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

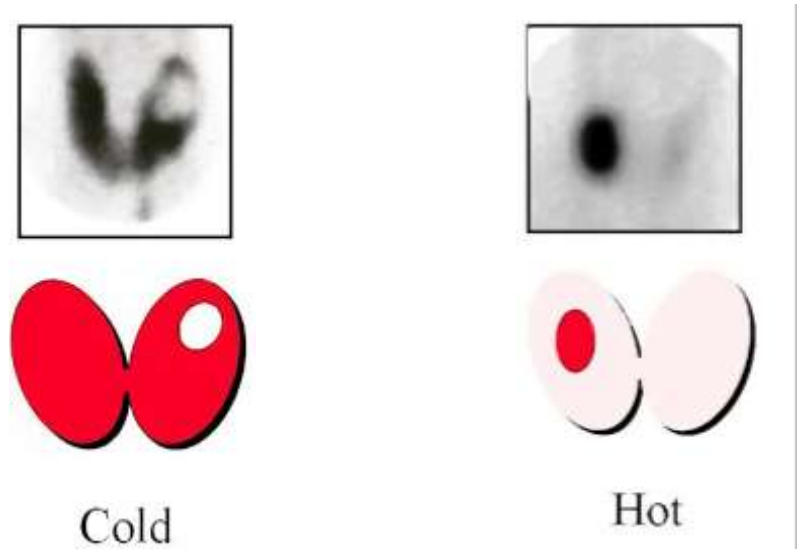
- Thyroid nodule most likely to be malignant if:

✓ Solitary.

✓ Nodules in younger patients .

✓ Nodules in males .

✓ Nodules that doesn't take up radioactive iodine in imaging studies (cold nodules).



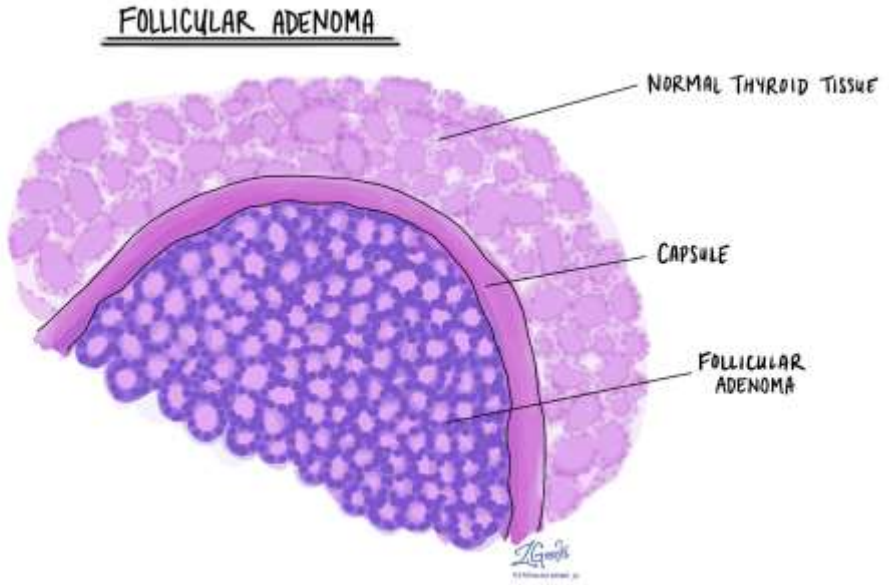
Neoplastic thyroid lesions

- 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)

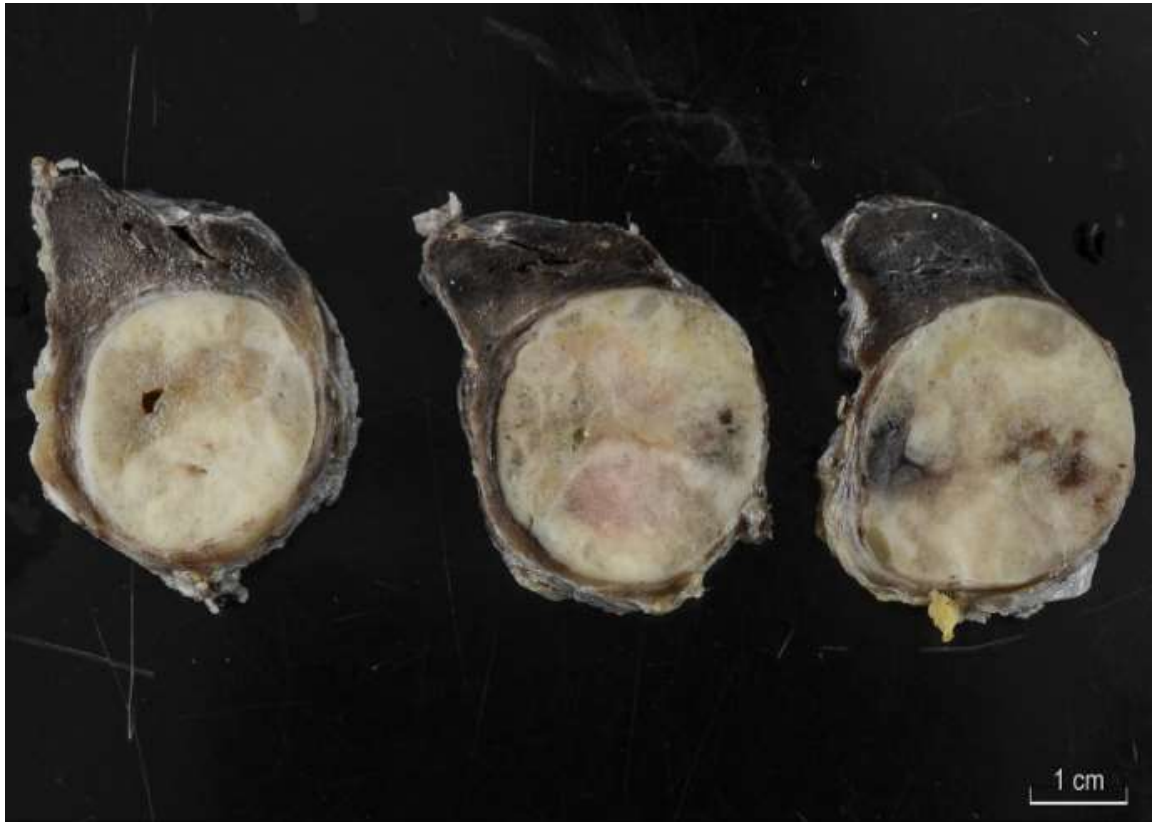
Follicular adenoma

- 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.



