

Anaesthetic implications of hypothyroidism – Dr.A.Vasukinathan

HOD, Dept of Anaesthesiology, Kanyakumari Medical College Hospital.

In 1850 THOMAS BLIZARD CURLING (1811-1888) surgeon at London hospital presented a paper describing two girls with idiotic look and stunted growth. This was the first report of hypothyroidism in the history of medicine. Nearly one and a half century later we have come a long way in understanding hypothyroidism. Simply put hypothyroidism is due to low serum T4 or T3 or both. Incidence of hypothyroidism is around 0.5%-0.8% internationally and 3.9% nationally with male to female ratio of 1:10. Caused by either a primary thyroid pathology or secondary to pituitary/hypothalamic pathology.

Causes of Hypothyroidism

▪PRIMARY HYPOTHYROIDISM

Autoimmune

Irradiation to the neck

Previous ¹³¹I therapy

Surgical removal

Thyroiditis (Hashimoto's disease)

Severe iodine depletion

Medications (iodines, propylthiouracil, methimazole)

Hereditary defects in biosynthesis

Congenital defects in gland development

▪SECONDARY OR TERTIARY HYPOTHYROIDISM

Pituitary

Hypothalamic

Clinical features

Hypothyroidism may present as slowing in physical and mental activity or asymptomatic with an insidious onset. Signs and symptoms are subtle and nonspecific. Classical signs and symptoms are present in only 50%-60% of younger patients.

Signs and Symptoms of Hypothyroidism

Symptoms

Tiredness, weakness

Dry skin

Cold intolerance

Hair loss

Difficulty concentrating and poor memory

Constipation

Weight gain with poor appetite

Dyspnoea

Hoarse voice

Menorrhagia (lateroligomenorrhoea or amenorrhoea)

Paraesthesia

Impaired hearing

Signs

Dry coarse skin; cool peripheral extremities

Puffy face, hands, and feet

(Myxoedema)

Diffuse alopecia

Bradycardia

Peripheral edema

Delayed tendon reflex relaxation (hung reflexes)

Carpal tunnel syndrome

Serous cavity effusions

Changes in cardio vascular system

Cardiac output is decreased secondary to reduction in stroke volume and heart rate. Blood volume reduced. Peripheral vascular resistance is increased.

Cardiac enlargement and pericardial effusion may occur in severe cases. Numbers and sensitivity of the β receptors is decreased. Systolic BP is

Reduced whereas diastolic BP is increased maintaining the map. Baroreceptor reflex is blunted.

Respiratory changes

Maximum breathing capacity and diffusion capacity is decreased. ventilatory response to hypoxia and hypercarbia is decreased.

GIT changes

GIT motility is reduced. constipation and poor appetite may be present. adynamic ileus may occur in the Postop period.

Neurology

Paresthesia, slow speech can be present. Thyroid neuropathy –sensory, nerve entrapment, 8th nerve affection, dysesthesias.

Other systems

Other problems are anemia., coagulopathy, moreover these patients are more prone for sleep apnoea.

Diagnosis of hypothyroidism

	T3	T4	TSH	THBR
Primary hypothyroidism	low	low	high	low
Secondary hypothyroidism	low	low	low	low
Sick euthyroid syndrome	low	normal	normal	normal
pregnancy	normal	elevated	normal	low

Treatment of hypothyroidism

Treatment of hypothyroidism is obviously thyroxin replacement. Tab L thyroxin is usually started with a low dose and gradually increased to an optimum dose to obtain a normal TSH.(50µg initially, increased over a period weeks to 300µg-500µg)in elderly patients and patients with CAHD thyroxin is started at a lower dose like 25µg and increased over a period of months if necessary with ECG monitoring.

Treatment of myxoedema coma

it is a medical emergency with a reported mortality of up to 50%and needs aggressive management. Presents with hypothermia hypoventilation hypotension,hyponatremia,and treated with l-thyroxin 300-500µg and maintained with 50µg/day.-tri iodothyronin 25µg eighth hourly can also be given.Supportive therapy with IV fluids,thermoregulation, correction of ≤electrolytes and cardiorespiratory support.

