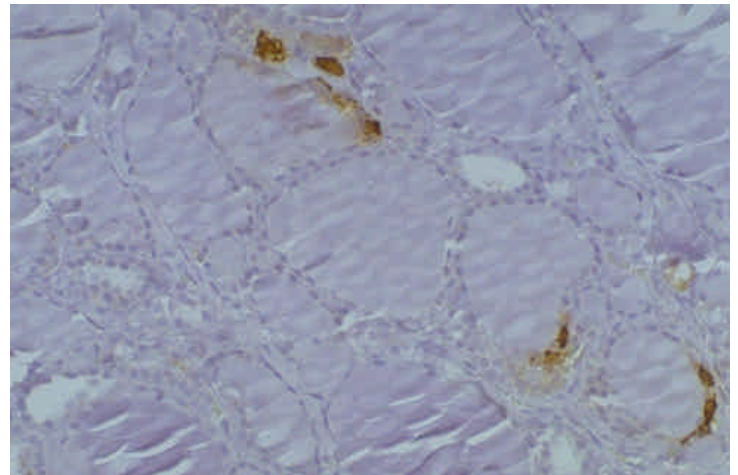
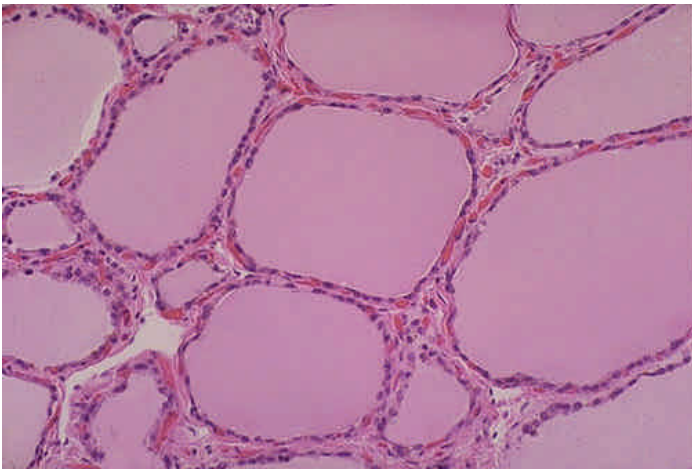


Thyroid Cancer:

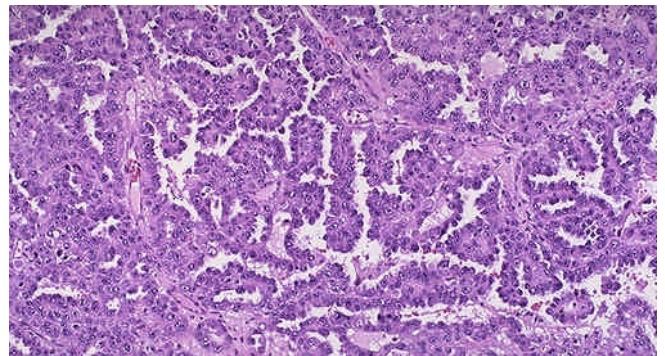
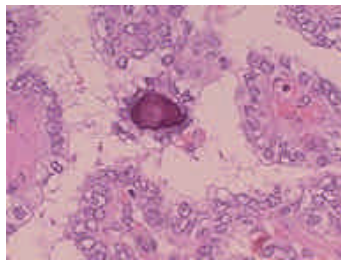


Normal thyroid consisting of follicles line by an epithelium filled with colloid with small variation in size. Interstitium containing neuroendocrine "C" cells identified by immunoperoxidase stain on the right. These cells secrete calcitonin.

Papillary Carcinoma:

Most common thyroid cancers at 75%; best prognosis with 5% mortality at 20 yrs if no evidence of local invasion.

Look for history of radiation, familial papillary carcinoma, Cowden syndrome, or familial adenomatous polyposis coli.



Can be multifocal with propensity to invade lymphatics within thyroid (found 30% at time of diagnosis) and lymph node metastases are common. These tumors most often arise in middle-aged females.

