Schecter Conference

Hypo/Hyperthyroid, Thyroiditis, Thyroid nodules, Thyroid CA

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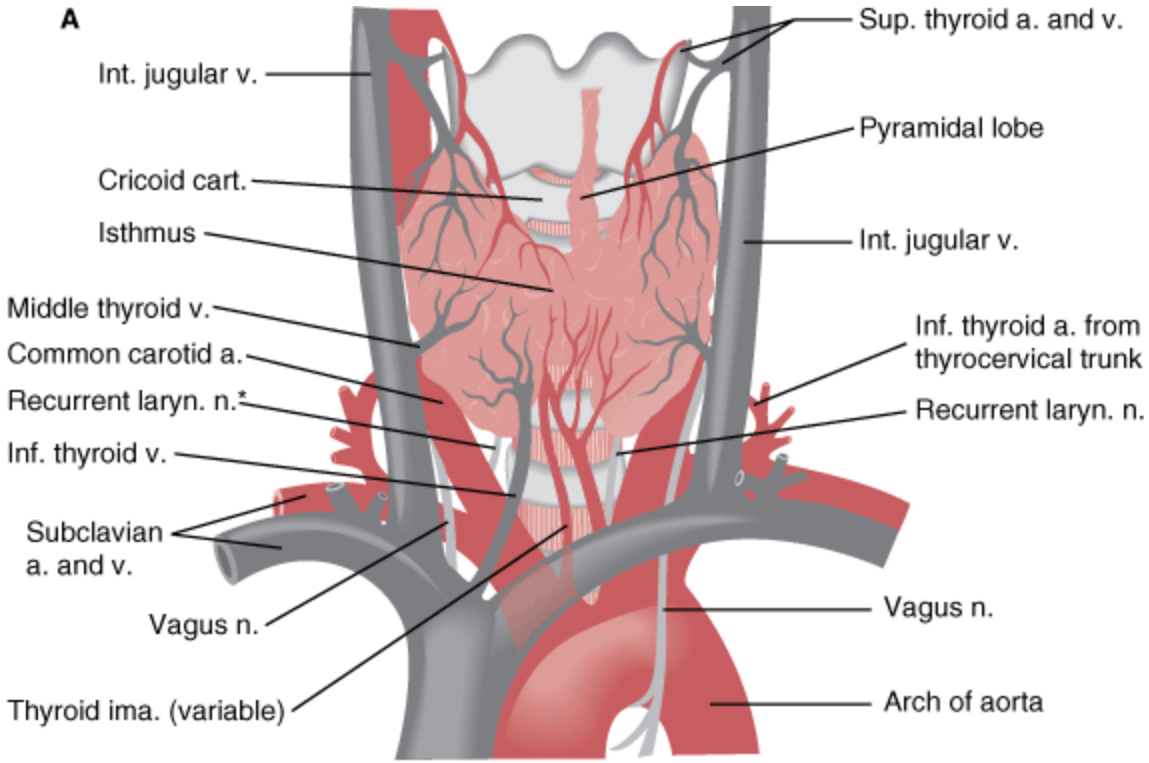
Thyroid Embyrology and Anatomy

- Develops as a median endodermal downgrowth from the first and second pharyngeal pouches, migrates caudally, then contacts the ultimobranchial bodies developing from the fourth pharyngeal pouches
- When it reaches the position it occupies in the adult, with the isthmus situated just below the cricoid cartilage, the thyroid divides into two lobes
- The path the gland follows may result in thyroglossal remnants (cysts) or ectopic thyroid tissue (lingual thyroid).
- A pyramidal lobe is frequently present.
- Agenesis of one thyroid lobe, almost always the left, may occur.
- The normal thyroid weighs 15–25 g and is attached to the trachea by loose connective tissue.
- highly vascularized organ, blood supply principally from the superior and inferior thyroid arteries. Also possible thyroid ima artery.



