Anatomy

- Brownish-red, highly vascular gland
- Location: anterior neck at C5-T1, overlays 2nd – 4th tracheal rings
- Avg. width: 12-15 mm (each lobe)
- Avg. height: 50-60 mm long
- Avg. weight: 25-30 g in adults (slightly more in women)
- **enlarges during menstruation and pregnancy**
- Pyramidal lobe:
  - often ascends from the isthmus or the adjacent part of either lobe (usu L) up to the hyoid bone
  - may be attached by a fibrous/fibromuscular band -> “levator” of the thyroid gland

Relation w/ Strap muscles

- Lateral: sternothyroid
- Anterior: omohyoid muscle, sternohyoid
- Inferior: SCM (lower portion)
- Careful: motor nerve supply from the ansa cervicalis enters these muscles inferiorly.

Vascular Anatomy

**ARTERIAL:**

- Superior and inferior thyroid arteries (occ thyroidea ima)
- ++ collateral anastomoses (ipsi and contralaterally)
- Thyroid ima (when pres) originates from aortic arch or innominate artery, enters the thyroid at inferior border of isthmus.

**VENOUS:**

- 3 pairs of veins:
  - STV – asc along STA and becomes a tributary of the IJV
  - MTV – directly lateral → IJV
  - ITV (variable):
    - R – passes ant to innominate a → R BCV or ant trachea → L BCV
    - L – drainage → L BCV
    - **occ – both inf veins form a common trunk “thyroid ima vein” → empties into L BCV

Relationship with RLN:

- RLN ascends in the TE groove and enters the larynx b/w the inferior cornu of the thyroid cartilage and the arch of the cricoid
- RLN can be found after it emerges from the superior thoracic outlet:
  - Sup: thyroid lobe
  - Lat: common carotid artery
  - Medial: trachea
Lymphatics

- Extensive, multidirectional flow
- Periglandular
  - → prelaryngeal (Delphian)
  - → pretracheal
  - → paratracheal (along RLN)
  - → brachiocephalic (sup mediastinum)
  - → deep cervical
  - → thoracic duct

Structure

- Under pretracheal → thyroid inner true capsule = thin and closely adherent to the gland
- capsule extensions within the gland form septae, dividing it into lobes and lobules
- lobules are composed of follicles = structural units of the gland = layer epithelium enclosing a colloid-filled cavity
- colloid (pink on H&E stain) contains an iodinated glycoprotein, iodothyroglobulin (precursor of thyroid hormones).
- Epithelial cells = 2 types:
  - **principal** (ie: follicular) – formation of colloid (iodothyroglobulin)
  - **parafollicular** (ie: C cells - clear, light), lie adjacent to follicles w/in basal lamina -> produce calcitonin

**THYROID PHYSIOLOGY**

**Thyroid Hormone Synthesis**

1. Iodide trapping
2. Oxidation of iodide and iodination of thyroglobulin
3. Coupling of iodotyrosine molecules within thyroglobulin (formation of T3 and T4)
4. Proteolysis of thyroglobulin
5. Deiodination of iodotyrosines
6. Intrathyroidal deiodination of T4 to T3

**Hypothalamic Pituitary Axis**

![Diagram of the hypothalamic pituitary axis](image)
THYROID HORMONES IN THE BLOOD

- Approximately 99.98% of T4 is bound to 3 serum proteins: Thyroid binding globulin (TBG) ~75%; Thyroid binding prealbumin (TBPA or transthyretin) 15-20%; albumin ~5-10%
- Only ~0.02% of the total T4 in blood is unbound or free.
- Only ~0.4% of total T3 in blood is free.

Effects of Thyroid Hormone

- Fetal brain and skeletal maturation
- Increase in basal metabolic rate
- Inotropic and chronotropic effects on heart
- Increases sensitivity to catecholamines
- Stimulates gut motility
- Increase bone turnover
- Increase in serum glucose, decrease in serum cholesterol
- Increases oxygen consumption in most target tissues.

Disorders of Thyroid:

- Functional-Hyperthyroidism
- Hypothyroidism
- (Euthyroid)
- Thyroiditis.
- Neoplasms – adenoma/carcinoma.
- Congenital – Thyroglossal cyst/duct.

History

- Period-Duration.Days.Weks.Months.years
- Progress-Rapid, slowly
- Pressure symptoms.Dyspnea.Dysphagia
- Palpitation.TG
- Pain-Thyroiditis
- Paralysis-Change of voice.Malignancy?

