

Risk

- Incidence: Approximately 5:10,000; prevalence: 1.12%, with 1.3 million pts in USA.
- Female-to-male ratio: 7:1; more common in women age 30–60 y.
- Family history indicating genetic factor(s) can be involved.

Perioperative Risks

- “Thyroid storm” due to surge of plasma thyroid hormones
- Airway compromise due to hematoma compressing airway or nerve injury
- Hypocalcemia
- Cardiovascular complications: dysrhythmia, hemodynamic alterations

Worry About

- Signs of airway obstruction, nerve injury
- Signs of metabolism and electrolyte abnormalities
- Dysrhythmias

Overview

- Most common cause of hyperthyroidism.
- Clinical manifestations are generally nonspecific initially: Fatigue, weight loss, muscle weakness, heat intolerance, diarrhea, nervousness, diffuse glandular enlargement in neck, anemia, and thrombocytopenia.
- Extrathyroid involvement includes ophthalmopathy (25%), dermopathy (1%), and clubbing (0.1%).
- Dx involves normal/low TSH with high T₃, T₄ positive TSH-receptor antibody, RAI uptake, and ultrasound with Doppler.

- Life-threatening “thyroid storm” can be induced by stress or illness. Symptoms include tachycardia, dysrhythmias, MI, worsened CHF, hyperthermia, anxiety, agitation, confusion, hyperpyrexia, and anorexia. Rx includes fluids, propranolol (1–5 mg IV), hydrocortisone (replacing the exhausted adrenocortical hormone), potassium iodide (KI 60 mg or NaI 1–2.5 g), and PTU (initiate therapy as soon as possible).

Etiology

- Autoimmune disease.
- An autoantibody binds to a TSH receptor-stimulating thyroid to enlarge and produce more thyroid hormones.

Usual Treatment

- Beta-blockers:
 - Block sympathetic overactivity, decreased palpitations, anxiety, tremor.
 - Inhibit peripheral conversion of T₄ → T₃ at high doses (e.g., >160 mg/d of propranolol).
- Thionamide antithyroid drug therapy:
 - PTU and methimazole decreased T₄ → T₃ conversion.
 - Hormone synthesis interferes with TPO.
 - They are given for several mo (12–18 mo) and take several wk for effect.
 - PTU has hepatotoxicity but is used in pts with intolerance to methimazole, first trimester pregnancy, thyroid storm.
 - Other adverse effects include agranulocytosis (1:500 with methimazole), antineutrophil cytoplasmic antibody-positive vasculitis, pruritic rash, and arthralgias.

- RAI therapy:
 - Decreased hormone secretion and synthesis by integrating within the thyroid hormone and causing ionizing damage to thyroid follicular cells.
 - Takes 6–10 wk for clinical effect.
 - Most pts become hypothyroid after a single dose.
 - Destruction of thyroid tissue occasionally results in worsening of thyrotoxicosis, so pretreatment with PTU is considered in high-risk pts (e.g., CAD).
 - Contraindicated in pregnancy and breastfeeding.
- Dexamethasone:
 - Inhibit peripheral conversion of T₄ → T₃.
- Thyroidectomy:
 - Indications include very large goiters with compressive symptoms, concomitant suspicious thyroid nodules, vital organ dysfunction, and concurrent hyperparathyroidism requiring surgery.
 - For preparation of surgery, pts should be rendered euthyroid, and 1–3 mo of antithyroid drug therapy is indicated.
 - For urgent surgery, preparation with beta-blockers dexamethasone and cholestyramine has been recommended.
 - Pts not euthyroid at surgery are at greater risk for thyroid storm.
- Potassium iodide therapy:
 - For use with pts allergic to antithyroid drugs or as primary therapy in mild disease.
 - Iodide reduces vascularity and has acute inhibitory effects on new thyroid hormone synthesis referred to as Wolff-Chaikoff effect.

Assessment Points

System	Effect	Assessment by Hx	PE	Test
CV	T ₃ , T ₄ increase HR, contractility	Palpitation, angina	Increased HR, Htn	ECG, CXR, ECHO
HEME	Anemia, agranulocytosis (secondary to PTU)	Decreased menstrual flow	Diffusely enlarged thyroid	CBC, nuclear scan
GI	T ₃ , T ₄ affect GI motility	Diarrhea, increased appetite	Weight loss	
RESP	Airway compression	Breathlessness, tracheomalacia	Trachea deviation	CXR, CT
NEURO	Myopathy	Anxiety, insomnia, irritability	Shaking hands, tremors	
DERM	Autoimmune attack on eye muscles and fat tissue Carbohydrate buildup leading to Graves dermopathy	Sweating, fatigue, heat sensitivity, weight loss, pretibial myxoedema	Exophthalmos, light sensitivity, double vision, warm, wet skin	Eye exam Skin exam

Key References: Chan GW, Mandel SJ: Therapy insight: management of Graves’ disease during pregnancy, *Nat Clin Pract Endocrinol Metab* 3(6):470–478, 2007; Burch HB, Cooper DS: Management of Graves disease review, *JAMA* 314(23):2544–2554, 2015.

Perioperative Implications

Preoperative Preparation/Induction/Maintenance

- Preop, all pts should be clinically euthyroid, by beta-blockade with iodide for 7–14 d.
- Airway obstruction by neck mass may be intrathoracic. Consider CXR, CT, and flow-volume loops. Potential difficult airway may arise. Use awake-fiberoptic intubation for severe obstruction and place ET tube beyond compression point.
- Goiter may make emergency tracheostomy difficult.
- Obstructive manifestations include SVC obstruction, decreased venous return, hemodynamic instability.
- Continue all thyroid medications until the day of surgery.
- Increased cardiac output may slow the rise of alveolar concentration of inhaled anesthetics.

- Catecholamines: Avoid sympathomimetic drugs ketamine, epinephrine, pancuronium, vasoactive drugs.
- Risk of “thyroid storm” periop.

Monitoring

- Routine ASA monitoring.
- Consider arterial line.
- Monitor thyroid hormone levels.

General Anesthesia

- GA is preferable, maintained with volatile or IV agents.

Extubation

- Airway edema, surgical site hematoma, or recurrent laryngeal nerve injury may cause airway compromise.
- Rule out tracheomalacia.

Anticipated Problems/Concerns

- Hematoma or airway obstruction. Administer O₂, CPAP. May require wound opening and reintubation.

- Hypocalcemia, usually 24–72 h postop. Look for Chvostek sign (facial muscle spasm) and Trousseau sign (carpopedal spasm). Monitor serum Ca⁺⁺ and Mg⁺⁺. Hypoparathyroidism may present as laryngospasm. Administer Ca⁺⁺ and Mg⁺⁺ (promotes PTH release).
- Recurrent laryngeal nerve palsy, usually unilaterally. This results in voice change and slight stridor. Bilateral is rare and may cause complete obstruction requiring reintubation or surgical airway.
- Damage to external branch of superior laryngeal nerve.
- Dysphagia.
- Tracheomalacia.
- Hypothyroidism.
- Persistent hyperthyroidism.