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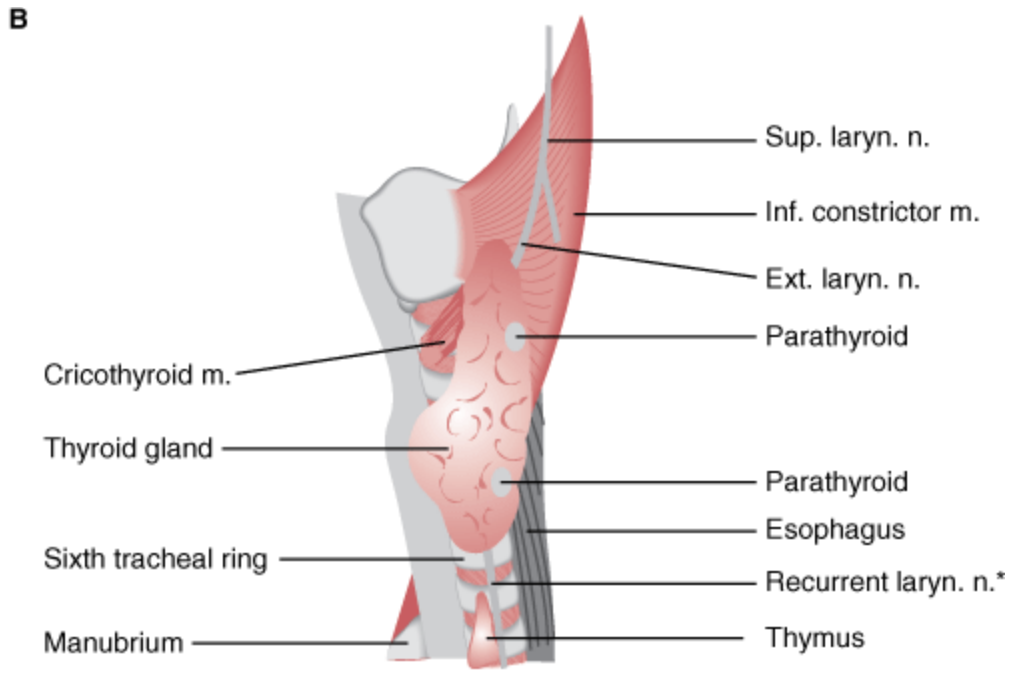
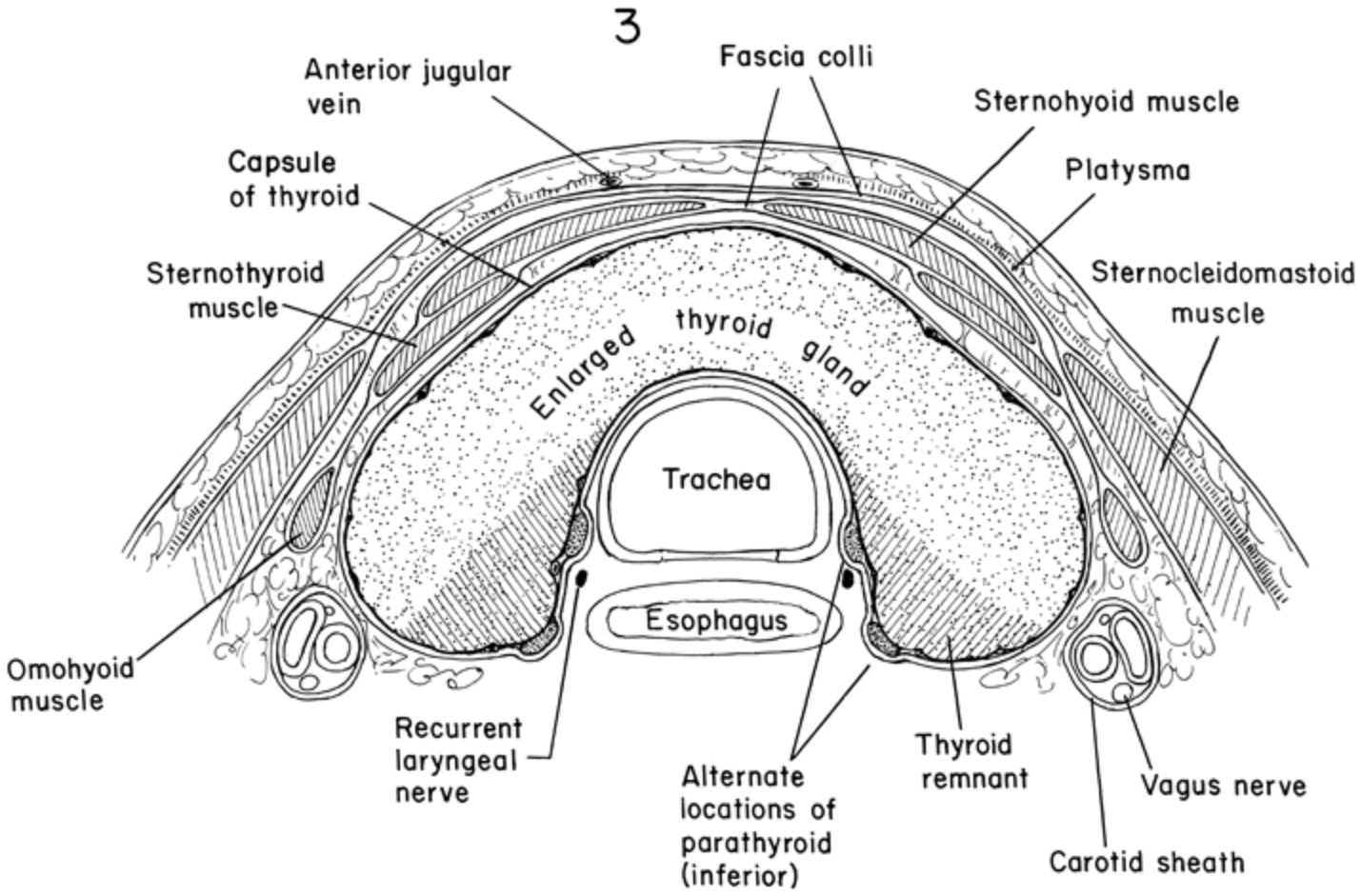


The recurrent laryngeal nerve runs in the tracheoesophageal groove on the left and has a slightly more oblique course on the right before it enters the larynx just posterior to the cricothyroid muscle at the level of the cricoid cartilage.