Pertinent questions –clinical assessment of goiter

1. is it Goiter-?
2. Diffuse or Nodular?
3. Single nodule –Solitary thyroid nodule or Dominant nodule in MNG
4. Function wise: Hyper, Hypo or euthyroid?
5. Thyroiditis?
6. Signs of malignancy?
7. Retrosternal Extension?
8. recurrent
Classification of goiter

1. Simple nontoxic
   a. Diffuse hyperplastic-
      i. physiological-puberty,preg.
      ii. -prim.Iodine def-Endemic G
      iii. Sec.Iodine def.
      iv. Goiterogens-of Brassica family-Cabbage,soya bean
      v. Excess dietary flouride.
     vi. Drugs-PAS,Lithium,Phenyl butazone. Thiocyanates,potassium perchlorate.Antithyroid
         drugs.radioactive iodine. Dyshormonogenesis
   b. Colloid G
   c. MNG
   d. Solitary nontoxic nodule
   e. Recurrent nontoxic nodule

2. Toxic G
   a. Diffuse-prim- Graves’ dis
   b. MN (sec.)Plummer’s dis
   c. Toxic nodule-Solitary-Tertiary-Toxic adenoma
   d. Recurrent toxic G

3. Thyroiditis
   a. acute
   b. subacute
   c. chronic-CLT

4. neoplastic
   a. benign
   b. malign
Solitary thyroid nodule (STN)

Aims-
1. Determine whether it is causing localized or systemic symptoms
2. Whether it is benign or malignant

DDX:
1. Benign G
2. Cyst(intrathyroidal)
3. thyroiditis
4. Benign tumor
5. Malignant tumor
   - Hy- IND- Sex-STN-more likely to be Ca in a man than woman
   - Age=                  = in young (<20) & older >60Y
   - Thyroid Ca occurs in 40% of children withSTN
   - Residence(place of birth)-Benign nodule in endemic G areas
   - 6 Ps
   - Past Hy-Hy vof radiation to neck ( most important)-Low –dose therapeutic radiation(6.5-2000cGy) in infancy & childhood—Increased incidence of benign G(35%), or thyroid cancer(13%)
   - family Hy-Thyroid Ca is familial in 25% of patients with Medullary Ca
   - O/E- Palpate systematically – STN or MNG
   - Solitary hard nodule-like to be malignant
   - Cervical LAP-?

Investigations:
- US— Solid or cystic ?
  o number of nodules
  o Suspicious nodule?
  o Coexistent suspicious LN?
- FNA + US guide
  o Cytological results:
    1. Malignant
    2. Benign
    3. Suspicious
    4. Inadequate repeat biopsy
       - False +ive is rare
       - 20% of suspicious- & 5% of benign reports-are actually malignant
- CXR—including neck-Tracheal displacement.calcification of nodule.Pul.metastasis
- Indications for surgery
  1- suspicion or documented Ca
  2- Pressure symptoms
  3- TG4-Substernal extension
  5- Cosmetic deformity
- Non-op.Rx
  1- small or moderately sized MNG
  2- CLT.unless suspicious area
  3- Hy of radiation
  4- Family Hy of Ca. thyroid
Clinical Assessment of G

<table>
<thead>
<tr>
<th></th>
<th>Diffuse</th>
<th>MNG</th>
<th>STN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional:</td>
<td>Simple G</td>
<td>Simple, non-toxic</td>
<td>Colloid, Cyst.</td>
</tr>
<tr>
<td>Euthyroid</td>
<td>Grave’s disease</td>
<td>Toxic MNG</td>
<td></td>
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<tr>
<td>Hyperthy</td>
<td></td>
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<tr>
<td>Hypoth</td>
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<tr>
<td>Thypoiditis</td>
<td>Anaplastic.</td>
<td>Focal</td>
<td></td>
</tr>
<tr>
<td>Malignancy</td>
<td>Medullary, Lymphoma</td>
<td>Follicular</td>
<td>Papillary</td>
</tr>
<tr>
<td>Recurrent</td>
<td></td>
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</table>

**MNG**

**Pathogenesis:**

1. Persistent TSH stimulation—Diffuse hyperplasia of gland (all active lobules)—later with
2. fluctuation of TSH level—mixed areas of active & inactive lobules develop-----
3. active lobules become more vascular & hyperplastic
4. Hage occur with necrosis in the center
5. nodule formation
6. center of nodule is inactive & only margin is active i.e. internodular tissue is active----
7. Formation of many nodules—MNG

Colloid G- Due to long standing Iodine deficiency + localized accumulation of significant colloid in the gland

