

HYPOTHYROIDISM AND MYXOEDEMA CRISIS

HYPOTHYROIDISM IS A CONDITION OF INSUFFICIENT THYROID HORMONE PRODUCTION THAT CAUSES SLOWED METABOLISM

MYXOEDEMA COMA (OR CRISIS) → THE END SPECTRUM OF SEVERE HYPOTHYROIDISM AND IS AN EMERGENCY CHARACTERISED BY MULTI-ORGAN AND METABOLIC DYSFUNCTION RESULTING FROM SEVERE AND UNTREATED HYPOTHYROIDISM, PRECIPITATED BY A NUMBER OF STRESSORS

CRISIS IS HERALDED BY MENTAL STATUS CHANGES, HYPOTENSION AND HYPOTHERMIA

PRIMARY HYPOTHYROIDISM IS CAUSED BY INTRINSIC GLAND DYSFUNCTION (MOST COMMON TYPE), WHEREAS SECONDARY IS CAUSED BY A DEFICIENCY OF T.S.H.

Table 223-1 Common Causes of Hypothyroidism	
Primary Hypothyroidism (disorders at thyroid gland)	Secondary Hypothyroidism (disorders at hypothalamic-pituitary axis)
Autoimmune etiologies (Hashimoto)	Panhypopituitarism
Thyroiditis (subacute, silent, postpartum)*	Pituitary adenoma
Iodine deficiency	Infiltrative causes (e.g., hemochromatosis, sarcoidosis)
After ablation (surgical, radioiodine)	
After external radiation	Tumors impinging on the hypothalamus
Infiltrative disease (lymphoma, sarcoid, amyloidosis, tuberculosis)	History of brain irradiation
	Infection (e.g., tuberculosis)
Congenital	
Drugs affecting thyroid gland function	
Amiodarone	
Lithium	
Potassium perchlorate	
Iodine (in patients with preexisting autoimmune disease)	
α-Interferon	
Interleukin-2	
Idiopathic	

CLINICAL FEATURES OF HYPOTHYROIDISM:

Table 223-2 Symptoms and Signs of Hypothyroidism	
Symptoms	Signs
Hair loss	Periorbital puffiness
Fatigue	Loss of outer third of eyebrow
Depression	Pallor
Shortness of breath	Macroglossia
Weight gain	Hoarseness
Constipation	Bradycardia
Menstrual irregularities	Hypoventilation
Infertility	Absent or decreased bowel sounds
Muscle cramps	Nonpitting edema
Joint pain	Delayed relaxation of ankle jerks
Cold intolerance	Peripheral neuropathy
	Cool, rough, dry skin
	Hypothermia

- Constitutional symptoms include cold intolerance, weight gain, weakness, lethargy and fatigue
- Hypothermia is due to decreased BMR and absence of shivering
- Husky voice due to mucopolysaccharide infiltration of the vocal cords
- **NEUROPSYCHIATRIC FINDINGS:**
 - ↓ DTR
 - Dementia
 - Psychosis
 - Paraesthesia
 - Depression
 - Poor memory
- **CARDIOPULMONARY FINDINGS:**
 - Angina
 - Bradycardia
 - Pericardial/pleural effusions → low voltage on ECG
 - Cardiomyopathy
- **DERMATOLOGIC FINDINGS:**
 - Dry skin
 - Hair loss
 - Non-pitting oedema (particularly periorbital, facial) → due to hyaluronic acid deposition and is non-dependent initially
 - Macroglossia



- MENORRHAGIA due to decreased thyrotropin releasing hormone

CLINICAL FEATURES OF MYXOEDEMA CRISIS:

- A state of metabolic and multi-organ decompensation characterised by preexisting uncorrected hypothyroidism
 - Mental status changes
 - Hypothermia (<35.5C)
 - Hypotension and bradycardia
 - hypoventilation
 - PRECIPITATING STRESSORS
- These patients exhibit shock as their capillaries are “leaky”

- Infection can be present even in absence of classical findings of fever, ↑HR, leukocytosis → all suppressed in hypothyroidism. Hypothermia is so common that even a normal temperature should suggest underlying infection.
- Other respiratory compromise can occur from Upper airway obstruction → macroglossia and vocal cord infiltration
- PRECIPITATING STRESSORS:
 - Infection
 - Anaesthetic agents
 - Cold exposure
 - Trauma
 - AMI/CHF
 - GI bleed
 - Metabolic → hypoxia, ↓Na, ↓BSL, ↑CO₂
 - Surgery
 - Burns
 - Medications → beta-blockers
 - Non-compliance with treatment
- DIAGNOSIS IS CLINICAL → DIFFERENTIAL INCLUDES sepsis, depression, adrenal crisis, CHF, CVA, ↓BSL, drug OD, meningitis

