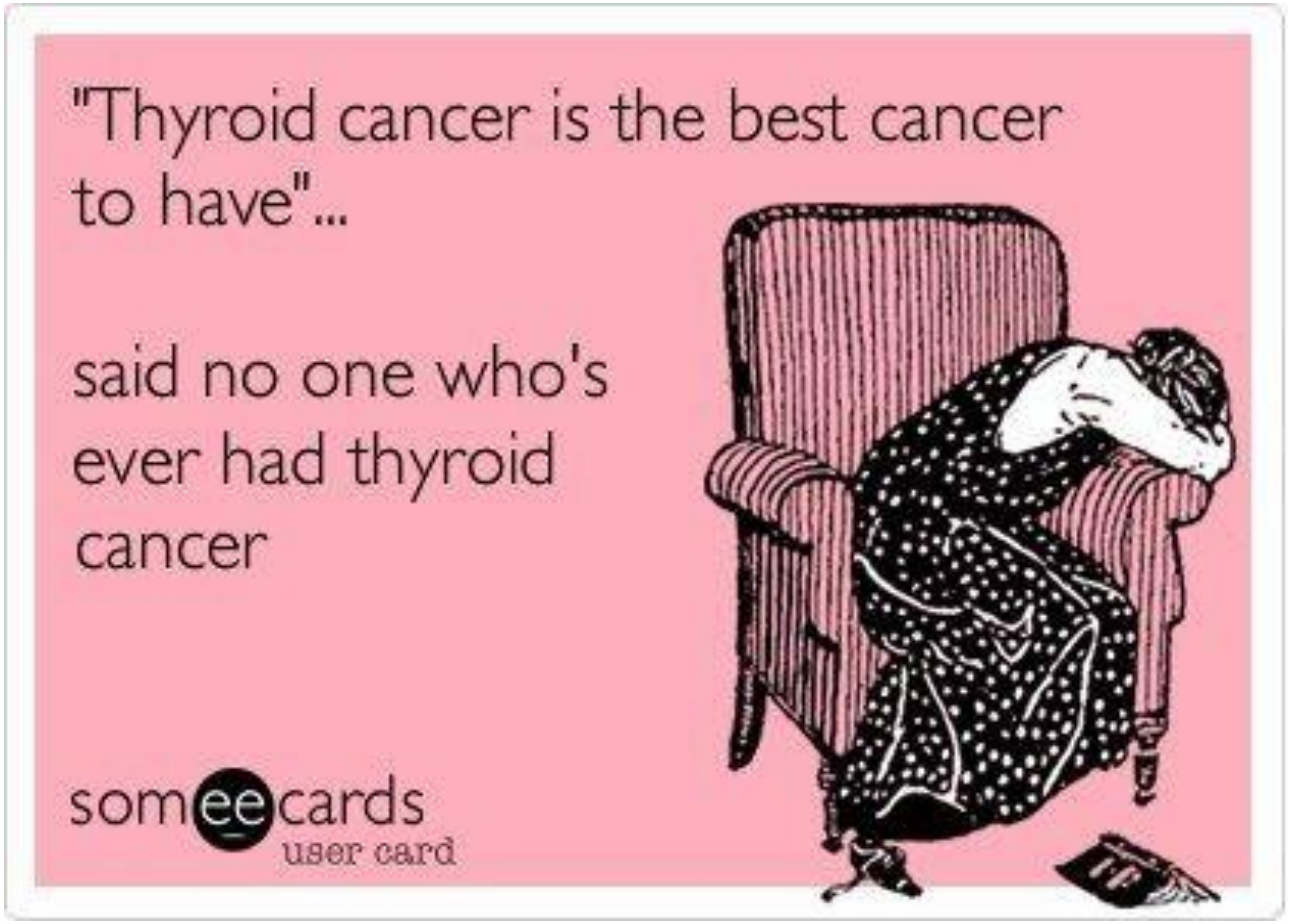
Endocrine system 2024
Thyroid gland part 2

Dr Heyam Awad

MD, FRCPath

Thyroid tumors



Thyroid neoplasms present as single nodules

Thyroid tumors

- Tumors of the thyroid gland can be benign or malignant.
- They are usually solitary (single not multiple)
- Benign lesions in the thyroid are commoner than malignant ones.
- Carcinomas of the thyroid are uncommon, accounting for much less than 10% of solitary thyroid nodules

Neoplastic thyroid lesions

Benign: follicular adenoma and its variants (example: Hurthle cell adenoma, atypical adenoma)

Malignant:

1.papillary carcinoma

2. Follicular carcinoma

3. medullary carcinoma

4. Anaplatic carcinoma.

Follicular adenomas

- Are benign neoplasms derived from follicular epithelium.
- solitary.
- The tumor is demarcated and compressed the adjacent thyroid parenchyma by a well-defined, intact capsule
- cold nodules on scanning *but might be functional.*

Microscopic examination of follicular adenoma,

- The cells are arranged in follicles and its variants

a. Hurthle cell adenoma:

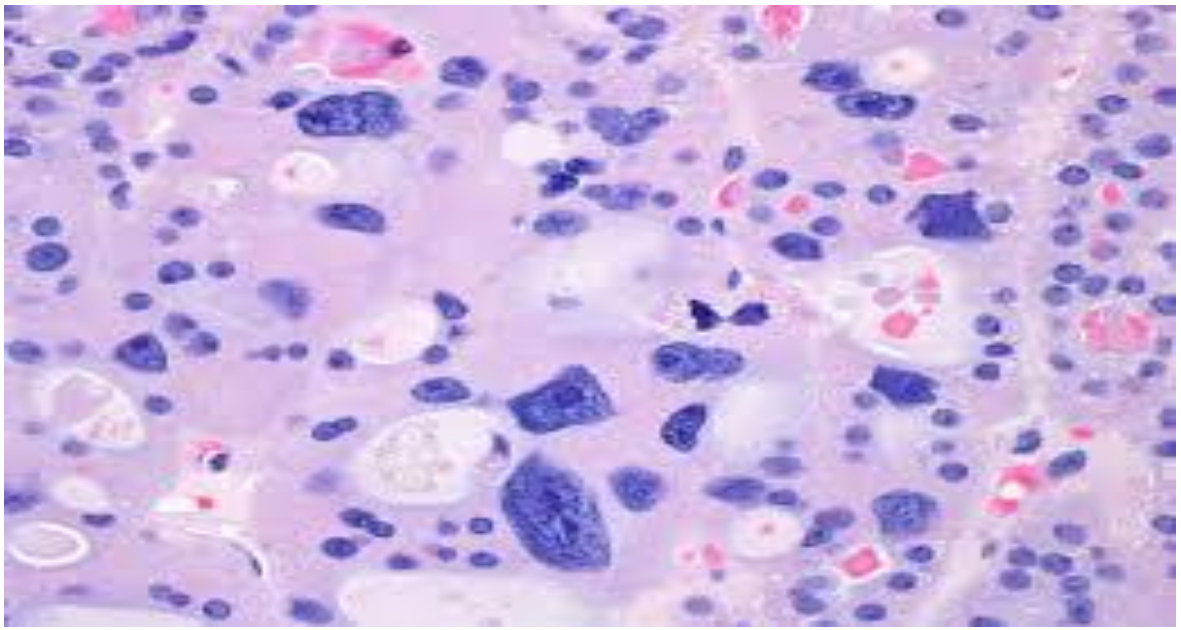
- The neoplastic cells show oxyphil or Hürthle cell change) and its behavior is not different from those of a conventional adenoma.

b. Atypical adenoma:

- The neoplastic cells exhibit focal nuclear atypia, (endocrine atypia);and these features do not constitute evidence of malignancy

