Endocrine system 2023
Thyroid gland part 1

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Diseases of thyroid gland

Diseases of the thyroid gland are related to

a. Derangement of thyroid hormones (Hyperthyroidism and Hypothyroidism)
b. or to the mass effect of the enlarged gland. i:e if the gland is enlarged it can cause compression of the surrounding structures.

- There is no relation between mass effect and level of hormonal production.

Thyroid diseases

1. ***Mass effect***: enlargement can be due to: inflammation, neoplasms, autoimmune diseases. (details later)

Thyroid enlargement, due to any cause is called: **goiter.**

AGAIN: enlarged gland doesn't necessarily mean increased hormone production.

2. ***Hyperthyroidism = thyrotoxicosis.***

3. ***Hypothyroidism.***

Goiter: enlarged thyroid.. Regardless of the cause and regardless of the levels of the hormones.

Thyrotoxicosis/ hyperthyroidism causes

1. ***Primary***

a. Diffuse toxic hyperplasia (Graves disease)

b. Hyperfunctioning (Toxic) multinodular goitre.

c. Hyperfunctioning (toxic) adenoma

2. Secondary -- TSH-secreting pituitary adenoma (rare)

Clinical manifestations of thyrotoxicosis

- Thyroid hormones increase basal metabolic rate, increase appetite, increase breakdown of fat and glucose
- Also increase heart rate, cause hypertension
- Increase body temperature

- SO if these hormones are increased you expect to see a wide range of symptoms.

Clinical manifestations of thyrotoxicosis

a. Constitutional symptoms : warm flushed skin, heat intolerance and excessive sweating ,weight loss despite increased appetite.

b. Malabsorption, and diarrhoea (because of increased intestinal motility)

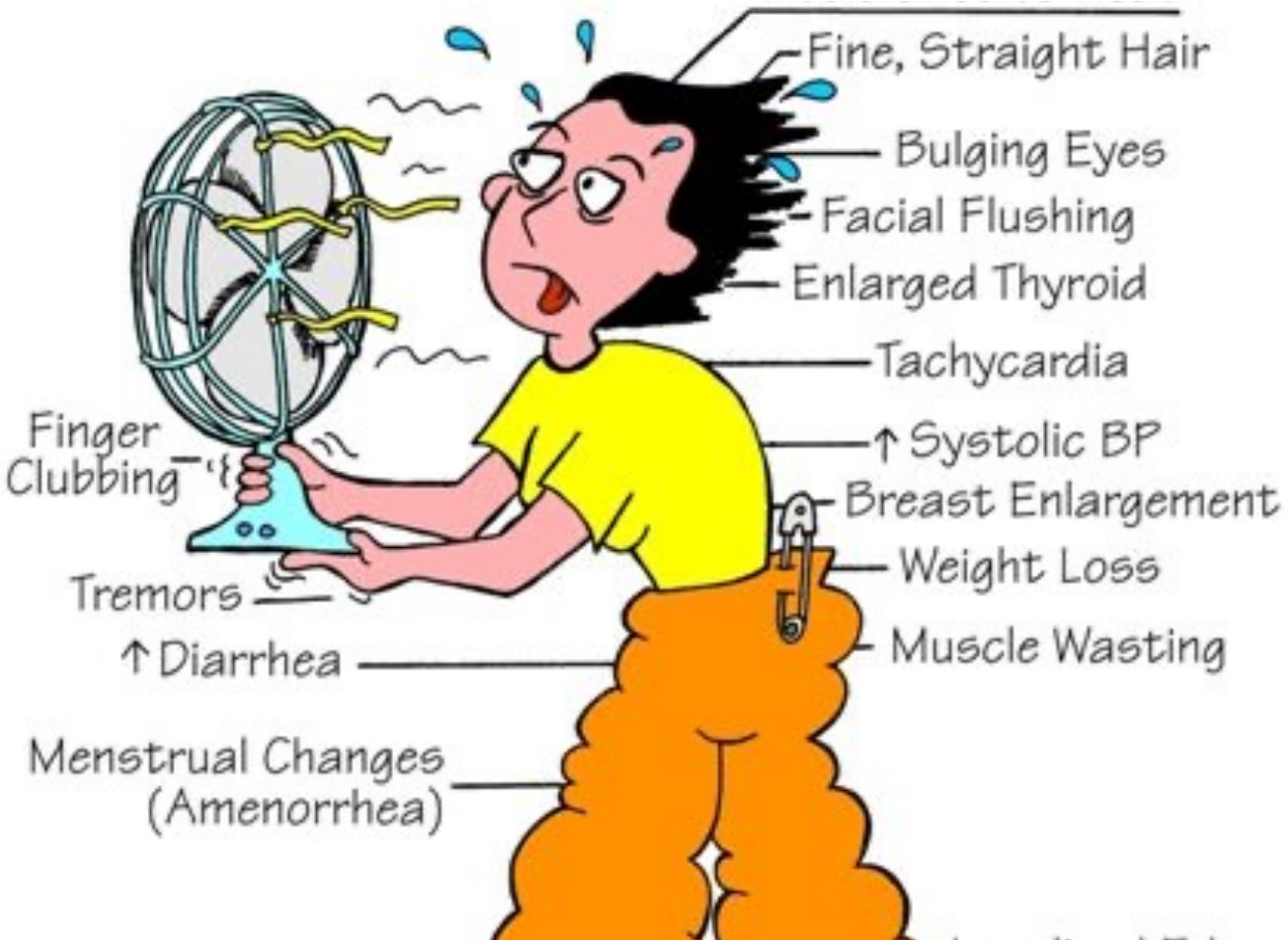
c. Tachycardia

d. Nervousness, tremor, and irritability.

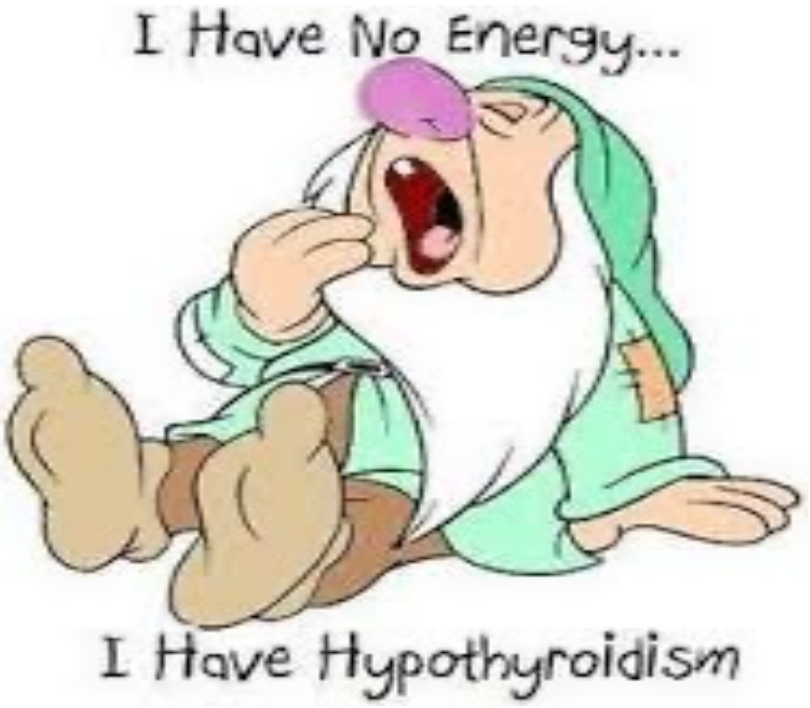
e. A wide, staring gaze and lid lag because of sympathetic overstimulation of the levator palpebrae superioris

f. 50% develop proximal muscle weakness (thyroid myopathy).

hyperthyroidism



hypothyroidism



HYPOTHYROIDISM

Primary causes

a. - Worldwide, the most common cause of hypothyroidism is dietary deficiency of iodine.

b. In most developed countries, autoimmune diseases predominate such as Hashimoto thyroiditis

c. Genetic defects such as *Thyroid dysgenesis or* congenital biosynthetic defect (dyshormogentic goitre).