Zollinger RM Jr, Zollinger RM Sr: *Zollinger's Atlas of Surgical Operations*, 8th Edition: http://www.accesssurgery.com

Physiology

- function -> to synthesize, store, and secrete the thyroid hormones (TH): thyroxine (T4) and triiodothyronine (T3)

- Iodide is absorbed from the GI tract, actively trapped by the acinar cells of the thyroid, then oxidized and combined with tyrosine in thyroglobulin to form monoiodotyrosine (MIT) and diiodotyrosine (DIT)

-MIT and DIT are coupled to form the active hormones T4 and T3, initially stored in the colloid of the gland

-Following hydrolysis of the thyroglobulin, T4 and T3 are secreted into the plasma, becoming almost instantaneously bound to plasma proteins

- T3 in euthyroid individuals, however, is produced by extrathyroidal conversion of T4 to T3.

Thyroid function regulation

- Thyroid function is regulated by a feedback mechanism via the hypothalamus and pituitary
- Thyrotropin-releasing factor (TRF) formed in hypothalamus → stimulates release of TSH (thyroid-stimulating hormone) from the pituitary → TSH binds to TSH receptors on the thyroid → stimulates release of TH (T3/T4) / thyroid cellular function
- TH suppresses TSH and TRF
- TSH suppresses TRF
- TSH also stimulates thyroid growth

Evaluation of the Thyroid

- Patient with goiter (enlargement of the thyroid)
  - history (local and systemic systems and family history)
  - examination of the gland
  - selective use of thyroid function tests
  - Use a systematic method of palpating the gland to determine:
    - size, contour, consistency, nodularity, and fixation and to examine for displacement of the trachea and palpable cervical lymph nodes.
    - thyroid gland moves cephalad with deglutition, whereas adjacent lymph nodes do not. The isthmus of the thyroid gland is situated immediately caudal to the cricoid cartilage

Lab tests

- Thyroid function
  - assessed by highly sensitive TSH assays: hypothyroidism (increased TSH levels), euthyroidism, and hyperthyroidism (decreased TSH levels)
  - Hence most of the time, serum T3, T4, and other variables need not be measure
  - free T4 level is helpful after treatment for Graves disease because the TSH level may remain suppressed despite the patient being euthyroid
  - A serum T3 level is useful for diagnosing T3 toxicosis (high T3 and low TSH), or the euthyroid sick, low T3 syndrome (low T3 and normal or slightly increased TSH)

- Radioactive iodine (RAI) uptake
  - useful for differentiating between hyperthyroidism and increased secretion of thyroid hormone (low TSH and increased radioactive iodine uptake) vs subacute thyroiditis (low TSH and low radioactive iodine uptake)
  - Patients with the latter "leak" thyroid hormone from the gland, which suppresses serum TSH levels and, consequently, iodine uptake by the thyroid
  - Patients with Graves disease have increased levels of thyroid-stimulating immunoglobulins that increase iodine uptake despite low TSH levels.

Hyperthyroidism (Thyrotoxicosis)

Essentials of Diagnosis:

- Nervousness, weight loss with increased appetite, heat intolerance, increased sweating, muscular weakness and fatigue, increased bowel frequency, polyuria, menstrual irregularities, infertility
- Goiter, tachycardia, atrial fibrillation, warm moist skin, thyroid thrill and bruit, cardiac flow murmur; gynecomastia
- Eye signs: stare, lid lag, exophthalmos
- TSH low or absent; TSI, iodine uptake, T3, and T4 increased; T3 suppression test abnormal (failure to suppress radioiodine uptake)

Hyperthyroidism

Causes:

- increased secretion of thyroid hormone (**Graves disease, Plummer disease,** iodine-induced**,** amiodarone toxicity, TSH-secreting pituitary tumors, human chorionic gonadotropin [hCG]-secreting tumors)
- other disorders that increase TH without increasing thyroid gland secretion (factitious hyperthyroidism, subacute thyroiditis, struma ovarii, and, rarely, metastatic thyroid cancers that secrete excess thyroid hormone)
- most common causes -> diffusely hypersecretory goiter (Graves disease) and nodular toxic goiter (Plummer disease)

Hyperthyroidism

- Sx are due to increased levels of thyroid hormone
- Clinical manifestations may be subtle or marked, tend to go through periods of exacerbation and remission
- Some patients ultimately develop hypothyroidism spontaneously (about 15%) or as a result of treatment

- Graves disease: autoimmune disease—often with a familial predisposition
- Etiology of Plummer disease is unknown

- T3 toxicosis - normal T4, normal or elevated radioiodine uptake, normal protein binding but with increased serum T3
- T4 pseudothyrotoxicosis - occasionally seen in critically ill patients - increased levels of T4 and decreased levels of T3 due to failure to convert T4 to T3
- Thyrotoxicosis associated with toxic nodular goiter is usually less severe than that associated with Graves disease and is only rarely if ever associated with the extrathyroidal manifestations of Graves disease such as exophthalmos, pretibial myxedema, thyroid acropathy, or periodic hypocalcemic paralysis

- If left untreated, thyrotoxicosis causes progressive and profound catabolic disturbances and cardiac damage
- Death may occur in thyroid storm or because of heart failure or severe cachexia

Hyperthyroidism
SYMPTOMS AND SIGNS

- classic findings: nervousness, increased diaphoresis, heat intolerance, tachycardia, palpitations, fatigue, and weight loss in association with a nodular, multinodular, or diffuse goiter; pt may have a flushed and staring appearance, the skin is warm, thin, and moist, and the hair is fine.