**MNG: Clinical features—**

1. More common in middle aged females
2. long Hy—many years. slowly progressive
3. Many nodules. Dif. size, in both lobes, isthmus
4. nodule—firm, nontender & moves with deglutition.
5. Recent increase in size—short duration—Hage weeks to months—malign transformation

**Complications of MNG**

1. Sec thyrotoxicosis
2. Follicular Ca. of thyroid
3. Hage in a nodule
4. tracheal compression—retrosternal extension/obstruction
5. Cosmetic problem

**Investigations**

- TFTs–TSH, F(T4)
- U/S
- FNA
- Rx Surgery S/T
- Near total thyroidectomy
- Total T
Solitary thyroid nodule

Causes

1. Thyroid cyst
2. Thyroid adenomas
   a. Follicular
   b. Hurthle cell
3. Papillary Ca
4. Dominant nodule in MNG

Types:

1. Toxic adenoma
2. Nontoxic Solitary nodule based on radioactive study:
   a. Hot –autonomous toxic nodule
   b. Warm-normally functioning nodule
   c. Cold-nonfunctioning-thyroiditis, thyroid cyst, hage, malig

Clinical features

1. Single palpable nodule
2. progress- rapid enlargement may be malig
3. Age – extreme of life – can be malig. 30 % are cystic
4. up to 20 % of cold nodule –malig
5. site- commonest site at junction of isthmus wit one of lat lobe.

Clinical features suggesting malig:

1. Any nodule can be malig
2. Rapid onset/or recent increase in size.
3. Pressure effects
4. Paralysis- hoarseness of voice
5. Hard, irregular, fixed nodule
6. Palpable significant cervical LAP

Investigations

1. TFTs
2. neck U/S
3. FNA
4. Radioactive isotope study(Iodine 123,131, Tc 99
5. XR- neck- tracheal deviation.

Rx

Indications for surgery:

1. Cyst->4cm.Hagic,Malig or suspecios on FNA, Recurrent Cyst. Complex cyst (both solid & cystic component).
2. follicular neoplasm
3. malig nodule
4. toxic adenoma in young patient
5. pressure effects
6. Cosmetic reason
Rx-continued

A. Conservative- Colloid nodule- T4 Rx- respond in 50%
   - if nodule: reappears, or enlarges rapidly or causes cosmetic problem—then -HT(hemithyroidectomy
B. Surgery- minimal op.HT
   1. Nontoxic G- hemithyroidectomy including the isthmus.
   2. Papillary Ca. near total T.+ suppression dose of T4(0.2-0.3mg/d)
   3. Toxic adenoma-age >45; radioactive iodine(131) 5 milli curie orally. Age <45Contro with antithyroid then
      surgery- hemithyroidectomy
   4. If FNA-follicular adenoma-hemithyroidectomy
   5. If HPE- follicular Ca(capsular & vascular invasion) then complete total T( W/N1wk or after 3wks)
   6. if nodule in the isthmus- isthmusectomy + part of adjacent lat. lobes
   7. If FNA- Medullary Ca-Total T+bilat. neck nodal dissection including central compartment

Thyroid cyst

1. Tensly cystic swelling may be hard-
2. common cause – colloid degeneration. 50%- absence of epithelial lining
3. 30% of solitary nodules are cystic
4. 15% cystic swellings- are malig
5. cystic formation is common in papillary ca.
6. complex cyst- contains both cystic & solid areas, more likely to be mlig
7. FNAC may cause regression of simple cyst.
8. Recurrence after 3 aspiration or if cyst hagic—surgery
9. Complex cyst or > 4cm or malig or suspicious- surgery

SOB in Goiter

1. MNG- tracheal compression
2. Retosternal G
3. Sec toxic G- CHF
4. Ca. infiltrating the trachea

Thyrotoxicosis & Hyperthyroidism

Thyrotoxicosis- symptoms complex caused by increased levels of thyroid hormones’. Types:

1. Diffuse toxic G- graves’ dis- Prim thyrotoxicosis.
2. toxic MNG-Sec Thyrotoxicosis
3. Toxic adenoma- nodule
4. Others:
   a. thyrotoxicosis factitia- drug induced . Excessive intake of T4
   b. Jod Basedow thyrotoxicosis- by large doses of iodine given to hyperplastic endemic G
   c. Thyroiditis- de Quervain’s or Autoimmune
   d. Occ. Ca thyroid
   e. Neonatal thyrotoxicosis- subsides in 3-4 wks
   f. Struma ovarii
   g. Drugs-amiodarone- antiarrhythmic agent
Clinical features