Secondary causes: Pituitary or hypothalamic disorder.

hypothyroidism

It causes two clinical syndromes.

- **Cretinism**.. Hypothyroidism in infancy and early childhood
- **Myxedema**… hypothyroidism in older children and adults.

- The difference of features of hypothyroidism among these age groups is because thyroid hormones are vital early in life for brain and body development.

Cretinism :*R*efers to hypothyroidism developing in infancy or early childhood

1. Endemic cretinism: in dietary iodine deficiency is endemic, including mountainous areas (the Himalayas)
2. *Sporadic cretinism.* Caused by enzyme defects that interfere with thyroid hormone synthesis

Clinical features of cretinism include:

- Impaired development of skeletal system- short stature,
- Coarse facial features, protruding tongue, umbilical hernia.
- Central nervous system problems , with mental retardation

M*yxedema.* or Gull syndrome :

a. cold intolerance and obesity

b. Generalized apathy and mental sluggishness that in the early stages of disease may mimic depression

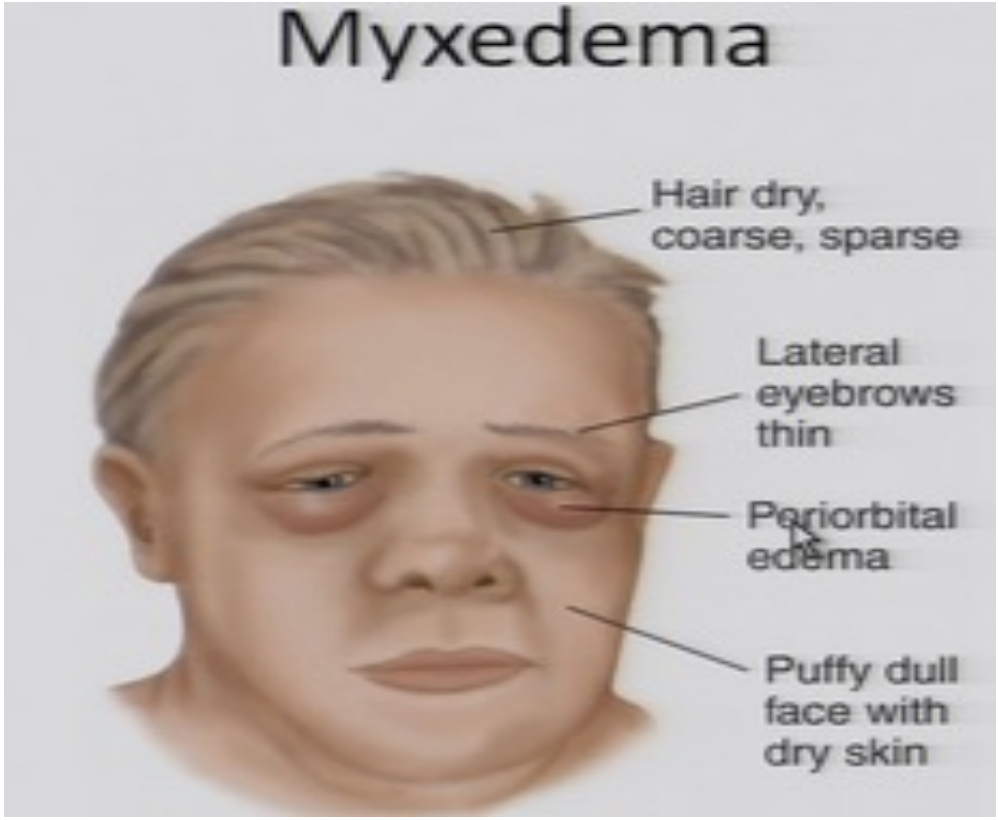
c. Broadening and coarsening of facial features

d. Enlargement of the tongue, and deepening of the voice.

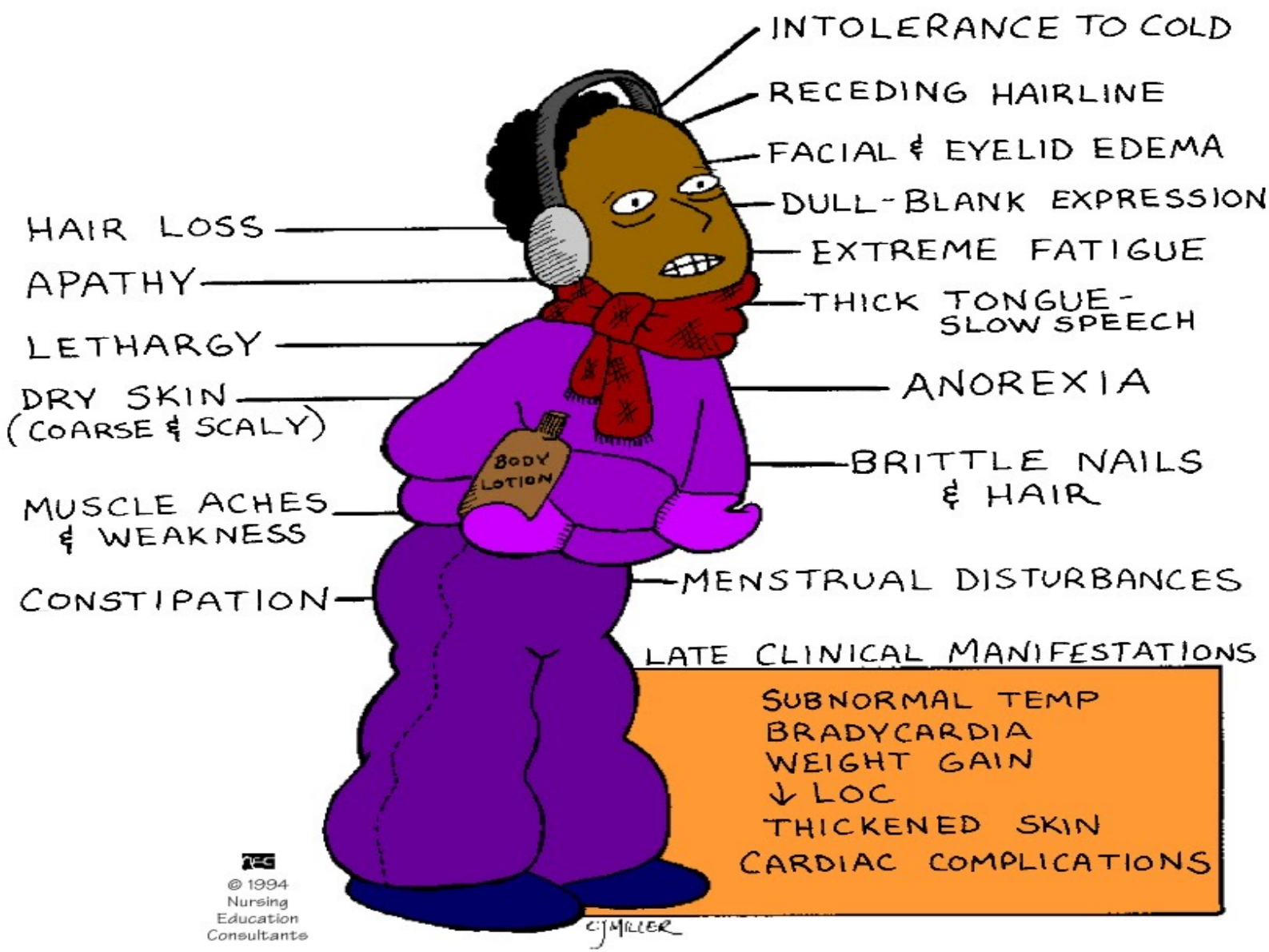
e. Bowel motility is decreased, resulting in constipation.

f. Pericardial effusions are common; in later stages, the heart is enlarged, and heart failure may supervene.

g. Mucopolysaccharide-rich edematous fluid accumulates in skin, subcutaneous tissue, and number of visceral sites


Myxedema
Hair dry, coarse, sparse
Lateral eyebrows thin
Periorbital edema
Puffy dull face with dry skin

HYPOTHYROIDISM



Thyroiditis.

