

# Anaesthesia In Thyroid Disorder

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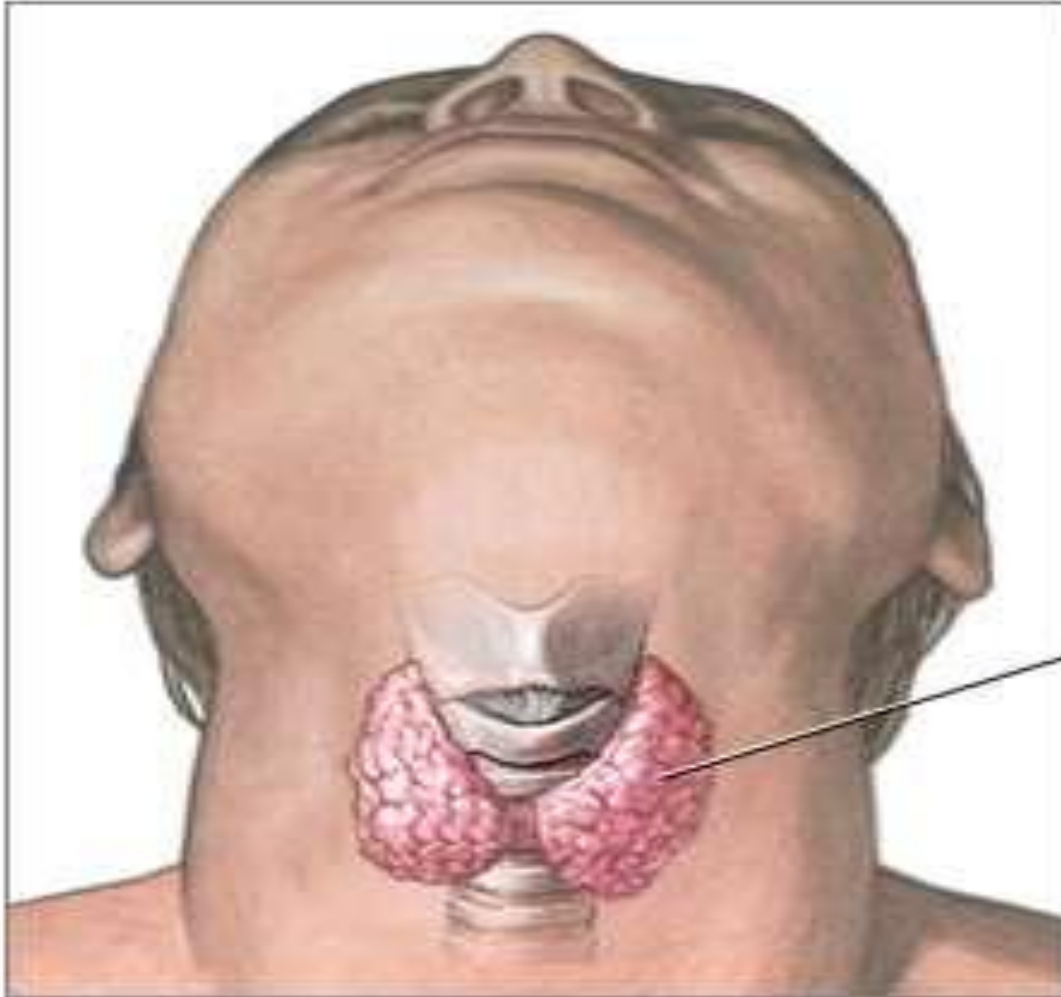
BIRDEM General Hospital

# Anatomy

- ❑ Endocrine gland : Consist of two lobe
- ❑ Located : Anteriorly in neck  
extending from C5 to T1.
- ❑ Size : 5 cm long, 3 cm wide and 2 cm thick.
- ❑ Weight: 20 - 25 gm in adult.

