Pathology - Topic 31 - Endocrine system

Thyroid Swellings

- A thyroid swelling may be diffuse or nodular, and it may occur with normal, increased or reduced hormone production.
- Size and function must therefore be assessed separately.
- Clinical examination, TSH and free hormone measurements, ultrasound and selected tissue sampling provide complementary information.
    - A normal thyroid function result does not exclude a malignant nodule.
    - Conversely, a large goitre is not necessarily malignant.

Goitre and Iodine Supply

- A goitre is enlargement of the thyroid.

Morphological Forms

1. Diffuse Non-Toxic Goitre

- Iodine deficiency can reduce hormone synthesis and increase TSH stimulation, producing follicular hypertrophy and hyperplasia.
    - Dietary goitrogens, inherited synthetic defects and other factors can contribute even where iodine intake is adequate.
- Early enlargement can be diffuse, with crowded active follicles.
- Later involution produces enlarged follicles filled with colloid.

2. Multinodular Goitre

- Repeated cycles of stimulation and involution create nodules of different sizes and activity.
- Haemorrhage, cystic change, fibrosis and calcification may develop.
- The gross gland has an irregular nodular surface and a variable cut appearance.
- Microscopy shows uneven colloid-rich follicles and areas of hyperplasia or degeneration.
    - Some nodules acquire autonomous function and produce toxic multinodular goitre. A large gland can compress the trachea or oesophagus.

Effects of Iodine Excess

- An iodine load can precipitate hyperthyroidism in susceptible autonomous thyroid tissue, especially a longstanding nodular gland; this is the Jod–Basedow phenomenon.
- Excess iodine initially inhibits hormone synthesis through the Wolff–Chaikoff effect; failure to escape from this inhibition can cause hypothyroidism in susceptible individuals.

Copyright by Engacy Learning Private Limited. All rights reserved. Reproduction or distribution without written consent is strictly prohibited.