- Incidence
  - Age - any
  - Sex - F: M 8:1
  - Prim. Commonly in younger age group
  - Sec. is common in older age group
  - Graves’ disease may present without obvious goiter

- Suspect Graves’ disease in:
  1. Unexplained behavioural problem
  2. Insomnia
  3. Myopathy
  4. Unexplained diarrhea or wt loss
  5. Tachycardia
  6. Menstrual changes or infertility

Symptoms

1. CNS-Irritability. Nervousness. Insomnia
3. Skeletal system: Increase in linear growth in children
5. CVS: Tachycardia. SOB at rest or on mild exertion. Angina. Arrhythmias. CHF (in elderly)
6. GIT: Wt loss despite good appetite. Diarrhea (due to increased activity at ganglionic level).
7. GUT: oligo or amenorrhea. Occ. Urinary frequency

Sympathetic overactivity causes:

- SOB, Palpitation. Tiredness. Heat intolerance. Sweating. Nervousness, increased appetite & decrease in Wt. Because of increased catabolism they have increased appetite, decrease wt & also increased creatinine level which signifies myopathy due to more muscle catabolism.
- Fine tremor due to diffuse irritability of gray matter.
- Thrill & bruit are detected in upper pole as the Sup TA enters the gland superficially while ITA enters from deeper plane so the thrill cannot be felt in lower pole

Hyperthyroidism Features:
THYROID EYE DISEASE

INfiltration

- soft tissue involvement: chemosis, conjunctival injection over the recti insertions, puffy lids
- Superior limbic keratoconjunctivitis (SLK)

Clinical Characteristics of Exophthalmos

- Proptosis
- Corneal Damage
- Periorbital edema
- Chemosis
- Conjunctival injection
- Extraocular muscle impairment
- Optic neuropathy

Clinical Characteristics of Localized Myxedema

- Raised surface
- Thick, leathery consistency
- Nodularity, sometimes
- Sharply demarcated margins
- Prominent hair follicles
- Usually over pretibial area
- Non-tender

Graves’ Disease - Localized Myxedema

- Margins sharply demarcated
- Nodularity
- Thickened skin
- Margins sharply demarcated

Thyroid Acropachy

- Clubbing of fingers
- Painless
- Periosteal bone formation and periosteal proliferation
- Soft tissue swelling that is pigmented and hyperkeratotic
Wayne’s (Clinical) diagnostic indices

Symptoms & Signs

1. heat intolerance(+5).
2. excessive sweating(+3)
3. Increased appetite(+3)
4. deceased Wt(+3)
5. Nervousness(+2)
6. Tiredness(+2)
7. palpitation(+2)
8. Dyspnea on exertion(+1) preference to heat (-5)

Wayne’s –Clinical Diagnostic indices

Signs

1. Hyperkinetic movement +4 absent -2
2. AF = +4 absent -3
3. Goiter +3
4. Tachycardia +3
5. Bruit over thyroid +2
6. Exophthalmos +2
7. Lid retraction +2
8. Hot hand =+2 absent -2
9. lid lag +1
10. -moist hand +1 absent -1
   • >19 points ------TG
   • 11-19 equivocal
   • <11 NON TG

TFTs

<table>
<thead>
<tr>
<th>Type of Hyperthy</th>
<th>TSH</th>
<th>T4</th>
<th>T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional</td>
<td>Undetect.</td>
<td>increased</td>
<td>Increased</td>
</tr>
<tr>
<td>T3 Hyperth</td>
<td>=</td>
<td>N</td>
<td>=</td>
</tr>
<tr>
<td>Subclinical</td>
<td>=</td>
<td>N</td>
<td>N</td>
</tr>
</tbody>
</table>

Rx

• medical
• Surgery
• Radioactive iodine Rx
Medical Rx Indications

1. young age
2. preg
3. preoperative preparation
4. soon after starting radioactive Iodine 6-12 weeks
5. B-Blockers:
   a. Carbimazole
   b. methimazole
   c. propyl thiouracil 50 mg tab

- Lugol’s iodine (5% iodine+10% KI) 10-30 drops/d.
- For 10 days.
- Suppression- replacement Rx= Antithyroid+Eltroxin

- Advantages:
  - Avoid op & its complications
  - avoid radioactive iodine Rx

- Disadvantage: Cost, Duration, Relapse Rate, Patient’s compliance, SE

Surgery indications

1. failure of medical Rx
2. toxic adenoma
3. Toxic MNG
   - preoperative Preparation- Euthyroid clinically & bioch
   - sleeping pulse, 90/min
   - general preparation: HB. BUN. CXR. ECG. Blood gp & save serum
   - Specific prep: XR neck. S.Ca(s. Albumin), ENT Check up of the vocal cords.
   - Informed consent- Change in voice. Hypoparathyroidism (tetany)