- ❑ Blood supply : superior & inferior thyroid artery
- ❑ Nerve supply : superior, middle & inferior cervical ganglia of autonomic nervous system. parasympathetic from Vagus nerve

# Anatomy



Thyroid  
gland

# Physiology

## Hormones:

1. Thyroxine(T4)
2. Tri iodothyronine (T3)
3. Calcitonin

# THYROID HORMONES

TRH (Hypothalamus)



TSH (Ant. Pituitary)



Thyroglobulin (iodinated by peroxidase) back to cell

T4 thyroxine

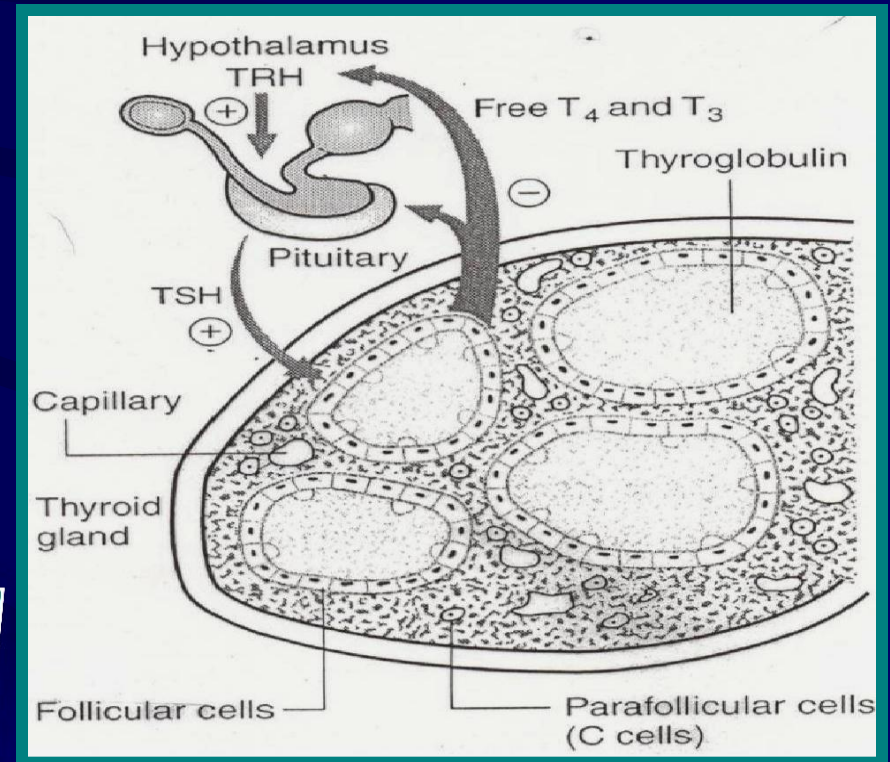


Thyroxine  
5'-deiodinase

T3 triiodothyronine  
More biologically active  
80% outside



1. ANABOLIC GROWTH
2. CALORIGENIC EFFECT
3. INCREASE (ADRENERGIC RECEPTORS)



Thyroid gland essential for body to –

1. Regulation of gene expression
2. Regulation of growth & development
3. Regulation of general metabolism
4. Regulation of tissue differentiation

# Common disorder

## A. If hormone excess-

1. Graves' disease
2. Multinodular goitre
3. Adenoma
4. Subacute thyroiditis

## B. Hormone deficiency-

1. Hashimoto's thyroiditis
2. Atrophic hypothyroidism



## C. Hormone resistance-

- Thyroid hormone resistance syndrome

## D. Non-functioning tumors-

1. Differentiated carcinoma
2. Medullary carcinoma
3. Lymphoma

# Hypothyroidism

Impaired secretion of thyroid hormones or under activity of the thyroid glands leading to hypometabolic state-

- A high TSH level
- A low Free T4 & T3 level in serum
- A low total T4 & T3 level

# Causes of Hypothyroidism

1. Primary hypothyroidism
2. Autoimmune (Hashimoto's thyroiditis)
3. Post thyroidectomy
4. Post radioactive iodine
5. Over dosage of antithyroid medication
6. Iodine deficiency
7. Secondary hypothyroidism (failure of the hypothalamic-pituitary axis)

# Clinical features

## □ General

- Tiredness, somnolence
- Weight gain
- Cold intolerance
- Hoarseness
- Goitre

## □ Cardio-respiratory

- Bradycardia
- Hypertension
- Angina
- Cardiac Failure
- Pericardial & Pleural effusion

## □ Neuromuscular -

- Delayed relaxation of tendon reflexes
- Muscle fatigue
- Lethargy
- Depression
- Deafness

## □ Others -

- Constipation
- Pretibial swelling
- Dry, flaky skin and hair

# Diagnosis

## 1. Thyroid function test –

- i. Free & total T4 – low
- ii. Free & total T3 – low
- iii. Serum TSH – raised ( $> 20$  mU/L)
- iv. Radioactive iodine uptake test

