

Endocrine system-II. THYROID NEOPLASMS

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THYROID NEOPLASMS

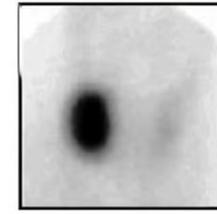
- Thyroid tumors range from circumscribed, benign adenomas to highly aggressive, anaplastic carcinomas.
- Fortunately, the overwhelming majority of solitary nodules of the thyroid prove to be either :
 - ✓ benign adenomas.
 - ✓ localized, non-neoplastic conditions , e.g:
 - ❖ dominant nodule in multinodular goiter.
 - ❖ simple cysts.
 - ❖ foci of thyroiditis.

Benign vs malignant

- **Thyroid nodule most likely to be malignant if:**
 - ✓ Nodules in younger patients .
 - ✓ Nodules in males .
 - ✓ Nodules that doesn't take up radioactive iodine in imaging studies (cold nodules).



Cold



Hot

Neoplastic thyroid lesions

- **Benign:**

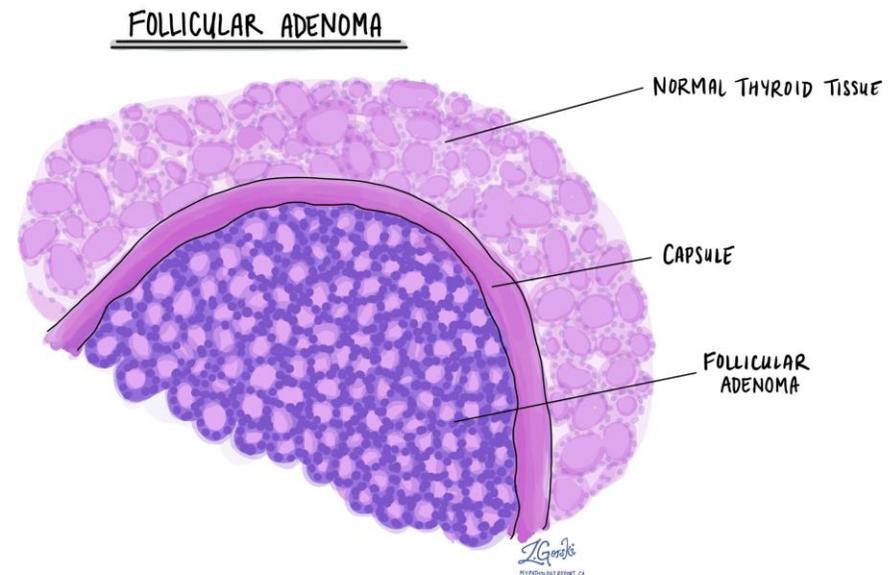
- follicular adenoma .

- **Malignant:**

- Papillary carcinoma (accounting for more than 85% of cases)
- Follicular carcinoma (5% to 15% of cases)
- Anaplastic (undifferentiated) carcinoma (<5% of cases)
- Medullary carcinoma (5% of cases)

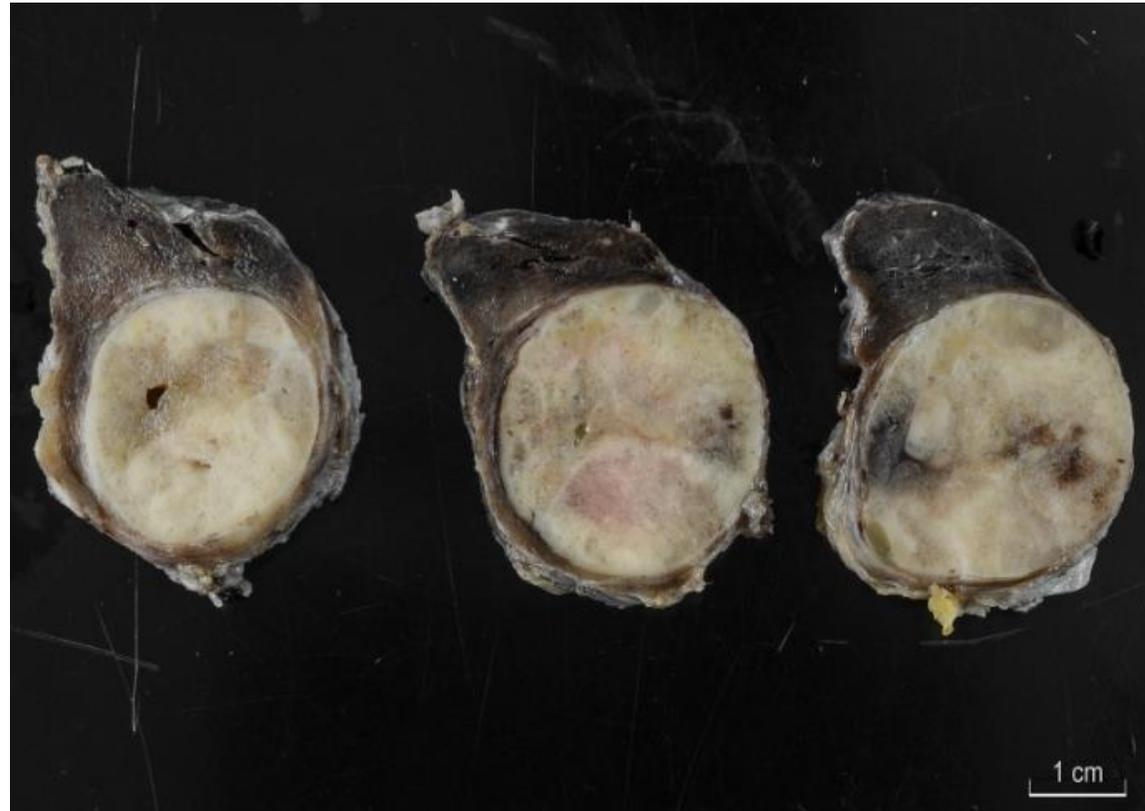
Follicular adenoma

- Adenomas of the thyroid are benign neoplasms derived from follicular epithelium.
- Follicular adenomas usually are solitary, DDX??
- the vast majority of adenomas are nonfunctional, a small proportion produce thyroid hormones (toxic adenomas), causing clinically apparent thyrotoxicosis.



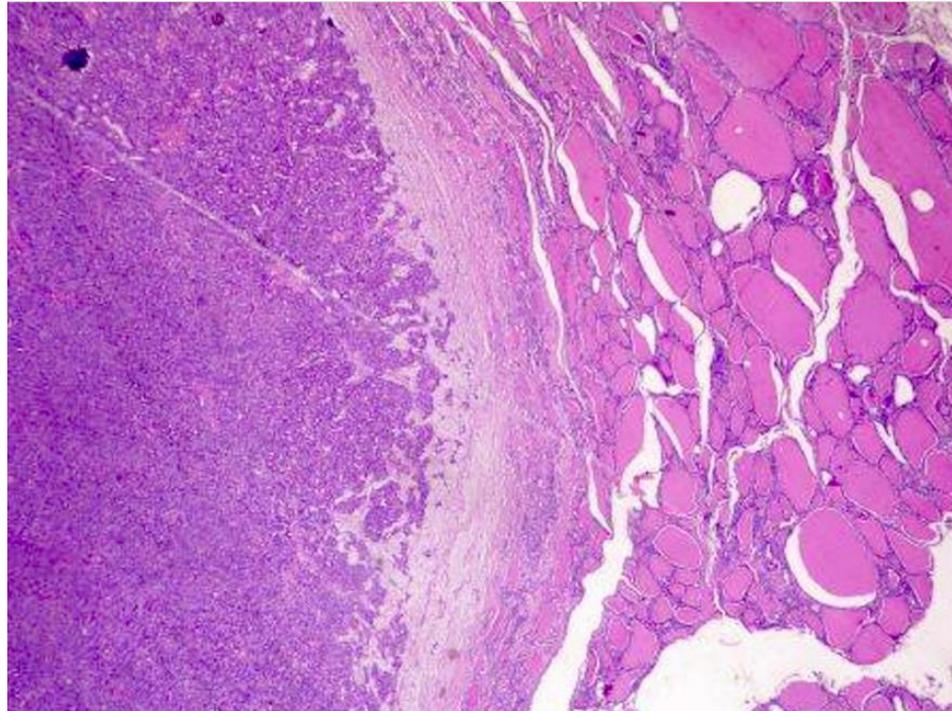
Morphology

- Solitary, encapsulated, variable size (1 - 10 cm).