- Advantages
  - rapid & high cure rate.
  - avoid long term medical Rx & its cconsequences
  - avoid RAI

- Disadvantages:
  - Complocations of op.
  - recurrent thyrotoxicosis 5%
  - Hypothyroidism 20-45%

RAI Rx

Indications

1. hyperthy after 45y
2. toxic adenoma
3. recurrent thyrotoxicosis

Dose 5-10 millicurie (needs 3 months)

**Advantages:**
1. No surgery
2. no prolonged medical Rx

**Disadvantages:**
1. takes 3 months to achieve its goal
2. pat isolations & precausions
3. radiation effects. mutations?
4. specific center & equipment (facility)
5. proper follow up as all—hypothyroidism
In Pregnancy

- Antithyroid drugs - propyl thiouracil is preferable
- Surgery in second trimester can be done

In Children: Medical Rx usually till adolescent period 7 then surgery if needed

Hypo-thyroidism Myxedema Features:

Hypothyroidism

Causes

A. cong. Agenesis. Dyshormonogenesis
B. acquired:
   1. Trauma- iatrogenic- Surgery –after thyroidectomy
   2. metabolic-iodine deficency
   3. inflam & infective – thyroiditis. CLT( Hashimoto’s)
   4. radiation. RAI Rx
   5. anti Thyroid drugs.
   6. drugs- Lithium. Amiodorone

Clinical features:

1. Goiter
2. general- tiredness. Wt gain.cold intolerance. Hyperlipidemia.
3. hematological. Anemia.
5. CVS-bradycardia.angina..CHF. Pericardial effusion.
7. GIT. Ileus. Constipation.
8. developemental.growth & mental retardation. Delayed puberty..
9. locomotor. Carpal tunnel synd. Myalgia.ataxia
10. CNS psychicosis(Myxoedema madness). Depression
11. ENT- hoarseness. Deafness.
Investigations TFTs

- TSH high.
- T3 & T4 low

Rx

- replacement Rx; eltroxin 100-150microgram/d
- in elderly with IHD- start low dose initially 25-50 then gradually increase it

Lingual Thyroid (failure of descent)

- Verification that lingual mass is thyroid by its ability to trap I\textsuperscript{123}
- Significance: May be only thyroid tissue in body (~70% of time), removal resulting in hypothyroidism;
- Treatment: consists of TSH suppression to shrink size

INFLAMMATORY THYROID DISEASE

THYROIDITIS...

- Diverse group of diseases
- Little or no relationship with one another
- Variable symptoms
  - Thyroid pain
  - Goitre
  - Thyroid dysfunction

CLASSIFICATION...

- Acute
  - Bacterial infection: especially Staphylococcus, Streptococcus, and Enterobacter
  - Fungal infection: Aspergillus, Candida, Coccidioides, Histoplasma,& Pneumocystis
  - Radiation thyroiditis after treatment
  - Amiodarone (may also be subacute or chronic)
- Subacute
  - Viral (or granulomatous) thyroiditis
  - Silent thyroiditis (including postpartum thyroiditis)
  - Mycobacterial infection
- Chronic
  - Autoimmunity: focal thyroiditis, Hashimoto's thyroiditis, atrophic thyroiditis
  - Riedel's thyroiditis
  - Parasitic thyroiditis: echinococcosis, strongyloidiasis, cysticercosis
- Traumatic: after palpation
INFECTIONOUS THYROIDITIS...

- **Acute**
  - Haematogenous spread
  - Piriform sinus fistula
  - Staph Aureus, Strep Haemolyticus, Pneumococcal
- **Chronic**
  - Immunocompromised host
  - Mycobacterial, fungal, PCP
- **Symptoms & Signs**
  - Sudden neck pain (usually unilateral)
  - Unilateral neck mass (fluctuant)
  - Fevers, chills
- **Investigations & Diagnosis**
  - High index of clinical suspicion
  - TFT’S – Usually normal
  - U/S – Identify single or multiple collections
  - Needle aspiration – Fluid for M,C+S
- **DDx**
  - Haemorrhage into thyroid nodule/cyst
  - Usually not systemically unwell
- **Treatment**
  - Drainage
  - Identification of organism + appropriate ABx
  - Identification of tract/fistula’s + excision

RADIATION THYROIDITIS...