- = inflammation of the thyroid gland
- Several types:
- 1. Chronic Lymphocytic (Hashimoto) Thyroiditis
- 2.Subacute Granulomatous (de Quervain) Thyroiditis
- 3. Subacute Lymphocytic Thyroiditis
- 4.Riedel thyroiditis

1.Hashimoto thyroiditis.. Named after a Japanese doctor.

Chronic Lymphocytic (Hashimoto) Thyroiditis

- *Is the most common cause of hypothyroidism in areas of the world where iodine levels are sufficient.*
- It is characterized by gradual thyroid failure secondary to autoimmune destruction of the thyroid gland
- It is most prevalent between the ages of 45 and 65 years and is more common in women than in men

***NOTE: ALL THYROID DISEASES ARE MORE IN WOMEN**

- It can occur in children and is a major cause of non-endemic goiter in children

- ***Clinically*** ,

Painless *thyroid enlargement associated with some degree of hypothyroidism,*

Patients with Hashimoto thyroiditis often :

1. Have *other autoimmune diseases*
2. Are at *increased risk for the development of B cell non-Hodgkin lymphomas* within the thyroid gland.

Note:

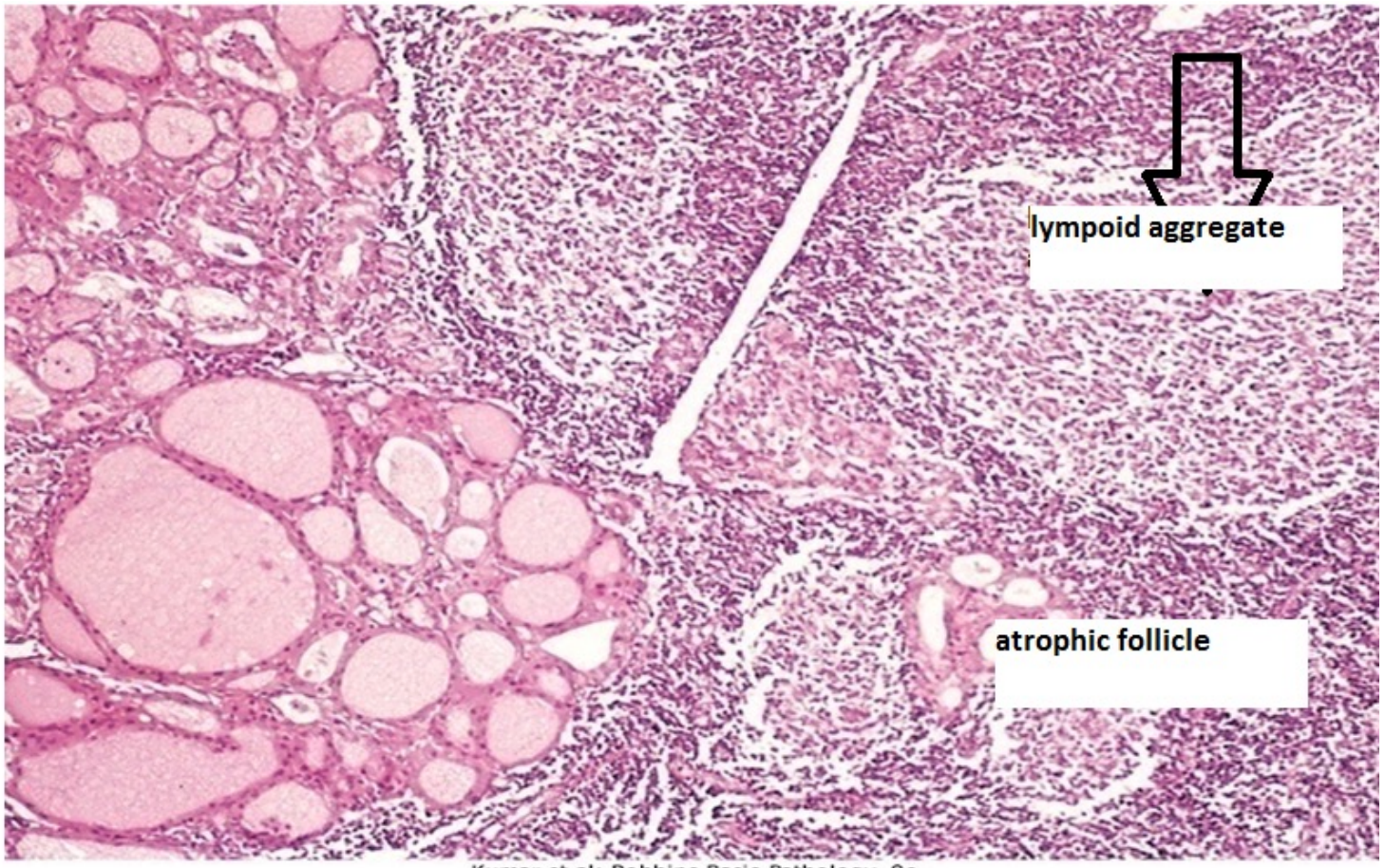
- The relationship between Hashimoto disease and thyroid epithelial cancers remains controversial, with some morphologic and molecular studies suggesting **a predisposition to papillary carcinomas**

- Gross(macroscopic) features:

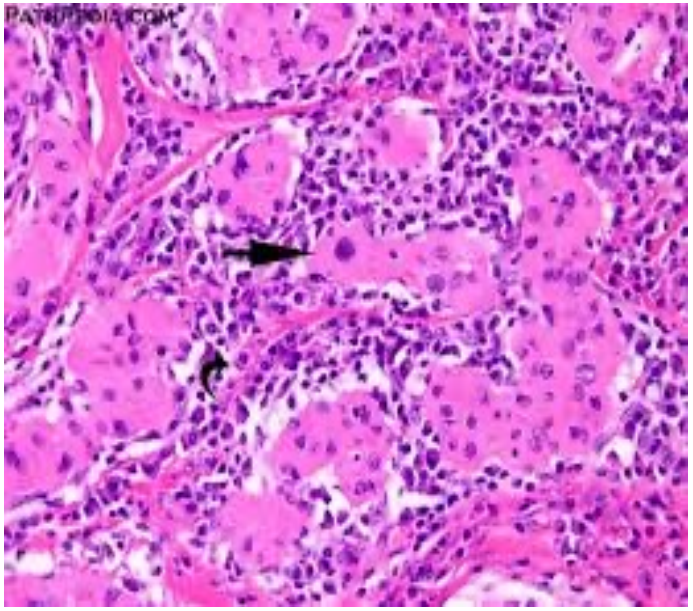
- Diffuse and symmetric enlargement of the thyroid Microscopic examination reveals