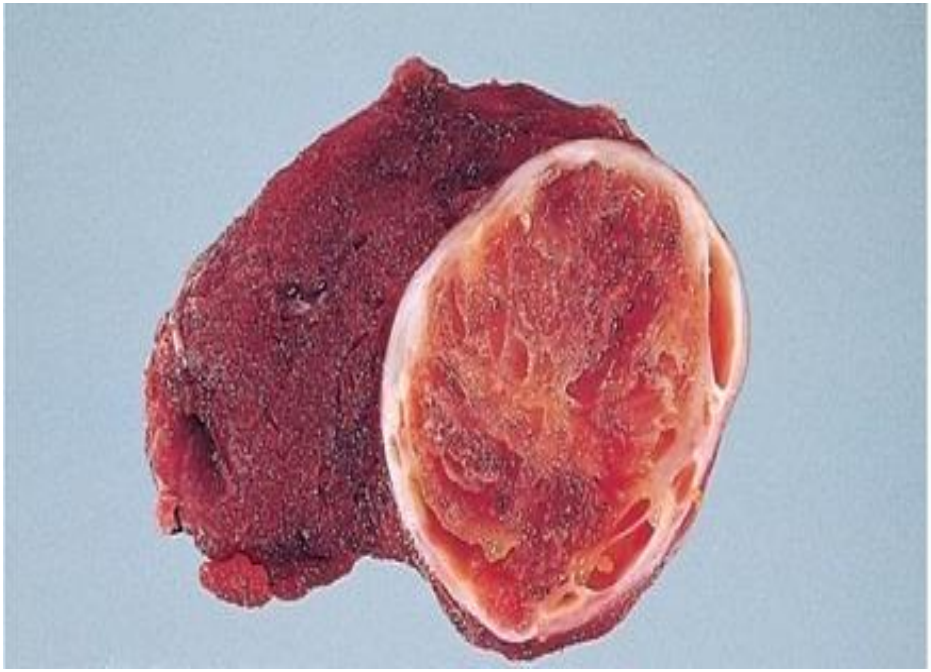
Endocrine atypia

- Note the large, hyperchromatic, pleomorphic cells. These are atypical and this atypia in endocrine glands doesn't necessarily mean malignancy.

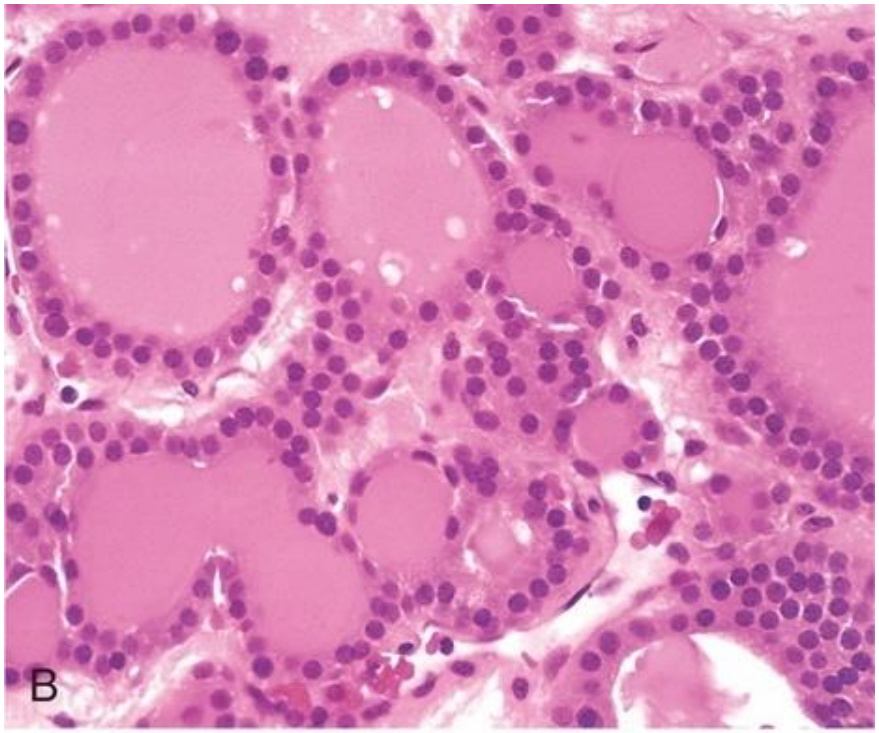


Follicular adenoma

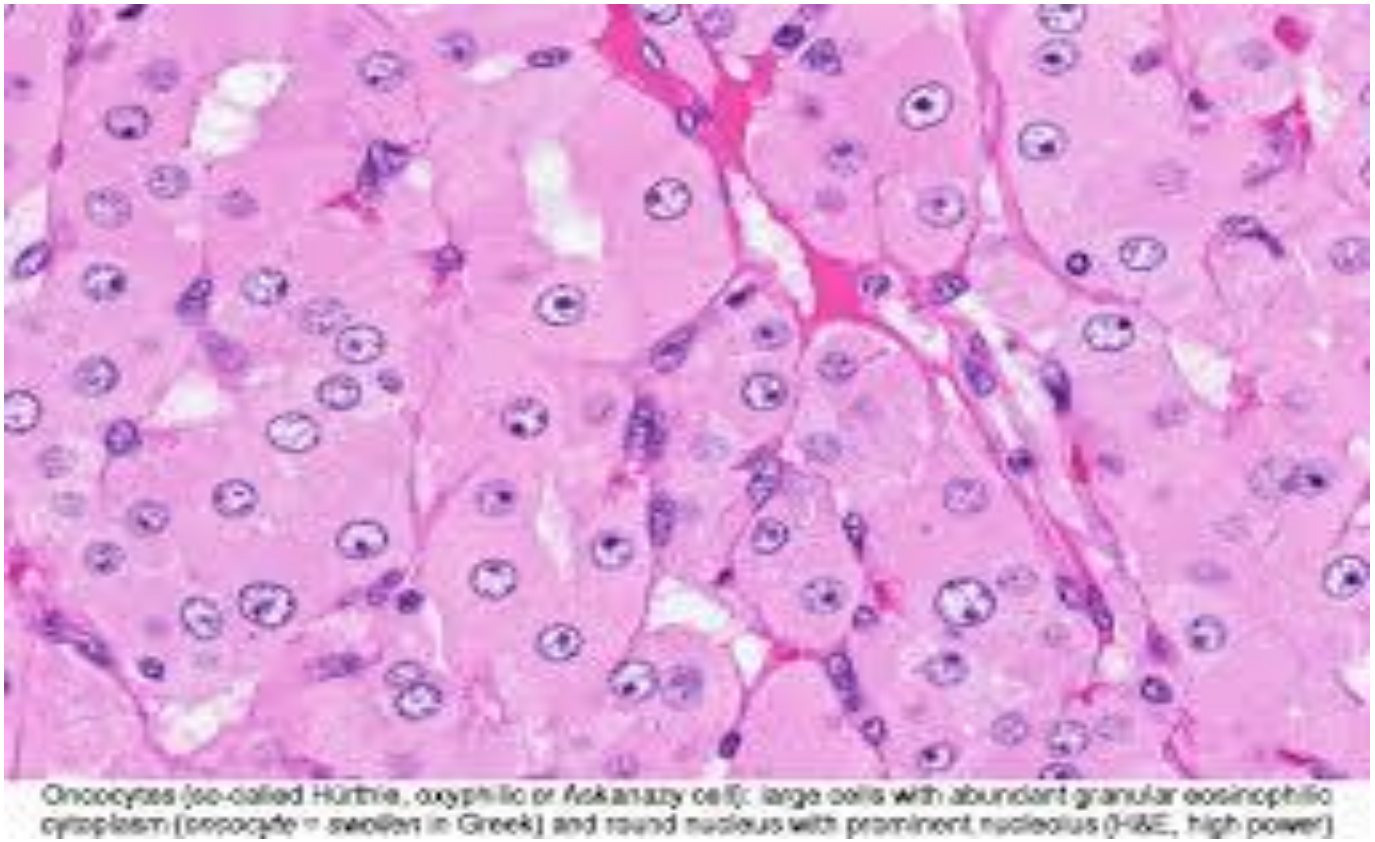
- Well demarcated, encapsulated nodules.



Micro: composed of follicles similar to the normal thyroid follicles.



Hurthle cell adenoma, cells are large with abundant eosinophilic cytoplasm.