Histology

- **Closely packed follicles.**
- **Completely enveloped by thin fibrous capsule**
- **surrounding thyroid tissue shows signs of compression.**



Treatment

- Lobectomy (not enucleation).
- Carry an excellent prognosis
 - do not recur or metastasize.

Thyroid carcinoma

- 1% of all cancer in U.S., 0.2% of all cancer deaths.
- Increasing incidence due to new diagnostic practices which detect smaller tumors.
- 20 year survival is 90%, because most are indolent papillary carcinomas
- A female predominance has been noted among patients who develop thyroid carcinoma in the early and middle adult years (Often estrogen receptor positive).

1. Papillary Carcinoma.

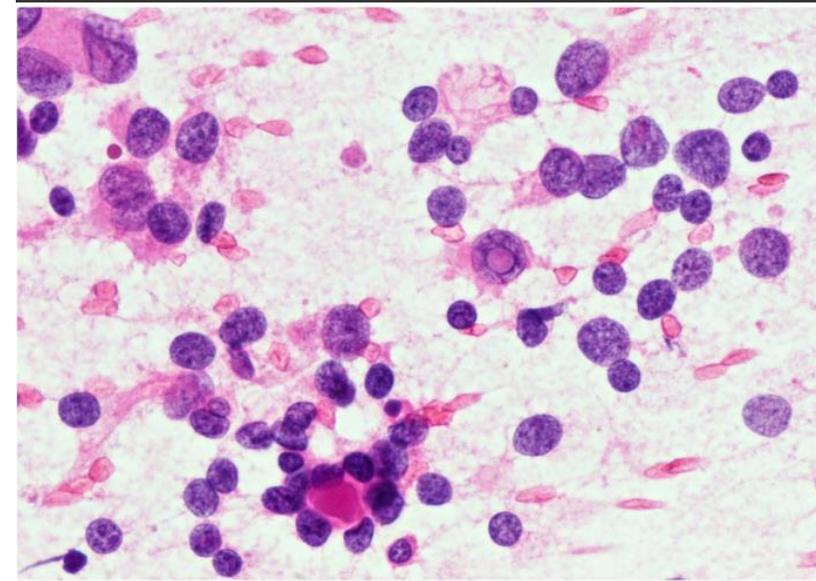
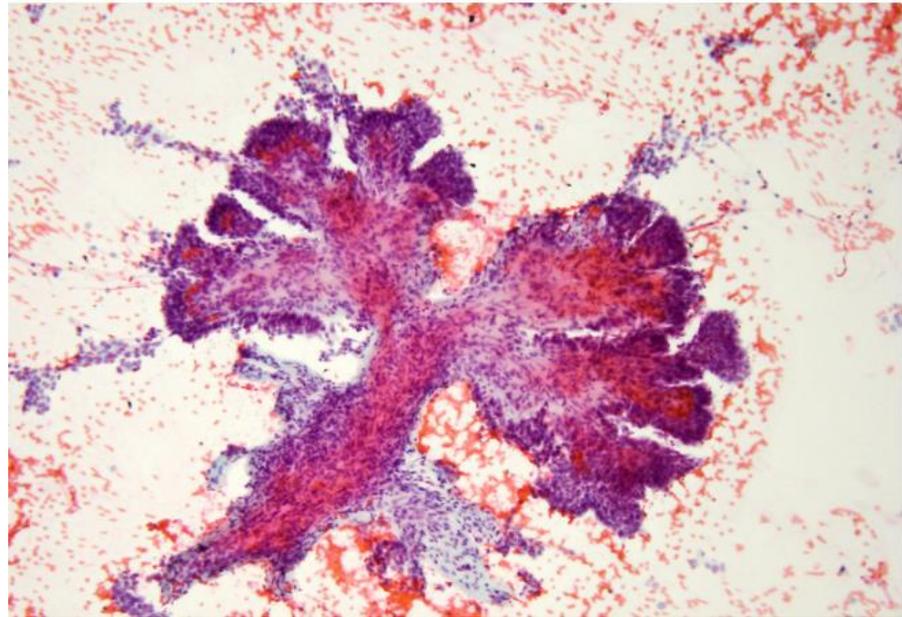
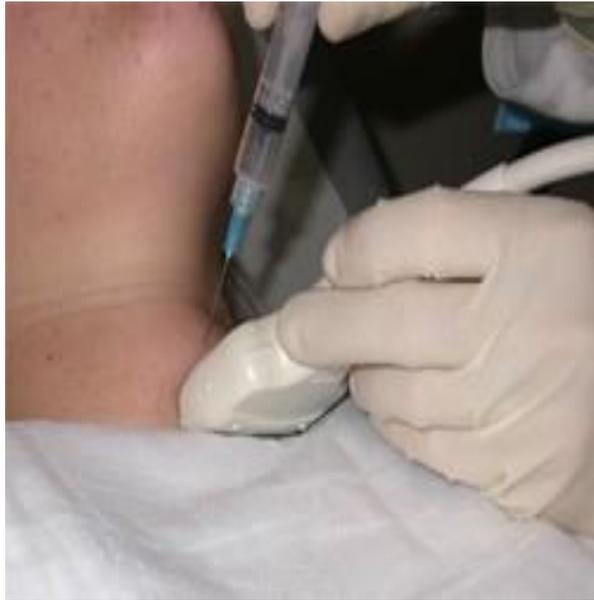
- The most common types of thyroid carcinoma.
- Female predominance; F:M ratio = ~3:1
- Median age of diagnosis in 50s
- Ionizing radiation is the best established risk factor.
- Mainly 2 genes are involved:
 1. BRAF amplification.
 2. RET gene rearrangement .

Clinical features.

- Presented as Painless palpable thyroid mass.
- The diagnosis is first rendered on ultrasound guided pre-operative fine needle aspiration cytology
- Surgical pathology report of a resected specimen provides further information about the subtyping (i.e., variant) and microstaging
- Commonly treated with surgical resection.