- Graves: may be exophthalmos, pretibial myxedema, or vitiligo, virtually never seen in single or multinodular toxic goiter

- The Achilles reflex time is shortened in hyperthyroidism and prolonged in hypothyroidism

- Patient on the verge of thyroid storm has accentuated symptoms and signs of thyrotoxicosis, with hyperpyrexia, tachycardia, cardiac failure, neuromuscular excitation, delirium, or jaundice

Hyperthyroidism
LABORATORY FINDINGS

- suppressed TSH, elevation of T3, free T4, and radioactive iodine
- Look at meds: certain drugs and organic iodinated compounds affect some thyroid function tests, and iodide excess may result in either hypothyroidism or hyperthyroidism (jodbasedow effect)
- mild disease – labs likely only slightly abnormal
  - two additional tests are helpful
  - T3 suppression test - hyperthyroid patients fail to suppress the thyroidal uptake of radioiodine when given exogenous T3
  - TRH test - serum TSH levels fail to rise in response to administration of TRH in hyperthyroid patients
- Other findings include a high thyroid-stimulating immunoglobulin (TSI) level, low serum cholesterol, lymphocytosis, and occasionally hypercalcemia, hypercalciuria, or glycosuria

Hyperthyroidism
Differential Diagnosis

- Anxiety neurosis, heart disease, anemia, gastrointestinal disease, cirrhosis, tuberculosis, myasthenia and other muscular disorders, menopausal syndrome, pheochromocytoma, primary ophthalmopathy, and thyrotoxicosis factitia

- Anxiety neurosis is most frequently confused with hyperthyroidism; however, the fatigue of hyperthyroidism is often relieved by rest, the palms are warm and moist, tachycardia persists during sleep, and thyroid function tests are abnormal

Hyperthyroidism
Treatment

- Depends, must be individualized
- Includes antithyroid drugs, radioactive iodine, or thyroidectomy

ANTITHYROID DRUGS

- propylthiouracil (PTU) and methimazole; interfere with organic binding of iodine and prevent coupling of iodotyrosines in the thyroid gland
- advantage in treatment of Graves -> inhibits function of gland without destroying tissue; lower incidence of subsequent hypothyroidism

- Usually used in preparation for surgery or radioactive iodine treatment but may be used as definitive treatment

- When propylthiouracil is given as definitive treatment, the goal is to maintain the patient in a euthyroid state until a natural remission occurs
  - Reliable patients with small goiters are good candidates for this regimen. A prolonged remission after 18 months of treatment occurs in 30% of patients, some of whom eventually become hypothyroid.

Hyperthyroidism
Treatment

RADIOIODINE

- Give Radioiodine (131I) after the patient has been treated with antithyroid medications and has become euthyroid
- Indicated for patients > 40, poor surgical candidates, or recurrent disease
- less expensive than surgery and is effective.

- does not increase the risk of leukemia or of congenital anomalies
- does increased incidence of benign thyroid tumors and, rarely, thyroid cancer

- In young patients, the radiation hazard is certainly increased, and the chance of developing hypothyroidism is virtually 100%.
- After the first year of treatment with radioiodine, the incidence of hypothyroidism increases about 3% per year

- NOT for children and pregnant women

SURGERY

- Main advantages are rapid control of disease and a lower incidence of hypothyroidism than can be achieved with radioiodine treatment

- Preferred treatment
  - (1) in the presence of a very large goiter or a multinodular goiter with relatively low radioactive iodine uptake
  - (2) if there is a suspicious or malignant thyroid nodule
  - (3) for patients with ophthalmopathy
  - (4) for the treatment of pregnant patients or children
  - (5) for the treatment of women who wish to become pregnant within 1 year after treatment,
  - (6) for patients with amiodarone-induced hyperthyroidism
  - (7) for the treatment of psychologically or mentally incompetent patients or patients who are for any reason unable to maintain adequate long-term follow-up evaluation.

Preparation for Surgery

- Pre-op: combined use of iodides and antithyroid drugs:
  - Drugs given until euthyroid, up until the time of operation
  - Three drops of potassium iodide solution or Lugol iodine solution given for 10 days before surgery in conjunction with the propylthiouracil to decrease the friability and vascularity of the thyroid → thus technically facilitating thyroidectomy

- Occasional hyperthyroid pt requiring emergency operation for unrelated problems (appy) requires immediate control of the hyperthyroidism
  - **thyroid storm** or hyperthyroid crises may be precipitated by surgical stress or trauma
  - Prevent release of preformed thyroid hormone by administration of Lugol iodine solution or with ipodate sodium
  - give propranolol to antagonize the peripheral manifestations of thyrotoxicosis
  - decrease thyroid hormone production and extrathyroidal conversion of T4 to T3 by giving propylthiouracil
  - The combined use of propranolol and iodide has been demonstrated to lower serum thyroid hormone levels.
  - Also treat precipitating causes (eg, infection, drug reactions); support vital functions by giving oxygen, sedatives, intravenous fluids, and corticosteroids; reduce fever
  - Reserpine may be useful in the patient in whom nervousness is a prominent symptom
  - cooling blanket—not aspirin—should be used in patients requiring an operation

Subtotal Thyroidectomy

- **Rapid**: subtotal, near total, or total thyroidectomy eliminates both the hyperthyroidism and the goiter
- **Safe**: The death rate < 0.1%

- All but about 5 g of thyroid are removed, sparing the parathyroid glands and the recurrent laryngeal nerves
- Injuries to recurrent laryngeal nerves and parathyroid glands < 2%

- Total thyroidectomy is generally indicated for patients with Graves ophthalmopathy.