Microscopically papillary carcinoma consists of single layers of thyroid cells arranged in avascular projections (with fibrovascular cores) with large pale nuclei (high N:C ratio, mitotic figures, ground glass "orphan annie" appearance), intranuclear inclusion bodies and anaplastic features.

Psammoma bodies are laminated calcified spheres which are a diagnostic feature. Papillary carcinoma can be purely papillary or mixed with follicular carcinoma, both treated with similar therapies.

Histological variants including tall cell, columnar cell, and diffuse sclerosing types are associated with high risk of occurrence. This lesion is usually unencapsulated, slow growing with intraglandular metastasis and local lymph node extension.

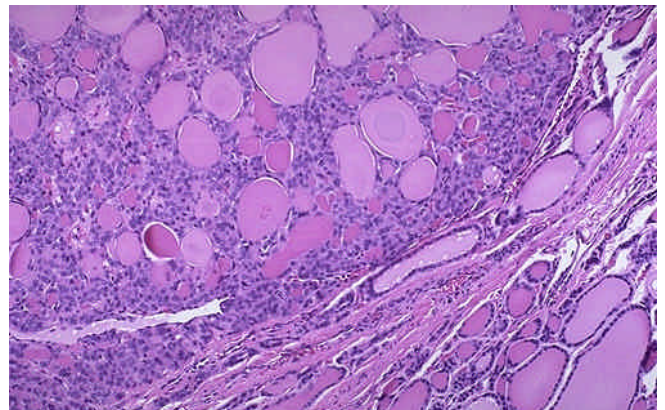
Treatment:

- Retain ability to synthesize thyroglobulin and concentrate iodine early, radiotherapy is effective.
- Partial thyroidectomy or total thyroidectomy with modified neck dissection; > 1 cm, multicentric or invasive for latter

Postsurgical:

With total thyroidectomy – radioiodine for 2-4 months to ablate the thyroid bed. Then follow with thyroglobulin levels as marker for activity. I-131 has risk potential for future malignant growth.

Follicular:



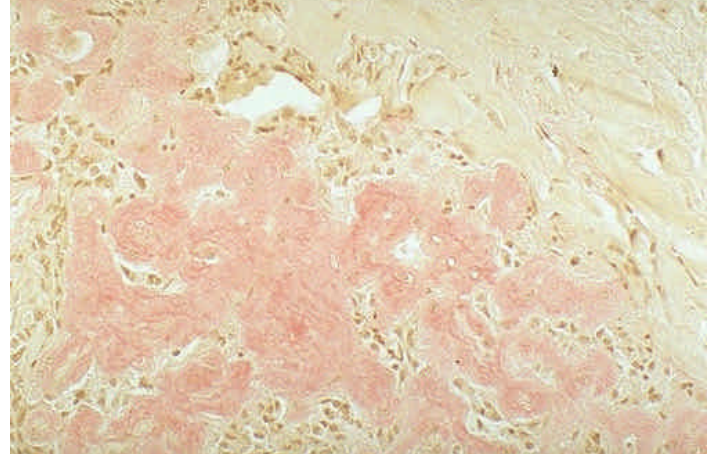
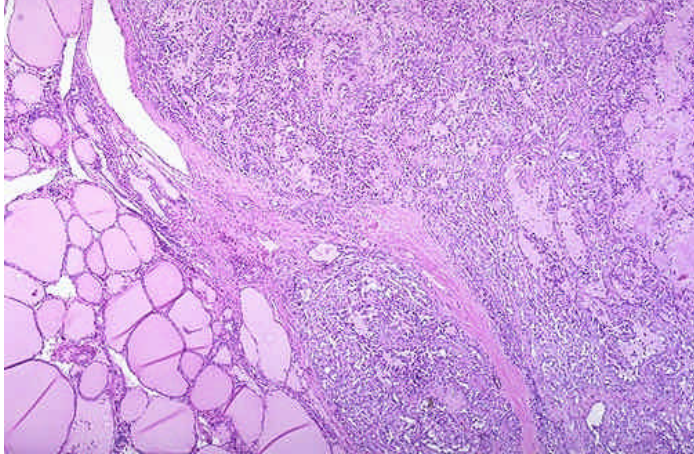
Second most common thyroid cancer at 16%. Grossly, masses are generally well circumscribed, with slightly darker thyroid parenchyma and cold on scintigraphy.