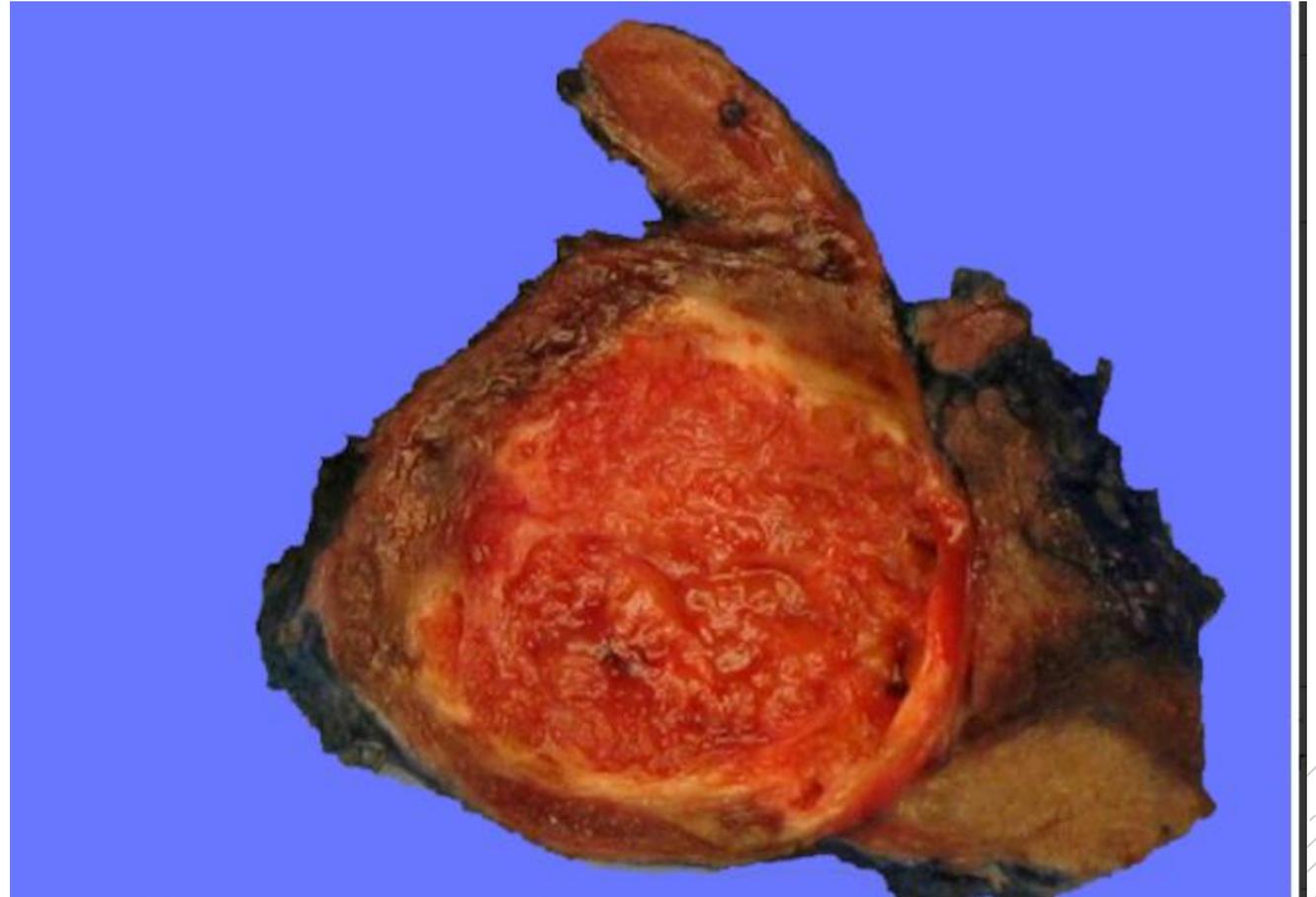


ultrasound guided pre-operative fine needle aspiration
cytology.



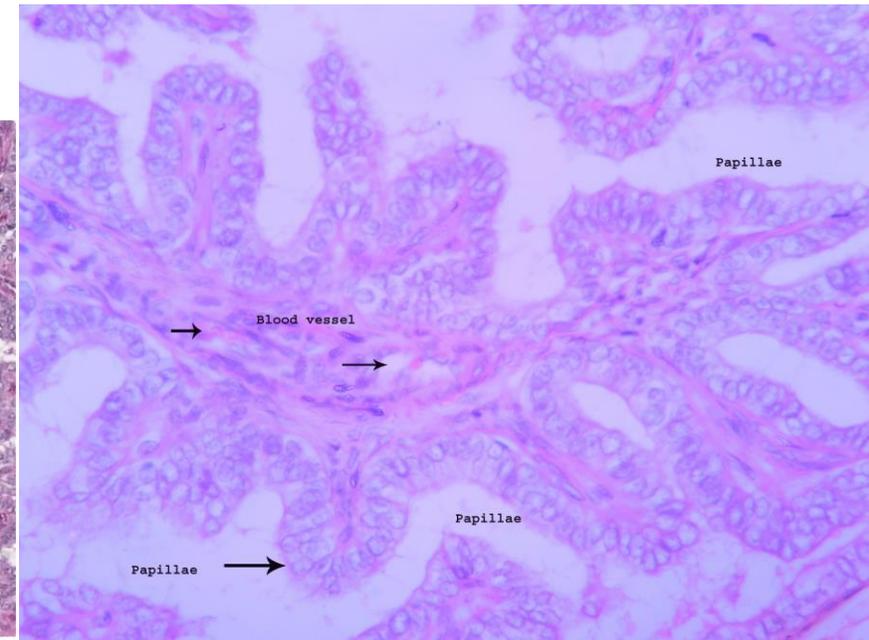
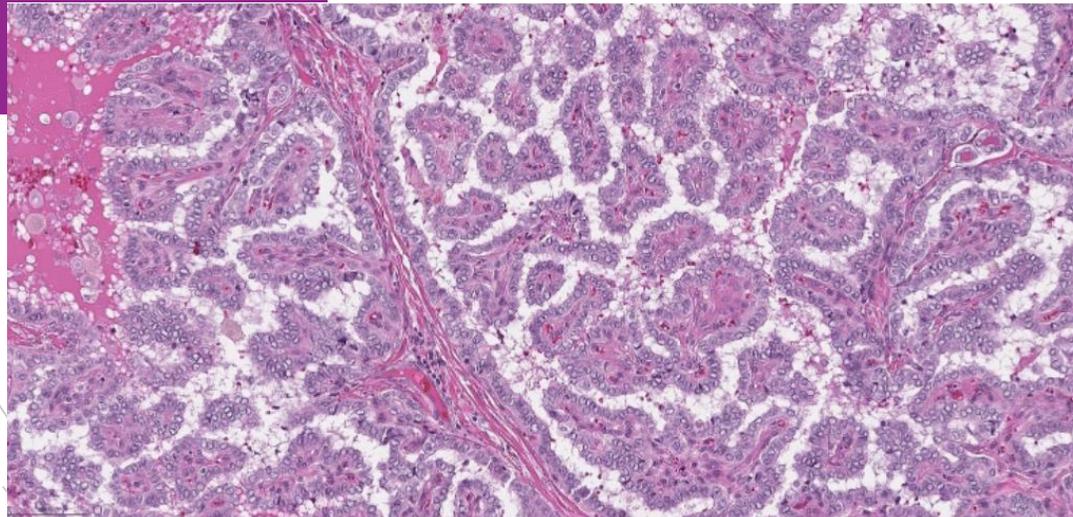
Morphology