- recurrent hyperthyroidism and hypothyroidism frequency depends on the amount of thyroid remaining and on the natural history of the hyperthyroidism

EVALUATION OF THYROID NODULES & GOITERS

- Questions:
  - 1) is it causing localized or systemic symptoms
  - 2) is it benign or malignant

- DDx: benign goiter, intrathyroidal cysts, thyroiditis, benign/malignant tumors, metastatic tumors

- History: duration of swelling, recent growth, local symptoms (dysphagia, pain, or voice changes), and systemic symptoms (hyperthyroidism, hypothyroidism, or those from possible tumors metastatic to the thyroid)

- The patient's age, sex, place of birth, family history, and history of radiation to the neck are most important

- Low-dose therapeutic radiation (6.5–2000 cGy) in infancy or childhood is associated with an increased incidence of benign goiter (about 35%) or thyroid cancer (about 13%) in later life

Thyroid Nodules

- More likely to be cancer in a man than in a woman, and in young (under 20 years) and older (over 60 years) patients rather than in others
- Thyroid cancer is familial in about 25% of patients with medullary thyroid cancer (familial medullary thyroid cancer, multiple endocrine neoplasia [MEN] types 2a and 2b) and in about 7% of patients with papillary or Hürthle cell cancer
- Papillary thyroid cancer occurs more often in patients with Cowden syndrome, Gardner syndrome, or Carney syndrome
- A solitary hard thyroid nodule is likely to be malignant, whereas most multinodular goiters are benign
- Ultrasound evaluation helps document the number of nodules, whether a nodule is suspicious for cancer, and whether there are coexistent suspicious lymph nodes.

Diagnostic Tests

- Percutaneous needle biopsy = most cost-effective diagnostic test
- Cytology classified as malignant, benign, indeterminate or suspicious, and inadequate specimen
- Needle biopsy is not as helpful if hx irradiation to the neck or familial thyroid cancer because radiation-induced tumors are often multifocal, and a negative biopsy may therefore be unreliable
- About 40% of these patients will have thyroid cancer
- Radioiodine scanning -> use selectively to determine whether a follicular neoplasm by cytologic examination is functioning (warm or hot) or nonfunctioning (cold)
  - Hot solitary thyroid nodules may cause hyperthyroidism but are rarely malignant
  - Cold solitary thyroid nodules have an incidence of cancer of about 20% and should be removed
- Thyroid carcinoma is uncommon (about 3%) in multinodular goiters, but if there is a dominant nodule or one that enlarges, it should be biopsied or remove

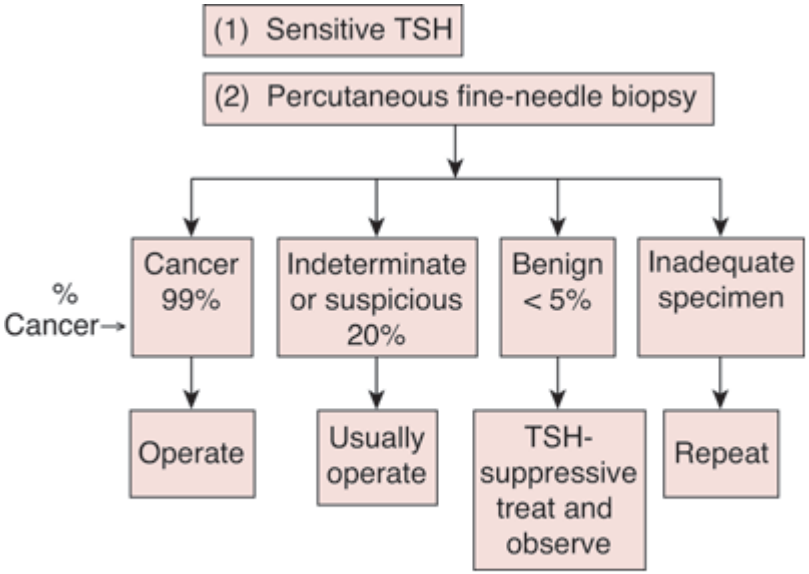
Other tests

. Ultrasound differentiates solid and cystic lesions and, may detect enlarged lymph nodes

. A chest x-ray including the neck is helpful in demonstrating tracheal displacement, calcification of the thyroid nodule, or the presence of pulmonary metastases

CT or MRI scans are usually not necessary but are helpful when the limits of the tumor cannot be defined, such as in patients with large, invasive, or substernal goiters or tumors.

Evaluation of thyroid nodule.



Surgery

- Indications for surgical removal of a nodular goiter:
  - (1) suspicion of or documented cancer
  - (2) symptoms of pressure
  - (3) hyperthyroidism
  - (4) substernal extension
  - (5) cosmetic deformity

  - Incidentally discovered thyroid nodules by US, CT, MRI, PET should be evaluated by FNA and U/S → 50% of thyroid nodules discovered on PET scanning are malignant

  - Nonoperative tx if small or moderately sized multinodular goiters and Hashimoto thyroiditis unless there is a clinically suspicious area that is growing or if the patient was exposed to radiation or has a family history of thyroid carcinoma

Simple or Nontoxic Goiter

AKA Diffuse & Multinodular Goiter

Causes:

- physiologic, occurring during puberty or pregnancy
- 2/2 living in endemic (iodine-poor) regions
- result of prolonged exposure to goitrogenic foods or drug
- early in life 2/2 congenital defect in TH production or Hashimoto thyroiditis