Microscopically, small follicles are formed that contain small cuboidal cells with poor colloid formation. The distinction between carcinoma or adenoma is the presence of capsular or vascular invasion. This cannot be discerned on FNA so operative frozen is necessary.

Follicular carcinoma can concentrate iodine so is responsive to I-131 ablation. This disease is slightly more aggressive than papillary and may spread to local lymph nodes or the bone or lung.

Treatment and prognosis is similar to that of papillary disease.

Medullary Carcinoma:



This represents 5% of thyroid cancers; this neuroendocrine disease involves the parafollicular or C cells. These tumors can secrete calcitonin, histaminase, prostaglandins, serotonin and other peptides. These usually demonstrate local extension into the lymph nodes, surrounding muscle and trachea. It can also spread through blood to lungs and viscera.

Microscopically, sheets of cells with abundant, interspersed amyloid that stains with Congo red.

1/3 are sporadic, 1/3 associated with MEN2 and 1/3 are familial with no other associated endocrinologies.

This disease is more aggressive than papillary or follicular.

MEN2b have most aggressive

MEN2a are least aggressive

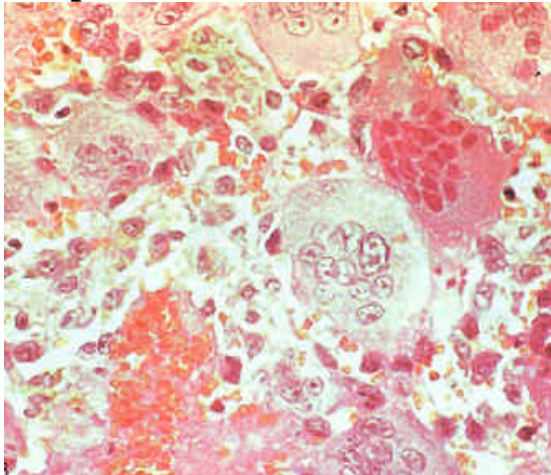
1) medullary carcinoma 2) pheochromocytoma 3) hyperparathyroidism 1) medullary carcinoma, 2) pheochromocytoma 3) mult. mucosal neuromas

Treatment: Total thyroidectomy with regional lymph node dissection; no role of I-131 therapy or chemotherapy;

Patients are monitored by physical exam, calcitonin, CEA and TSH every 6 months for recurrence.

Family members should be screened for RET proto-oncogene associated with MEN2a and MEN2b.

Anaplastic Carcinoma:



1% of all Thyroid cancers; Histologically includes small cell, giant cell and spindle cell carcinomas.