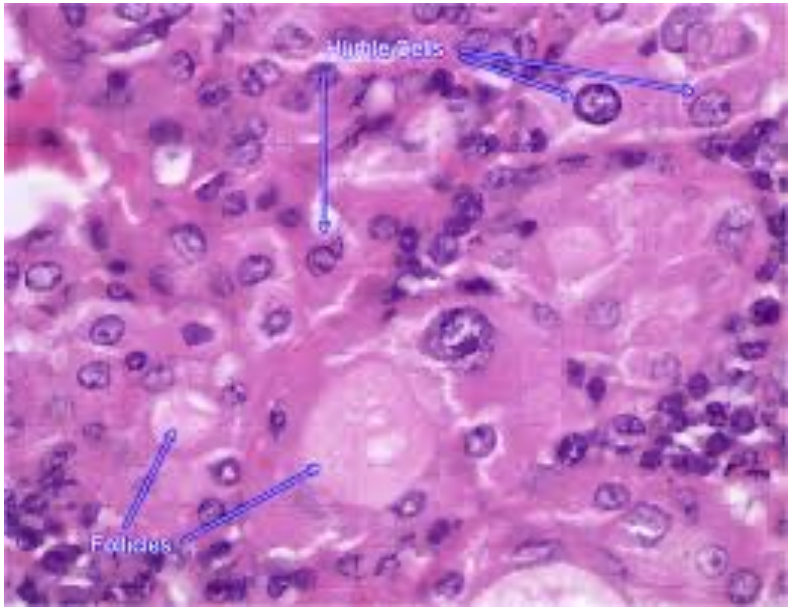
1. Infiltration by small lymphocytes, plasma cells, and well-developed germinal centers
2. The thyroid follicles are atrophic
3. Some follicles are lined by epithelial cells with abundant eosinophilic, cytoplasm, termed Hürthle cells and these Hurthle cells have numerous mitochondria

Hashimoto thyroiditis



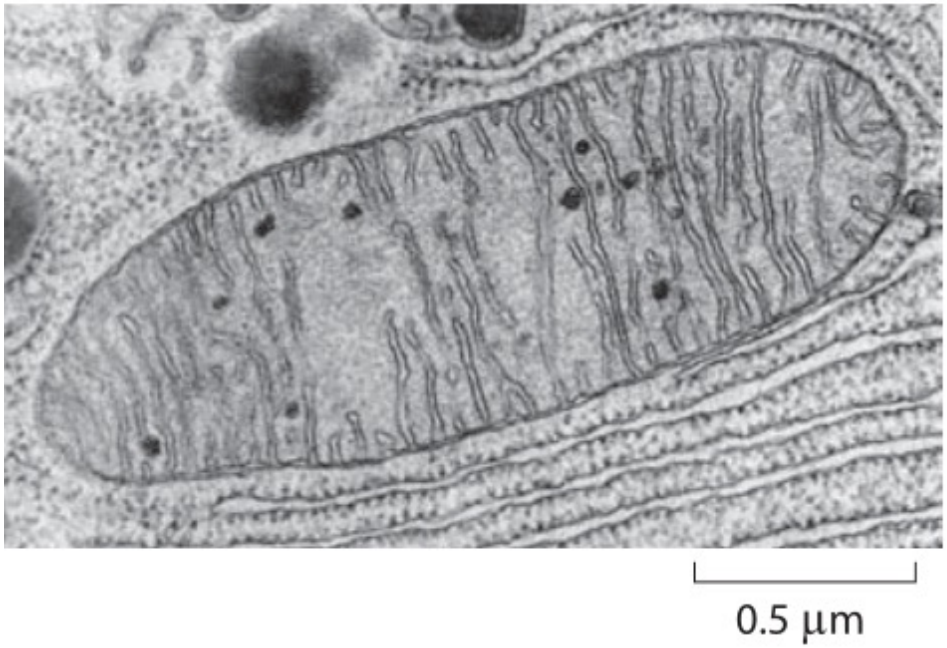
Hurthle cells: large cells with abundant eosinophilic cytoplasm, due to increased mitochondria



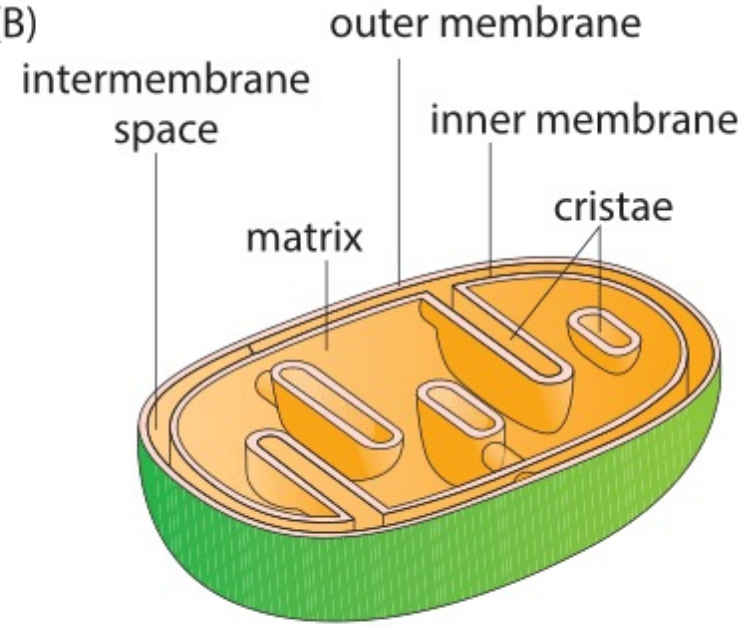


Hurthle cell cytoplasm is full of mitochondria

(A)



(B)



3-D view of mitochondrion

2. Subacute Granulomatous (de Quervain) Thyroiditis

- Is much less common than Hashimoto disease
- Is most common between the ages of 30 and 50 and,
- More frequently in women than in men.
- Is believed to be caused by a viral infection and a majority of patients have a history of an upper respiratory infection just before the onset of thyroiditis.

- Clinical Features :

-Acute onset characterized by neck pain (with swallowing)

- Fever, malaise (tiredness), and variable enlargement of the thyroid.

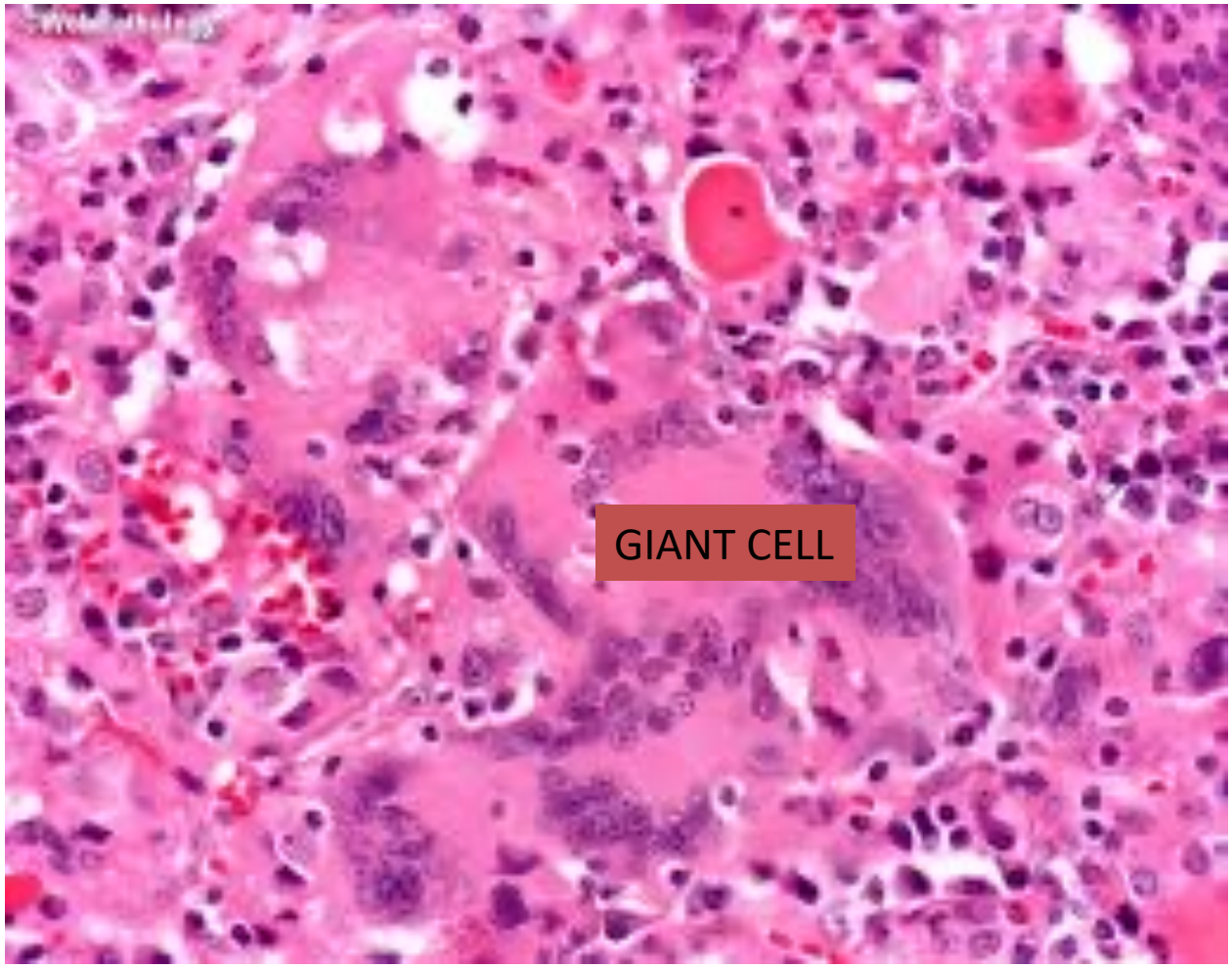
- The leukocyte count is increased.

