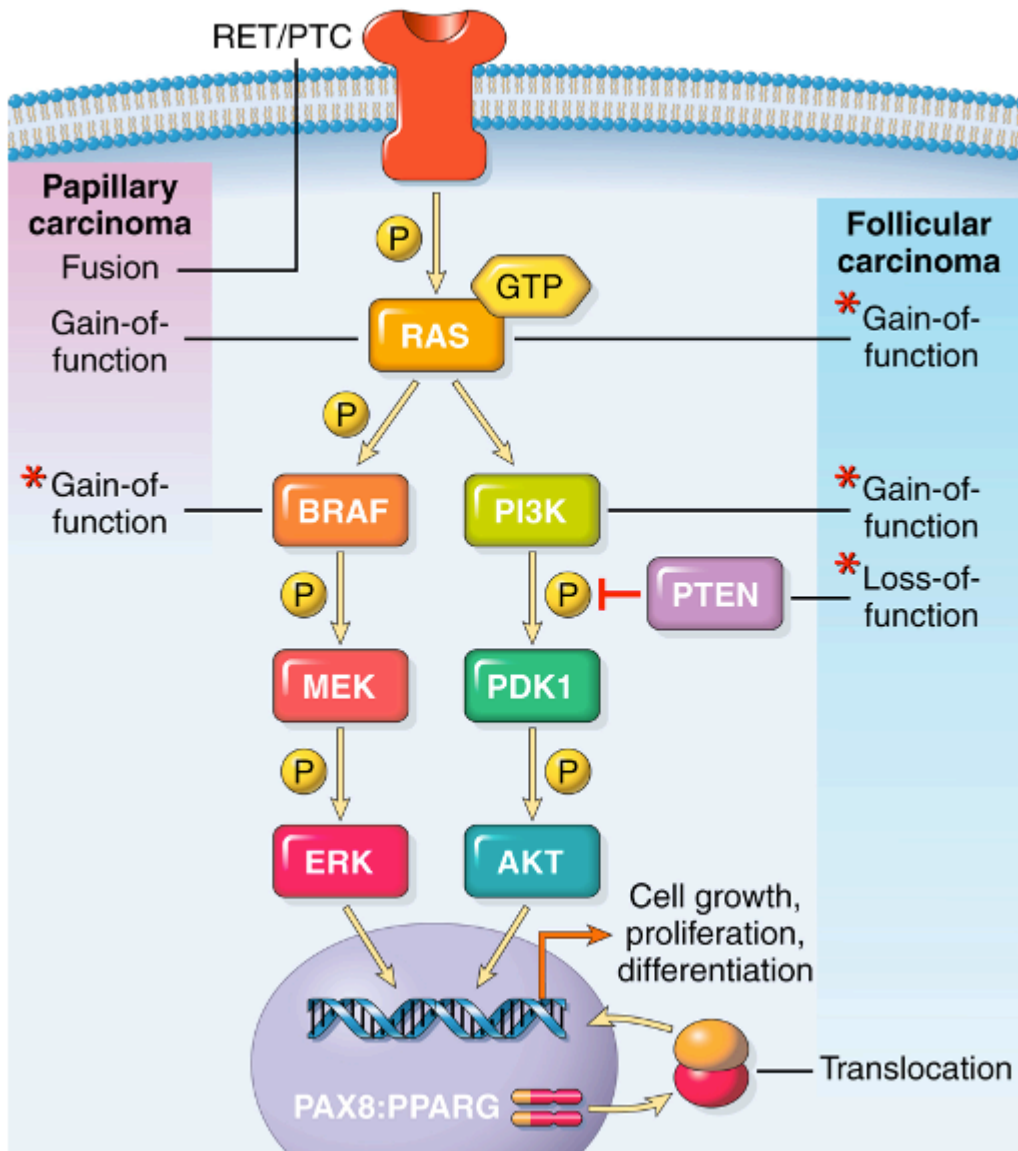
Amyloid (misfolded calcitonin)

- **Anaplastic Thyroid Carcinoma:** One of the most aggressive cancers, often seen in elderly patients. Histologically, these tumors are undifferentiated and exhibit marked anaplasia with numerous mitoses. Patients often present with rapidly enlarging neck masses and die within months.



Mutations in Thyroid Cancer:

Thyroid cancer is often driven by specific genetic mutations. In **papillary thyroid carcinoma (PTC)**, the most common mutation is **BRAF V600E**, which leads to uncontrolled cell growth and is associated with more aggressive tumors. **RET::PTC rearrangements** and **RAS mutations** are also common in PTC. In **follicular thyroid carcinoma (FTC)**, **RAS mutations** and **PAX8::PPAR γ rearrangements** are the most frequently seen mutations. In **medullary thyroid carcinoma (MTC)**, **RET mutations** are key, particularly in familial cases like **Multiple Endocrine Neoplasia (MEN)** syndromes.



Robbins (11th ed): 18-11

This Chapter's PDF

LINK

- Note: The interactive features of this chapter are not reproducible in this PDF format.