- Behavior of thyroid adenomas :

a. Carry an excellent prognosis
b. do not recur or metastasize
c. and are *not* forerunners to carcinomas

Thyroid carcinoma

- Account for about 1.5% of all cancers
- A female predominance has been noted among patients who develop thyroid carcinoma in the early and middle adult years

-cases manifesting in childhood and late adult life are distributed equally between men and women

Main types

1. Papillary carcinoma (for more than 85% of cases)
2. Follicular carcinoma (5% to 15% of cases)
3. Anaplastic carcinoma (less than 5% of cases)
4. Medullary carcinoma (5% of cases

Papillary Carcinoma :

Is the most common form

- accounts for the majority of thyroid carcinomas associated with previous exposure to ionizing radiation.
- May occur at any age.

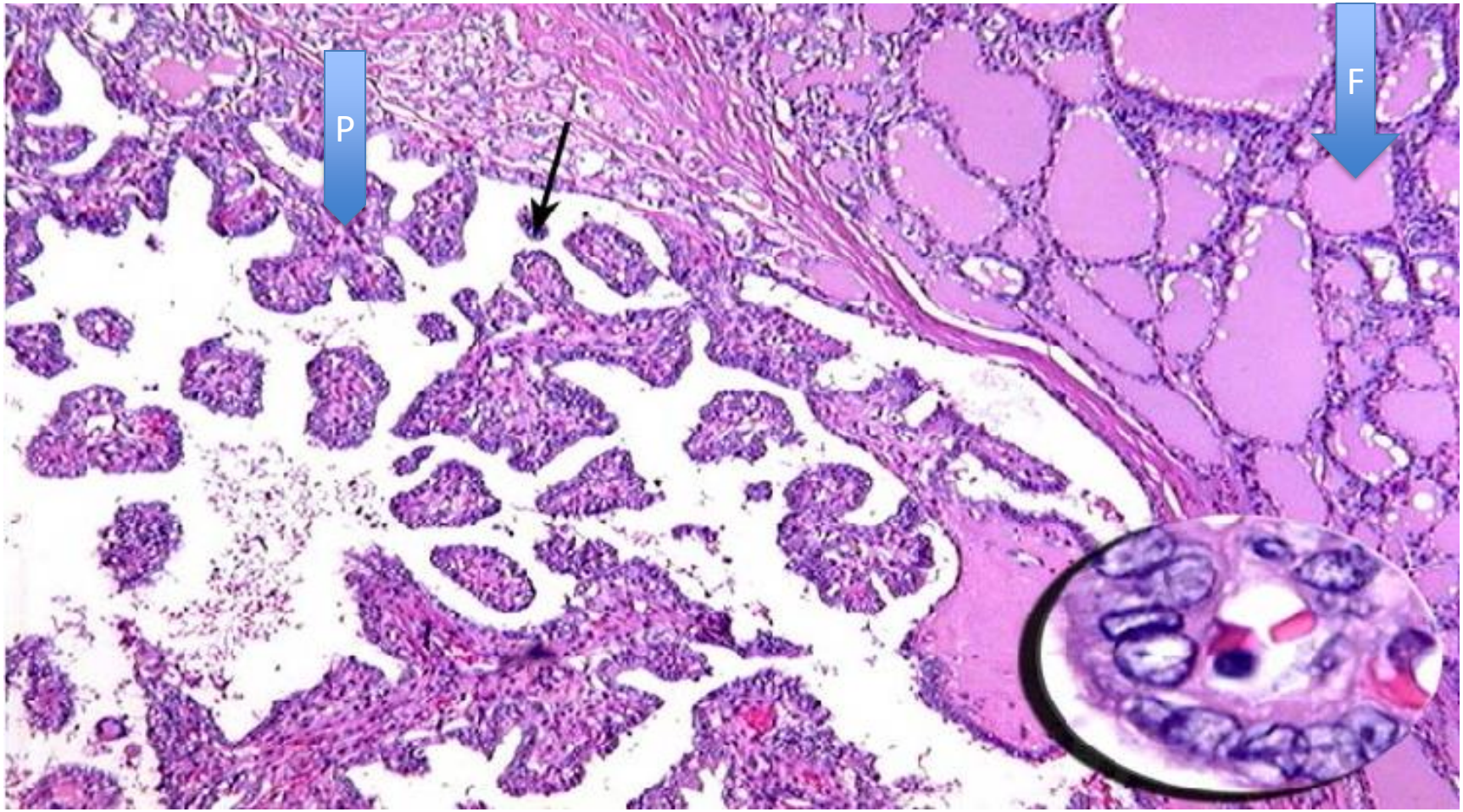
Gross: Either solitary or multifocal lesions

- Some are well circumscribed and even encapsulated; others infiltrate the adjacent parenchyma and the definitive diagnosis is made by microscopic examination

Microscopic features of papillary carcinoma

- 1. the presence of papillae.
- 2. nuclear features
- 3. Concentrically calcified structures (psammoma bodies)

Papillae (P). Note the difference from the normal follicles (F)

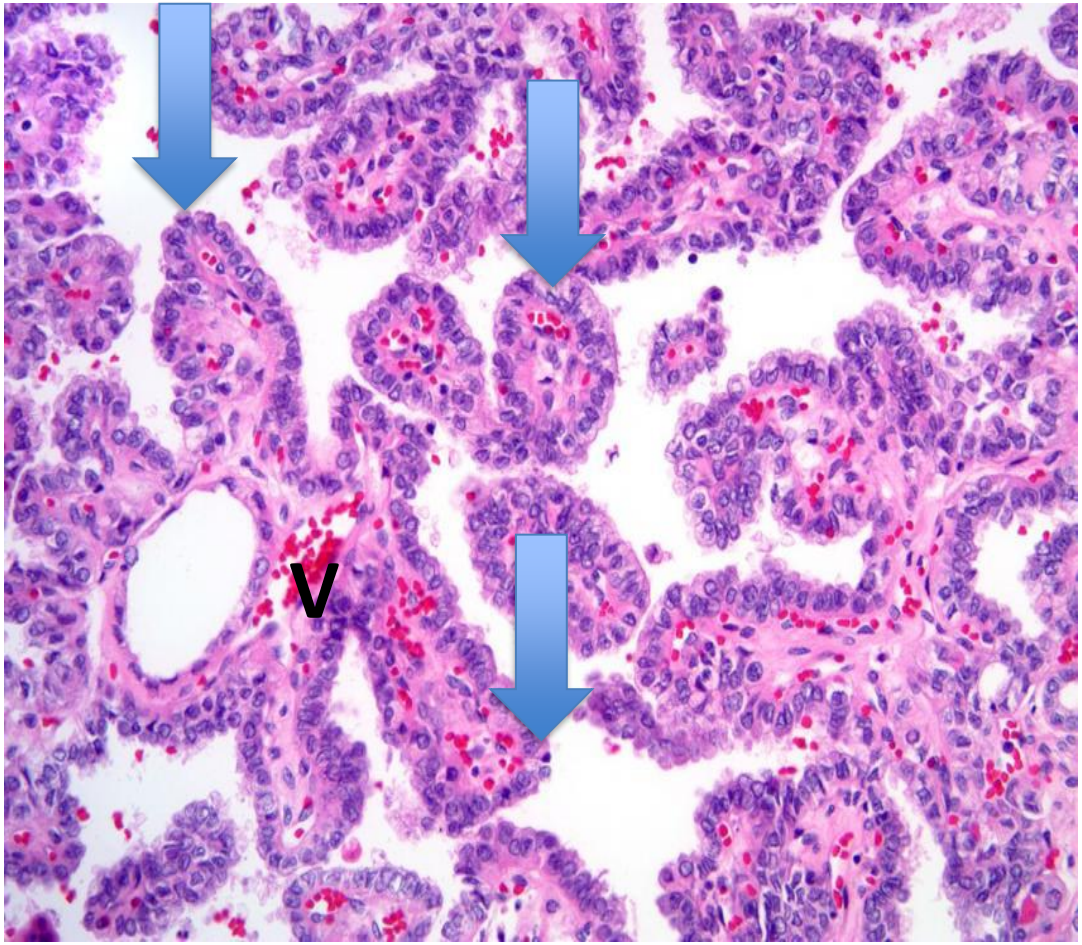


Papillae

-Papillae (arrows) are finger-like projections covered by epithelial cells (the blue dots around the papillae).