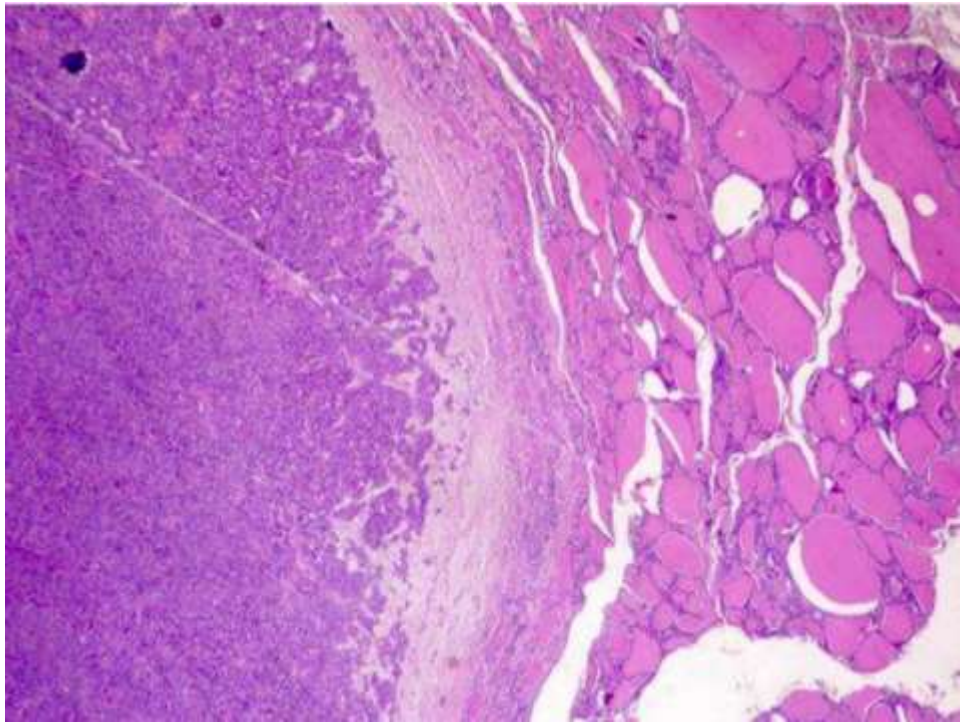
Morphology

- 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

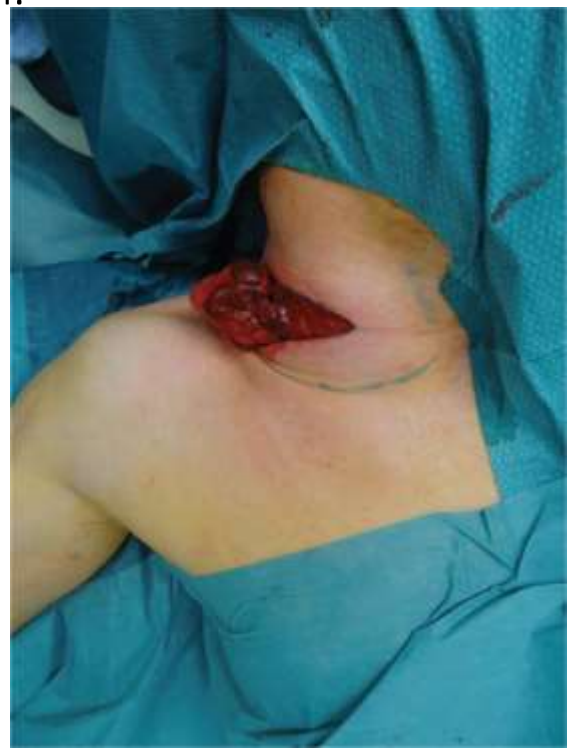
- 1% of all cancer in U.S., 0.2% of all cancer deaths.
- Increasing incidence due to new diagnostic practices which detect smaller tumors.
- 20 year survival is 90%, because most are indolent papillary carcinomas
- A female predominance has been noted among patients who develop thyroid carcinoma in the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

1. Papillary Carcinoma.

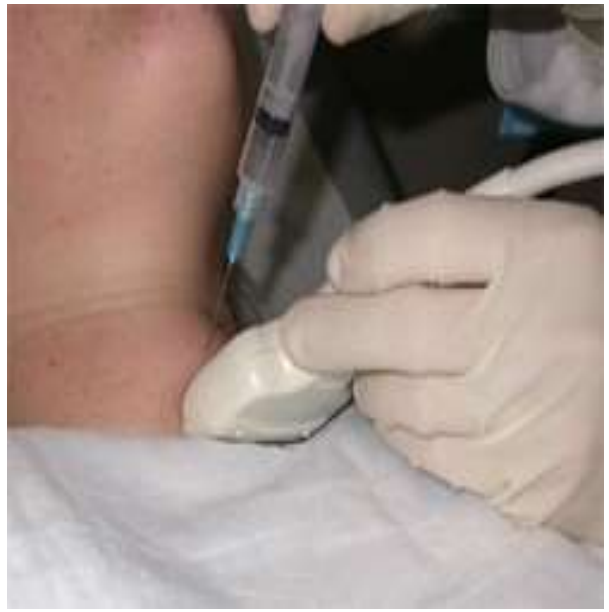
- The most common types of thyroid carcinoma.
- Female predominance; F:M ratio = ~3:1
- Median age of diagnosis in 50s
- Ionizing radiation is the best established risk factor.
- Mainly 2 genes are involved:
- 1. BRAF amplification.
- 2. RET gene rearrangment .

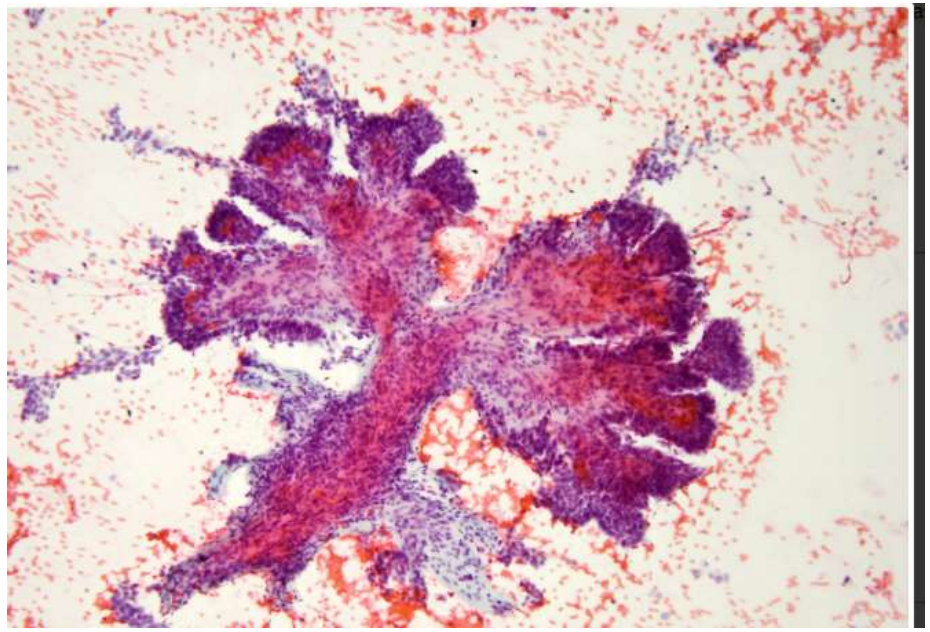
Clinical features.

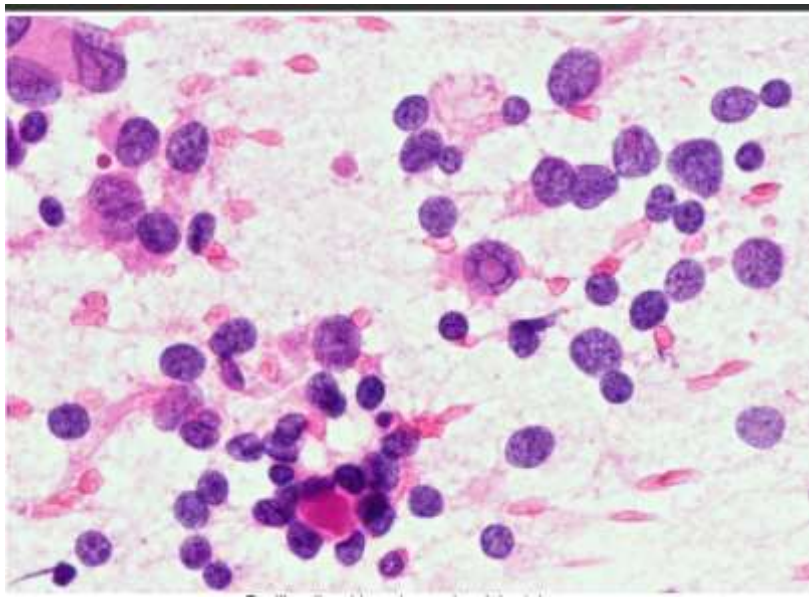
- Presented as Painless palpable thyroid mass.
- The diagnosis is first rendered on ultrasound guided pre-operative fine needle aspiration cytology
- Surgical pathology report of a resected specimen provides further information about the subtyping (i.e., variant) and microstaging
- Commonly treated with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



ultrasound guided pre-operative fine needle aspiration cytology.

