THYROID ANAESTHESIA

Dr F. Raymond

2-5-07
Baroda district, India
Goitre family
Introduction

- Thyroid disease is common
- Endemic areas 15-30%
- Thyroid enlargement affects up to 10% of the British population.
HISTORY

- Chinese literature – Goitres described 2700 B.C.
- 12th-13thC – Italy is centre of thyroid surgery (Hot irons, Setons, etc)
- 1596-1800 – 8 op’ns with scalpel
- 1821 ‘Hedonus’ – 6 successful op’ns by dissection & lig’n
- 1849 ‘Nikolai Pirogoff’ 1st G.A. for Tyroid Op’n. (Ether on 17 y.o. girl with tracheal compression).
- 1907 – ‘Dunhill’ Thyroidectomy under L.A.
- S. Rowbotham (Anaesthetist) – 946 goitre op’ns (1941-44), prior to antithyroid drugs, 9 deaths.
Anatomy

- **Anterior neck** –
  - isthmus overlies trachea inferior to cricoid cartilage, lateral lobes extend to oesophagus posteriorly, inferiorly to ~6th ring of trachea

- Deep to sternothyroid & sternohyoid

- Gland surrounded by fibrous capsule, external is a sheath of pretracheal fascia – moves with swallowing and speech.

- Blood supply – Sup. & Inf. Thyroid arteries

- ~25gm’s (Larger in women)

- Recurrent Laryngeal Nerve – Groove between trachea, oesophagus and thyroid

- Other structures – Parathyroids, major vessels & nerves
Anatomy

Locating the Thyroid Gland

- Thyroid cartilage
- Thyroid gland
- Trachea
- Sternum
- Clavicle
Physiology

- Thyroid hormone synthesis, storage & release
- Pituitary and Hypothalamic controls
- Metabolic actions – via adenylate cyclase
  - Changes in speed of biochemical reactions
  - Total body O2 consumption
  - Energy (heat) production
Pharmacology

Propylthiouracil - thrombocytopenia, hypoprothrombinemia
Carbimazole
BB’s
Iodide
Radioactive Iodine – esp older Pt’s with Hyperthyroidism.

Aneasthetic drugs – eg hyperthyroidism ->
  increased Cl & Vd of propofol., decreased dig levels, increased warfarin effects
Antithyroid Drugs

- **Antithyroids** – High relapse rates (30-50%)
  - Inhibit oxidation of inorganic iodine, and iodination of tyrosol residues of thyroglobulin
  - Carbimazole -> Methimazole in vivo
  - Propylthiouracil
    - Inhibits conversion of T4 -> T3 in peripheral tissues
    - Favors conversion to reverse T3 (inactive)
    - Both block synthesis of thyroxine (binding and coupling), take 6-8 weeks to work.
    - S.E.’s – Common = rashes, Uncommon 1:500 agranulocytosis, aplastic anaemia (usually reversible on stopping), Hepatitis.

- **BB’s** – Propranolol – ameliorate Sx’s, ~1 week prior to surgery. Decreases conversion T4 -> T3 in circul’n & tissues

- **Iodide** – Reduces vascularity & size.

- **Radioiodine** – over time, majority become hypothyroid
Indications for surgery

- Malignancy
- Obstructive Sx’s
- Retrosternal goitre
- Hyperthyroidism – Unresponsive to medical Rx or recurrent.
- Cosmetic
- Anxiety
- Hashimoto’s – with suspicion of superimposed lymphoma.
Preoperative Assessment

• History

• Examination
  • Airway
  • Pembertons sign
  • Hyper/Hypo thyroidism

• Investigations
  • Bloods
  • CXR
  • Ultrasound
  • Nuclear med.
  • CT
  • MRI
  • Histopathology
  • Laryngoscopy
History

- Dyspnoea – exertional, Postural
- Change in voice
- Swallowing difficulties
- Choking
- Sx of Hyperthyroidism or Hypothyroidism
- Previous Thyroid surgery
- Other systems – Mets (medullary ca ass. With phaeochromocytoma).
- Clin Hx predicts Obst’n poorly.
Examination

- Size and position of goitre – lack of relation between size and upper airway obst’n. (Use a flow meter).

- **Airway**- Particular attention.
  - Substernal (up to 15%) – Often Sx’ic, ass compression and deviation > 70%
  - Other signs – L.N.’s, Trachea, veins, thrills, bruit, eyes, Hyper/Hypothyroidism.
### Thyroid Function Tests

#### Table 22-9. Tests of Thyroid Gland Function

<table>
<thead>
<tr>
<th>Test</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total plasma thyroxine (T₄) level</td>
<td>Detects ≥90% of hyperthyroid patients; influenced by level of T₄-binding globulin (see Table 22-10)</td>
</tr>
<tr>
<td>Resin triiodothyronine uptake (RT₃U)</td>
<td>Clarifies whether changes in T₄ level are due to thyroid gland dysfunction or alterations in T₄-binding globulin</td>
</tr>
<tr>
<td>Total plasma triiodothyronine (T₃) level</td>
<td>Confirm diagnosis of hyperthyroidism; may be low in absence of hypothyroidism in patients who are cirrhotic, uremic, or malnourished</td>
</tr>
<tr>
<td>Thyroid stimulating hormone (TSH) level</td>
<td>Confirms diagnosis of primary hypothyroidism; may be increased before T₄ level is decreased</td>
</tr>
<tr>
<td>Thyroid scan</td>
<td>Demonstrates iodide-concentrating capacity of thyroid gland; functioning thyroid gland tissue is rarely malignant</td>
</tr>
<tr>
<td>Ultrasonography</td>
<td>Discriminates between cystic (rarely malignant) and solid (may be malignant) nodules</td>
</tr>
<tr>
<td>Antibodies to thyroid gland components</td>
<td>Distinguishes Hashimoto’s thyroiditis from cancer</td>
</tr>
</tbody>
</table>
Hypothyroidism

- **Incidence** ~ Level of Iodine in diet, Prevalence overt 5/1000, subclinical 15/1000 (Iodine sufficient areas).