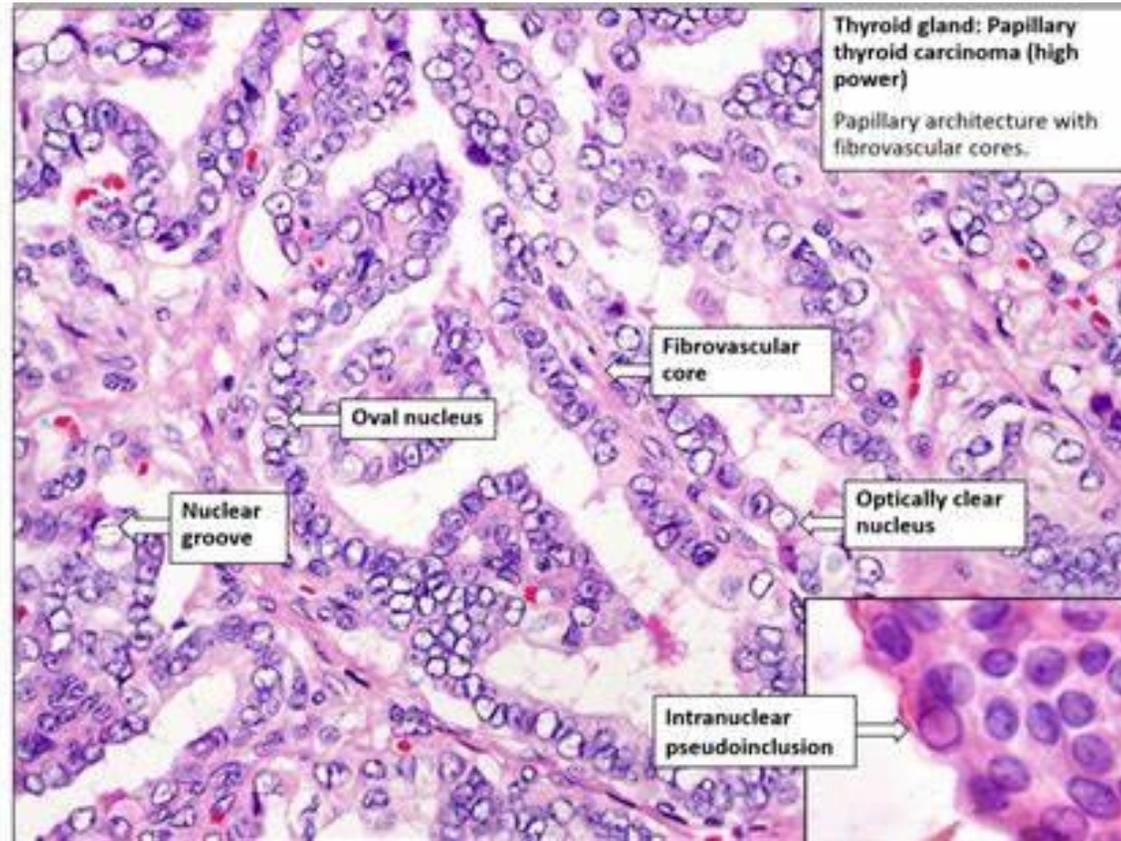
- Solid or cystic mass with papillary projections



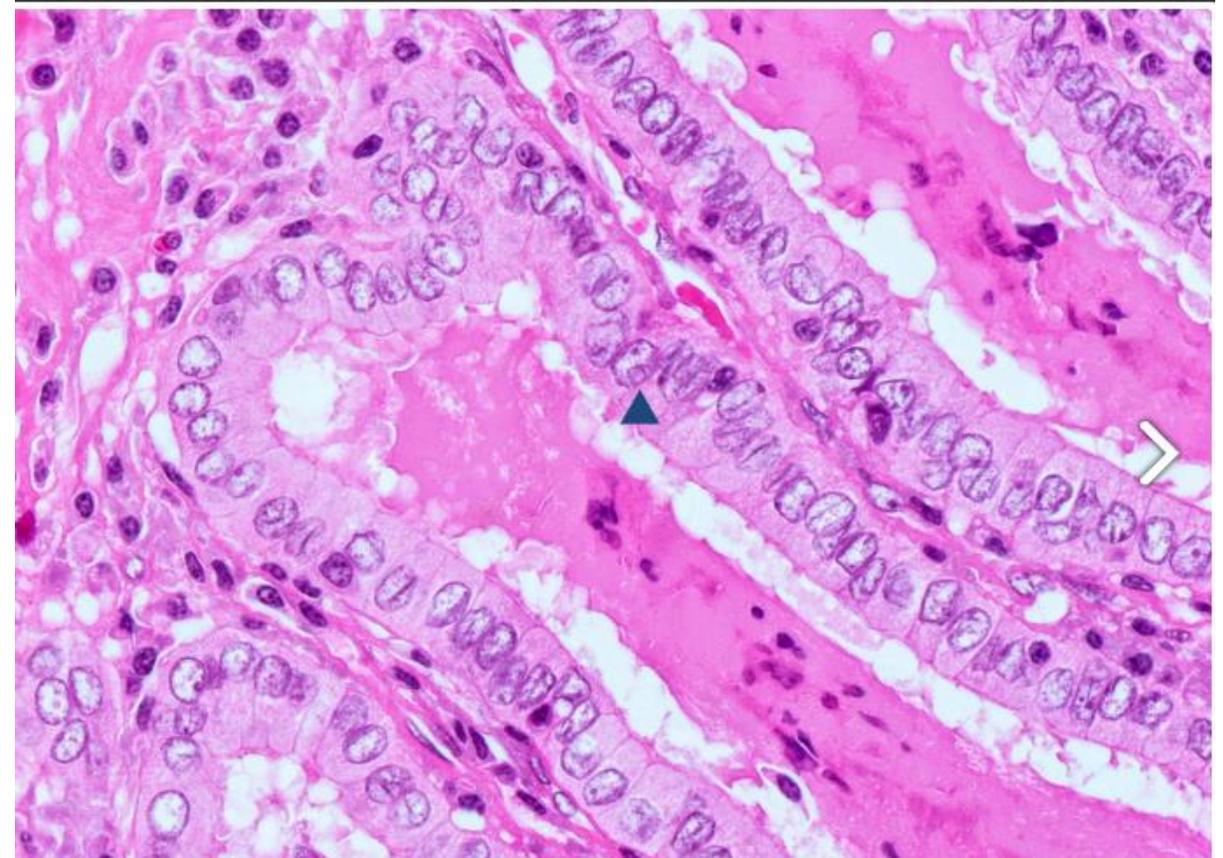
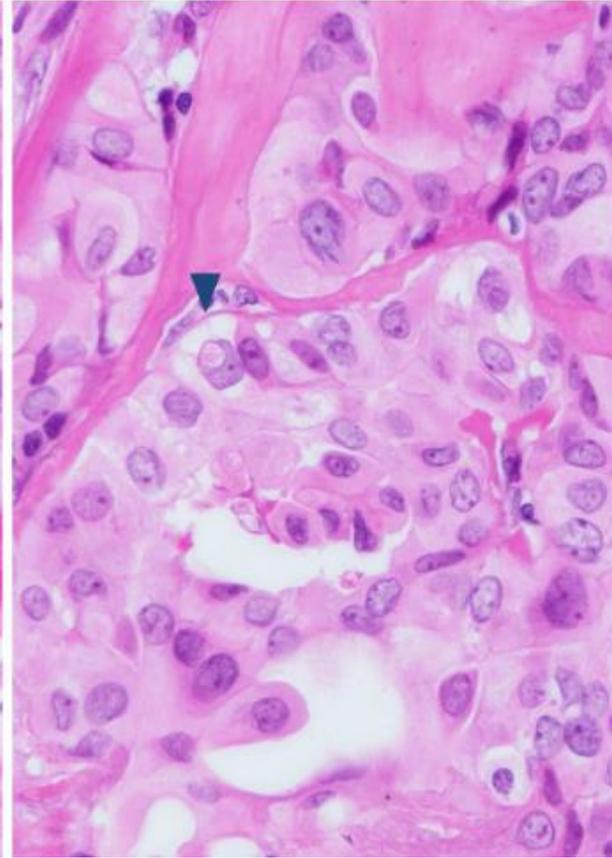
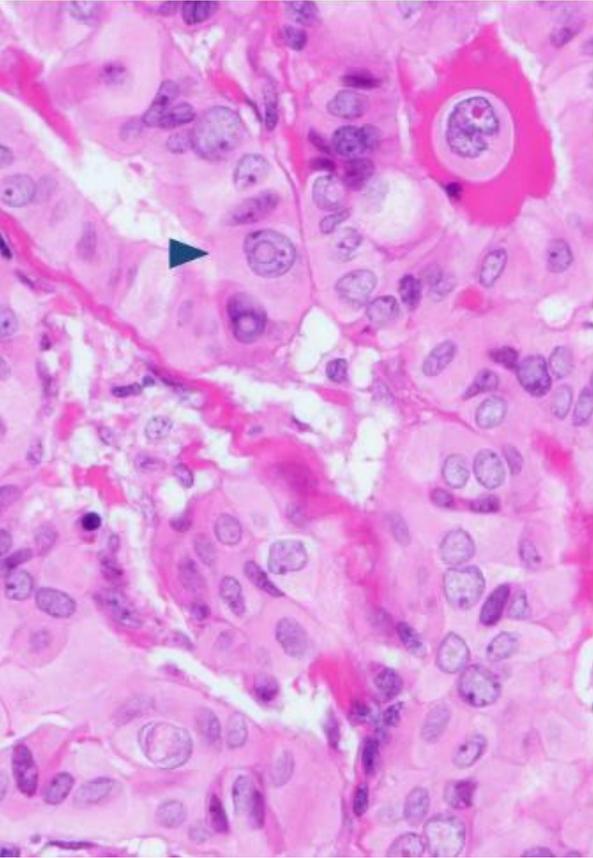
- Defined by two cardinal features:
 - ✓ true papillae with a fibrovascular core.
 - ✓ nuclear features of papillary carcinoma.