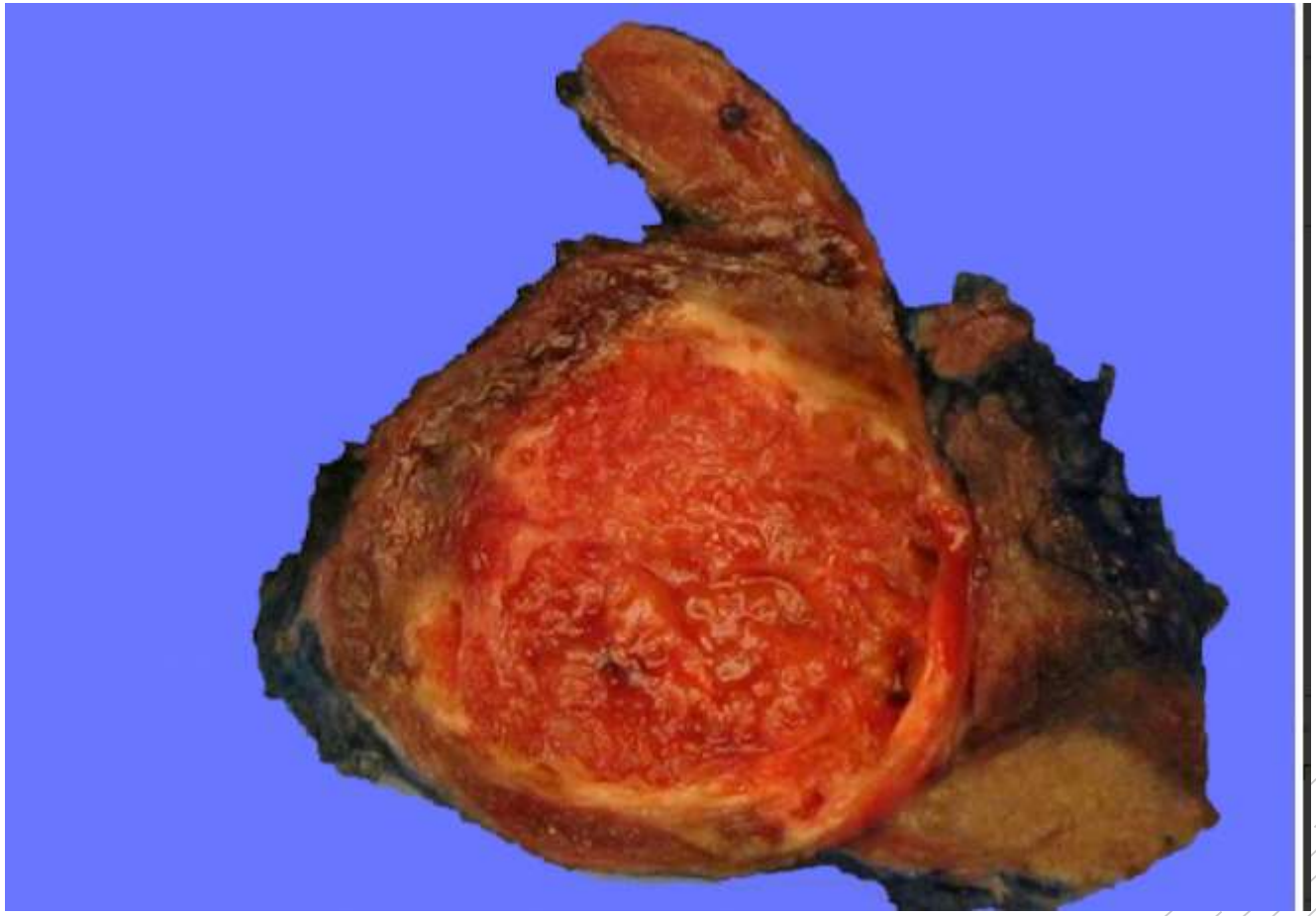






Morphology

- Solid or cystic mass with papillary projections

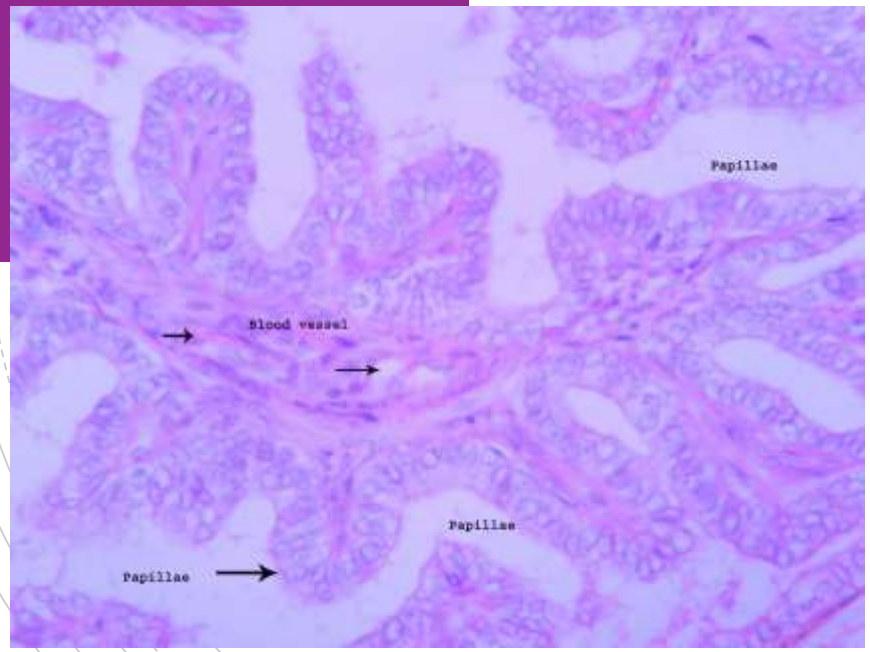


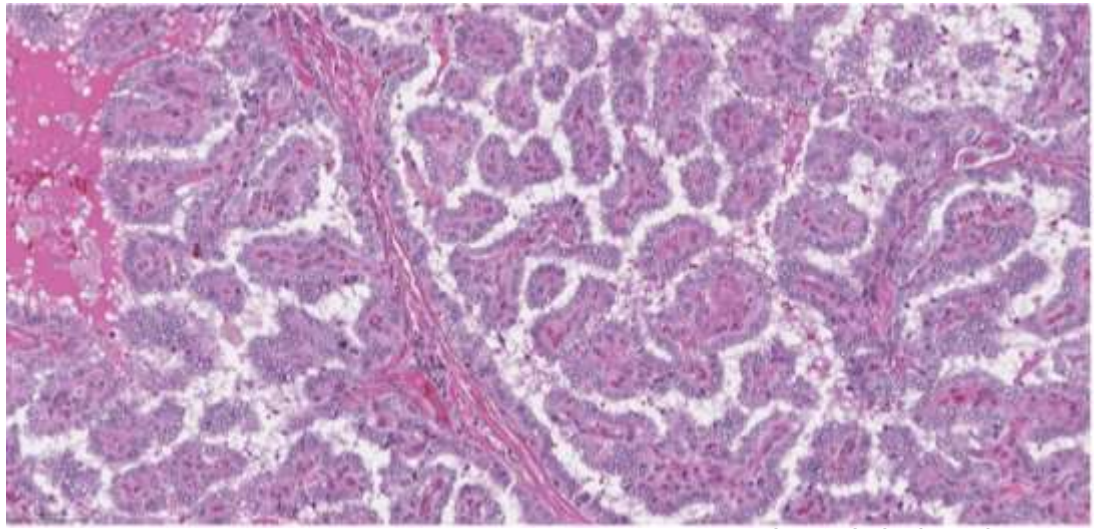
Histology.