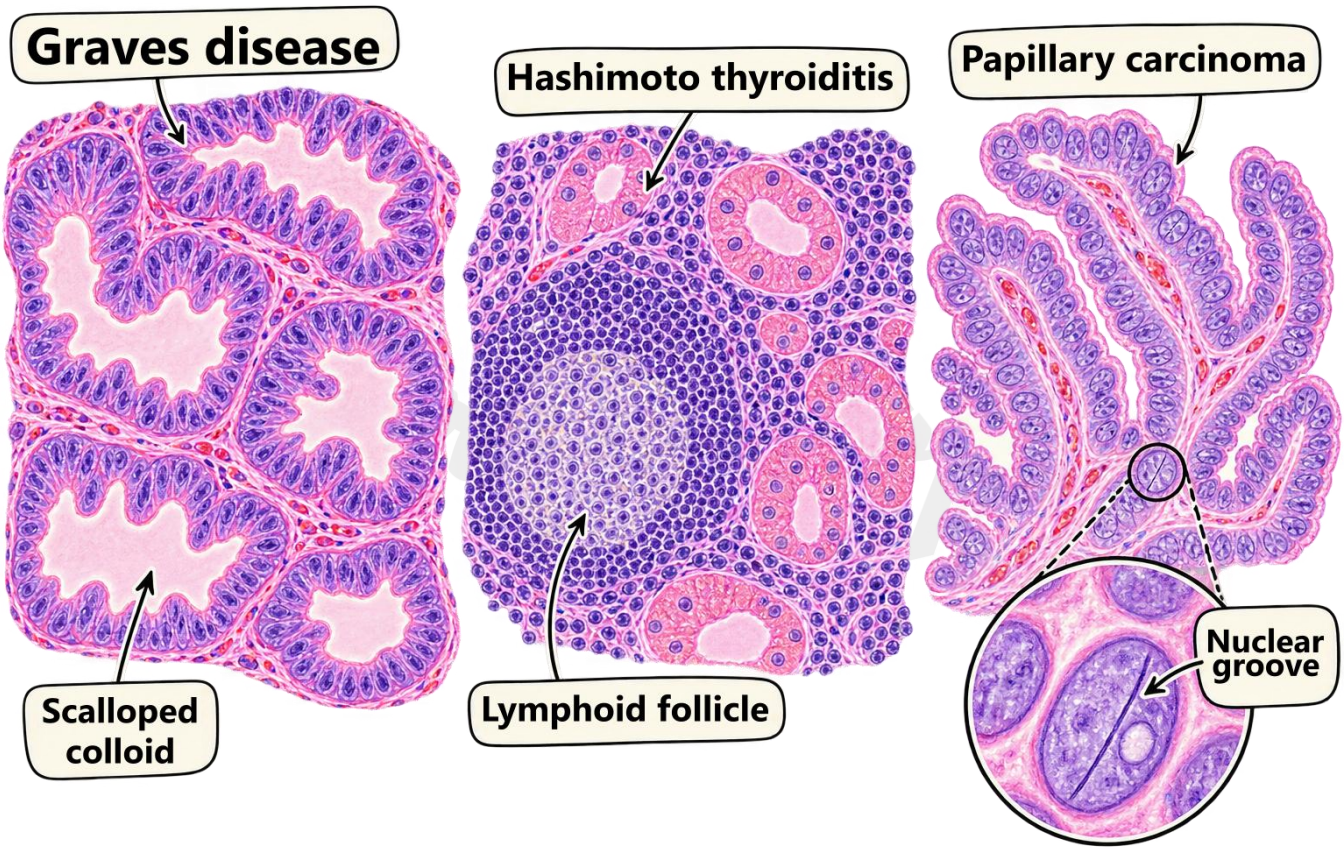
Thyrotoxicosis and Graves Disease

- **Thyrotoxicosis** means excessive thyroid hormone action in tissues. **Hyperthyroidism** specifically means increased hormone synthesis and secretion by the thyroid.

Causes of Thyroid Hormone Excess

- Graves disease, toxic multinodular goitre and a toxic adenoma cause hyperthyroidism.
- Destructive thyroiditis can cause thyrotoxicosis by releasing stored hormone without increased synthesis.
    - Excess administered thyroid hormone is another possible cause of thyrotoxicosis.

Graves Disease and Morphology



Characteristic microscopic patterns in Graves disease, Hashimoto thyroiditis and papillary carcinoma

TSH-receptor Stimulation and Gland Enlargement

- Stimulating antibodies activate the TSH receptor, producing hormone synthesis and follicular growth despite suppression of pituitary TSH.
- The gland becomes diffusely enlarged and highly active.

Follicular and Colloid Morphology

- Microscopy shows tall crowded follicular cells with infoldings into the lumen.
- The infoldings lack the true fibrovascular cores of neoplastic papillae.
    - Colloid is pale and scalloped at its margins because it is being actively resorbed.

Copyright by Engacy Learning Private Limited. All rights reserved. Reproduction or distribution without written consent is strictly prohibited.

- Lymphoid infiltration may be present.

Extrathyroid Autoimmune Manifestations

- Autoimmune changes in orbital tissues can produce Graves orbitopathy.
- Pretibial myxoedema is another characteristic but less common manifestation.
- Immune activation of orbital fibroblasts with glycosaminoglycan deposition, oedema and tissue expansion contributes to the ophthalmopathy.

Clinical Effects of Hormone Excess

- Excess hormone increases metabolic activity and adrenergic responsiveness.
- Weight loss, heat intolerance, tremor, palpitations and frequent stools are typical features.
  - Older adults may have less obvious symptoms and present with arrhythmia or heart failure.

Blood Tests and Uptake Patterns

- Primary hyperthyroidism usually produces suppressed TSH with raised free T4, free T3 or both. TSH-receptor antibodies support Graves disease.
- Radionuclide uptake is usually diffusely increased in Graves disease, focal in a toxic adenoma and patchy in toxic multinodular goitre.
- Uptake is low in destructive thyroiditis or exogenous hormone excess.
  - Recent iodine exposure and medicines can alter uptake, so scan interpretation requires context.

Cardiovascular, Skeletal and Systemic Complications

- Complications include atrial fibrillation, cardiac dysfunction and accelerated bone loss.
- Thyroid storm is a severe systemic decompensation rather than simply a particular hormone concentration.

Hypothyroidism and Thyroiditis

- Hypothyroidism is reduced thyroid-hormone action, while thyroiditis is inflammation of the thyroid that may alter hormone release or lead to gland failure.

Hypothyroidism

Primary and Central Hypothyroidism

A. Primary Hypothyroidism

- Primary hypothyroidism results from thyroid failure and usually causes high TSH with low free T4.
- Causes include autoimmune destruction, iodine deficiency and loss of thyroid tissue after treatment.

Copyright by Engacy Learning Private Limited. All rights reserved. Reproduction or distribution without written consent is strictly prohibited.

B. Central Hypothyroidism

- Central hypothyroidism results from pituitary or hypothalamic disease.
- Free T4 is low, while TSH may be low or inappropriately normal.
- TSH alone can therefore be misleading when central disease is suspected.

Consequences of Reduced Hormone Action

- Reduced hormone action causes fatigue, cold intolerance, constipation, slowed thinking and weight gain.
- Accumulation of glycosaminoglycans contributes to non-pitting myxoedema.
- Congenital severe hormone deficiency can impair growth and brain development.
- The effect depends on timing and severity, making early detection important.

Major Types of Thyroiditis

1. Hashimoto Thyroiditis

Autoimmunity and Morphology

- Hashimoto thyroiditis is an autoimmune destruction of thyroid follicles.
- Anti-thyroid peroxidase and anti-thyroglobulin antibodies support the autoimmune setting.
- Cytotoxic T-cell injury, cytokine effects and antibody-associated mechanisms contribute to loss of follicles, with replacement by lymphoid infiltrates and variable fibrosis.
- The gland may be diffusely enlarged before becoming atrophic.
- Microscopy shows lymphoid follicles with germinal centres, damaged follicles and oncocytic Hürthle-cell change.
- Hürthle-cell change reflects abundant granular eosinophilic cytoplasm from mitochondrial accumulation and is not itself proof of a neoplasm.