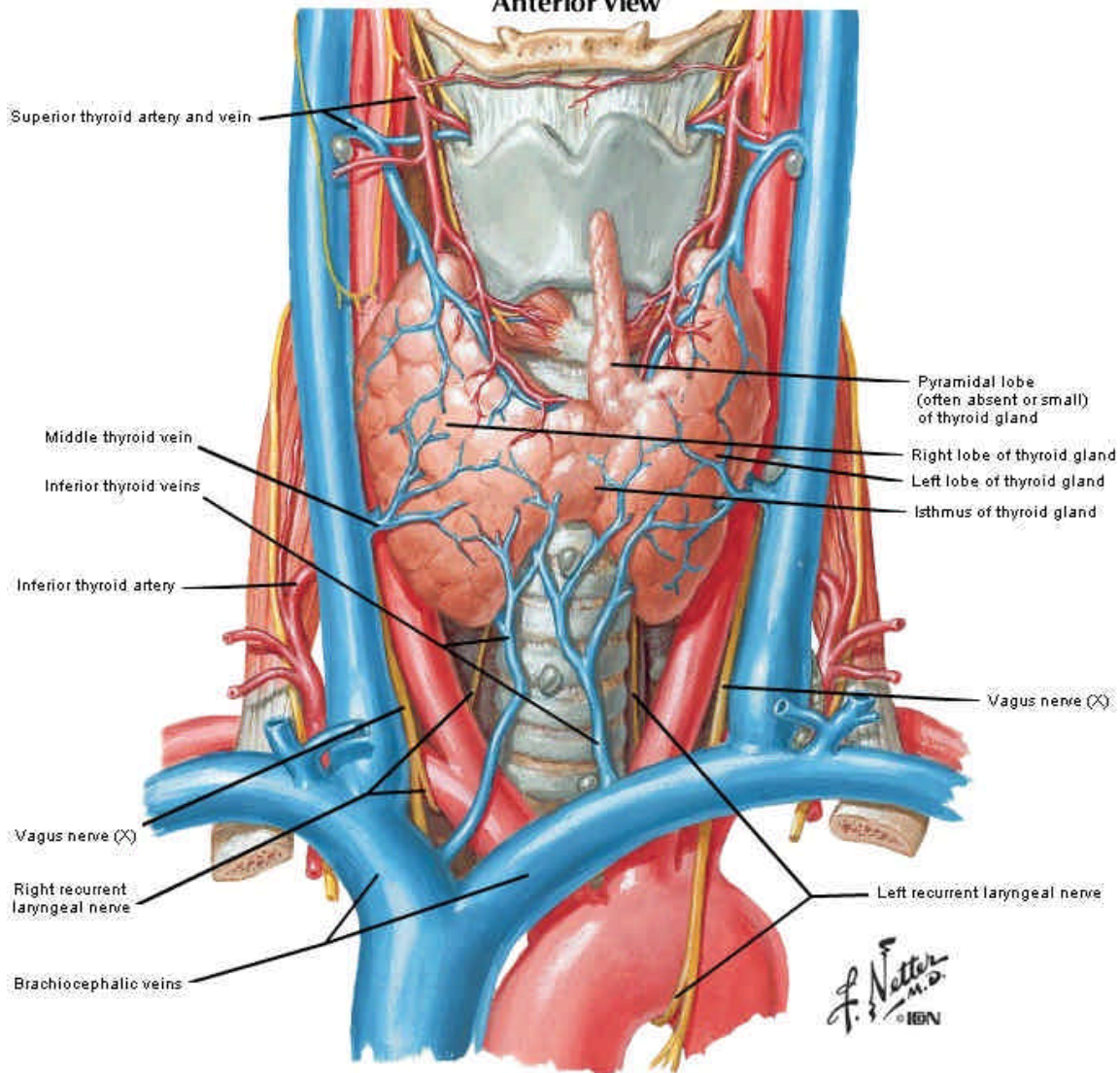
This is the most aggressive form and rapidly expands by local extension.

This results in death in 6-36 months.

Typical presentation is an elderly person with long standing goiter with sudden rapid expansion of the gland and compressive symptoms or vocal cord paralysis.

Treatment: This is resistant to all treatment modalities. Treatment is palliative and includes isthmectomy to prevent tracheal compression plus XRT and suppressive levothyroxine therapy.

Thyroid Gland Anterior View



The **thyroid gland** produces a hormone thyroxin, stored in the follicles, and released accordingly to control the metabolic rate of the body. This gland is composed of two lateral lobes which is connected midline by the isthmus. A pyramidal lobe is present approximately 50% of the time, usually noted on the left side.

The thyroid gland is attached to the trachea by Berry's ligament.

The blood supply of this endocrine organ is rich. The thyroid arteries include the:

superior thyroid artery, which is usually the first branch of the external carotid artery, and the **inferior thyroid artery**, a branch of the thyrocervical trunk of the subclavian artery. This artery is unique in that it travels independently of venous structures. This artery ascends along the medial border of the anterior scalene muscle behind the carotid sheath and sympathetic trunk.

The **thyroidea ima artery** is present around 4-10% of the time, and ascends from the brachiocephalic artery or directly from the aorta. It ascends along the ventral surface of the trachea.

The venous return consists of the superior, middle and inferior thyroid veins.