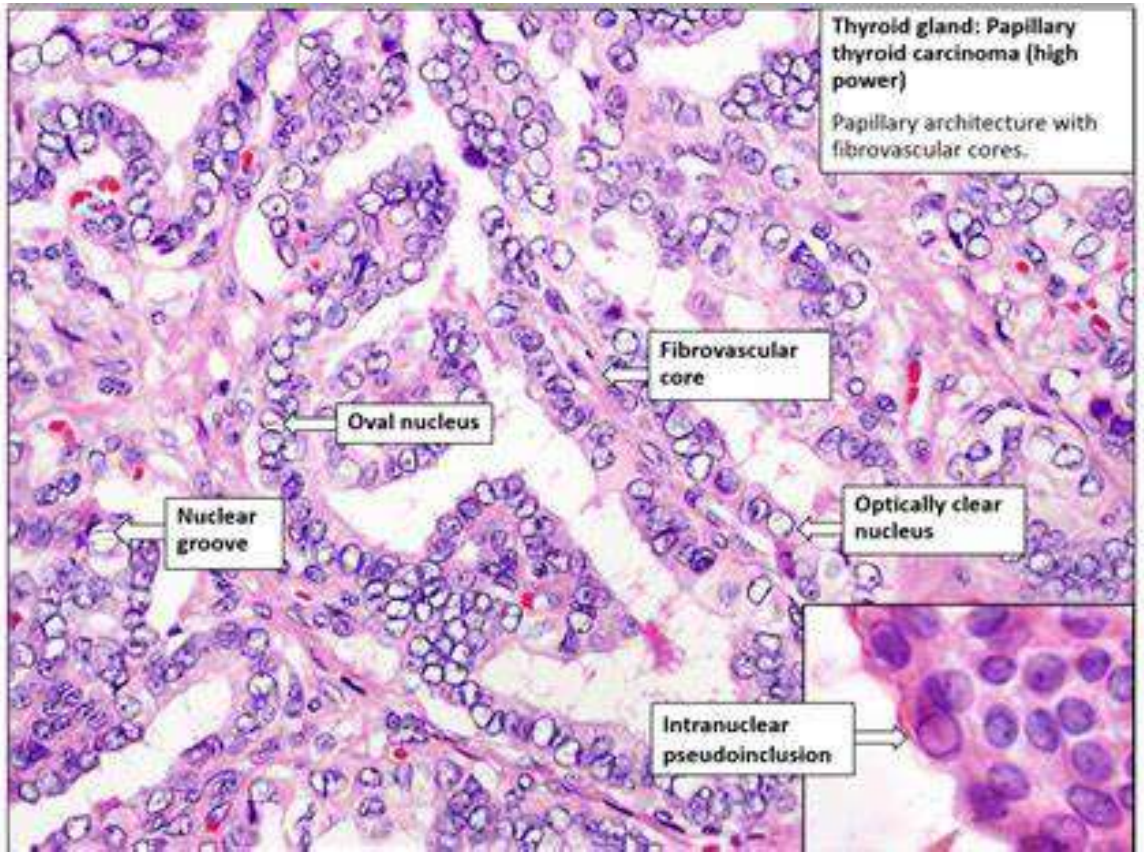
- Defined by two cardinal features:

✓ true papillae with a fibrovascular core.

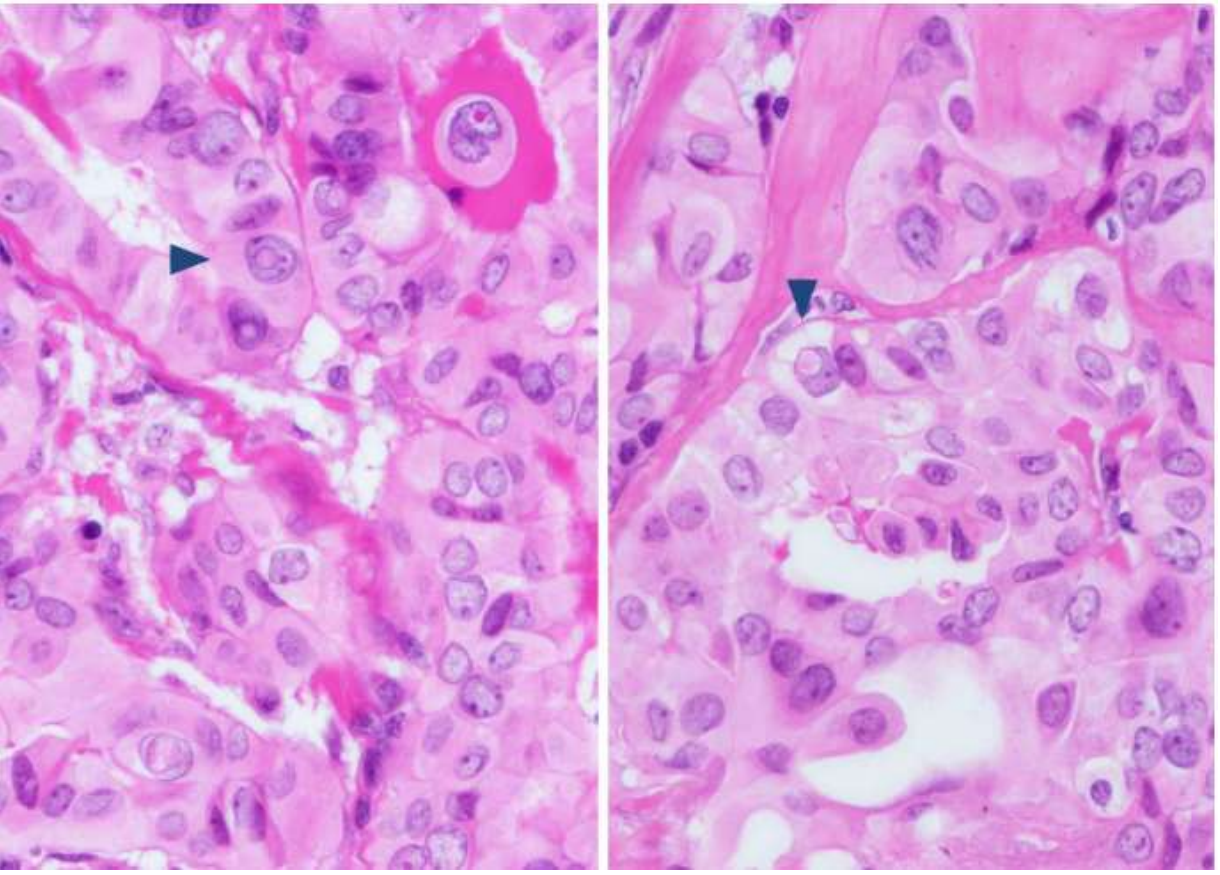
✓ nuclear features of papillary carcinoma.