Clinical Course and Associations

- A brief release-related thyrotoxic phase may precede hypothyroidism.
- Long-standing autoimmune thyroiditis is associated with increased risk of thyroid lymphoma.

2. Subacute Granulomatous and Painless Thyroiditis

A. Subacute Granulomatous Thyroiditis

- Subacute granulomatous thyroiditis commonly follows a viral-type illness and produces a painful tender gland.
- Disrupted follicles are surrounded by macrophages and multinucleated giant cells.

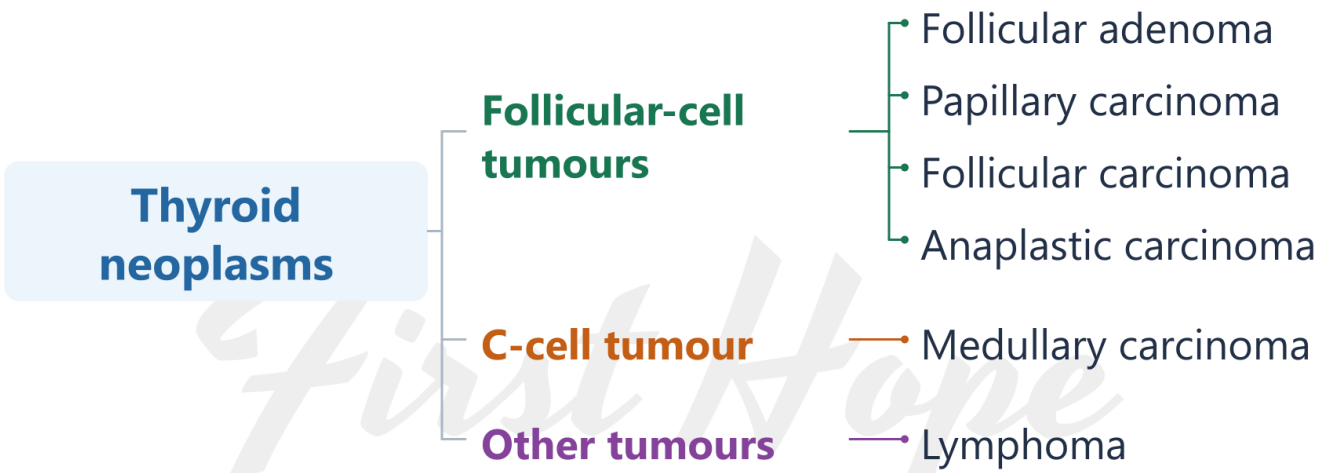
Copyright by Engacy Learning Private Limited. All rights reserved. Reproduction or distribution without written consent is strictly prohibited.

B. Painless and Postpartum Thyroiditis

- Painless and postpartum thyroiditis usually have a lymphocytic autoimmune pattern.
- Both can pass through thyrotoxic and hypothyroid phases before recovery or persistent dysfunction.
- Low uptake during the thyrotoxic phase reflects release of stored hormone rather than increased synthesis.

Thyroid Neoplasms

- Thyroid neoplasms are clonal tumours of thyroid cells and include both benign and malignant entities.



Follicular Adenoma

- A follicular adenoma is usually a solitary encapsulated nodule composed of follicular cells.
- Its architecture differs from the surrounding thyroid but lacks capsular or vascular invasion.
- Adenoma and follicular carcinoma can look similar on cytology.
- The capsule and relevant vessels must be examined histologically to assess invasion.
  - Fine-needle aspiration can identify a follicular neoplasm but cannot reliably distinguish all adenomas from carcinomas.

Major Thyroid Carcinoma Types

1. Papillary Thyroid Carcinoma

➢ Papillary carcinoma is the most common thyroid malignancy and is associated with prior ionising radiation in some cases. MAPK pathway abnormalities, including BRAF alterations and kinase fusions, occur in different tumours.

Characteristic Morphology

- Characteristic nuclei are enlarged, overlapping and pale, with grooves and intranuclear cytoplasmic pseudoinclusions.

Copyright by Engacy Learning Private Limited. All rights reserved. Reproduction or distribution without written consent is strictly prohibited.

FREE PREVIEW

Click here to visit our website

MBBS PREMIUM NOTES

Complete MBBS notes for every subject and year are available only in the FirstHope app.

Scan or click here

Click here to get the app >

Available on Google Play

Browse MBBS notes by year

firsthope.co.in/mbbs

Click here to explore MBBS >

Scan or click here

FirstHope Medical on Instagram

@firsthope.medical

Click here to follow

App and notes help

Find answers about access and downloads

Click here for help

YEAR 1 / YEAR 2 / YEAR 3 / YEAR 4