2. Lactate Dehydrogenase(LDH) and Creatinine kinase(CK) - raised
3. Serum cholesterol and triglyceride – raised
4. Serum sodium – low
5. E.C.G – Sinus bradycardia

# Medical Treatment

1. Replacement therapy with thyroxine –
  - Start with a dose of thyroxine 50 micgm / day for 3 weeks followed by
  - 100micgm / day for 3 weeks
  - Finally 150 micgm / day single daily dose.
2. Follow-up : Clinical checkup, serum TSH & T4 level



# Anaesthetic consideration

- ❑ Euthyroid state is ideal
- ❑ Continue thyroid replacement medication on morning of surgery.
- ❑ Aspiration prophylaxis – due to delayed gastric emptying times
- ❑ Sedative & narcotic administered more cautiously - more prone to drug induced respiratory depression

# Preoperative

- Airway evaluation
- Patients tend to be obese
- Large tongue
- Short neck
- Goitre
- Swelling of upper airway

# Intraoperative

- Patients are more sensitive to hypotensive effects of anesthetic agents because -
  1. Decreased cardiac output
  2. Blunted baroreceptor reflexes &
  3. Decreased intravascular volume

So, Invasive monitoring on a per patient basis

- ❑ Ketamine or Etomidate may be induction agents of choice
- ❑ Succinylcholine and non-depolarizing muscle relaxants are generally safe for use.
- ❑ Used peripheral nerve stimulator for monitoring muscle relaxant.

- ❑ Controlled ventilation is recommended as patients tend to hypoventilate
- ❑ Hypothermia occurs quickly
- ❑ Hematological (anaemia, platelet, coagulation dysfunction) disorder

- ❑ Electrolyte imbalances
- ❑ Hypoglycemia is common
- ❑ Extubation/Emergence may be delayed secondary to hypothermia, respiratory depression, or slowed drug metabolism

# Postoperative

- ❑ Try to maintain normothermia
- ❑ Cautiously administer Opioids ,  
Consider regional techniques or  
Ketorolac for pain control

# Emergency

## Myxedema Coma

- ❑ Rare form of decompensated Hypothyroidism
- ❑ Medical emergency with mortality rate of  
15- 20%
- ❑ Infection
- ❑ CNS depression - especially in elderly



## □ Characterized by

- Stupor or coma
- Hypoventilation
- Hypothermia
- Bradycardia
- Hypotension,
- Severe dilutional hyponatremia (SIADH)
- CHF

## Treatment

- ❑ IV thyroxine is indicated (L-thyroxine loading dose 300-500ug, followed by 50ug/day for 24-48hrs)
- ❑ IV hydration with dextrose containing crystalloid
- ❑ Correction of electrolyte abnormalities
- ❑ Support cardiovascular and pulmonary systems as necessary

# Hyperthyroidism

Clinical syndrome which results from exposure of the body tissues to excess circulating levels of free thyroid hormones. More common in female.

- Suppressed serum TSH level(  $< 0.1$  mU/L)
- Raised serum T3 & T4 level

# Causes of Hyperthyroidism

1. Graves' disease
2. Toxic multinodular goitre
3. TSH secreting pituitary tumors
4. Toxic thyroid adenoma
5. Over dosage of thyroid replacement hormone

# Clinical feature

## □ General

- Goitre
- Weight loss
- Heat intolerance
- Diarrhoea
- Exophthalmos

## □ Cardio-respiratory

- Palpitation
- Sinus tachycardia
- Atrial fibrillation
- Congestive heart failure
- Dyspnoea on exertion
- Exacerbation of asthma

## □ Neuromuscular

- Muscle weakness
- Hyperactive reflexes
- Nervousness
- Fine tremor
- Periodic paralysis

## □ Others

- Gynaecomastia
- Lymphadenopathy
- Thirst
- Infertility

# Diagnosis

## 1. Thyroid function test –

- i. Free & total T4 – raised
- ii. Free & total T3 – raised
- iii. Serum TSH – low
- iv. Radioactive iodine uptake test

2. Anti thyroid antibodies ( measurement of TSH receptor antibodies)
3. Fine needle aspiration cytology (FNAC)
4. Chest X-ray