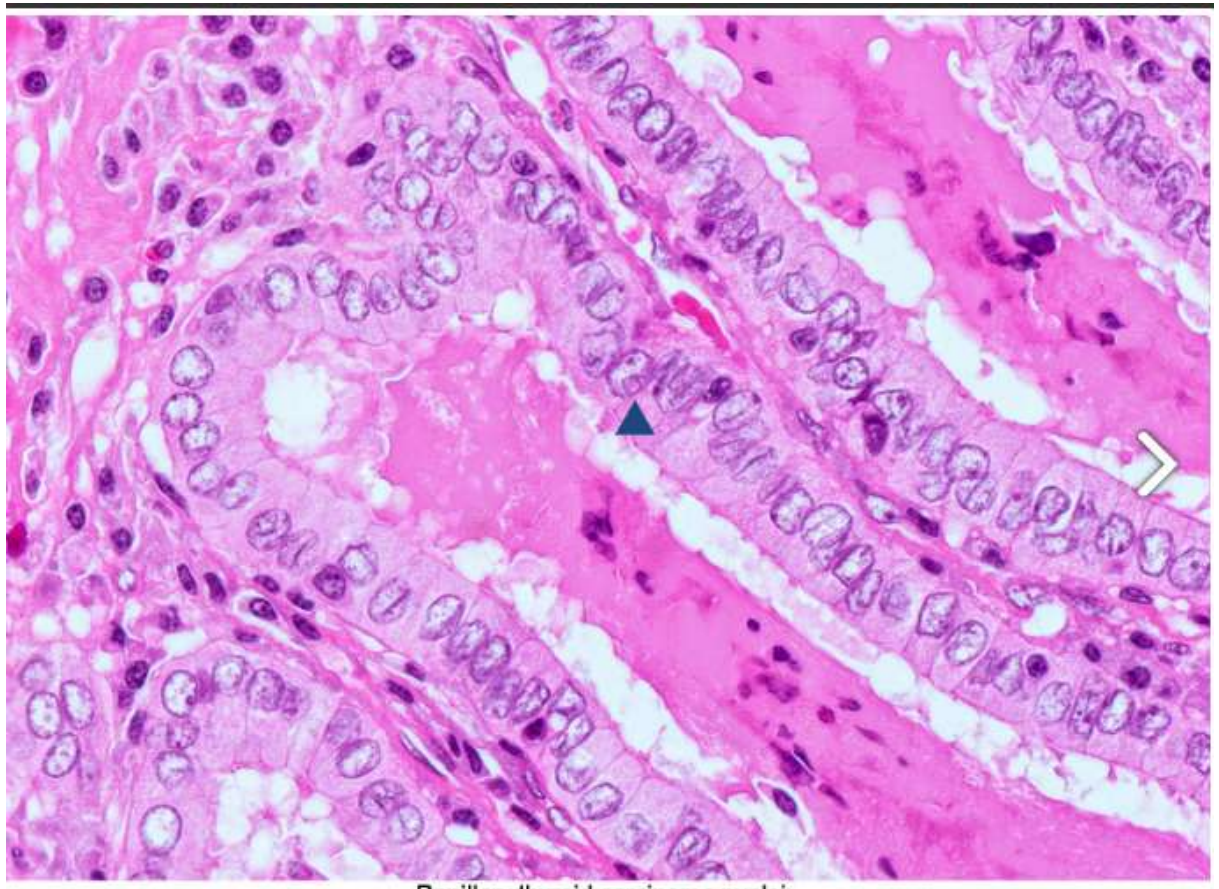






- irregular nuclear contour.
- nuclear groove.
- nuclear pseudoinclusion





Papillary thyroid carcinoma nuclei:

2. Follicular Carcinoma.

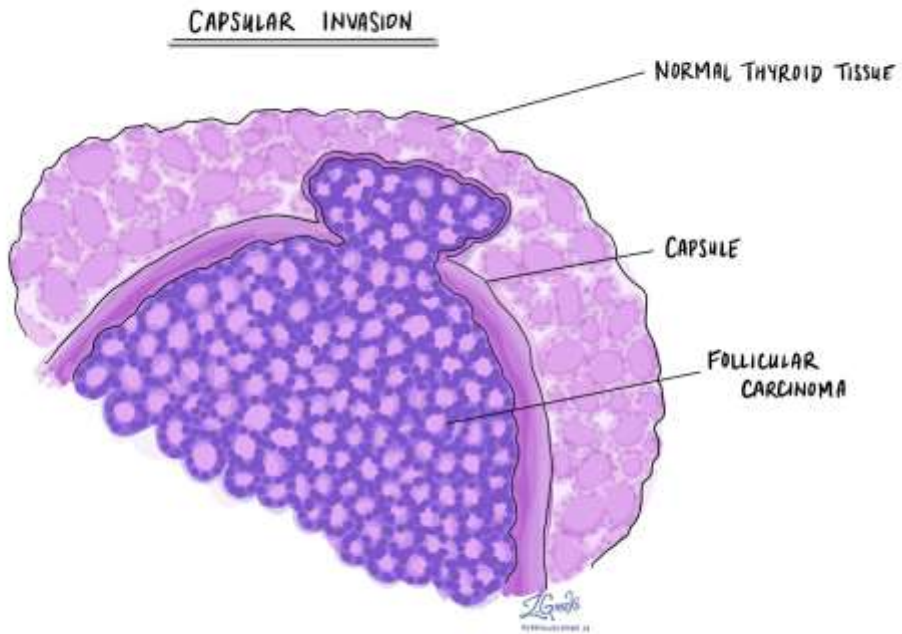
- Thyroid carcinoma with follicular differentiation but no papillary nuclear feature.
- Follicular lesion with capsular or vascular invasion but without papillary nuclear features.
- More common in women and in areas with dietary iodine deficiency .
- The peak incidence between the ages of 40 and 60 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

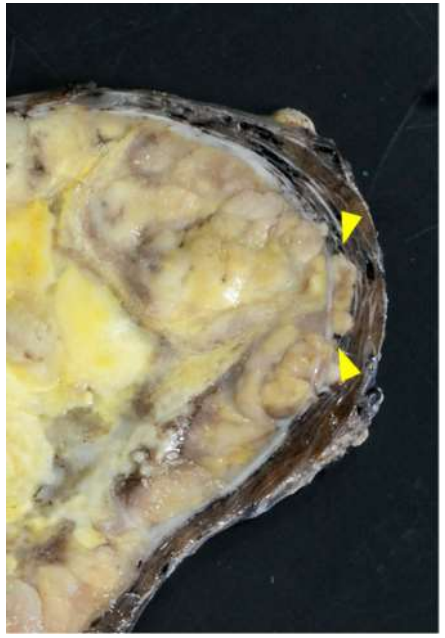
- Usually "cold" on radionuclide scan
- Does not metastasize through lymphatics but does spread to lungs, liver, bone, brain via blood vessels
- Less than 5% with ipsilateral lymphadenopathy.
- **Treatment:**

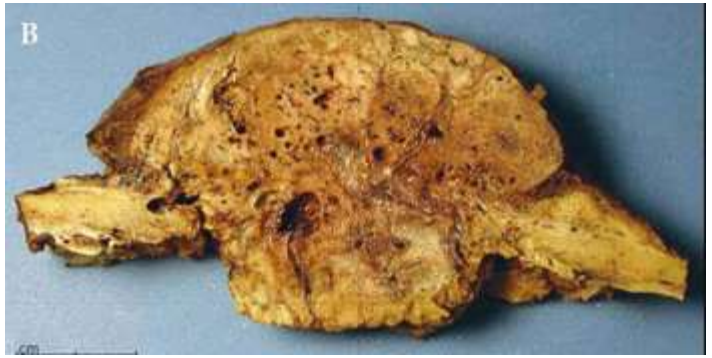
✓ thyroidectomy and radioactive iodine

✓ No nodal dissection is needed

Morphology

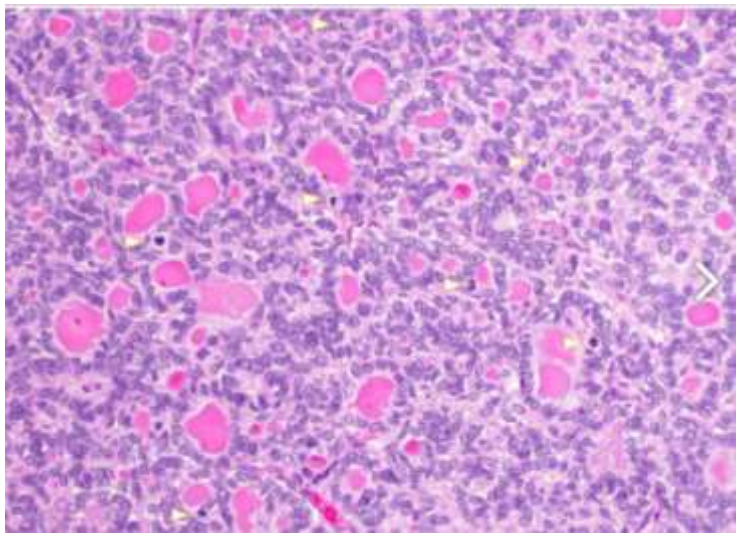
- Tan to brown solid cut surface, can have cystic changes and hemorrhage
- Minimally invasive: usually single encapsulated nodule, with thickened and irregular capsule
- Widely invasive: extensive permeation of capsule or no capsule.

