Endocrine Emergencies

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Myxedema Coma

- Life-threatening hypothyroidism resulting from untreated or inadequately treated hypothyroidism
- Precipitated by severe stressors
  - MI, sepsis, cold exposure, sedatives
- Can occur with any etiology of hypothyroidism
  - Hashimotos
  - s/p thyroid ablation (surgical/I131)
  - hypopituitarism

Myxedema Coma: Signs and Symptoms

- Altered consciousness
  - Confusion, lethargy, obtundation
  - Psychosis - "Myxedema Madness"
  - Progresses to coma if left untreated
- Hypothermia
  - Due to decrease in thermogenesis
- Hypotension
  - Decreased myocardial contractility causing ↓ CO
- Bradycardia
- Pericardial effusion
  - Increased capillary permeability allows for leakage of protein into interstitial space
  - Monitor for signs of tamponade

Myxedema Coma: Signs and Symptoms

- Hyponatremia (Hypoosmolar Euvolemic)
  - Improves with treatment of hypothyroidism
  - Rarely can be severe enough to cause seizures but if so requires more aggressive treatment
- Hypoglycemia
  - Presumed mechanism is decreased gluconeogenesis
  - May be due to concurrent adrenal insufficiency/hypothalamic-pituitary dysfunction
- Hypoventilation
  - Central suppression of ventilatory drive -> hypercapnea
  - Mechanical ventilation may be required if severe
- Dry skin
- Nonpitting edema
  - Mucin deposits in tissues
  - Can have swelling of tongue and lips making for difficult intubation


A
B
C
D
E

Myxedema Coma: Diagnosis

- **History and Physical**
- **Laboratory confirmation**
  - Most commonly primary hypothyroidism
    - ↑TSH, ↓free T4
  - Secondary hypothyroidism more rare
    - Nml/↓TSH, ↓free T4

Myxedema Coma: Treatment

- Do not delay treatment for laboratory confirmation if index of suspicion is high
- Draw TFTs prior to initiating treatment if possible
- Thyroid Hormone Therapy
  - Controversial whether to use T4 alone or in combination with T3
  - Most recommend treatment with T4 due to easier dose adjustments, steadier state and less risk for adverse effects
  - Initial loading dose of 200-400mcg IV, then 50-100mcg IV daily (can be given PO but may have ↓GI absorption)
  - If no improvement may need to initiate T3 because of decreased conversion of T4->T3 in severe hypothyroid state
    - T3 alone: 10mcg IV q4 X 24hrs, then 10mcg IV q6 X1-2 days, then T4 alone
    - Can be given in combination with T4 at a dose of 10mcg q8-12hrs but may also need to lower the dose of T4 given

Myxedema Coma: Treatment

- Glucocorticoids
  - Possibility of coexistent primary adrenal insufficiency with Hashimotos
  - If hypothyroidism is secondary to pituitary/hypothalamic insufficiency, they will likely also have a secondary adrenal insufficiency
  - Initiating thyroid hormone therapy increases the metabolism of cortisol and can precipitate adrenal insufficiency
  - Stress dose hydrocortisone
    - 50mg IV q6 or 100mg IV q8

Myxedema Coma: Treatment

- Passive rewarming
  - Aggressive rewarming can cause peripheral vasodilatation and lead to hypotension
  - More aggressive if hemodynamic compromise thought to be due to profound hypothermia
- Avoid sedatives and narcotics
- Supportive care
- Treat precipitating factor if one exists

Thyroid Storm

- Usually patients with known underlying hyperthyroidism or untreated hyperthyroidism
- Precipitated by a stressor
  - Surgery, trauma, infection, MI, CVA
- Iodine load (ie, IV contrast) given to a patient with uncontrolled hyperthyroidism
- Noncompliance with antithyroidal drugs
- Surreptitious use of thyroid hormone

Thyroid Storm: Signs and Symptoms

- Arrhythmias (ST/afib)
- High-Output CHF
- Hyperpyrexia
- Agitation
- Delirium
- Psychosis
- Stupor
- Coma
- Nausea
- Vomiting
- Diarrhea
- Jaundice
- Hyperreflexia
- Tremor
- Weight loss

Thyroid Storm: Diagnosis

- **History and Physical**
- Lab Studies
  - ↓ TSH, ↑ T3, ↑ T4
  - ↑ TSH if TSH secreting adenoma (rare)
  - Keep in mind that sick euthyroid can present with a low TSH

Thyroid Storm: Treatment

- AntiThyroidal agents to inhibit new hormone production
  - Methimazole 20-25mg PO/PR q6
  - PTU 200-400mg PO/PR q6
    - Black box warning -> a/w irreversible liver damage
    - Only use in pregnant patients because of teratogenicity of methimazole
    - PTU decreases peripheral conversion of T4->T3 in addition to inhibiting hormone synthesis
  - No available IV form of either
- Iodine to inhibit thyroid hormone release
  - Iodine elixors (Lugol's solution)
  - Wait at least 1 hour after methimazole/PTU given to administer iodine because it can stimulate new hormone synthesis and worsen thyrotoxicosis