- May occur 5-10 days after Radioiodine Treatment
- Due to radiation induced inflammation + necrosis
- **Symptoms**
  - Mild pain/tenderness
  - Mild hyperthyroidism
- **Diagnosis**
  - Clinical grounds
- **Treatment**
  - Spontaneous resolution over 7-10 days
SUBACUTE THYROIDITIS...

- **Subacute Granulomatous Thyroiditis**
  - (De Quervains, Giant Cell Thyroiditis)
    - Usually between 2\textsuperscript{nd} & 5\textsuperscript{th} decade
    - Ratio: F 5: M 1
- **Pathogenesis**
  - Viral infection
  - Post viral Inflammatory process
  - Often URTI + clusters associated with Coxsackie, mumps, measles
- **Mechanism**
  - Viral antigen binds HLA-B35 molecules on macrophages
  - Activation of cytotoxic T cells which damage thyroid follicular cells because of structural similarities
  - Self-limiting process
  - No direct association with autoimmune disease
- **Symptoms & Signs**
  - Neck pain+/- radiation to jaw/ears
  - Fever, Malaise, myalgia
  - Slight diffuse enlargement of thyroid
  - Mild to severe tenderness (may be unilateral, diagnosis should not be made in absence of pain)
  - Hyperthyroidism followed transient hypothyroidism (2 to 8 weeks) (Mild Symptoms)
- **Symptoms of Hyperthyroidism**
  - Weakness
  - Fatigue
  - Irritability
  - Palpitations
  - Tachycardia
  - Tremor
  - Thyroid Stare
  - Increased appetite
- **Investigations & Diagnosis**
  - **Hormone Status**
    - ↑T4, ↑T3, ↓TSH (Early)
      - Inflammation damages thyroid follicles & activates proteolysis of thyroglobulin
    - As inflammation subsides hormones normalise
  - **U/S**
    - Enlarged, diffusely or focally hypo-echogenic (Helps differentiate from DDx of haemorrhage into a nodule or acute infectious Thyroiditis)
  - **Thyroid Scintigraphy**
    - ↓↓Radionuclide Uptake
- **FNAC**
  - Widespread infiltration with Neutrophils, Lymphocytes, Histocytes & Giant Cells
  - Collapse of Thyroid follicles
  - Necrosis of follicular cells
- **Others**
  - Mild anaemia
  - Leukocytosis
  - ESR >50 (strong confirmatory evidence)
• Treatment
  o Symptomatic
  o Pain control
    ▪ NSAIDS- High dose aspirin (up to 3gms/daily)
      - Naproxen
  o If no improvement in several days:
    ▪ Prednisolone (30mg- 40mg/ daily)
    ▪ Wean over 8-12 weeks
  o If no improvement:
    ▪ Re-evaluate
  o Hyperthyroidism Symptoms
    ▪ B blockade – Propanolol (40-120mg/daily), Atenolol (25-50mg/daily)
    ▪ Thioamides – No use

• Prognosis
  o Recovery usually complete
  o Tenderness may persist for several months
  o Treat Hypothyroidism if necessary

AUTOIMMUNE THYROIDITIS...

Hashimoto’s Thyroiditis (Chronic Lymphocytic Autoimmune Thyroiditis)
  • Most common cause of Hypothyroidism in iodine sufficient parts of the world
  • Familial association with GRAVE’S and occasionally Graves evolves into Hashimoto’s & vice- versa.
  • Hashimoto described in 1912- pathology report with goitre & intensive lymphocytic infiltration
  • Ratio- Female 7 : Male 1
  • Concordance Rate in Monozygotic twins ~30-60%
  • Combination of genetic & Environmental susceptibility

THYROID ANTIGENS / ANTIBODIES
  • Several antibodies directed against Thyroid tissue have been identified in Auto Immune Thyroiditis
    o TSH Receptor
    o Thyroglobulin
    o Thyroid Peroxidase
    o Sodium Iodide transporters

TSH RECEPTOR...
  • May have stimulatory or inhibitory A/b’s which cause Graves or Hashimoto’s respectively
  • TSH Receptors A/b’s are specific for Graves or Hashimoto’s (not always present)
Clinical Features... Hypothyroidism

- **Symptoms**
  - Fatigue
  - Cold intolerance
  - Hair loss
  - ↓ Libido
  - ↓ concentration
  - ↑ weight
  - Constipation
  - Hoarse voice
  - Menorrhagia
  - Impaired hearing

- **Signs**
  - Coarse Skin
  - Bradycardia
  - Myopathy
  - Puffy Face
  - Peripheral oedema
  - Delayed tendon reflexes

Hashimoto’s....