Mechanism:

- Represents a compensatory response to inadequate TH production, possibly also involving thyroid growth immunoglobulins
- Usually responds favorably to TH administration

Simple or Nontoxic Goiter

Findings:

- In diffuse goiter, thyroid is symmetrically enlarged and has a smooth surface without areas of encapsulation
- As goiter persists, has tendency to form nodules
- most have multinodular glands by the time they seek medical care
- Symptoms: awareness of neck mass and dyspnea, dysphagia, or symptoms 2/2 venous obstruction
- Thyroid function is usually normal, though the sensitive TSH may be suppressed and the radioiodine uptake increased

Surgery

- indicated to relieve the pressure symptoms of a large goiter for substernal goiter or to rule out cancer when there are localized areas of hardness or rapid growth. FNA very helpful.

INFLAMMATORY THYROID DISEASE

- acute, subacute, or chronic thyroiditis
- suppurative or nonsuppurative

- **Acute suppurative thyroiditis:**
  - uncommon
  - sudden onset of severe neck pain accompanied by dysphagia, fever, and chills.
  - usually follows an acute URI
  - diagnosed by percutaneous aspiration, smear, and culture
  - treated by surgical drainag
  - most often streptococci, staphylococci, pneumococci, or coliforms
  - may also be associated with a piriform sinus fistula -> thus, barium swallow in persistent or recurrent cases.

- **Subacute thyroiditis,**
  - noninfectious disorder
  - thyroid swelling, head and chest pain, fever, weakness, malaise, palpitations, and weight loss
  - some have no pain (silent thyroiditis) -> must be distinguished from Graves disease
  - ESR and serum gamma globulinare almost always elevated
  - radioiodine uptake is very low or absent w/ increased or normal thyroid hormone levels
  - illness is usually self-limited, and aspirin and corticosteroids relieve symptoms
  - most of these patients eventually become euthyroid.

Inflamm Dz cont'd

- **Hashimoto thyroiditis**
  - most common form of thyroiditis,
  - enlargement of the thyroid +/- pain and tenderness.
  - Much more common in women (about 15% of U.S. women)
  - occasionally causes dysphagia or hypothyroidism.
  - autoimmune disease
  - Serum titers of antimicrosomal and antithyroglobulin antibodies are elevate
  - Tx: giving small doses of TH
  - OR if marked pressure symptoms, suspected malignant tumor, and cosmetic reasons
  - In patients with pressure or choking symptoms, surgical division of the isthmus provides relief
  - If the thyroid is large or asymmetric and fails to regress after treatment with exogenous TH, if it contains a discrete nodule, or grows rapidly, percutaneous needle biopsy or thyroidectomy is recommended
  - Thyroid lymphoma can rarely occur

  - **Riedel thyroiditis**
  - rare
  - Presents as hard woody mass in the thyroid region with marked fibrosis and chronic inflammation in and around the gland
  - The inflammatory process infiltrates muscles and causes symptoms of tracheal compression.
  - Hypothyroidism is usually present, and hypoparathyroid may develop.
  - Surgical treatment is required to relieve tracheal or esophageal obstruction.

BENIGN TUMORS OF THE THYROID

- Adenomas, involutionary nodules, cysts, or localized thyroiditis
- Most adenomas are of the follicular type.
- Adenomas are usually solitary and encapsulated and compress the adjacent thyroid
- The major reasons for removal are a suspicion of cancer, functional overactivity producing hyperthyroidism, and cosmetic disfigurement

MALIGNANT TUMORS OF THE THYROID

Essentials of Diagnosis

- History of irradiation to the neck
- Painless or enlarging nodule, dysphagia, or hoarseness
- Firm or hard, fixed thyroid nodule; ipsilateral cervical lymphadenopathy
- Normal thyroid function; nodule stippled with microcalcifications and solid (ultrasound), cold (radioiodine scan); positive or suspicious cytology
- Family history of thyroid cancer

Malignant Thyroid Tumors

- **General Considerations**
  - classification is important
  - a wide range of growth and malignant behaviors

