Endocrine Update:
Understanding Adrenal Insufficiency
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YAY!!!!
WOO-HOO!!!!

What’s the Adrenal Gland Got To Do With It?
Understanding Adrenal Insufficiency, Adrenal Fatigue and Adrenal Crisis

Case Study #1
38 year old female, bunionectomy L foot
VS: BP 104/60, P 62, RR 18, SaO2 98% R/A
Pain level 0 / 10
Mild nausea, no vomiting
PACU time 45 minutes
Taking fluids OK

Case Study #2
43 year old female, Pre-op for Colonoscopy
VS: BP 92/50, P 38, RR 16, SaO2 98% R/A
Monitor: RSR with PVCs, bigeminy
Nausea, no vomiting

Adrenal Gland Anatomy/Physiology
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- Adrenal Cortex
  - > 50 steroids produced
  - Cortisol * (glucocorticoid steroid)
  - Aldosterone * (mineralocorticoid steroid)
  - Androgens

- Adrenal Medulla
  - 80% Epinephrine
  - 20% Norepinephrine

Hormone Production

Glucocorticoid steroids:
- Stimulate gluconeogenesis - the formation of glucose from non-carbohydrate sources, such as amino acids
- Mobilize amino acids and fatty acids
- Give rise to ketone bodies in metabolism
- Exhibit anti-inflammatory effects
- Maintenance of normal vascular resistance to vasoconstrictors
- Nonspecific cardiac stimulants: activate release of vasoactive substances

Primary Adrenal Insufficiency

- Cause: Anatomic destruction of the gland, usually congenital but can be related to TB, fungal infections, hemorrhage, metastatic process, AIDS
- Often idiopathic atrophy, possibly autoimmune
- Rare, 50 cases per 1 million
- Glucocorticoid and mineralocorticoid properties lost

Secondary Adrenal Insufficiency

- Causes include:
  - Cure of Cushing’s syndrome*
  - Pituitary/hypothalamus lesions
  - Inflammation/infection
  - Autoimmune lesions
  - Trauma
  - Disease or suppression of hypothalamus – pituitary axis
  - Congenital
**Secondary Adrenal Insufficiency**

- Drug-induced:
  - Cytadren (adrenal steroid inhibitor used to treat Cushing’s Syndrome)
  - Etomidate
  - Ketoconazole
  - Dilantin
  - Barbituates
  - Rifampicin

**Secondary Adrenal Insufficiency**

- Usually only glucocorticoid properties lost
  - **Excessive therapeutic uses of steroids has greatly contributed to an increase in Secondary A.I.**
  - Estimated 6 million Americans undiagnosed A.I.- only presents during physiological stress

**Epidemiology**

- Primary adrenocortical insufficiency - ~ 50 cases per 1,000,000
- Men and women ~ same
- Women tend to be more associated with idiopathic autoimmune in origin
- In the US, ~ 80% cases thought to be autoimmune in origin

**Adrenal Insufficiency Symptoms**

- Weakness / Fatigue
- Nausea
- Salt Craving
- Diarrhea/Constipation
- Syncopy
- Hypotension
- Cardiac arrhythmias
- Shock
- Death

**Mortality / Morbidity**

- Acute Adrenal Insufficiency can be difficult to diagnose
- Rarely occurs without “trigger” event
- Left untreated (or unrecognized) there is a DISMAL prognosis for survival
- Therefore: is clinically suspected there should be no delay in treatment
- **DO NOT** delay treatment while waiting for diagnostic confirmation

**Potential Adrenal Crisis**

- Triggers:
  - Surgery
  - Anesthesia
  - **DO NOT USE Etomidate**
  - Reduced plasma cortisol and aldosterone levels have been reported following induction doses of Etomidate. These results persist for approximately 6 to 8 hours and appear to be unresponsive to ACTH stimulation.
  - Hypovolemia
  - Trauma
  - Hypothermia
Potential Adrenal Crisis

- Triggers, continued
  - Fever
  - Hypoglycemia
  - Pain
  - Depression
  - Alcohol
  - Life events

Adrenal Crisis

- Symptoms may be nonspecific
  - Anorexia, nausea/vomiting, abdominal pain, weakness, fatigue, lethargy, confusion

- If a patient presented with the above symptoms and a fever, would you think maybe the FLU or VIRUS... Or would you consider something more?