LABORATORY EVALUATION:

- High TSH with low T₄/T₃ confirms primary hypothyroidism, whereas low TSH with low FT₄, FT₃ confirms secondary hypothyroidism
- Multiple other tests to look for precipitants → blood cultures, CT brain, LP, cardiac enzymes
- Anaemia can be from hypothyroidism itself (macrocytic) or from blood loss due to menorrhagia (microcytic)
- Hyponatraemia is due to increased ADH and impaired free water clearance
- Hypoglycaemia is common because of concomitant adrenal insufficiency
- ABG → hypoxia, hypercapnia due to hypoventilation from fatigue/muscle weakness
- ECG demonstrates low voltage

TREATMENT:

<p>Supportive care</p> <ul style="list-style-type: none"> • Airway, breathing, and circulation support: ensure airway control, oxygen, IV access, and cardiac monitor • IV therapy: dextrose for hypoglycemia; water restriction for hyponatremia • Vasopressors: if indicated (ineffective without thyroid hormone replacement) • Hypothermia: treated with passive rewarming using blanket • Steroids: hydrocortisone (because of increased metabolic stress; 100–200 milligrams IV)
<p>↓</p> <p>Thyroid replacement therapy (see discussion Thyroid Replacement in text)</p> <ul style="list-style-type: none"> • IV T₄ (levothyroxine) at 4 micrograms/kg, followed in 24 h by 100 micrograms IV, then 50 micrograms IV until oral medication is tolerated. (Switch to 50–200 micrograms/d PO when patient is ambulatory.) <p>or</p> <ul style="list-style-type: none"> • IV T₃ (lithyronine or triiodothyronine) for myxedema coma at 20 micrograms followed by 10 micrograms IV every 8 h until the patient is conscious (given because of the risk of decreased T₃ generation from T₄ in severely hypothyroid patients). Start with no more than 10 micrograms IV for the elderly or those with coronary artery disease. • Either T₄ or T₃ can be used, but in severe myxedema coma, T₃ should be considered (either combined with T₄ or used alone) but with cautious use on patients with myocardial compromise.
<p>↓</p> <p>Identify and treat precipitating factors</p> <ul style="list-style-type: none"> • Infections. • Sedatives. • Anesthetic agents (e.g., etomidate). • Cold exposure. • Trauma. • Myocardial infarction or congestive heart failure. • Cerebrovascular accident. • GI hemorrhage.

- INITIATE TREATMENT WHILE WAITING FOR RESULTS
- SUPPORTIVE CARE:
 - Hypothermia managed by passive rather than active rewarming → active can lead to reversal of vasospasm and hypotension
 - IV hydrocortisone given due to possible concurrent adrenal insufficiency, especially if hypotension is present
 - Empiric antibiotics
 - Measure baseline TSH, FT4, FT3 and cortisol levels
- THYROID REPLACEMENT:
 - T4 alone or in combination with T3 can be given → IV initially then switch to oral when able, but beware as hypothyroidism decreases intestinal motility and GI absorption
 - Which preparation to use is controversial → T3 alone should be considered in crisis as DEIODINASE CONVERSION OF T4 TO T3 IS REDUCED IN THESE PATIENTS → exercise caution in those with myocardial dysfunction as T3 has more immediate action and more likely to cause arrhythmias whereas T4 has more smooth, steady onset of action
- IDENTIFY AND TREAT PRECIPITATING FACTORS
- ALL SHOULD BE ADMITTED TO I.C.U AS MYXOEDEMA CRISIS HAS HIGH MORTALITY RATE (30-60%)
 - Poor prognosis include advanced age, bradycardia and persistent hypotension
 - Standard doses of T4/T3 should be reduced in the elderly
 - T3 should be avoided in those with cardiac instability
- PREGNANT PATIENTS:
 - Pregnant women with underlying thyroid conditions are susceptible to becoming hypothyroid during pregnancy → there is an increased requirement of thyroid hormone because of increased rate of metabolism and its transplacental transport, which is essential for foetal development and maturation