- **Clin** — myocardial depression, decreased spont. ventilation, Abnormal baroreceptor func’n, Reduced plasma vol., anaemia, hypoglycaemia, hyponatremia, impaired hepatic drug metabolism.
  - Delayed gastric emptying,

- Hypometabolic state – CVS monitoring, beware (anaes agents, hypothermia, need for hydrocortisone cover with surgical stress).

- **Pt’s should be rendered euthyroid prior to surgery**
  - T1/2 T4 = 7 days
  - T1/2 T3 = 1.5 days
  - I.V. T3 & T4 preop’n for Myxoedematous coma.

- **Mild Hypothyroid** – avoid premeds, use regional if possible.

- **Anaesthesia** – several reports of severe CVS and Respiratory depr’n ass. with general anaesthesia.
Hyperthyroidism

- **Incidence ~** 2% women, 0.2% men
- **Prevalence –** overt 2/1000, subclinical 6/1000

- **Clin** – Hyperactivity, Wt loss, Tremor
  - **CVS** – A.F., CCF, Ischaemic heart disease, tachcardia
  - Anxiety, heat intolerance, Fatigue, Eye signs, Muscle weakness
  - Thrombocytopenia
  - G.A. for eye surgery & exophthalmos

- Pt’s should be rendered euthyroid prior to surgery
Preoperative Preparation

- Get Pt Euthyroid

- R/W all Ix’s – esp. C.T. thoracic inlet and follow the trachea down to the carina.
Preoperative Preparation

IV access - Extra access in foot

Invasive monitoring

- Positioning
- IDC
- Warming
- Anticipate blood loss
Anaesthetic

- **Premed’n** – beware hypothyroid, no anticolinergics for hyperT., +/- sed’n.
- routine monitoring, temp, +/- invasive
- **Induction** – Decrease symp. Stimul’n
  - Anxiolytic, potent opioid
  - Thiopentone or Propofpol
- Test ventilate if airway concerns
  - Relaxant of choice
  - Can lift large thyroid anteriorly to maintain airway
  - L/A to cords
  - Armored ETT – negotiates bends & kinks
Anaesthetic

- **Maintenance** (Titrate to type of thyroid disease)
  - O2/N2O +/- Volatile(Iso)
    - Opiates
    - L/A to anterior neck
    - Sup. & Deep cervical plexus blocks

- **Emergence** – reduce coughing, straining

- **Recovery** – Thyroid crisis, Obstructive Sx’s, complications
Anaesthetic - reminders

- **HyperT.**
  - Decrease symp.
  - Stim’n
  - Thio(thiourea) – some antithyroid activity
  - Increased MAC(clin impression – C.O.,temp)
  - CVS problems

- **HypoT.**
  - Sensitive to sed’n, CVS and Resp. depressants
  - Unstable Haemodynamics
  - Temp. Mx
  - Electrolytes
Complications

- Recurrent Laryngeal Nerve injury
  - Single – cord in mid pos’n (hoarseness)
  - Bilat – aphonia, obst’n during insp’n.

- Parathyroid damage

- Hypothyroidism

- Recurrent Hyperthyroidism

- Haemorrhage

- Wound Cx’s

- Damage to other structures
Complications - 2

- Superior laryngeal N.- supplies cricothyroid
- Laryngospasm
- Laryngeal Oedema
- Tracheomalacia – V. rare
- Cuff puncture
Post Op’n Ix.

- Laryngoscopy – Only if stridor or voice change (get Pt to say “eee”)
- Ca++
- FBE
- Thyroid function tests
Thyroid Storm

- Rare with advent of antithyroid drugs
- May be intraop, more common post op’n (6-18 hrs).
- **Hypermetabolic crisis** – Triggers in uncontrolled hyperthyroidism eg surgery, infection, trauma.
- **Supportive Mx** – Hydration, cooling (not aspirin), inotropes, +/- steroids, O2, carbohydrates
Thyroid Storm

- **First line Rx** –
- BB(*Propranolol*) 0.1mg/kg slow I.V.,
- antithyroid drugs eg PTU 1gm oral -> 200mg 6/24,
- 2-3 hrs later *Iodide*,
- *esmolol* useful in a number of cases,
- ? Dexamethasone (may inhibit T4->T3)
  dantrolene used successfully,
  theoretically Mg++
Some Pictures
Euthyroid, off clopidogrel 9 days
Positioning, reinforced ETT, high port, temp probe, secure tube
Set up
Delivery of ® Lobe
76 male,® thyroid Lobectomy
68 female, Multinodular goitre, Pembertons +ve
Left Multinodular Goitre
Tracheal compression and deviation to right
Tracheal compression & deviation
Recurrent Laryngeal Nerve
Finger = Tracheal position
Large thyroid around Trachea
Home Time!

P.S.