-The papillae have fibro-vascular cores (central region which is fibrous and contains blood vessels (V))

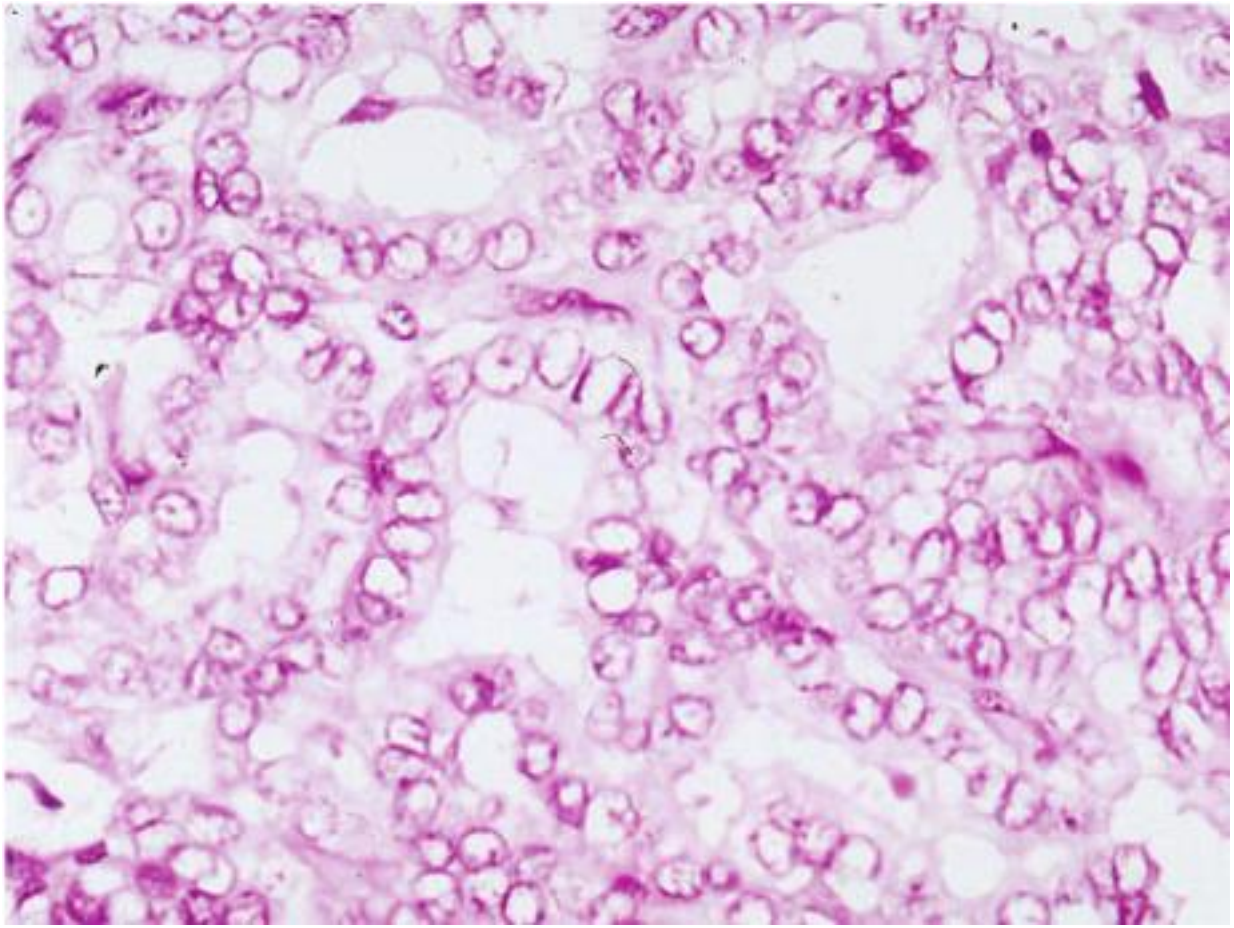
Note: all the red dots in the pic are red blood cells within the vessels.



Nuclear features

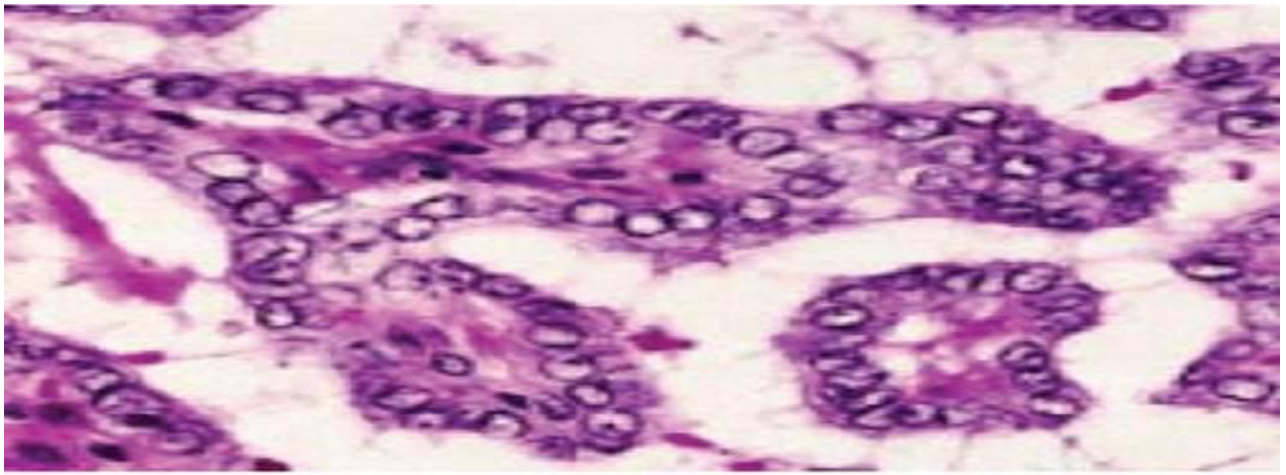
1. optically clear nuclei, or "Orphan Annie eye" nuclei , seen on histological but not cytological preparations (formalin artefact)
2. Have invaginations of the cytoplasm to the nucleus (pseudoinclusions)
3. Grooves within nuclei: so the nucleus looks like a coffee bean.

Clear nuclei: note the nuclei are white.