Histology.





- irregular nuclear contour.
- nuclear groove.
- nuclear pseudoinclusion



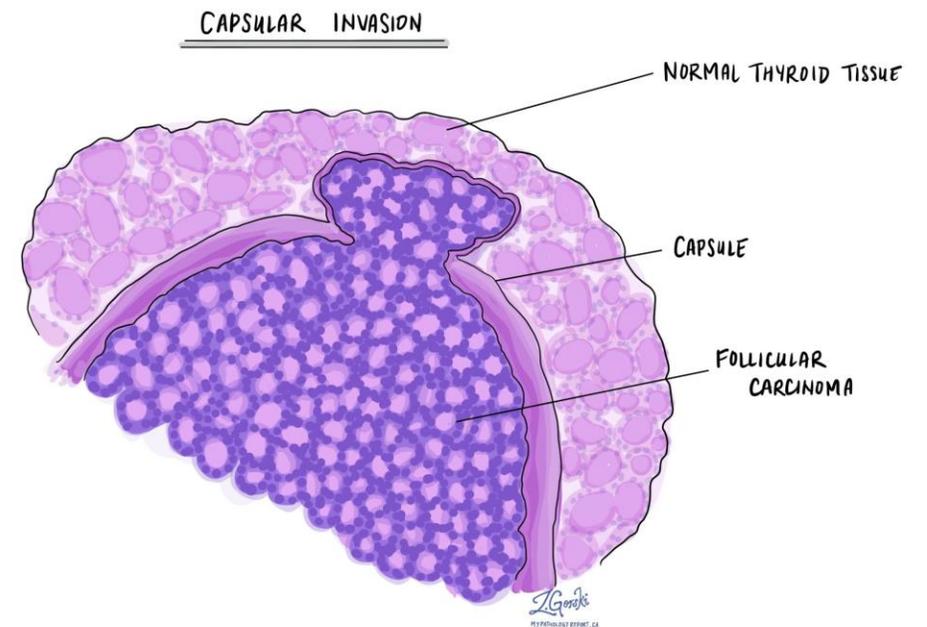
Papillary thyroid carcinoma nuclei:

2. Follicular Carcinoma.

- Thyroid carcinoma with follicular differentiation but no papillary nuclear feature.
- Follicular lesion with capsular or vascular invasion but without papillary nuclear features.
- More common in women and in areas with dietary iodine deficiency .
- The peak incidence between the ages of 40 and 60 years.
- **GENETIC FACTORS:**
 - ✓ Gain-of-function point mutations of RAS and PIK3CA.
 - ✓ Loss-of-function mutations of PTEN.

Two types

- 1. Minimally invasive follicular carcinoma
 - With capsular invasion .
 - With vascular invasion
- 2. Widely invasive.



Clinical features

- Usually "cold" on radionuclide scan
- Does not metastasize through lymphatics but does spread to lungs, liver, bone, brain via blood vessels
- Less than 5% with ipsilateral lymphadenopathy.
- **Treatment:**
 - ✓ thyroidectomy and radioactive iodine
 - ✓ No nodal dissection is needed

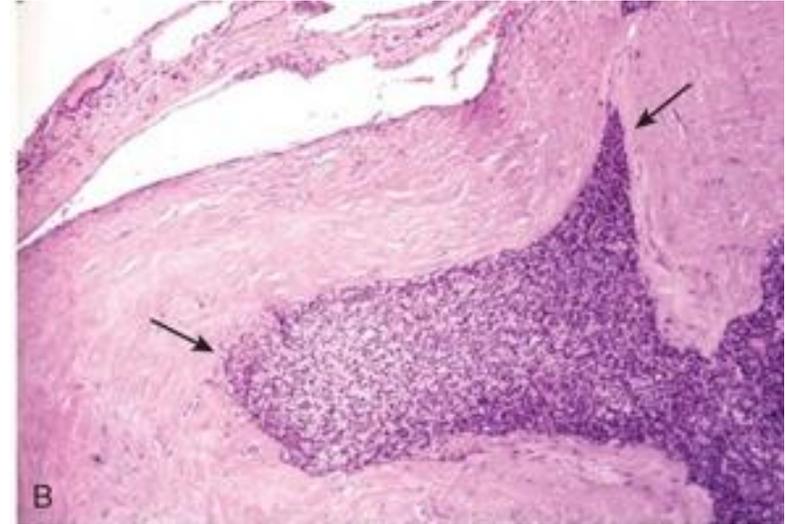
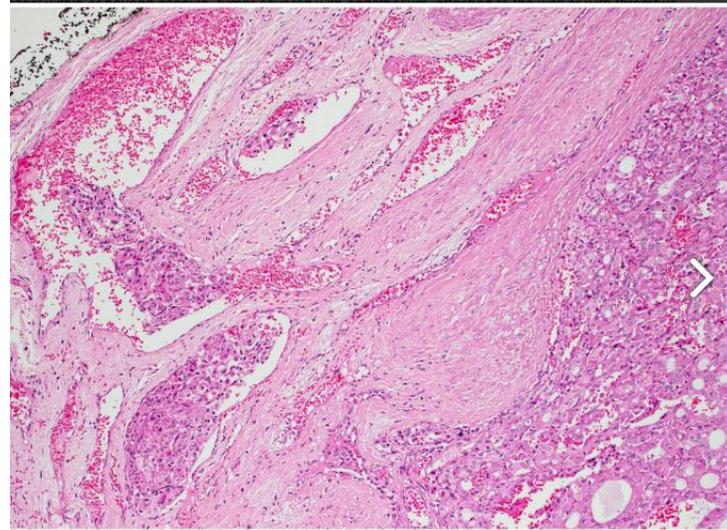
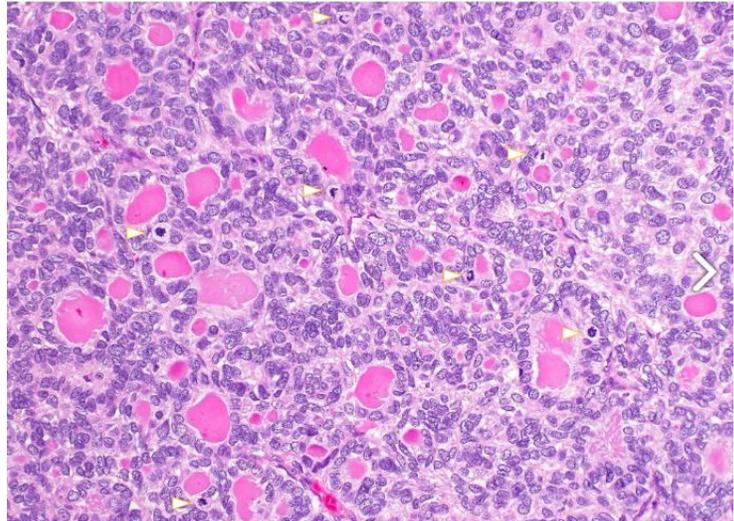
Morphology

- Tan to brown solid cut surface, can have cystic changes and hemorrhage
- Minimally invasive: usually single encapsulated nodule, with thickened and irregular capsule
- Widely invasive: extensive permeation of capsule or no capsule.