- The condition typically is self-limited, with most patients returning to a euthyroid state within 6 to 8 weeks

Histologic examination reveals

1. Disruption of thyroid follicles, with extravasation of colloid leading to a neutrophilic infiltrate, which is replaced by lymphocytes, plasma cells, and macrophages.
2. The extravasated colloid provokes a granulomatous reaction with giant cells that contain fragments of colloid.
3. Healing occurs by resolution of inflammation and fibrosis.

Subacute granulomatous thyroiditis



3. Subacute Lymphocytic Thyroiditis :

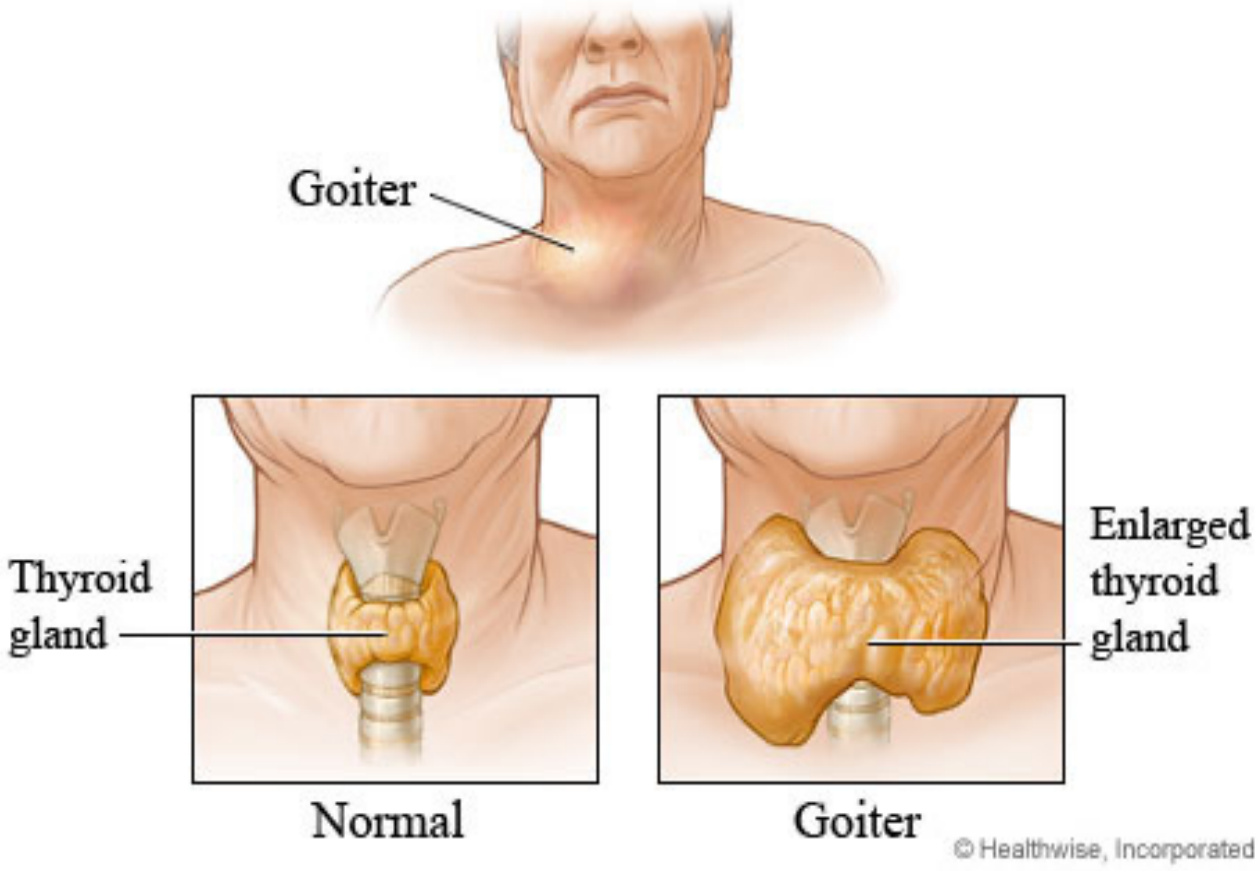
- Also is known as *silent* or *painless* thyroiditis;
- And in a subset of patients the onset of disease follows - pregnancy (*postpartum thyroiditis*).
- Most likely to be autoimmune because circulating antithyroid antibodies are found in a majority of patients
- It mostly affects middle-aged women, who present with a *painless* neck mass or features of thyrotoxicosis