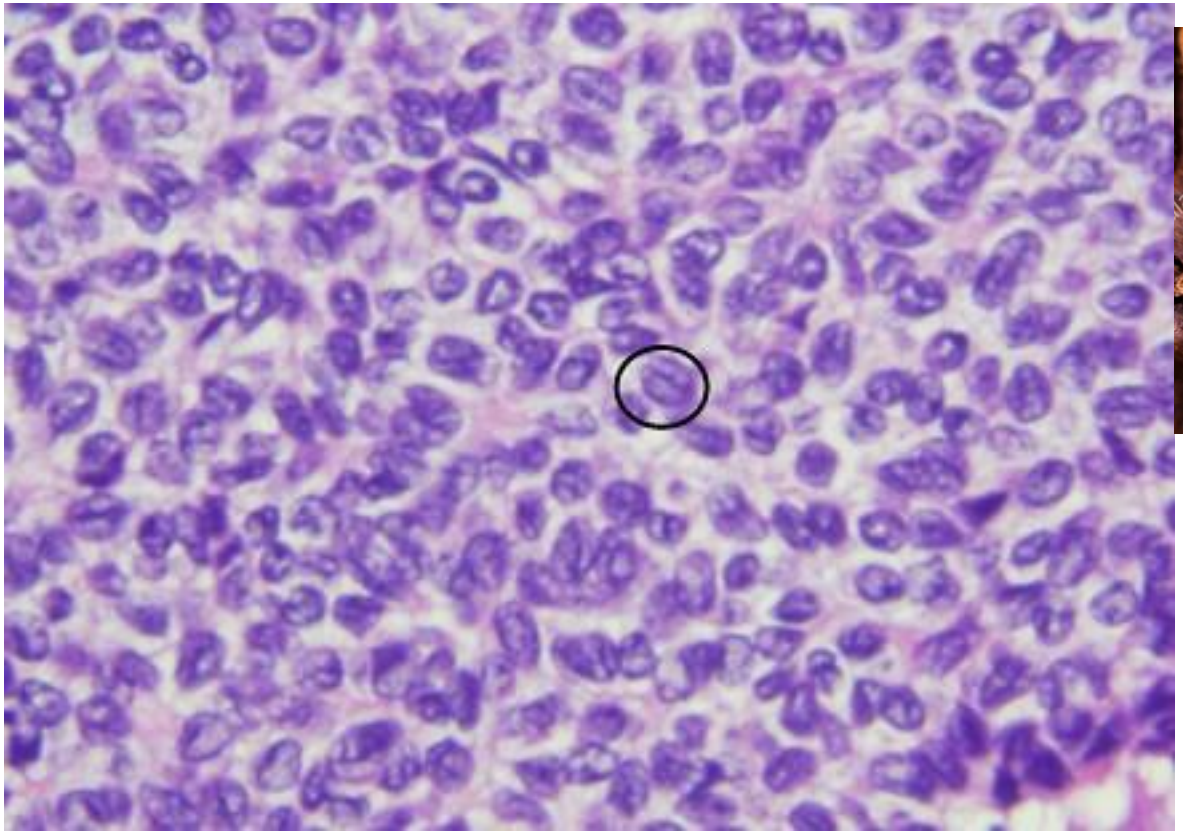


Orphan Annie eye! Because the nuclei are white and empty like Annie's character eyes!!

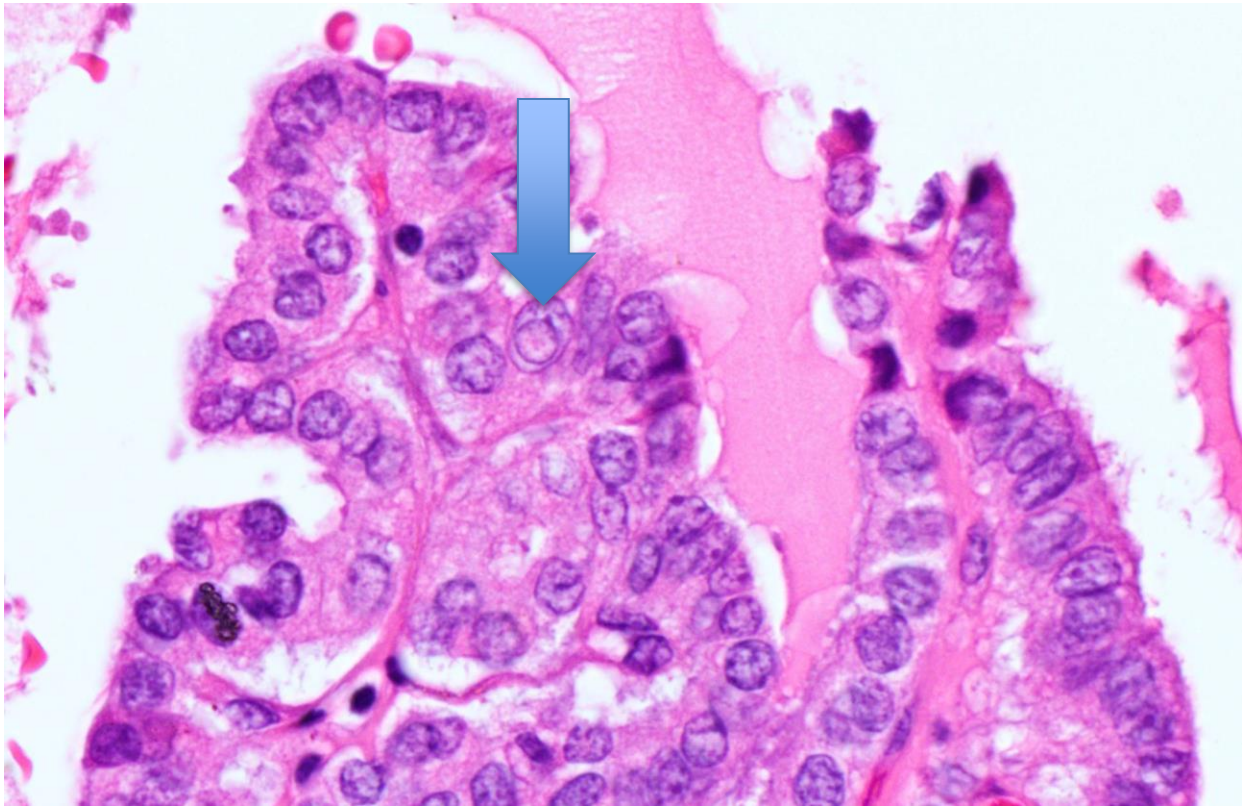
I know what you're thinking: pathological terms are funny.. You’re right