- **Goitre**
  - Variable in size
  - Irregular and firm in consistency
  - May cause pressure symptoms
  - 95% non-tender

- Hyperthyroidism may occur due to:
  - Concomitant Graves’ disease
  - Destructive Thyroiditis

- Associations with other Autoimmune disease Vitiligo, Pernicious anaemia, Addison’s, DM

- **Investigations**
  - TFT’s
    - ↑TSH, ↓T4, ↓T3
    - N.B T3 is N in about 25% because of adaptive response

  - Antibodies
    - Thyroid Peroxidase A/B – present in 95%
    - TSH-R A/B’s present in 10-20% (not routinely checked)

  - U/S
    - Heterogenous thyroid enlargement
    - May help in excluding MNG in asymmetrical goitre

  - FNA
    - Marked lymphocytic infiltration
    - Absence of colloid
    - Ix focal nodules if present
    - Useful if diagnostic concern persists

Hashimoto’s Histopathology...

- Marked Lymphocytic Infiltration with Germinal centre formation
- Absence of Colloid
- Mild to moderate fibrosis
- Follicular destruction
- Predominantly T cell driven
- A/B fixation of complement involved
  - Precipitating Factors implicated:
    - Infection, stress, sex steroids, pregnancy
Treatment
- Levothyroxine 1.5mcg/kg
- Dose adjusted according to TSH (in 12.5- 25 mcg increments)
- TSH measured 2 months after dosage adjustment
- T4/T3 combo available-no proven benefit
- Annual follow up
- Pregnancy= increased dose, up to 50%

Goitre usually regresses with thyroxine
- Amount of regression can be variable

Corticosteroids rarely warranted

Surgery usually not needed unless suspicious nodule or medical Mx failure

Drug induced Thyroiditis Amiodarone...

- Contains 35% Iodine
- Variable symptoms
- Hyperthyroidism
  - In 2-10% of patients
  - Thyroiditis (unknown cause)
  - Iodine induced hyperthyroidism
- Hypothyroidism
  - In 6-13% of patients
  - Antithyroid action of iodine

Clinical Findings...

- Thyroiditis
  - Small smooth Goitre
  - Onset -variable
  - ↓ Radio-iodine uptake
  - ↑ ESR
  - ↓ Vascularity
- Iodine Induced
  - Nodular Goitre
  - Onset- Early
  - ↑ Radio- iodine uptake
  - ↑ Vascularity on U/S

Management...

- Thyroiditis
  - NSAIDS +- Prednisolone
  - Duration of therapy depends on response
- Iodine Induced
  - Anti-thyroid medication
  - Potassium perchlorate
- Hypothyroidism
  - Thyroxine as necessary
  - Continue amiodarone if necessary
Drug Induced Thyroiditis Others...

- IFN alpha
  - Used for chronic Hep B, C
  - 5% cases thyroiditis
- IL-2
  - Used for treatment of various malignancies
- Lithium

Post-Partum Thyroiditis...

- Occurs within 1 year post-partum
- Incidence ~ 5%
- Exacerbation of autoimmune thyroiditis
- Variable presentation
  - Hyperthyroidism (20-30%)
  - Hypothyroidism (40-50%)
  - Transient
- Symptoms and signs usually mild
- Need to distinguish thyroiditis from GRAVES
- Recurrence & long term risks

Management...

- Thyroiditis
  - Transient, resolves 1-3mths
  - Symptomatic, beta blockers in severe cases
- Hypothyroidism
  - Symptomatic, thyroxine
- Graves
  - Carbimazole, propylthiouracil
  - Radioiodine
  - Surgery

Silent Thyroiditis...

- Indistinguishable from post-partum thyroiditis
- No pain
- Mild symptoms
- Symptomatic treatment
- Recovery is the rule
- Proportion develop long term hypothyroidism
Riedels Thyroiditis (Sclerosing Thyroiditis)...

- Rare
- Unknown cause
- Pathologically
  - Dense fibrous tissue
  - Invades adjacent structures
- Symptoms
  - Enlarging Goitre causing pressure symptoms
- Investigations
  - TFT’s – normal
  - U/S- fibrous patches
  - TPO A/b’s ~ 45% cases
  - FNA /Open Bx
    - Usually needed to exclude malignancy
    - So large amounts of fibrosis
- Treatments
  - Steroids (occasionally useful)
  - Surgery
    - Exclude malignancy
    - Relieve tracheal compression
- Prognosis
  - Usually subsides post-surgery

Trauma...