4. Riedel thyroiditis,:

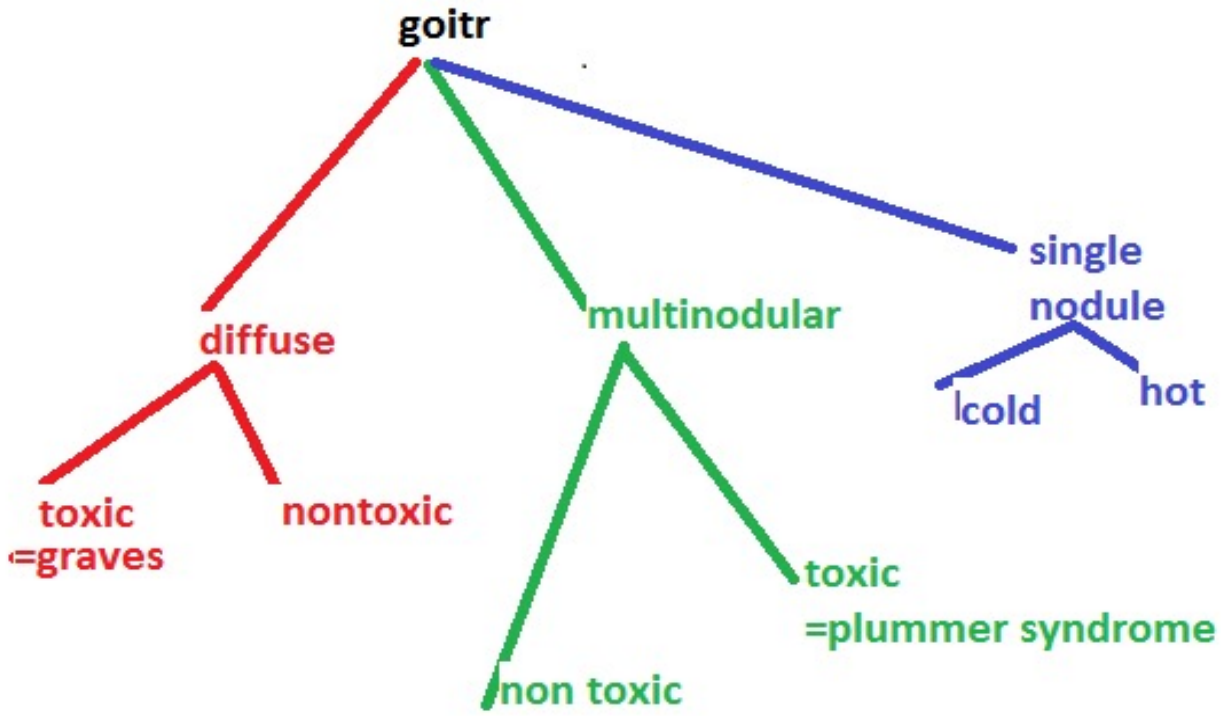
A rare disorder of unknown etiology,

- Characterized by extensive fibrosis involving the thyroid and adjacent structures simulating a thyroid neoplasm
- May be associated with idiopathic fibrosis in other parts of the body, such as the retroperitoneum
- The presence of circulating antithyroid antibodies in most patients suggests an autoimmune etiology

Goiter


Goiter
Thyroid gland
Enlarged thyroid gland
Normal
Goiter
© Healthwise, Incorporated

Goiter


goitr
diffuse
multinodular
single
nodule
toxic
=graves
nontoxic
cold
hot
toxic
=plummer syndrome
non toxic

GRAVES DISEASE

The most common cause of endogenous hyperthyroidism with a peak incidence in women between the ages of 20 and 40.

Triad of manifestations:

A. Thyrotoxicosis, All patients

B. Localized, infiltrative dermopathy (pretibial myxedema), minority of cases and involves the skin overlying the shins, and manifests as scaly thickening

C. Infiltrative ophthalmopathy with resultant exophthalmos in 40% of patients

Exophthalmos is the result of increased volume of the retro-orbital connective tissues by

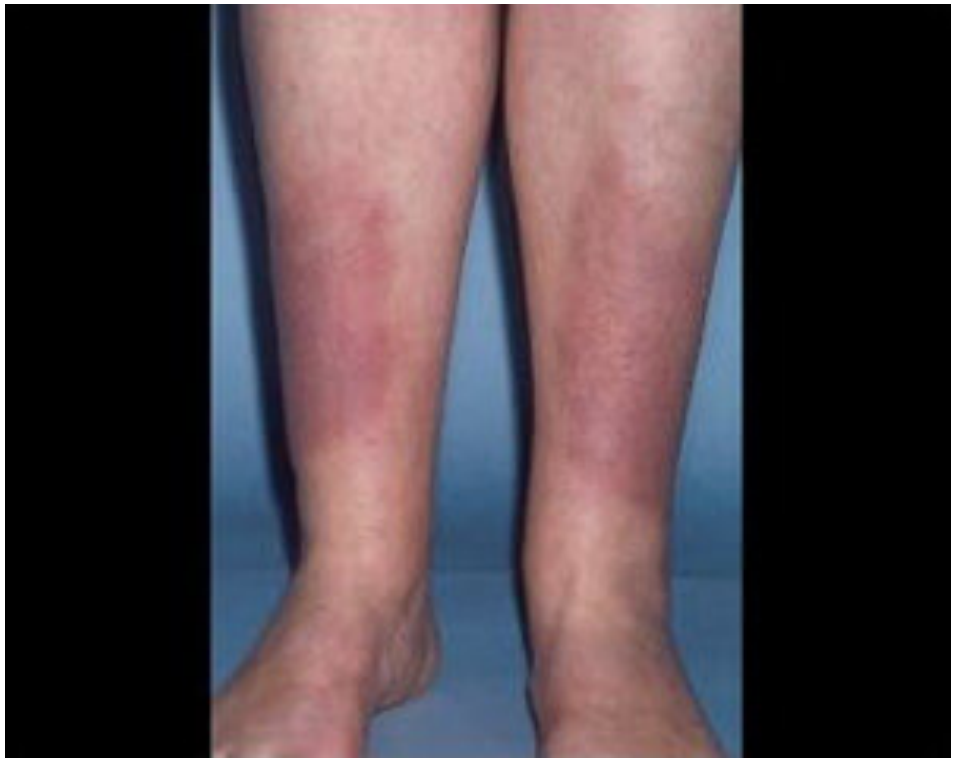
1. Marked infiltration of T cells with inflammatory edema
2. Accumulation of glycosaminoglycans
3. Increased numbers of adipocytes (fatty infiltration).

- These changes displace the eyeball forward, potentially interfering with the function of the extraocular muscles

- Exophthalmos may persist after successful treatment of the thyrotoxicosis, and may result in corneal injury.

exophthalmus

Pretibial myxedema



Gross: Diffuse Symmetrical enlargement of the thyroid gland with intact capsule,

DIFFUSE AND MULTINODULAR GOITER

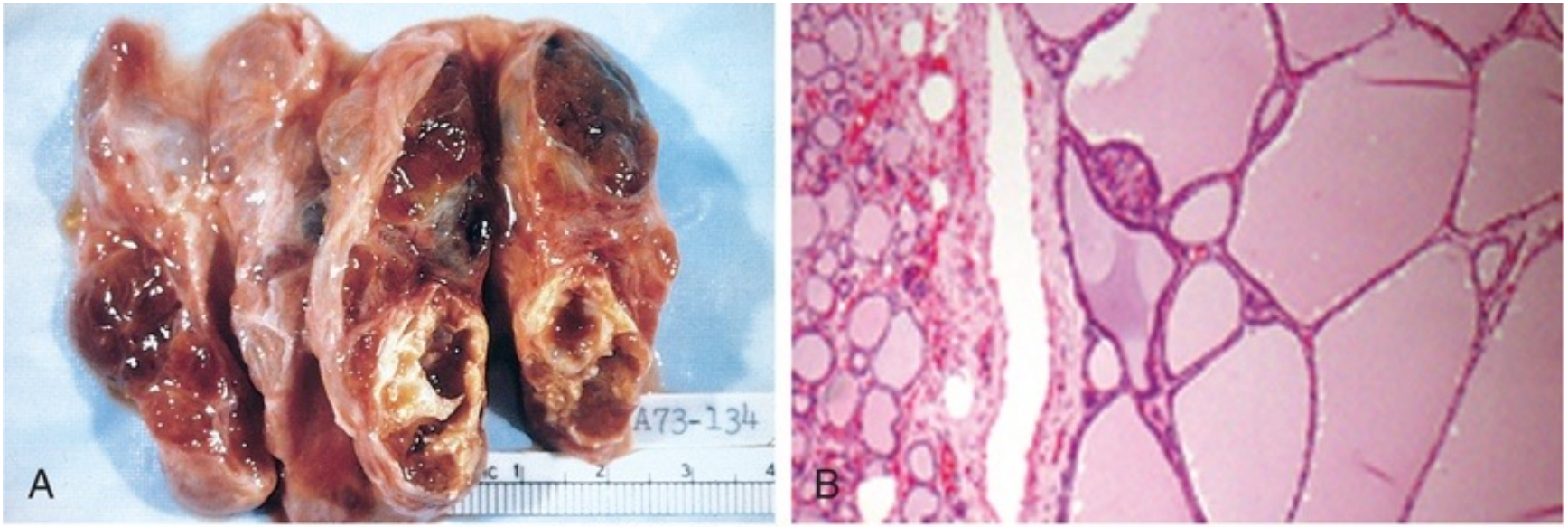
Enlargement of the thyroid, or *goiter,* is the most common manifestation of thyroid disease

Mechanism :

- *The goiters reflect impaired synthesis of thyroid hormone* often caused by dietary iodine deficiency and this leads to to a compensatory rise in the serum TSH, which in turn causes hyperplasia of the follicular cells and, ultimately, gross enlargement of the thyroid gland .