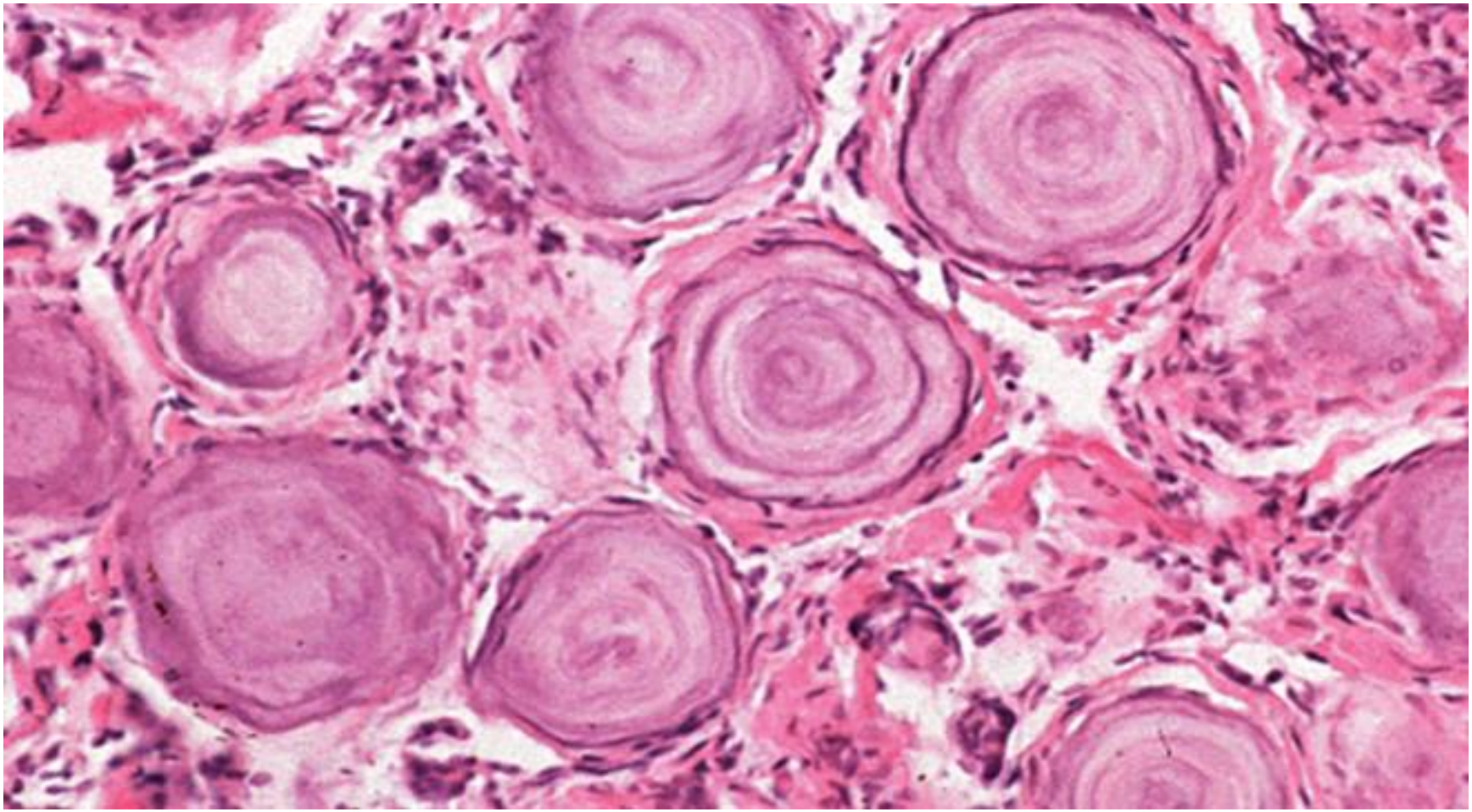
Nuclear grooves= coffee bean nuclei



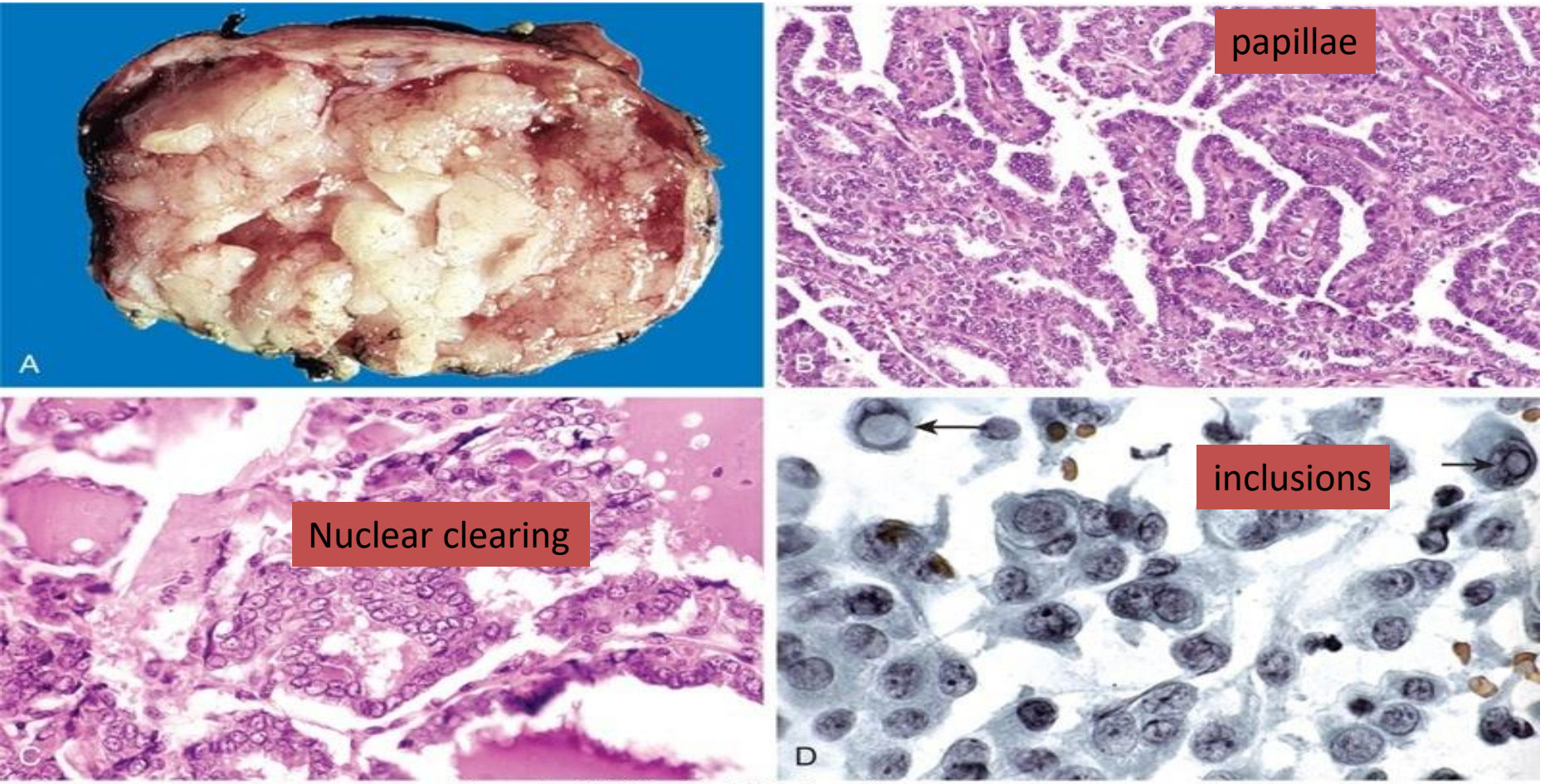
Nuclear inclusions



Psammoma bodies



Papillary carcinoma



Clinical Features of papillary carcinomas

a. Are nonfunctional tumors manifest as painless masses in the neck, either within the thyroid or as metastasis in a cervical lymph node

b. Are indolent lesions, with 10-year survival rates of 95%.

c. The presence of isolated cervical nodal metastases does not have influence on good prognosis of these lesions.

d. In a minority of patients, hematogenous metastases are present at the time of diagnosis, most commonly to lung.

Genetic factors related to papillary carcinoma

- Mainly 2 genes are involved:
- 1. BRAF amplification.
- 2. RET gene rearrangment resulting in a novel protein kinase.

Follicular Carcinoma :

-- More common in women and in areas with dietary iodine deficiency .

- The peak incidence between the ages of 40 and 60 years

On microscopic examination,

- Are composed of fairly uniform cells forming small follicles,
- In other cases, follicular differentiation is less apparent
- It may be

a. widely invasive, infiltrating the thyroid parenchyma and extrathyroidal soft tissues, or

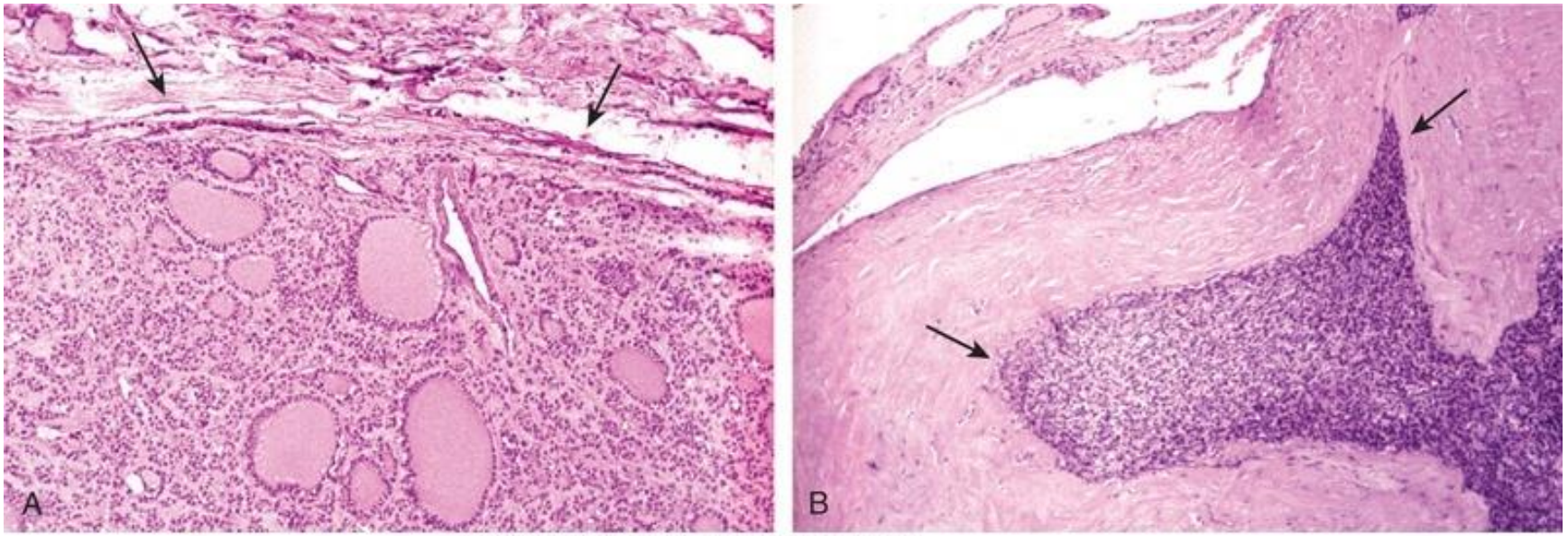
b. Minimally invasive that may be impossible to distinguish from follicular adenomas on gross examination and the .