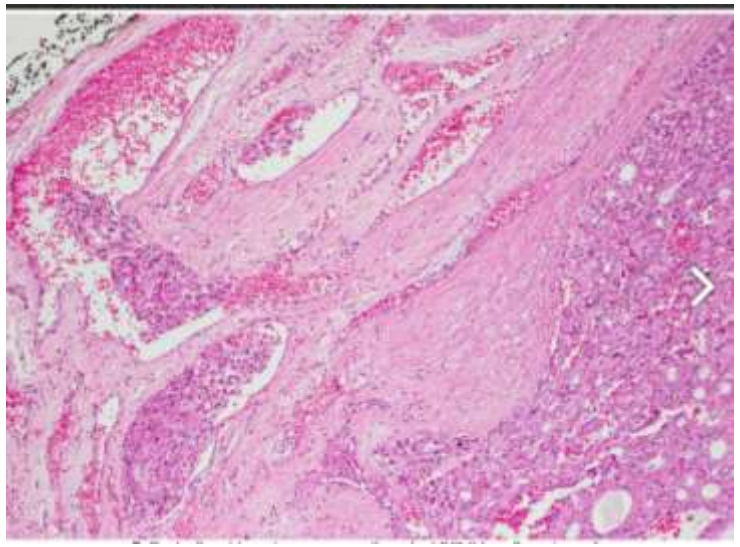


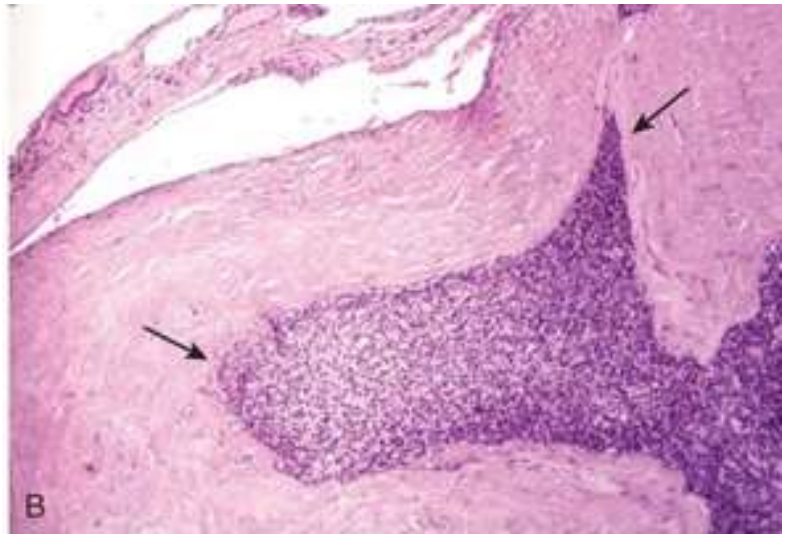


Histology

- 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)



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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:**

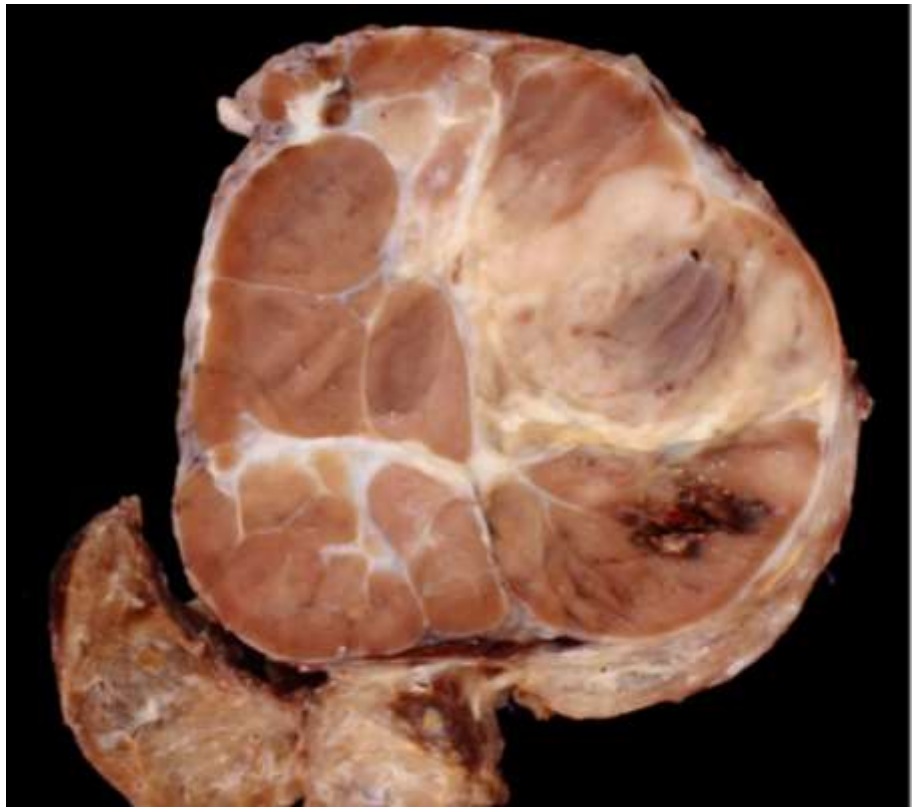
✓ Inactivation of TP53.

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

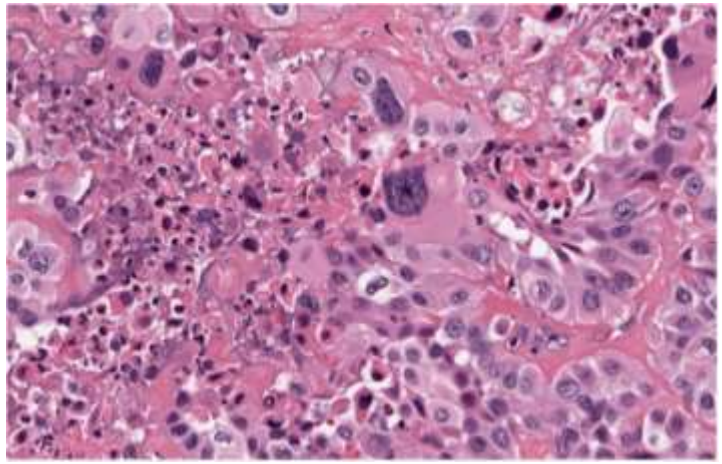
- Common features include :

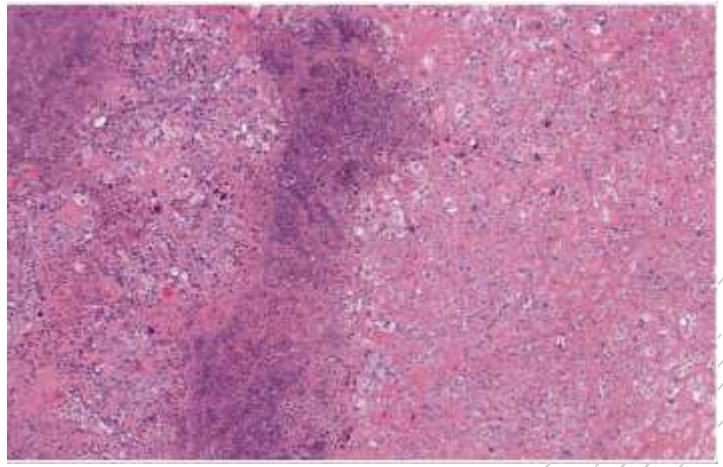
✓ widely invasive growth.

✓ extensive tumor necrosis.

✓ marked nuclear pleomorphism .