Thyroid Storm: Treatment

- Glucocorticoids
  - Steroids decrease peripheral conversion of T4 -> T3
  - Relative adrenal insufficiency in thyrotoxicosis due to accelerated metabolism of cortisol
  - Hydrocortisone 50mg IV q6 or 100mg IV q8
- Beta-adrenergic Blockade
  - Ability to ameliorate many of the symptoms of thyrotoxicosis
  - Some also decrease peripheral conversion of T4->T3 via inhibition of 5'-monodeiodinase
    - Propanolol has been most widely used and has highest lipid-solubility of the β-blockers allowing for sufficient concentration in tissues to inhibit conversion (40mg PO q6)
    - Also atenolol, alprenolol and metoprolol to lesser degees
    - Sotalol and nadolol have not been shown to inhibit conversion

Thyroid Storm: Treatment

- Treat precipitating factors if any
- Supportive care
- Avoid amiodarone
  - high iodine content (37% iodine by weight) can worsen thyroid storm initially
- NO Salicylates
  - displace bound thyroid hormone
- Cooling blankets/NSAIDS/tylenol (no ASA)

Adrenal Insufficiency

- Primary (AKA Addison's)
  - Autoimmune
  - Infectious
    - Tuberculosis
    - Fungal
    - CMV
  - Hemorrhagic
    - Meningococcemia
  - Lymphoma
- Secondary (Pituitary)
  - Sheehans
  - Sarcoidosis
  - Histoplasmosis
  - Tuberculosis
  - Lymphocytic hypophysitis
  - Trauma
  - s/p adenoma resection
- Tertiary (Hypothalamus)
  - Glucocorticoid therapy
  - Trauma

Adrenal Insufficiency: Signs and Symptoms

- Weakness
- Fatigue
- Anorexia
- Weight loss
- Nausea
- Vomiting
- Dizziness
- Orthostatic hypotension
- Hyponatremia
- Hypotension
- Hyperkalemia and hyperpigmentation in primary adrenal failure

Adrenal Insufficiency: Diagnosis

- Cortisol concentration is highest in early AM (6AM)
  - Nml level in **healthy** individuals is 10-20mcg/dL
  - Should be higher during times of stress/illness
  - AM Cortisol < 10mcg/dL suggests insufficiency and warrants further workup
- If primary adrenal insufficiency is suspected, an ACTH level can be ordered to help differentiate primary from secondary but results will not be available immediately thus the ACTH-stimulation test should be performed to aid in diagnosis

Adrenal Insufficiency: Diagnosis

- ACTH-stimulation test
  - Measure cortisol level at time 0 minutes
  - Inject 250mcg cosyntropin (synthetic ACTH) IV bolus immediately after initial cortisol drawn
  - Measure cortisol level at time 60 minutes
  - Normal response with intact adrenal function is a rise in serum cortisol to an absolute value of ≥20mcg/dL or a change in cortisol of ≥10mcg/dL
  - If inadequate response, presumed primary adrenal insufficiency

Adrenal Crisis

- Acute adrenal insufficiency
- MC in people with primary adrenal insufficiency
  - Patient who does not adequately increase their glucocorticoid dose during times of stress/acute illness
  - Patient with previously undiagnosed primary adrenal insufficiency during serious infection or major stressor

Adrenal Crisis

- Rare in secondary and tertiary adrenal insufficiency because have adequate function of RAA system
  - Abrupt withdrawal of glucocorticoids, especially after prolonged therapy
  - Pituitary apoplexy
    - Hemorrhage into pituitary gland, usually an adenoma, leading to sudden loss of pituitary function
    - Severe headache, diplopia, vomiting, hypotension
    - Neurosurgical emergency

Adrenal Crisis: Treatment

- Glucocorticoids
  - Hydrocortisone 50mg IV q6 or 100mg IV q8
  - Dexamethasone does not interfere with cortisol assay and can be given to patients initially if clinically warranted to allow time for ACTH-stim test to be performed
    - 4-10mg IV as a single dose
    - Never delay therapy!

Adrenal Crisis: Treatment

- Mineralocorticoids for primary adrenal insufficiency
  - Fludrocortisone 0.1mg PO daily
- Treatment of underlying cause if identified
- Supportive Care
  - IV fluids
  - Pressors if necessary

Hypoglycemia

- Feed the patient if they can eat
- If sugar does not improve with PO intake or patient NPO, give D50 IV (can give ½ amp initially)
- If obtunded, give D50 IV
- If obtunded and no IV access, give glucagon 0.5mg SC or IM
  - Be prepared that may cause severe vomiting
  - Doesn't work after prolonged fast because glycogen stores have been depleted

Hypoglycemia - Etiology

- Drug-induced
  - Sulfonylureas, Insulin
- Etoh
  - Inhibits gluconeogenosis, glycogenolysis is preserved
- Hepatic Dysfunction
- Adrenal Insufficiency
- Critical Illness
  - Septic shock
- Insulinoma
- Nesidioblastosis s/p gastric bypass
- Reactive hypoglycemia

Other Endocrine Emergencies

- DKA
- HHS

References

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