The superior thyroid vein crosses the common carotid artery to empty into the internal jugular vein, and is the only thyroid vein to accompany an artery.

The middle thyroid vein also crosses the common carotid to empty into the internal jugular.

The inferior thyroid vein descend along the trachea to empty into the brachiocephalic veins.

The recurrent laryngeal nerves, with esophageal, tracheal, cardiac, pharyngeal branches in addition to giving off the inferior laryngeal nerve both arise from the vagal nerves before their ascent into the larynx.

The **right recurrent laryngeal nerve** loops inferiorly around the subclavian artery to ascend between the trachea and esophagus.

The **left recurrent laryngeal nerve** loops inferiorly around the aorta, and ascends, maintaining a course more closely related to the trachea.

The values for **T** are:

TX: Primary tumor cannot be assessed

T0: No evidence of primary tumor

T1: The tumor is 2 cm (slightly less than an inch) or smaller

T2: Tumor is between 2 cm and 4 cm (slightly less than 2 inches)

T3: Tumor is larger than 4 cm or has begun to grow into nearby tissues outside the thyroid

T4a: Tumor of any size and has grown extensively beyond the thyroid gland into nearby tissues of the neck

T4b: Tumor has grown either back toward the spine or into nearby large blood vessels

The values for **N** are:

NX: Regional (nearby) lymph nodes cannot be assessed

N0: No regional lymph node spread

N1: Spread to lymph nodes

N1a: Spread to lymph nodes in the neck (cervical lymph nodes)

N1b: Spread to lymph nodes in the upper chest (upper mediastinal lymph nodes)

The **M** values are:

MX: Presence of distant metastasis (spread) cannot be assessed

M0: No distant metastasis

M1: Distant metastasis is present, involving nonregional lymph nodes, internal organs, bones, etc.

Patients Younger than 45 Years

Stage I: Any T, any N, M0: The cancer can be any size and may or may not have spread to lymph nodes. It has not spread to distant sites.

Stage II: Any T, any N, M1: The cancer can be any size and may or may not have spread to lymph nodes. It has spread to distant sites.

Patients 45 Years and Older

Stage I: T1, N0, M0: The cancer is less than 2 cm and has not spread to lymph nodes or distant sites.

Stage II: T2, N0, M0: The cancer is 2 to 4 cm and has not spread to lymph nodes or distant sites.

Stage III: T1-3, N0-N1a, M0: The cancer is larger than 4 cm or has grown slightly outside the thyroid and has not spread to lymph nodes or distant sites; or it is any size and has spread to local neck nodes but not to distant sites.

Stage IVA: T1-4a, N0-1b, M0: Tumor of any size and has grown beyond the thyroid gland to invade nearby tissues of the neck and may or may not have spread to local lymph nodes but not to distant sites; or it is any size and has spread to lymph nodes in the upper chest (upper mediastinal lymph nodes) but not to distant sites.

Stage IVB: T4b, Any N, M0: Tumor has grown either back to the spine or into nearby large blood vessels, may or may not have spread to lymph nodes, but has not spread to distant sites.

Stage IVC: Any T, any N, M1: Tumor is any size and may or may not have spread to lymph nodes, but it has spread to distant sites.

Stage Grouping for Medullary Thyroid Carcinoma

Stage grouping for medullary thyroid carcinoma in people of any age is the same as for papillary or follicular carcinoma in people older than age 45.

Stage Grouping for Anaplastic/Undifferentiated Thyroid Carcinoma

All anaplastic thyroid cancers are considered as stage IV, reflecting the poor prognosis of this type of cancer.

Thyroid Cancer Survival by Stage (From AJCC 6th Ed)

Papillary:

Stage	5-year relative survival rate
I	100%
II	100%
III	96%
IV	45%

Medullary:

Stage	5-year relative survival rate
I	100%
II	97%
III	78%
IV	24%

Follicular:

Stage	5-year relative survival rate
I	100%
II	100%
III	79%
IV	47%

Anaplastic: The 5-year relative survival for stage IV anaplastic (or undifferentiated) carcinoma is around 9%.