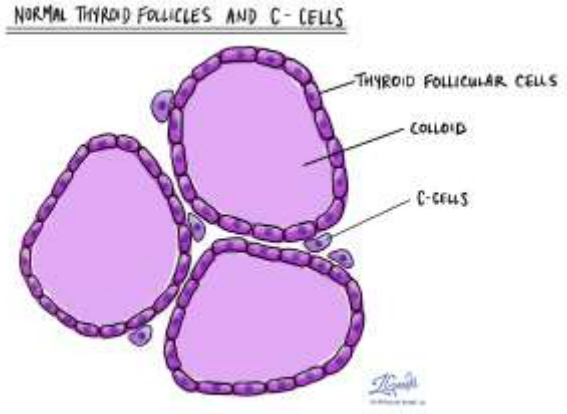
✓ high mitotic activity

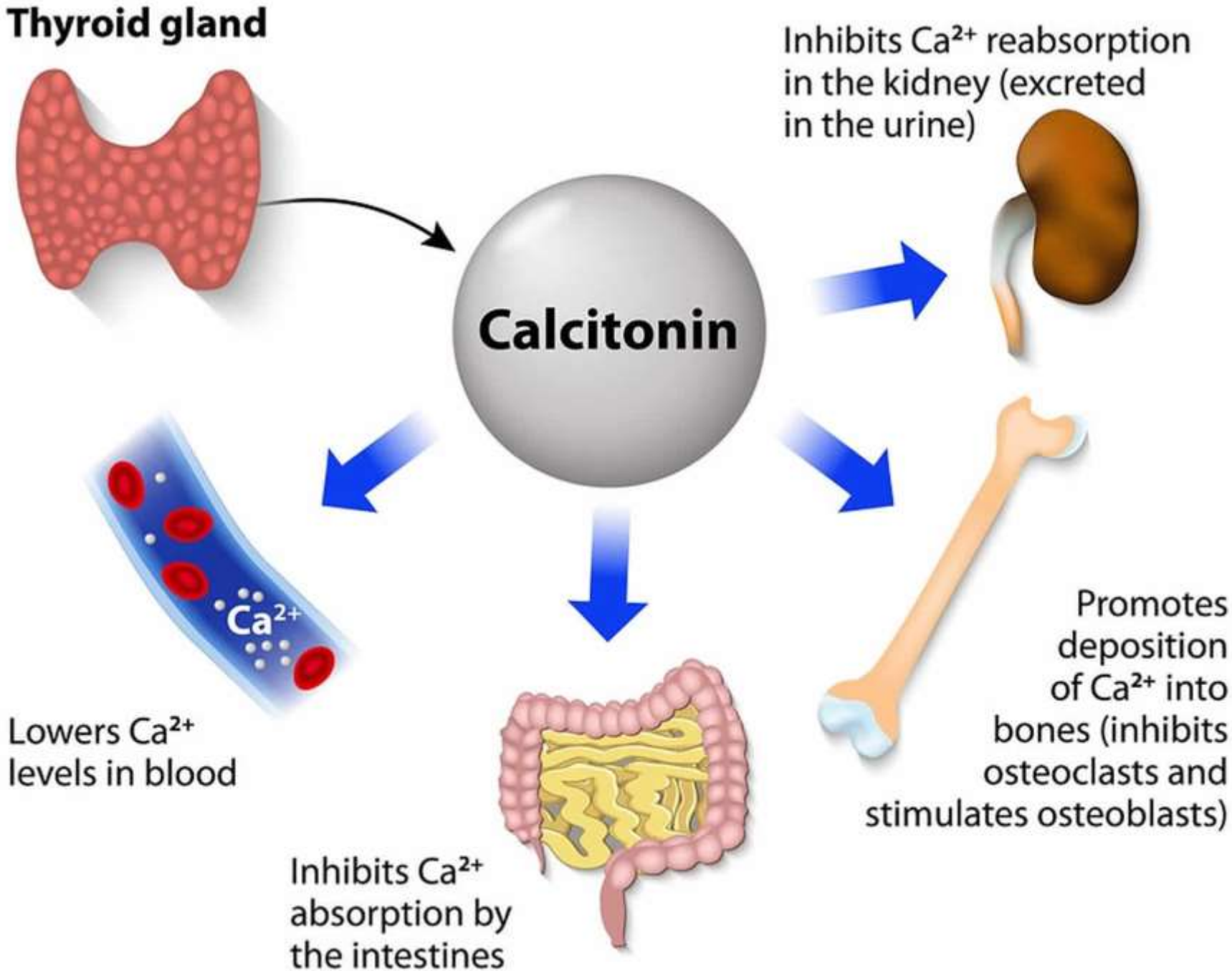


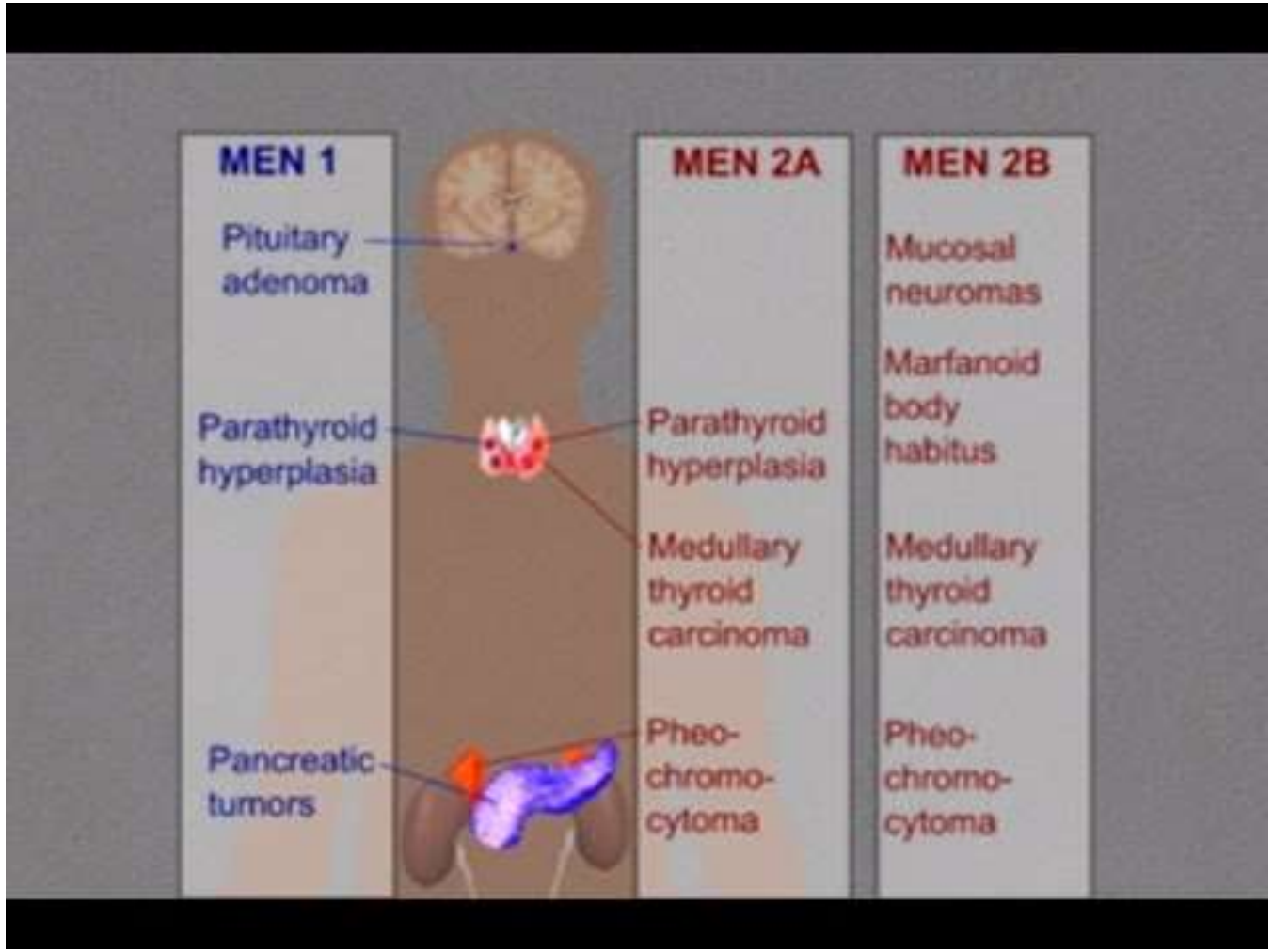


4. Medullary Carcinoma.

- 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




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

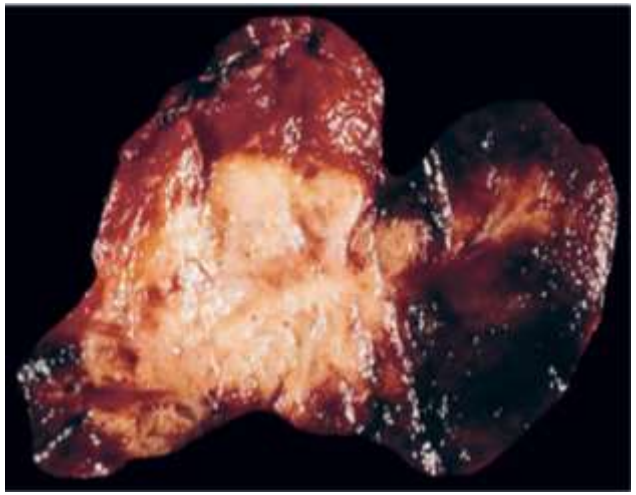

MEN 1
Pituitary adenoma
Parathyroid hyperplasia
Pancreatic tumors
MEN 2A
Parathyroid hyperplasia
Medullary thyroid carcinoma
Pheo-chromo-cytoma
MEN 2B
Mucosal neuromas
Marfanoid body habitus
Medullary thyroid carcinoma