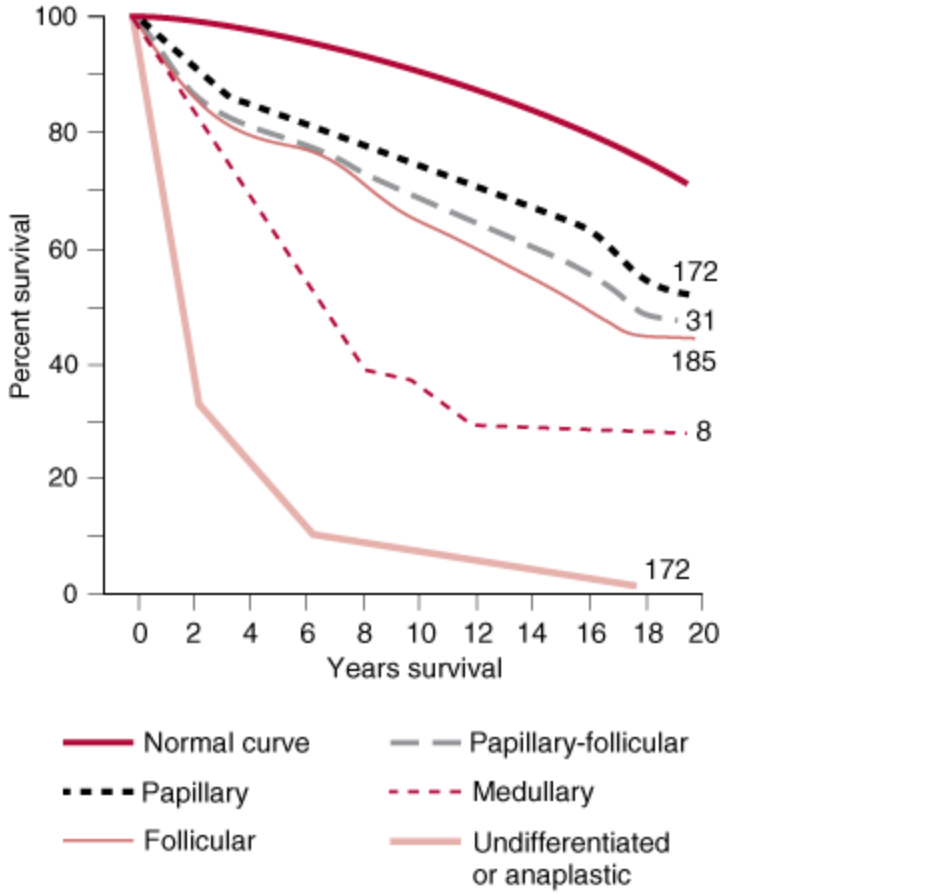
  - **Papillary Adenocarcinoma**
  - Usually in young adults
  - grows very slowly, metastasizes through lymphatics, and is compatible with long life even in the presence of metastases

  - **Undifferentiated carcinoma**
  - appears late in life, nonencapsulated, invasive
  - Forms large infiltrating tumors composed of anaplastic cells
  - most w/ with anaplastic thyroid Ca succumb to local recurrence, pulmonary metastasis, or both within 6 months.

  - Between these two extremes are follicular, Hürthle cell, and medullary carcinomas, sarcomas, lymphomas, and metastatic tumors

  - On average, 5% of patients with papillary, 10% of those with follicular, 15% of those with Hürthle cell, and 20% of those with medullary thyroid cancer will die within 10 years from these tumors

Survival rates after thyroidectomy for papillary, mixed papillary-follicular, follicular, medullary, and undifferentiated thyroid cancer



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Thyroid Cancer

- Cause unknown
- Patients who received low-dose (6.5–2000 cGy) therapeutic radiation to the thymus, tonsils, scalp, and skin in infancy, childhood, and adolescence have an increased risk of developing thyroid tumors
- The incidence of thyroid cancer increases for at least 30 years after irradiation.
- *RET/PTC* rearrangements occur in about 80% of radiation associated papillary thyroid cancers.

Types of Thyroid Cancer

- **PAPILLARY ADENOCARCINOMA**
  - 85% of cancers of the thyroid gland
  - usually appears in early adult life
  - presents as a solitary nodule
  - spreads via intraglandular lymphatics within the thyroid gland and then to the subcapsular and pericapsular lymph nodes.
  - 50% of children and 20% of adults present with LAD
  - may metastasize to lungs or bone
  - Microscopically, papillary projections of columnar epithelium.
  - Psammoma bodies are present in about 60% of cases
  - rate of growth may be stimulated by TSH
  - *BRAF* mutation associated with lymph node metastases and a higher recurrence rate

Types of Thyroid Cancer

- **FOLLICULAR ADENOCARCINOMA**
  - ~ 10% of malignant thyroid tumors
  - Appears later in life
  - may be rubbery or even soft on palpation
  - Encapsulated
  - Micro: may be difficult to distinguish from normal thyroid tissue
  - Capsular and vascular invasion distinguish follicular carcinomas from follicular adenomas
  - Only occasionally (6%) metastasize to the regional lymph nodes, but greater tendency to spread by the hematogenous route to the lungs, the skeleton, and, rarely, the liver.
  - Metastases from this tumor often demonstrate an avidity for radioactive iodine after total thyroidectomy
  - Skeletal metastases may appear years after resection of the primary lesion
  - Hürthle cell carcinoma is considered a variant -> more likely to be multifocal and involve lymph nodes than follicular carcinoma

Types of Thyroid Cancer

- **MEDULLARY CARCINOMA**
  - 7% of malignant tumors of the thyroid and 15% of thyroid cancer deaths
  - contains amyloid and is a solid, hard, nodular tumor, does not take up radioiodine and secretes calcitonin
  - Arise from parafollicular cells of the ultimobranchial bodies or C cells
  - Familial medullary carcinoma occurs in about 25% of patients (least aggressive form)
  - Isolated or occur with pheochromocytomas (often bilateral), lichen planus amyloidosis, and hyperparathyroidism (MEN 2a)
  - +/- pheochromocytomas (usually bilateral), marfanoid habitus, multiple neuromas, and ganglioneuromatosis (MEN 2b) – most aggressive form
  - Hirschsprung disease occurs more frequently in patients with familial medullary cancer
  - All screened for an *RET* point mutation on chromosome 10 because 10% of patients without a positive family history have de novo mutation
  - For patients detected by family genetic screening, most experts recommend prophylactic total thyroidectomy prior to age 6.