Adrenal Crisis

- Can go into “full blown” shock
  - Bradycardia/tachycardia / arrhythmias
  - Hypotension
  - Hypoglycemia
  - Acute Electrolyte Imbalances
    - Decreased Na+
    - Increased K+
    - Increased Ca+
  - Severe Weakness / Syncopy

Treatment

- Volume replacement, IV Fluid: NS
- Hydrocortisone 100 mg IV stat OR
- Decadron 4 mg IV stat (may be preferred because it has longer duration and does not interfere with subsequent ACTH stimulation testing)
- Dextrose 50% PRN for hypoglycemia
- Florinef 0.1 mg (mineralocorticoid replacement)
- Treat underlying problem

PALS Algorithm

- Shock Algorithm
  - Why not in ACLS?
- Fluid bolus
- Treat electrolyte imbalance
- Vasopressors
- **Stress dose of Hydrocortisone!**
  - If patient is not responding to fluids, vasopressors: consider patient at risk for Adrenal Insufficiency

Adrenal Fatigue

- Estimated 6 million Americans undiagnosed A.I.- only presents during physiological stress
- Theory: Today’s stressors cause the adrenal gland to “fatigue” and “give out”
- Not currently recognized as an “acceptable medical diagnosis”
- Can cause changes in carbohydrate/protein/fat metabolism
- Affect fluid/electrolyte balance
- Affect cardiovascular system
Adrenal Fatigue

Symptoms:
- Difficulty waking up in the morning
- Continued fatigue not relieved by sleep
- Cravings for salty foods
- Lethargy/Increased effort for routine tasks
- Decreased sex drive
- Decreased ability to handle stress
- More time needed to “rebound” from illness
- Mild symptoms of syncopy
- Decreased tolerance

Adrenal Fatigue

- If not recognized, how to we know?
- Think about the trigger events
- Sudden triggers, with underlying decreased adrenal function can result in an adrenal crisis

Living with Adrenal Insufficiency

- Steroid Dependant
  - Hydrocortisone
  - Florinef
- Emergency Meds
- Medic Alert bracelet
- Balance stressors
- Be well-educated patient!
  - Great tools available at NIH
- Up to 26% of patients are so disabled they are unable to work!

New Options on the Horizon

- Pitfalls of steroid hormone replacement
  - Current replacement cannot replace body’s own normal circadian rhythm of cortisol
  - Cortisol build during the early morning and peak 1 Hr after waking, gradually decline over the day and are low in the evening and at sleep onset
- Current meds have immediate-release with short half-life
- Investigation: Develop circadian hydrocortisone replacement therapy (Go Brits!)

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Presentation:
- Unusual thyroid symptoms
- Elective thyroidectomy - + Papillary CA
- Awaiting I-131 treatment.... Condition changed

Cushing’s Syndrome
- Most cases of Cushing syndrome are due to exogenous glucocorticoids. The annual incidence of endogenous Cushing syndrome has been estimated at 13 cases per million individuals. Of these cases, approximately 70% are due to Cushing disease, that is, a pituitary ACTH-producing tumor; 15% to ectopic ACTH; and 15% to a primary adrenal tumor

What happened next?
- Cushing’s Syndrome resolved
- However, contralateral adrenal gland did not recover. In most cases, the unaffected adrenal gland will recover 2-3 yrs after surgery
- Now..... Chronic Adrenal Insufficiency
- And has had Transsphenoidal pituitary resection

Life is a Gift: Treasure Every Moment