Histology

- solid pattern of follicles (small, normal sized or large).
- No nuclear features of papillary thyroid carcinoma
- Invasion of adjacent thyroid parenchyma, capsule (complete penetration) or blood vessels (in or beyond the capsule)



3. . Anaplastic Carcinoma.

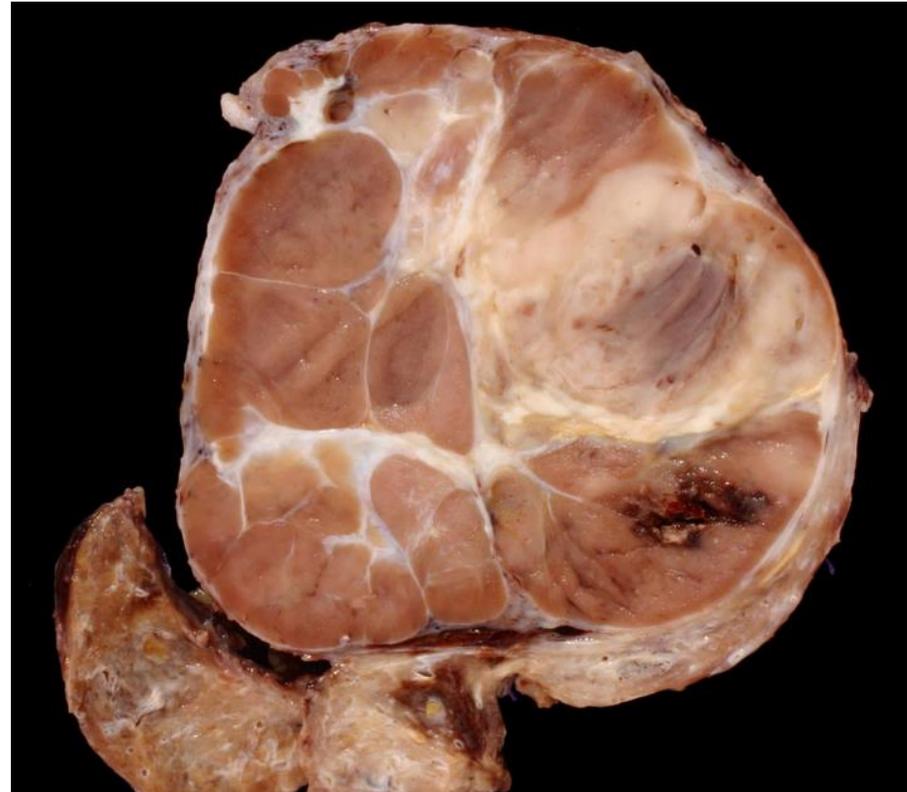
- A highly aggressive thyroid malignancy composed of undifferentiated follicular thyroid cells, devoid of morphologic features of thyroid origin.
- Medium age 60 - 70 years with incidence to rise with age, F:M = 2:1.
- Higher incidence in areas of dietary iodine deficiency.
- **GENETIC FACTORS:**
 - ✓ Inactivation of TP53.

Clinical features

- Rapidly enlarging, bulky neck mass invades adjacent structures causing hoarseness, dysphagia, dyspnea.
- fixed to the underlying structures.
- Extrathyroidal extension in majority of cases
- Regional nodal metastases and vocal cord paralysis present in up to 40% and 30%, respectively
- **Treatment**
- Radiation therapy, surgery when feasible or chemoradiation either concurrently or sequentially

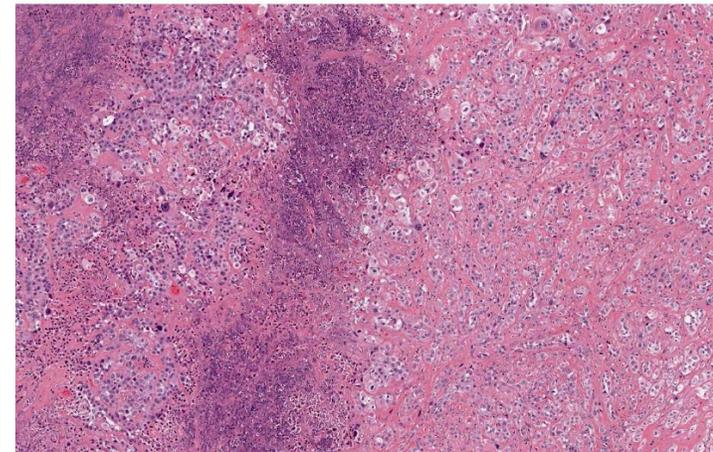
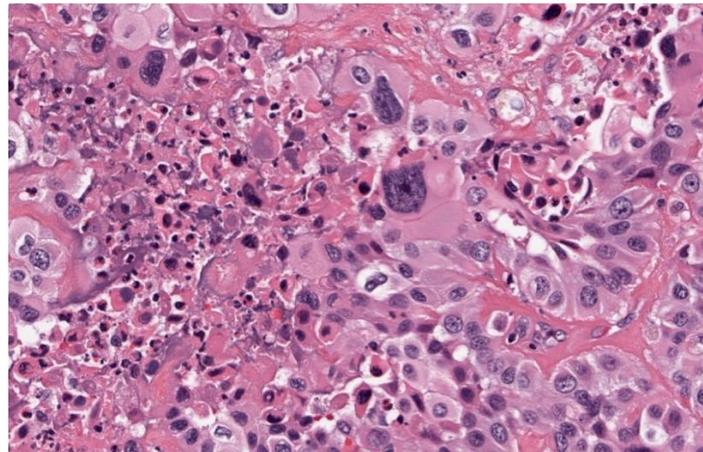
Morphology

- **Bulky solid mass (mean: 6 cm) with zones of necrosis or variegated appearance.**



Histology

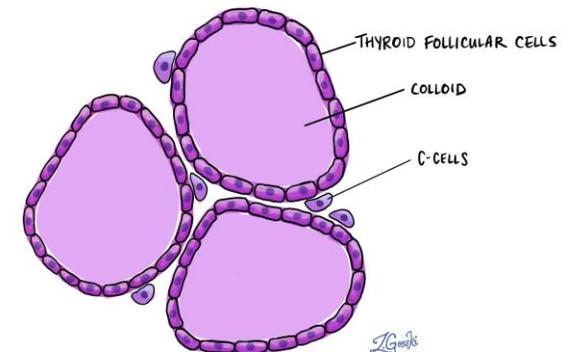
- **Common features include :**
 - ✓ widely invasive growth.
 - ✓ extensive tumor necrosis.
 - ✓ marked nuclear pleomorphism .
 - ✓ high mitotic activity



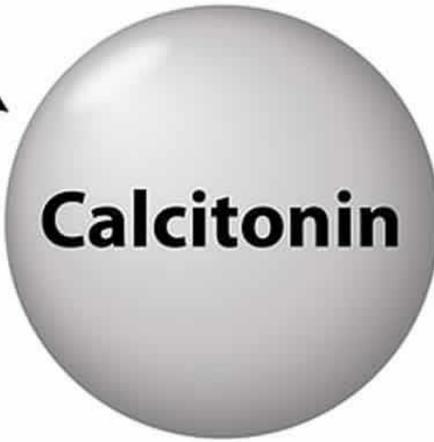
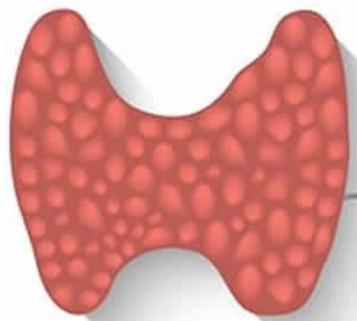
4. Medullary Carcinoma.