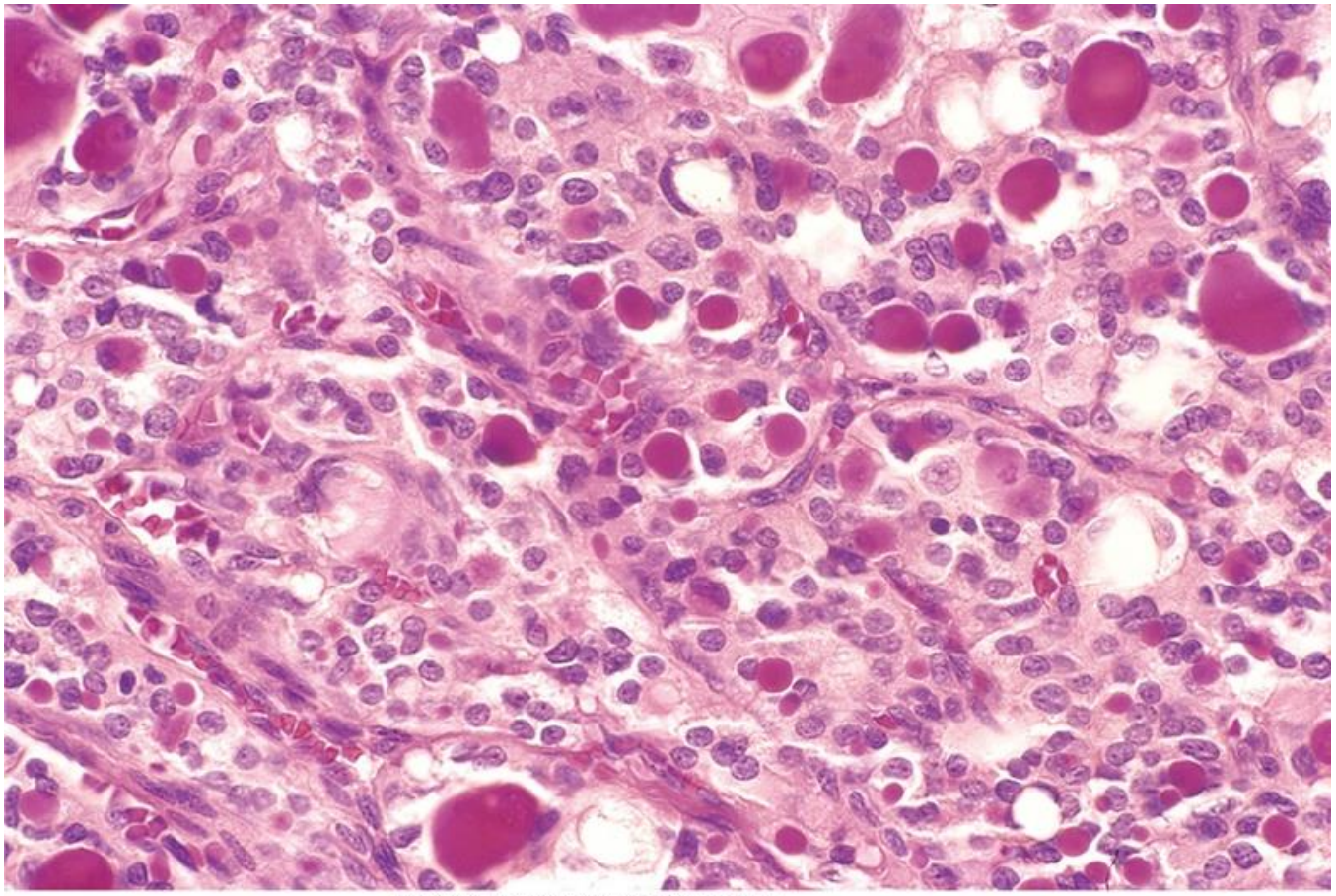
- requires extensive histologic sampling to exclude capsular and/or vascular invasion

Clinical Features

- Manifest most frequently as solitary *cold thyroid nodules.*
- Tend to metastasize through the bloodstream (*hematogenous dissemination*) to lungs, bone, and liver.
- Regional nodal metastases are uncommon .
- As many as half of patients with widely invasive carcinomas succumb to their disease within 10 years, while less than 10% of patients with minimally invasive follicular carcinomas die within the same time span.

Follicular carcinoma





GENETIC FACTORS

Follicular thyroid carcinomas:

a. Gain-of-function point mutations of *RAS* and *PIK3CA*,

b. Loss-of-function mutations of *PTEN*, a suppressor gene

c. A unique (2;3) translocation presents in one third to one half of follicular carcinomas which creates a **fusion gene composed of portions of *PAX8*, a gene that is important in thyroid development, and the peroxisome proliferator-activated receptor gene (*PPARG*), whose product is a nuclear receptor implicated in cell differentiation**

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3. Anaplastic Carcinoma

- Are undifferentiated tumors of the thyroid epithelium,
- The mean age of 65 years.
- They are aggressive, with a mortality rate of 100%.
- Approximately a quarter of patients have a past history a well-differentiated carcinoma, and a 1/4th harbor a well-differentiated tumor in the resected specimen.
- Metastases to distant sites are common, but **death occurs in less than 1 year as a result of aggressive local growth which compromise of vital structures in the neck.**

GENETIC FACTORS

Anaplastic carcinomas:

Inactivation of *TP53*, restricted to anaplastic carcinomas and may also relate to their aggressive behavior

4. Medullary Carcinoma

- neuroendocrine neoplasms.
- Secrete calcitonin, the measurement of which plays an important role in the diagnosis and postoperative follow-up evaluation of patients.
- In some cases, the tumor cells elaborate somatostatin, serotonin, and vasoactive intestinal peptide (VIP)

- Are sporadic in about 70% of cases and the remaining 30% are *familial* cases
- Familial cases:

a. Occurring in the setting of MEN syndrome 2A or 2B,

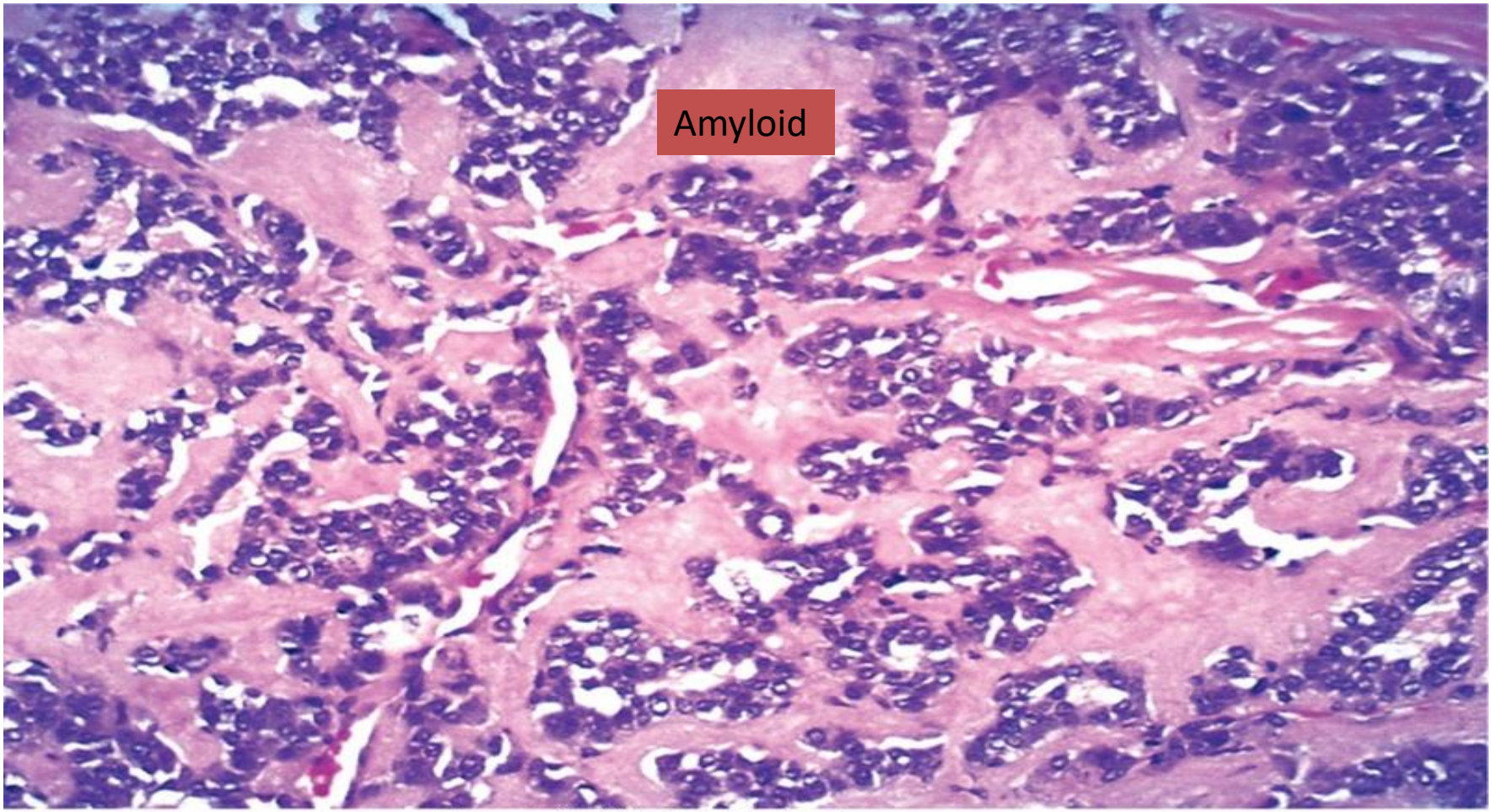
b. or familial medullary thyroid carcinoma without an associated MEN syndrome