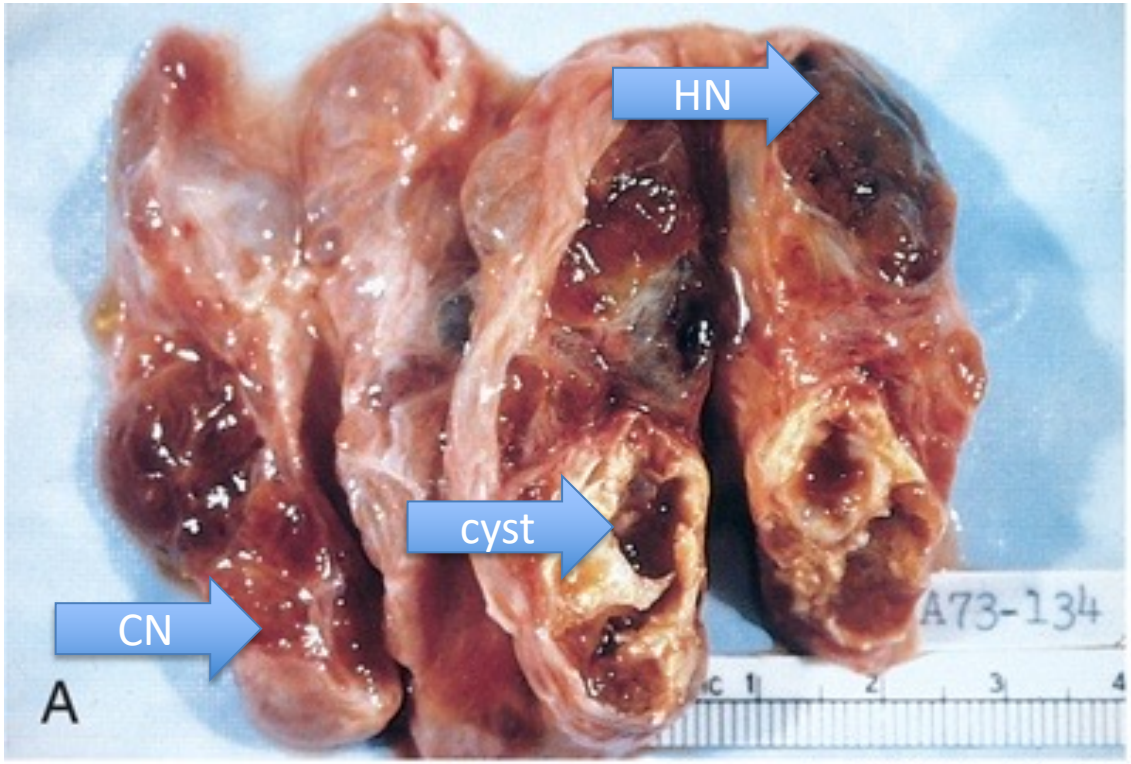
Macroscopic appearance

- Multinodular goiters cause multilobulated, asymmetrically enlarged glands . Old lesions often show fibrosis, hemorrhage, calcification



Kumar et al: Robbins Basic Pathology, 9e.

Multinodular goiter: thyroid shows several nodules, some are hemorrhagic (HN), others contain colloid (CN) and some become cystic.



multinodular goiter

Note:

- Multinodular goiters typically are hormonally silent (no hyperthyroidism)
- however, 10% of patients can manifest with thyrotoxicosis due to the development of autonomous nodules producing hormone independent of TSH stimulation and this condition, called toxic multinodular goiter or **Plummer syndrome**

Clinical Features :

a. The dominant features are *mass effects* of the goiter

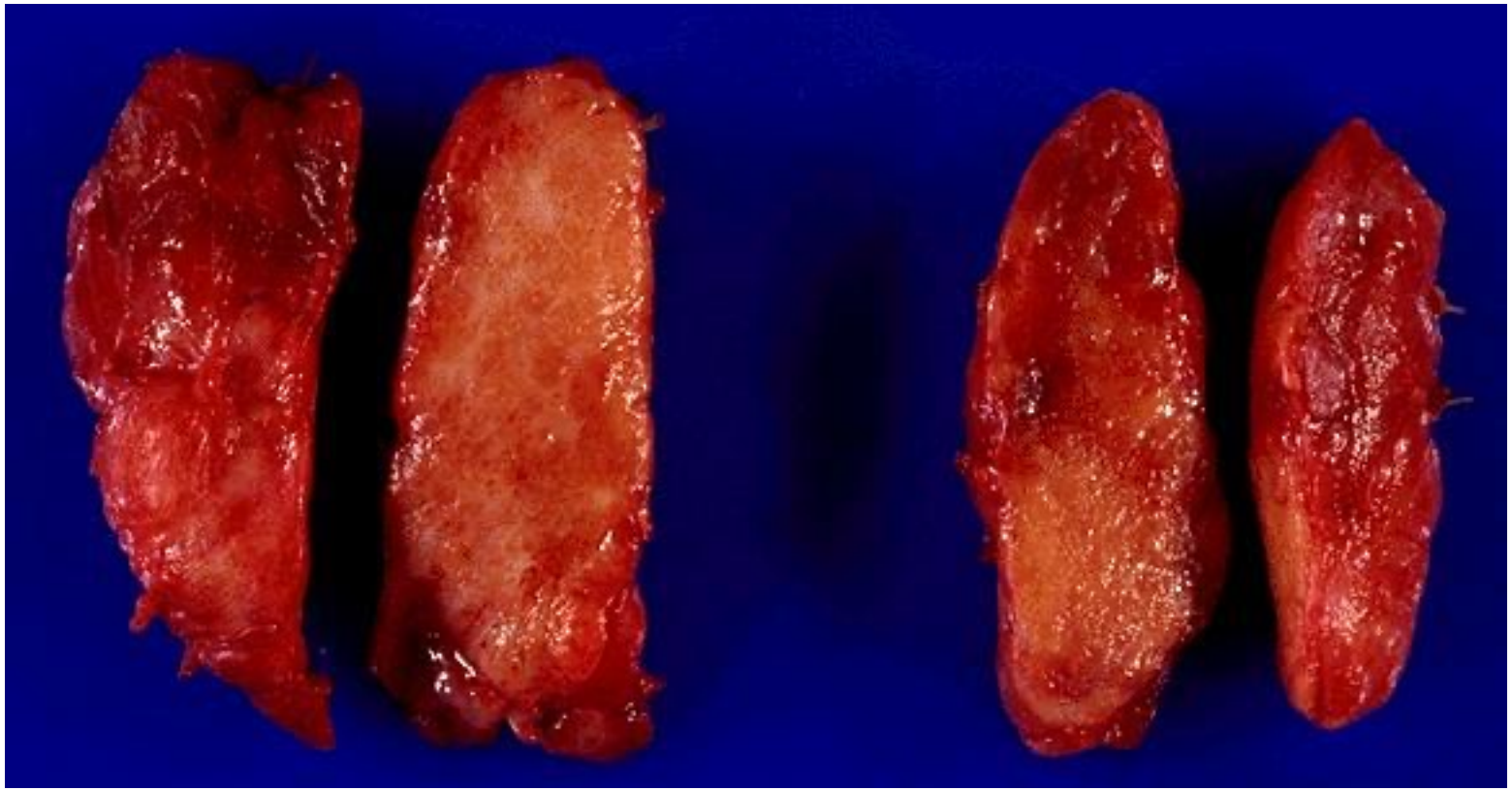
b. may cause airway obstruction, dysphagia, and compression of large vessels in the neck and upper thorax

c. The incidence of malignancy in long-standing multinodular goiters is low (less than 5%) but not zero and concern for malignancy arises with goiters that demonstrate sudden changes in size or associated symptoms (hoarseness)