- Neuroendocrine tumor derived from C cells (formerly called parafollicular cells), which secrete calcitonin
- 1 - 2% of thyroid carcinomas
- Either sporadic (nonhereditary) or familial (hereditary)
 - **Sporadic:** 70%, age 40 - 60, solitary
 - **Familial:** 30%, younger patients (mean age 35).
 - ✓ Occurring in the setting of MEN syndrome 2A or 2B,
 - ✓ familial medullary thyroid carcinoma without an associated MEN syndrome

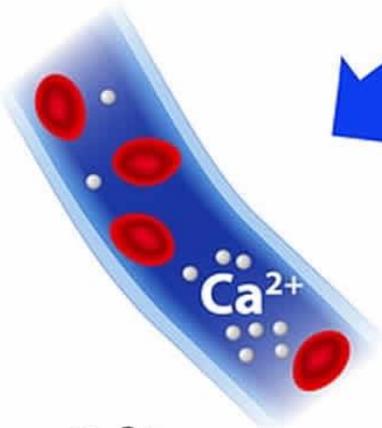
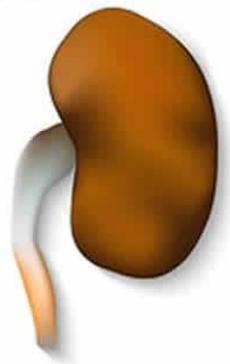
NORMAL THYROID FOLLICLES AND C-CELLS



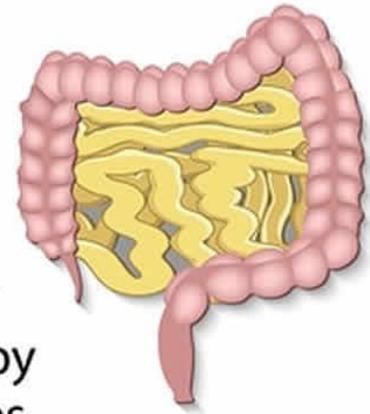
Thyroid gland



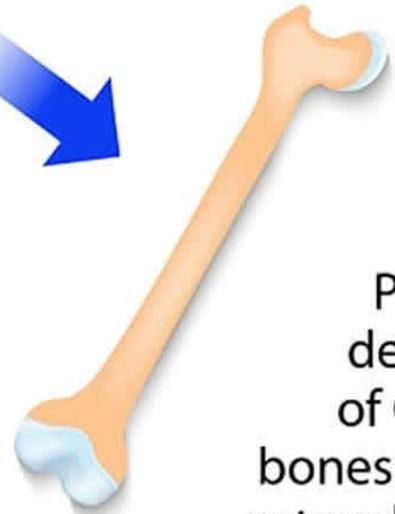
Inhibits Ca^{2+} reabsorption in the kidney (excreted in the urine)



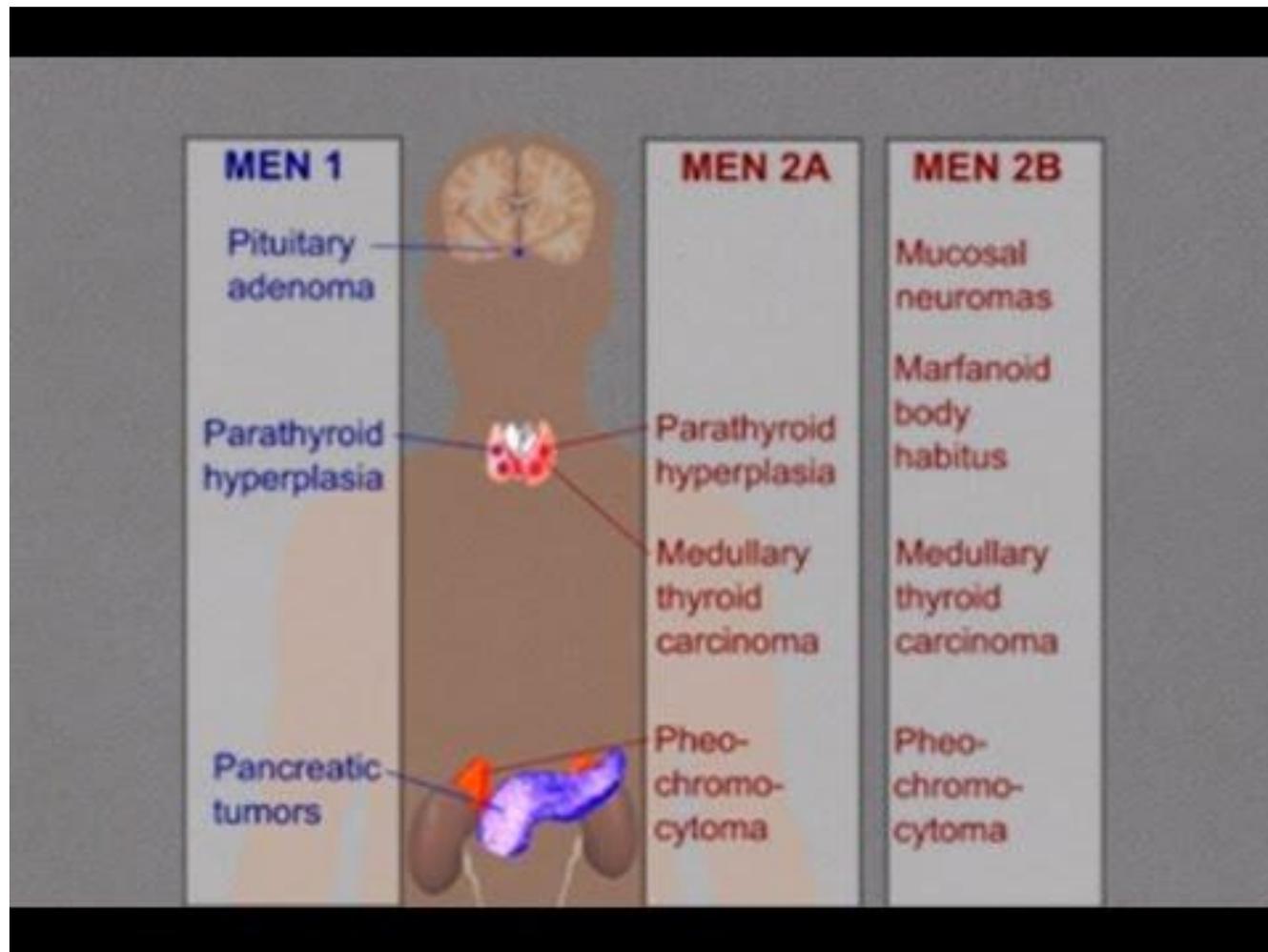
Lowers Ca^{2+} levels in blood



Inhibits Ca^{2+} absorption by the intestines



Promotes deposition of Ca^{2+} into bones (inhibits osteoclasts and stimulates osteoblasts)