- Neck surgery, Throat biopsy
- Physical Trauma (Sporting / MVA)
- Neck pain/ tenderness
- Hyperthyroidism
- Spontaneous resolution

Thyroid Cancer

Classification

- Epithelial cell tumors:
  - Differentiated
    - Papillary (75- 80%)
    - Follicular (10-15%)
  - Undifferentiated
    - Anaplastic (3-5%)
- Parafollicular (C- cell) tumors
  - Medullary ( 5% )
- Lymphoma (1-2%)
- Others
**Thyroid Carcinoma**

<table>
<thead>
<tr>
<th>Type</th>
<th>%</th>
<th>Age</th>
<th>Spread</th>
<th>Prognosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Papillary</td>
<td>65</td>
<td>Young &lt;45y</td>
<td>Lymph</td>
<td>Excellent</td>
</tr>
<tr>
<td>Follicular</td>
<td>20</td>
<td>Middle age</td>
<td>B.V.</td>
<td>Good</td>
</tr>
<tr>
<td>Anaplastic</td>
<td>10</td>
<td>Elderly</td>
<td>Local</td>
<td>Poor</td>
</tr>
<tr>
<td>Medullary</td>
<td>5</td>
<td>Elderly familial</td>
<td>All</td>
<td>Variable</td>
</tr>
</tbody>
</table>

**Thyroid Cancer**

- **Incidence**: 1%
- **M/F ratio**: 3:1
- **Risk factors**
  - Radiation exposure
    - External
      - Medical treatment for benign conditions
      - Medical treatment for malignancies
      - Environmental exposure- Nuclear weapons or accidents
    - Internal
      - Medical treatment of benign condition with I131
      - Diagnostic tests with I131
      - Environmental- fallout from nuclear weapons
  - Other factors
    - Diet- Iodine deficiency, goitrogens
    - Hormonal factors- female gender predominance
    - Benign thyroid disease
    - Alcohol

**Pathology**

- **Papillary carcinoma**;
  - 60-70% of all cases
  - Multifocal
  - Nonencapsulated, but circumscribed
  - Lymphatic spread
  - 80% 10 year survival
- **Follicular carcinoma**
  - 15-20% of thyroid cancers
  - Usually encapsulated
  - 60% 10 year survival
- **Hurthle cell neoplasm**
  - 5% of thyroid cancers
  - Variant of follicular cancer
  - Lymph node spread slightly higher than follicular cancer
  - Less avidity for I131
• Medullary cancer
  o Parafollicular C cells
  o Autosomal dominance inheritance in 20%
  o Unilateral involvement in sporadic, bilateral in familial forms
  o Calcitonin secretion
  o Metastasis both by lymphatic and blood stream
  o 10 year survival 90% in localised disease, 70% with cervical mets, 20% with distant mets

• Anaplastic cancer
  o Undifferentiated
  o Rapidly growing, often inoperable
  o Invade locally, metastasize both locally and distantly
  o Mean survival 6 months
  o 5 year survival rate 7%

• Lymphoma
  o Rare, rapidly enlarging tumour
  o Primary or secondary
  o Seventh decade, 6:1 F/M ratio
  o 5 year survival rate 75-80%, when confined to thyroid

• Staging and Prognosis
• AGES and AMES scoring systems
  o A  Age of patient
  o G  Tumour Grade
  o M  Distant metastasis
  o E  Extent of tumour
  o S  Size of tumour

Both scoring systems have identified 2 distinct subgroups;
  o Low-risk group; Men 40 years or younger, women 50 or younger, without distant metastasis (bone & lungs)
  o Older patients with intrathyroid follicular/papillary carcinoma, with minor capsular involvement with tumours < 5cms in diameter
  o High-risk group; All patients with distant metastasis
  o All older patients with extrathyroid papillary/follicular carcinoma & tumours >5 cms regardless of extent of disease

• Treatment of thyroid cancer
• Papillary cancer
  o < 1.5 cms  Lobectomy & isthmusectomy
  o > 1.5 cms  Total thyroidectomy
• Follicular cancer  Total thyroidectomy
• Hurthle  Total thyroidectomy
• Medullary  Total thyroidectomy & central neck dissection
• Adjuvant therapy
  o TSH suppression
  o Post-operative radioactive iodine ablation
  o External beam radiotherapy
• Surveillance
  o Serum thyroglobulin levels
  o CXR or CT scan
  o Repeat 131I if positive