Types of Thyroid Cancer

- **UNDIFFERENTIATED CARCINOMA**
  - rapidly growing tumor
  - Occurs in women beyond middle life
  - 1% of all thyroid cancers
  - usually evolves from a papillary or follicular neoplasm
  - solid, quickly enlarging, hard, irregular mass diffusely involving the gland and often invades the trachea, muscles, and neurovascular structures
  - may be painful and somewhat tender, may be fixed on swallowing, and may cause laryngeal or esophageal obstructive symptoms
  - Microscopically, there are three major types: giant cell, spindle cell, and small cell. Mitoses are frequent.
  - Cervical LAD and pulmonary metastases are common
  - Local recurrence after surgical treatment
  - Combination treatment with external radiation therapy, chemotherapy, and surgery offers palliation to some patients but is rarely curative

Treatment for Thyroid Cancer

Differentiated thyroid carcinoma -> operative removal

For papillary carcinoma over 1 cm -> near-total or total thyroidectomy
For solitary papillary carcinomas less than 1 cm -> thyroid lobectomy

Subtotal or partial lobectomy is **contraindicated** because recurrence is greater and survival is shorter

Total thyroidectomy is recommended for papillary (> 1.0 cm), follicular, Hürthle cell, and medullary carcinomas (if the operation can be done without producing permanent hypoparathyroidism or injury to the recurrent laryngeal nerves)

Total thyroidectomy is preferred over other operations because:

1) high incidence of multifocal tumor within the gland
2) a clinical recurrence rate of about 7% in the contralateral lobe if it is spared
3) the ease of assessment for recurrence by serum thyroglobulin assay and neck ultrasound exams during follow-up
4) also allows one to treat with radioiodine

Preoperative ultrasound is essential in papillary cancer, and all abnormal central and lateral neck should be removed.

Whether an ipsilated prophylactic central neck dissection should be done is controversial.

A functional modified radical neck dissection preserving the sternocleidomastoid muscle, spinal accessory nerve, and sensory nerve is performed if lymph nodes in the lateral neck are clinically involved.

Treatment cont'd

- Medullary carcinoma -> high incidence of nodal involvement:
  - bilateral central neck node cleanout in all patients
  - concomitant ipsilateral and contralateral modified radical neck dissection for tumors > 1.5 cm and when the central neck nodes are involved

- When serum calcitonin or CEA levels remain elevated after thyroidectomy, U/S or MRI of the neck and MRI of mediastinum should be done

- Markedly elevated calcitonin levels:
  - Laparoscopic evaluation of the liver for the common miliary metastases
  - If no liver mets, central neck dissection and bilateral functional neck dissections should be done, including removal of nodes from the superior mediastinum

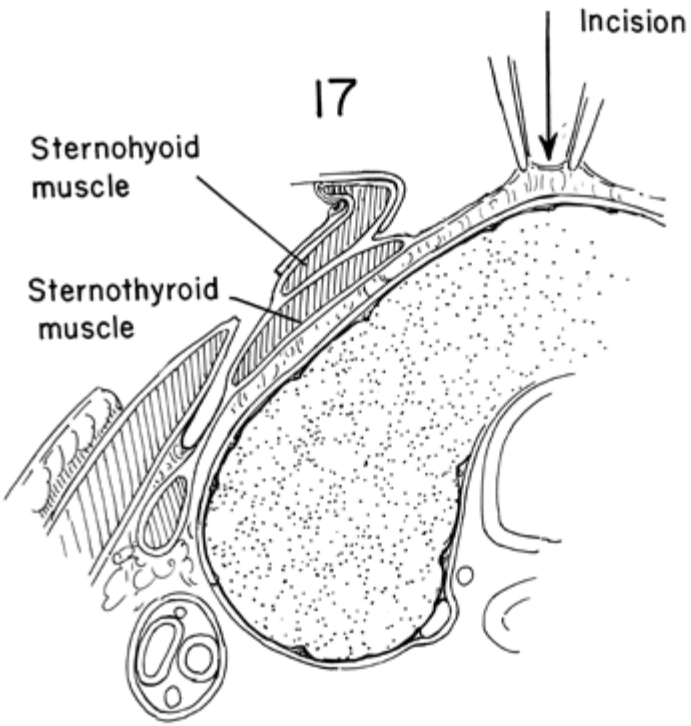
Treatment cont'd

- Isolated distant metastatic deposits of differentiated thyroid carcinoma should be removed surgically and treated with 131I after total thyroidectomy or thyroid ablation with radioactive iodine.
- All patients with thyroid cancer should be maintained indefinitely on suppressive doses of thyroid hormone (mild suppression for low-risk patients)
- For follow-up, it is helpful to measure basal and TSH-stimulated serum levels of thyroglobulin (a tumor marker for differentiated thyroid cancer), which are usually increased (> 2 ng/mL) in patients with residual tumor after total thyroidectomy.
- For **undifferentiated carcinoma, malignant lymphoma,** or **sarcoma,** the tumor should be excised as completely as possible and then treated by radiation and chemotherapy.
- Doxorubicin (Adriamycin), vincristine, and chlorambucil are the most effective agents. Carcinomas of the kidney, breast, and lung and other tumors sometimes metastasize to the thyroid, but they rarely present as a solitary nodule.

Emergency thyroidectomy

- exceedingly rare situation where pressure symptoms develop rapidly due to intrathyroid hemorrhage

- In all other situations thyroidectomy should be considered an elective procedure performed when the patient is in optimal physical health. This is true particularly in thyrotoxicosis.



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