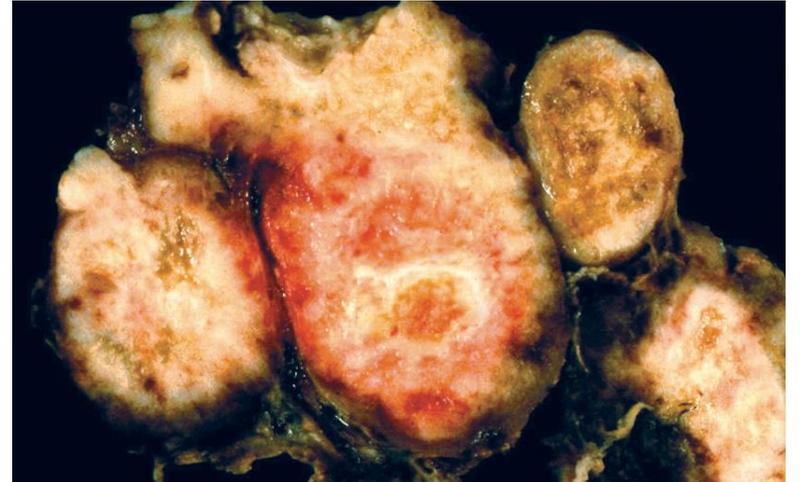
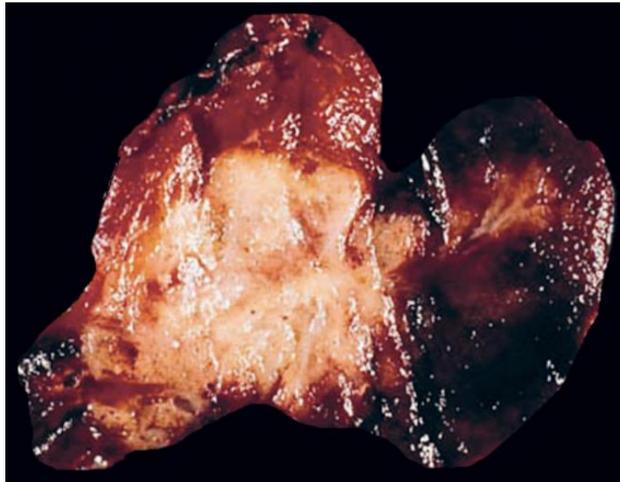


Clinical features

- Presents with painless thyroid mass, cold on scanning
- Up to 75% of patients have nodal metastasis.
- Serum calcitonin correlates with tumor burden .
- Patients with metastasis may have severe diarrhea and flushing
- Some tumors may produce ACTH or CRH (Cushing syndrome).

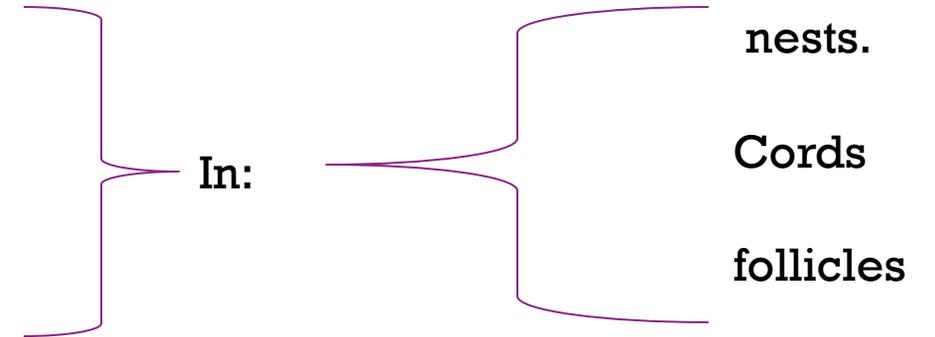
Morphology

- **Sporadic:** typically presents as a single circumscribed but nonencapsulated, gray-tan mass
- **Familial:** generally bilateral / multiple foci.



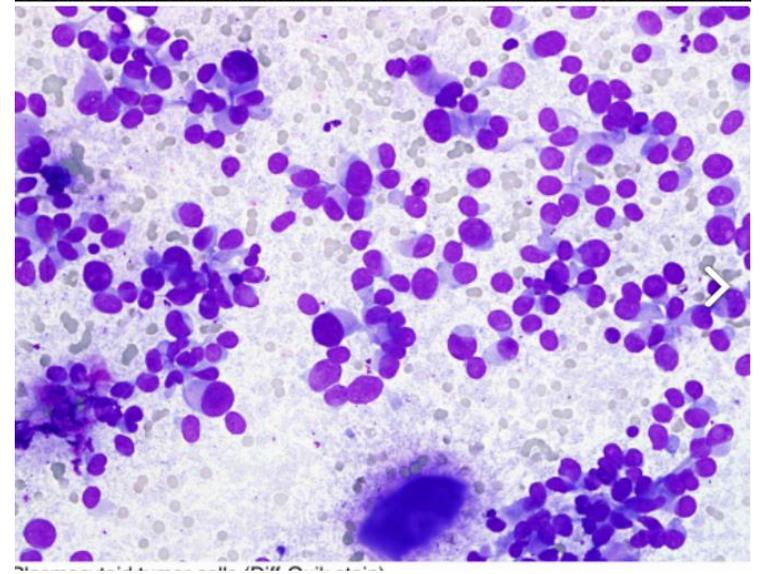
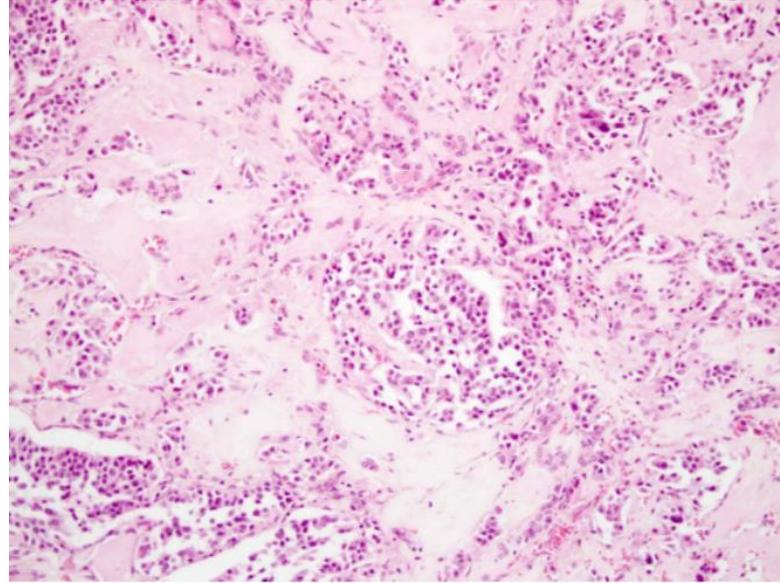
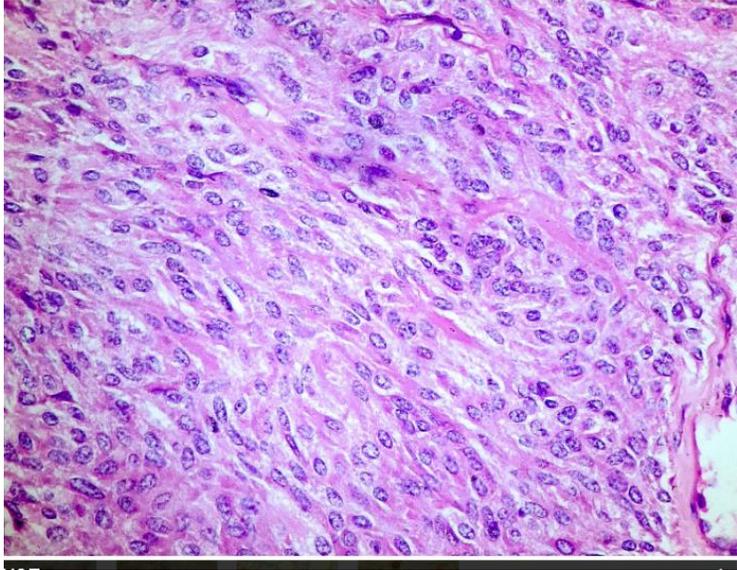
Histology

- Wide variety of morphology:
- Round.
- Plasmacytoid.
- polygonal
- spindle cells.



• Eosinophilic to amphophilic granular cytoplasm due to secretory granules

- Stroma has amyloid deposits from calcitonin



THANK YOU