Note: Both familial and sporadic forms demonstrate activating *RET* mutations.

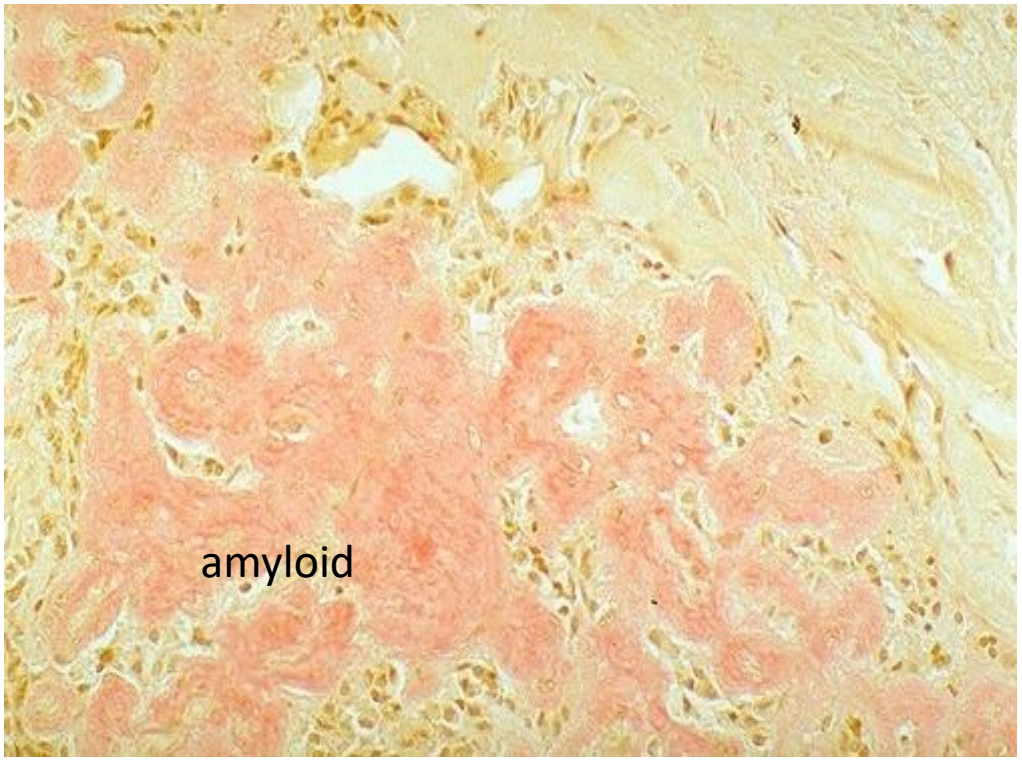
- Because medullary carcinoma secrete calcitonin; this calcitonin can accumulate and form amyloid protein.

- Amyloid: is several, chemically different proteins that share similar physical characteristics.. They can accumulate and form pink material called amyloid.. See next pic.

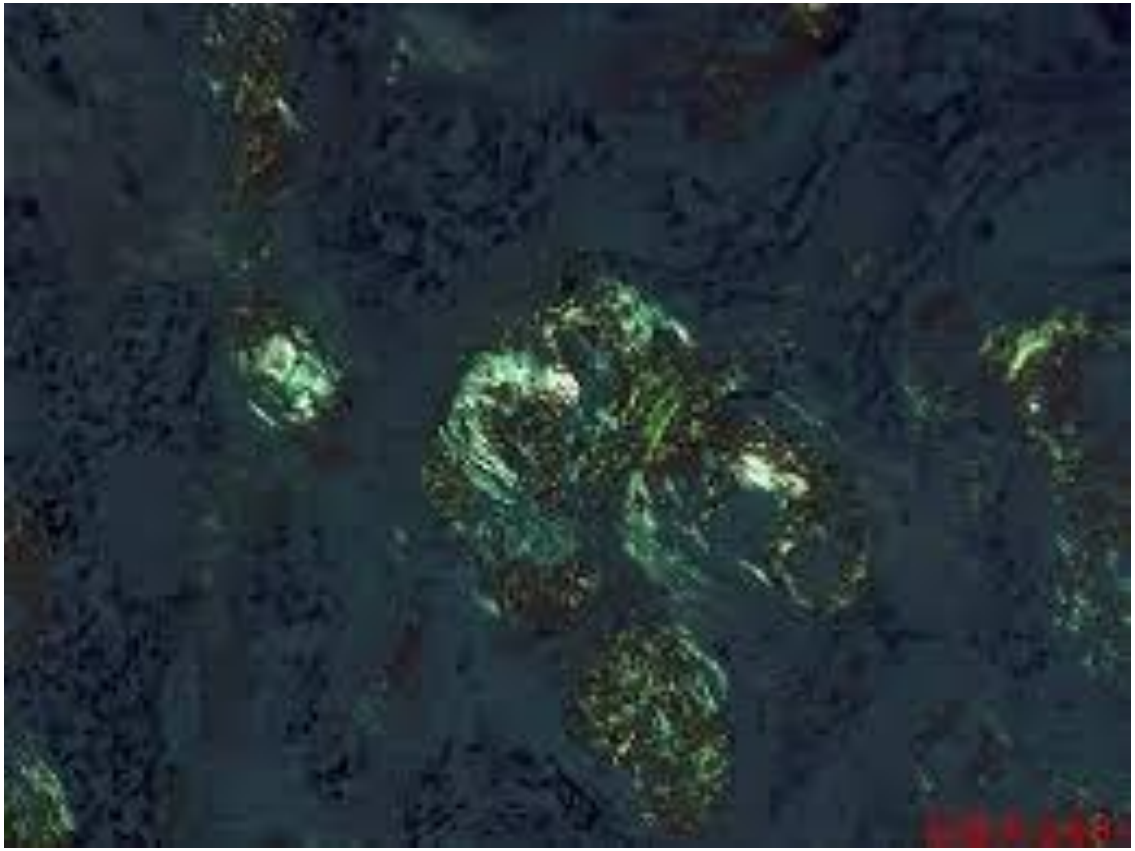
Medullary carcinoma



Amyloid stains with Congo red stain



With polarized light, amyloid gives this apple green color when stained with congo red




Thank you!