Pre op preparation

Mild-moderate hypothyroidism

Patients with subclinical hypothyroidism pose no problems during anaesthesia and it is not necessary to initiate thyroxin preoperatively in these group.in the mild-moderate hypothyroid there is no controlled studies to favour pre op thyroxin therapy except a few case reports, hence pre op thyroxin therapy in these group is tailored to the prevailing circumstances.in severe hypothyroidism($T_4 \leq 1\mu\text{g/dl}$) for elective surgeries surgery is differed until euthyroid state is achieved. Emergency surgery in this group is risky because of anticipated cardiovascular instability ,and myxoedema coma, intravenous thyroxin 300-500µg bolus followed by a maintenance dose of 50-200µg/day or intravenous triiodotyronin 25 -50 µg bolus followed by 25µg 8th hourly with ECG monitoring.hydrocortisone is also given intravenously in the dose of 100 -300 mg,

Anaesthetic management

While assessing the patient, apart from routine evaluation attention has to be paid for airway assessment,anemia,and ischemic heart disease.thyroxin supplement has to be continued till the morning of surgery.antisialagogue and antiemtic premedication is helpful since these patients are having decreased GIT motility and bradycardia.it is better to avoid sedative and narcotic premedication.

Anticipated problems

Hypothyroid patients are supposed to be more sensitive to anaesthetic drugs and inhalational agents though there is no clinical evidence supporting this. The observed decrease in the MAC value for inhaled anaesthetics is not clinically significant and probably due to decreased cardiac output and blood volume, as well as decreased metabolism and excretion. Other problems to be anticipated are airway problems due to macroglossia, upper airway edema, and airway deviation due to goitre. Patients may easily develop hypotension in the post induction period and the ventilatory response to hypoxia may be decreased. The anaesthetist should also be prepared for hypothermia, hyponatremia, and hypoglycaemia.

Monitoring

Pulse oximeter, NIBP, ECG, temperature monitoring, neuromuscular monitoring are essential. Invasive BP monitoring can be used in severe hypothyroids undergoing major surgeries.

Regional anaesthesia

Regional anaesthesia appears to be safe because it avoids all the airway related complications, and it is the choice of anaesthesia if the level of surgery permits its use. However, one should anticipate precipitous hypotension and post op shivering.

General anaesthesia

There are reports of thyroid surgeries done with cervical plexus block (3) and with LMA with spontaneous ventilation (4) endotracheal intubation with a flexometallic tube will be the safest option.

Induction

Ketamine is the better induction agent in hypothyroidism because it will not produce hypotension and bradycardia. Barbiturates and benzodiazepines can also be used if ketamine is contraindicated and hypothyroidism is mild or well controlled.

Maintanace

Anaesthesia is best maintained with oxygen and nitrous oxide and with intermittent opioids and muscle relaxants. Inhalational agents are better avoided or used very cautiously. Always maintain normothermia and prevent hypothermia, hypoglycaemia.

Post op care

Reversal of neuromuscular blockade is best done with neuromuscular monitoring. Cautious monitoring is done anticipating hypoventilation and respiratory depression. Post op analgesia is provided with either regional techniques (where ever possible) or non narcotic analgesics.

References

1. J. Lindholm and P. Laurberg, "Hypothyroidism and thyroid substitution: Historical aspects," *Journal of Thyroid Research*, vol. 2011.,
2. Unnikrishnan AG, Menon UV, Thyroid disorders in India; an epidemiological perspective. *Indian J Endocr Metab* 2011; 15; 78-81.
3. PAUL LO GERFO, BETH ANN DITKOFF, JOHN CHABOT and CARL FEIND. *Thyroid*, winter 1994, 4(4)
4. E F Shah, J G Allen, and R A Gretorex *Ann R Coll Surg Engl*. 2001.
5. "Clinical anaesthesia" Barash Paul G; Cullen, Bruce F; Stoelting Robert K'; 5th edition.
6. "Harrison's principle of internal medicine" Kasper; Braunwald. 16th edition.
7. Bhavani Shankar kodali; "Ramachandra Anaesthesia Continuing Education" Feb; 2004.