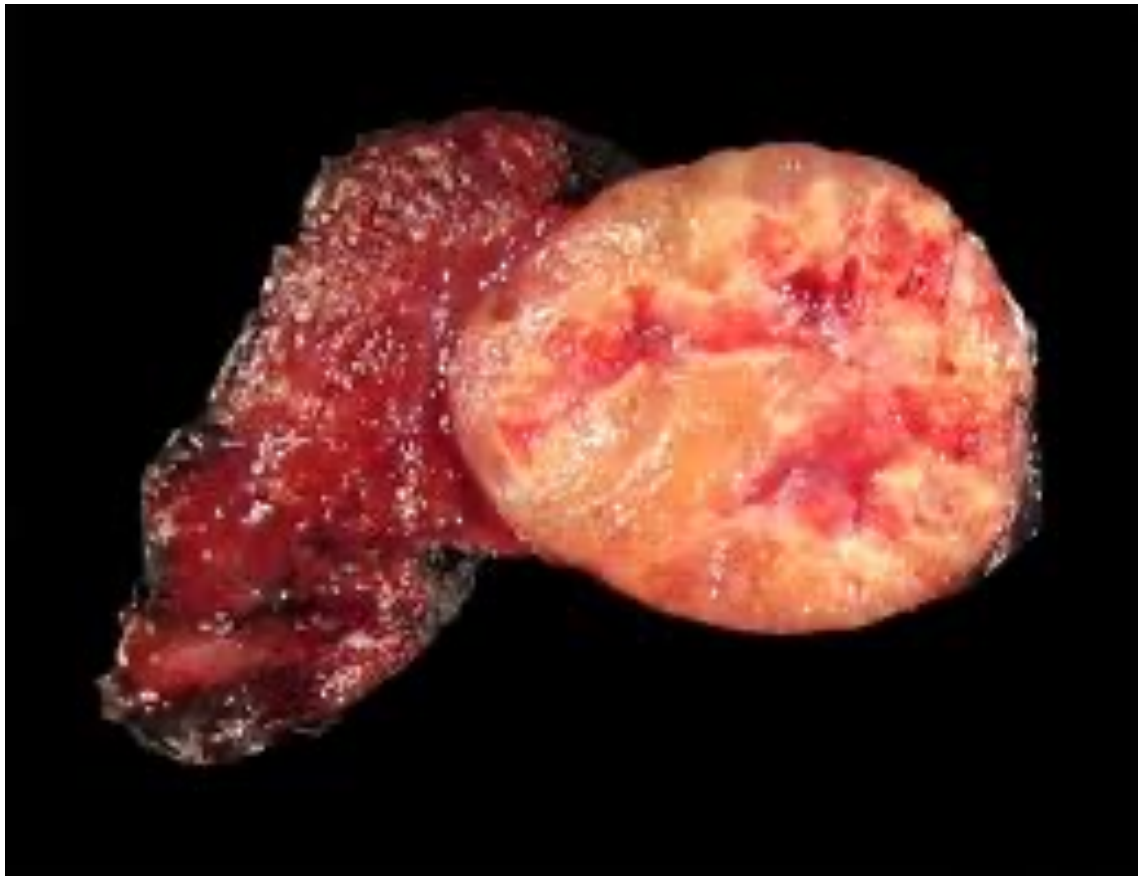
QUIZ.. What's the type of goiter on these macroscopic pictures:

- Case A

Case B

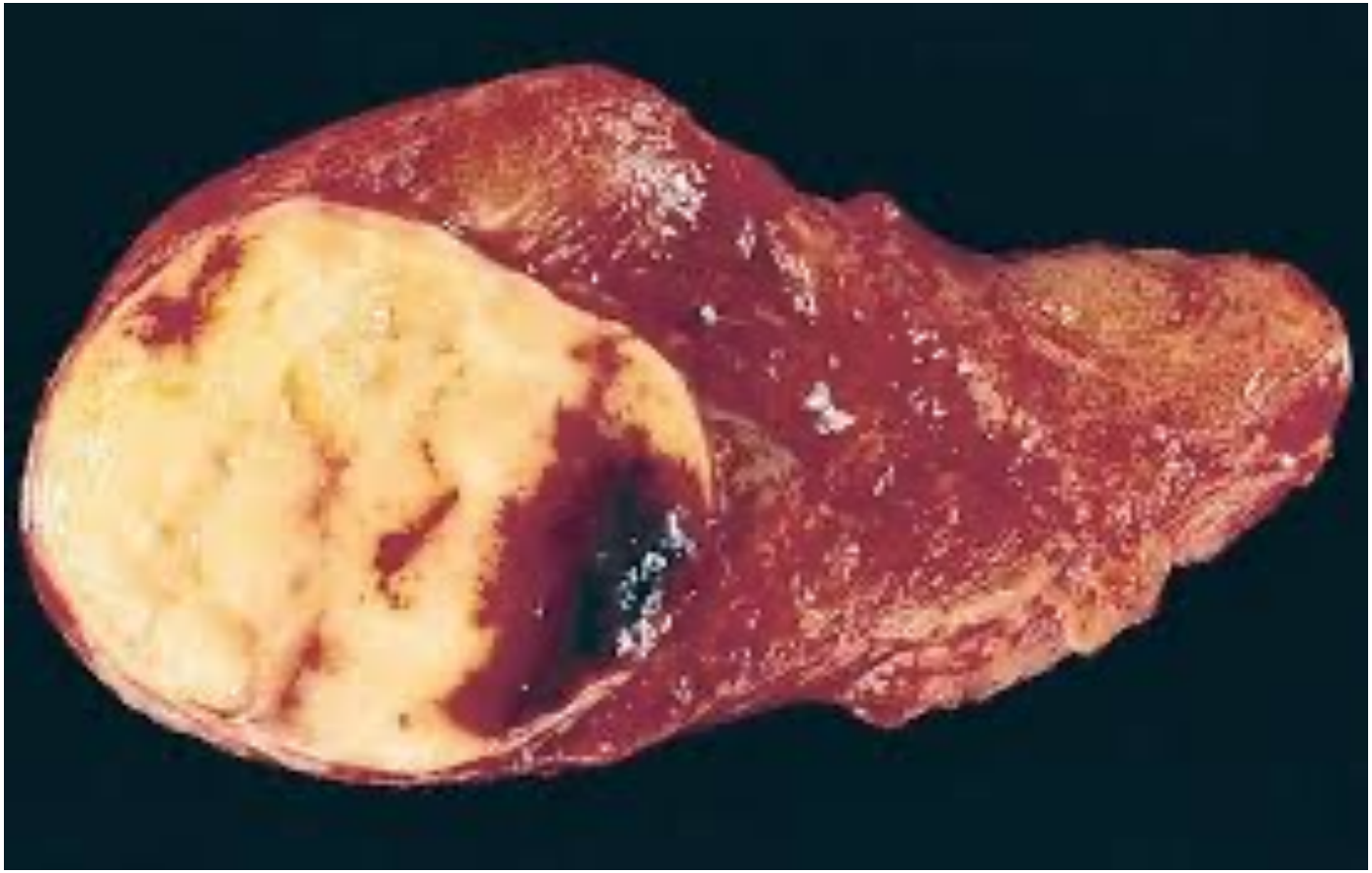


Case C



Case D

Case E



Answers

- A: multinodular.
- B and D: Diffuse
- C and E: single nodule.


Thank you!