# Medical treatment

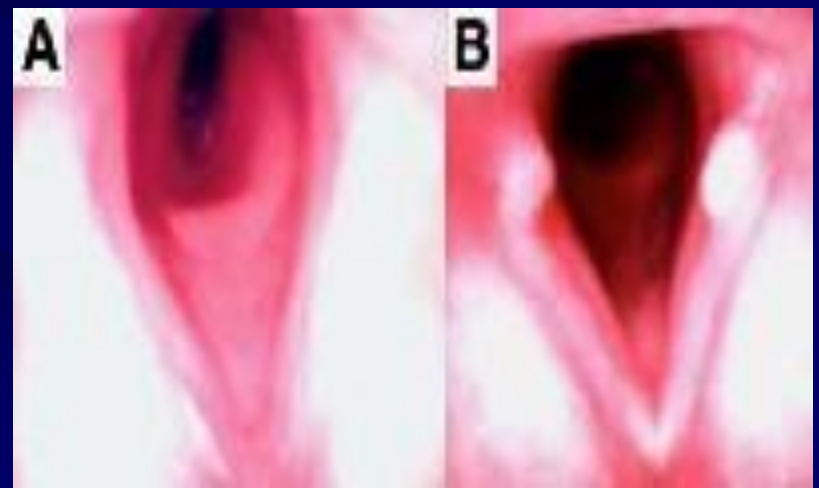
1. Anti-thyroid drug: Carbimazole -  
15 mg 8 hourly 2-3 days,  
10 mg 8 hourly 4 – 8 weeks  
5 – 20 mg daily for 18 – 24 months.
2. Subtotal thyroidectomy
3. Radioactive iodine
4. Beta-adrenoceptor antagonist- Propranolol  
160 mg daily.

# Anaesthetic consideration

- ❑ Ideally patient should be Euthyroid prior to any elective procedure.
- ❑ Antithyroid medications and beta-blockers should be continued through the morning of surgery.

# Preoperative

- Careful evaluation of patients airway



# Intraoperative

- ❑ Drugs that stimulate sympathetic nervous system should be avoided because of the possibility of increasing blood pressure and heart rate. Ex. Ketamine, Pancuronium, Atropine, Ephedrine.

- ❑ Thiopental may be induction agent of choice as it possess antithyroid activity at high doses.
- ❑ Muscle relaxant doses may be increased.
- ❑ Adequate anaesthetic depth should be obtained prior to laryngoscopy or surgical stimulation to avoid tachycardia, hypertension, ventricular dysrhythmias

- ❑ Anticipate exaggerated hypotensive response during induction as patient may be hypovolemic
- ❑ Eye protection

- ❑ Muscle relaxants can be given safely.
- ❑ Patients with autoimmune thyrotoxicosis are associated with an increase risk of myopathies and myasthenia gravis.
- ❑ Reversal with glycopyrrolate instead of atropine

# Postoperative Complication

1. Thyroid storm
2. Nerve injury
3. Heamatoma
4. Hypoparathyroidism



# Thyroid storm

- ❑ Thyroid storm is most serious problem
- ❑ Characterized by:
  - hyperpyrexia, tachycardia,
  - altered consciousness,
  - and hypertension

- ❑ Precipitating factors: infection, trauma, surgery
- ❑ Onset is usually 6-24 hours after surgery, but can happen intraoperatively mimicking malignant hyperthermia

## Treatment: ABC guideline

- Patient will be managed in Surgical ICU
- IV Hydration, cooling of patient
- IV Propranolol(0.5mg increments) /esmolol to control heart rate until less than 100.
- Propylthiouracil 250mg 6 hourly orally or by NG tube

- ❑ Sodium Iodide 1 gram over 12 hours  
correction of any precipitating events  
(infection)
- ❑ Cortisol is recommended if there is any  
coexisting adrenal gland suppression
- ❑ Mortality rate is approximately 20%

□ **Recurrent laryngeal nerve palsy:**

Unilateral – hoarseness

Bilateral - stridor

## □ Hematoma formation :

May cause airway compromise -  
required immediate opening of neck  
wound

## □ Hypoparathyroidism :

May result from unintentional removal of  
parathyroid glands. Hypocalcemia will  
result within 24-72 hours

# Take home message

- ❑ Patient should be Euthyroid state incase of routine operation
- ❑ If emergency surgery consultation may be taken from Endocrinologist to get highest benefit from minimum period
- ❑ Our small effort can get maximum result – so perioperaive period must be monitor cautiously



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