Pheo-chromo-cytoma

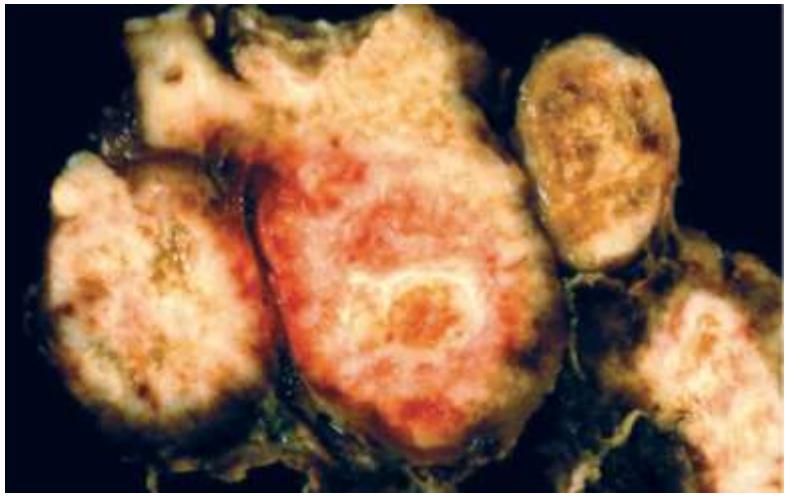
Clinical features

- 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

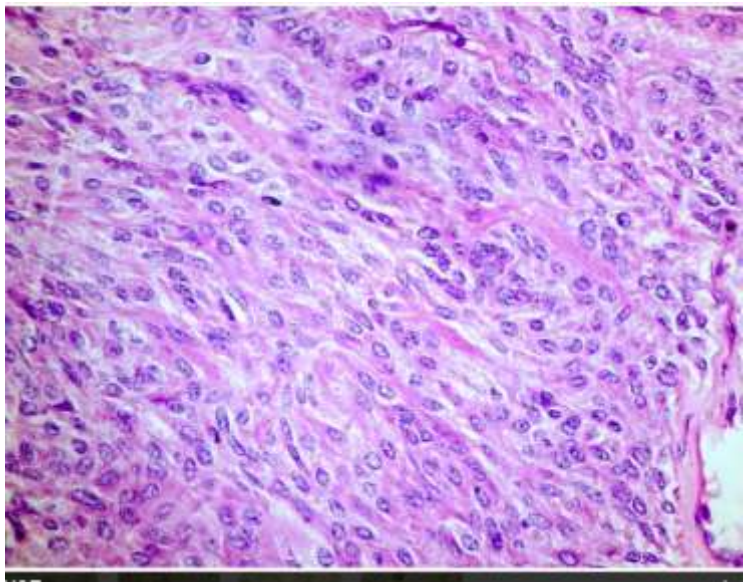
- Wide variety of morphology:
- Round.
- Plasmacytoid.
- polygonal
- spindle cells.

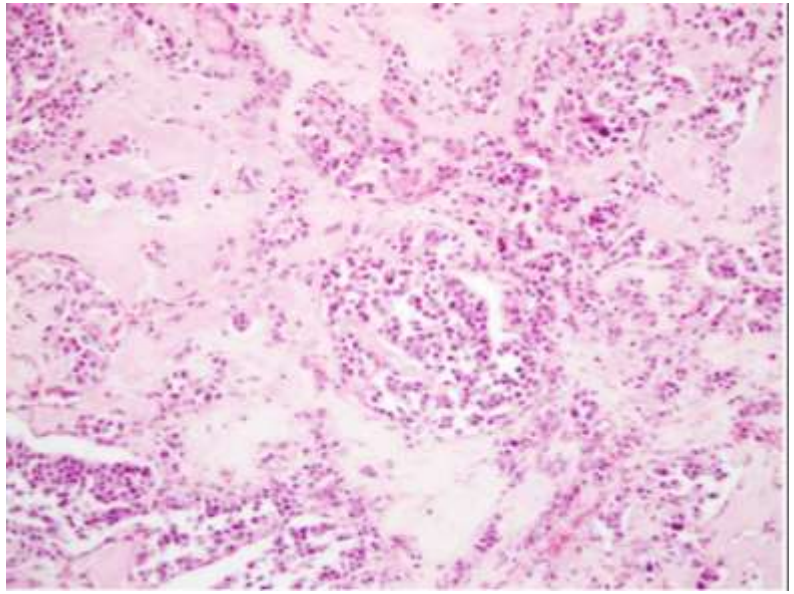
In:

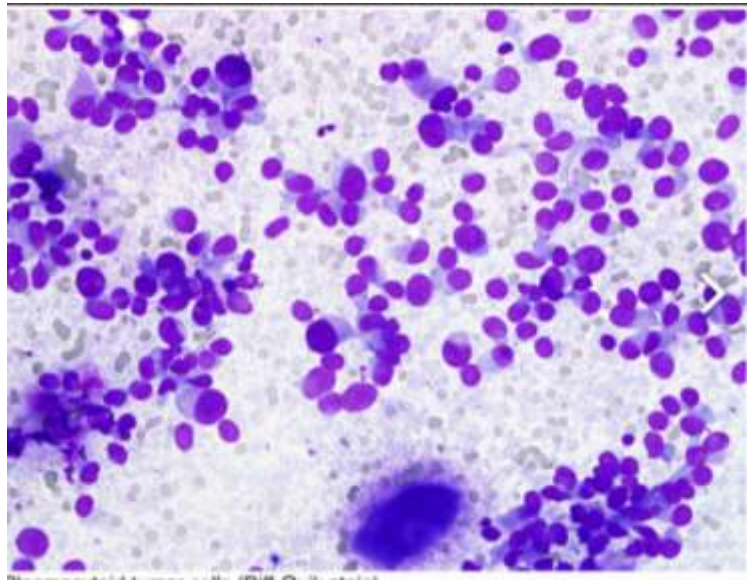
- nests.
- Cords
- follicles

•Eosinophilic to amphophilic granular cytoplasm due to secretory granules

- Stroma has amyloid deposits from calcitonin





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