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Objectives

• Diagnosis and Management of Adrenal Insufficiency/Crisis
Case

• 70yo M with history of stroke leaving him with residual left-sided weakness presented to the ED for altered mental status.
• Family states that this past week, he has been having a cough productive of yellow sputum. He has been having decreased alertness since yesterday. He has been refusing to eat and has been seen sweating.
Case

- **PMH**: CVA
- **PSH**: None
- **Meds**: None
- **All**: NKDA
- **SH/FH**: Lives at home with son and daughter-in-law. No alcohol use/illicit drug use, tobacco use
Case

• Physical Exam
  – T 38 BP 72/42 HR 120 RR 10 O2 sat 87% ra
  – Gen: Thin elderly gentleman laying in bed with mouth opened, unresponsive to voice or pain. GCS 3
  – HEENT: MM dry with thick yellow coating on mouth. OP otherwise appears clear with no tonsillar erythema or exudate
  – Neck: soft and supple with no lymphadenopathy
  – Chest: Reduced breath sounds in bilateral bases. Rhonchi heard in the right lung base
  – CV: Tachycardic but regular rhythm, no murmurs, rubs, or gallops
  – GI: Soft, non tender, no masses palpated
  – GU: Uncircumcised penis
  – Extremities: cool to touch, weak pulses felt in the periphery.
  – Skin: No rashes, or decubitus ulcer. + skin tenting.
Case

• Differential:

• Management
Case

• SIRS/Sepsis/Severe Sepsis/Septic shock?

CVP?
> 8-12

MAP?
< 65

SvO2?
< 70%

HCT?
< 30%

> 65

> 30%

500 cc Bolus

Vasopressor (NE preferred)

Consider
• Mechanical ventilation
• Steroids if persistently hypotensive

Transfuse

Inotrope (Dobutamine preferred)
Adrenal Insufficiency

• Background
  – Adrenal gland consists of cortex and medulla
    • Cortex: cortisol, aldosterone and androgens
    • Medulla: catecholamines
Adrenal Insufficiency

- Pathophysiology
  - Primary failure (aka Addison’s disease)
    - Deficiency of cortisol and aldosterone production

**Chronic**
- Autoimmune adrenalitis (Addison’s disease)—isolated or polyglandular deficiency, HIV infection (direct involvement or disseminated CMV, MAI, TB, cryptococcosis, histoplasmosis, blastomycosis, toxoplasmosis, *Pneumocystis* pneumonia)
- TB and disseminated infections as seen with HIV
- Metastatic cancer (breast, lung)
- Infiltrative (sarcoid, hemochromatosis, amyloid)
- Congenital (adrenal hypoplasia, adrenoleukodystrophy, ACTH resistance)
- Bilateral adrenalectomy
- Drug toxicity (etomidate, ketoconazole, rifampicin)

**Acute**
- Adrenal hemorrhage
- Meningococcemia and other sepsis
- Anticoagulation (heparins and warfarin)
- Anticardiolipin antibody syndrome
- Trauma
Adrenal Insufficiency

- Secondary failure
  - Due to decreased production of ACTH
  - Deficiency of only cortisol production
  - Aldosterone is regulated by renin-angiotensin system

Secondary Adrenal Failure

Chronic

- Pituitary tumor (primary or metastatic)
- Pituitary surgery or irradiation
- Chronic steroid use with functional deficiency
- Infiltrative (sarcoid, eosinophilic granuloma, TB)
- Traumatic brain injury
- Postpartum pituitary necrosis (Sheehan's syndrome)
- Empty sella syndrome

Acute

- Pituitary apoplexy (hemorrhage into a pituitary tumor)
- Postpartum pituitary necrosis (Sheehan's syndrome)
- Traumatic brain injury
- Relative adrenal insufficiency (sepsis, hepatic failure, severe acute pancreatitis, trauma)
Adrenal Insufficiency

• Symptoms
  – Chronic failure vague and nonspecific

<table>
<thead>
<tr>
<th>General</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Weakness, fatigue</td>
<td>100%</td>
</tr>
<tr>
<td>Anorexia</td>
<td>100%</td>
</tr>
<tr>
<td>Gastrointestinal symptoms</td>
<td>92%</td>
</tr>
<tr>
<td>Weight loss</td>
<td>100%</td>
</tr>
<tr>
<td>Hyponatremia</td>
<td>90%</td>
</tr>
<tr>
<td>Blood pressure ≤110/70 mm Hg</td>
<td>88–94%</td>
</tr>
<tr>
<td>Fevers (mild)</td>
<td>Common</td>
</tr>
<tr>
<td>Depression, apathy</td>
<td>20–40%</td>
</tr>
<tr>
<td>Myalgia, arthralgias</td>
<td>6–13%</td>
</tr>
<tr>
<td>Auricular calcifications</td>
<td>5%</td>
</tr>
</tbody>
</table>
Adrenal Insufficiency

<table>
<thead>
<tr>
<th>Condition</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitiligo</td>
<td>10%</td>
</tr>
<tr>
<td>Hyperkalemia</td>
<td>65%</td>
</tr>
<tr>
<td>Hyperchloremia and acidosis</td>
<td>65%</td>
</tr>
<tr>
<td>Hypoglycemia</td>
<td>Mild, occasional</td>
</tr>
<tr>
<td><strong>Secondary</strong></td>
<td></td>
</tr>
<tr>
<td>Hyperkalemia</td>
<td>Not present</td>
</tr>
<tr>
<td>Hyperpigmentation</td>
<td>Not present</td>
</tr>
<tr>
<td>Hypoglycemia</td>
<td>More severe, common</td>
</tr>
</tbody>
</table>
Adrenal Insufficiency

• Acute symptoms
  – Ranges from acute gastroenteritis with nausea, vomiting, fever and dehydration to vascular collapse or death
  – Hypotension or shock out of proportion to severity of illness.
  – Additional symptoms based on etiology:
    • Abdominal pain for adrenal hemorrhage/infarction
    • Headache suggesting acute pituitary apoplexy
Adrenal Insufficiency

• Differential Diagnosis
  – Chronic
    • Anorexia
    • Carcinoma
    • Chronic fatigue syndrome
    • Polymyalgia rheumatica
    • Myopathy
    • Hypothyroidism
    • Flu syndrome
  – Acute
    • Various causes of shock
Adrenal Insufficiency

• Diagnostic strategies
  – Chronic
    – AM cortisol measurement (normally 10 and 20 mcg/dL)
      » If below 3 mcg/dL is diagnostic of hypoadrenalism
      » If above 20 mcg/dL excludes diagnosis
    – ACTH (cosyntropin) stimulation test confirmatory
      » Obtain baseline cortisol
      » Then administer 250mcg of ACTH
      » Repeat levels at 30-60min
      » Normal levels should exceed 20mcg/dL
    – AM ACTH level
      » High level confirms primary
      » Low level confirms secondary
Adrenal Insufficiency

• Diagnosis (cont’d)
  – Acute crisis
    • Random cortisol
      – <15 mcg/dL = diagnostic
      – 15-33 mcg/dL = indeterminant
      – >33 mcg/dL = excludes
    • ACTH stimulation test
      – Rise of< 9 mcg/dL diagnostic

  – Hypoadrenalism of Sepsis and Critical Illness
    • Random cortisol <25 mcg/dL = likely
    • ACTH stimulation test <9 mcg/dL = diagnostic
Adrenal Insufficiency

• Management of acute insufficiency
  – ABCs, 2 large bore IVs place
  – Look for underlying cause
  – Infuse 2-3 L of 0.9% NS
  – Check for hypoglycemia
  – Give Hydrocortisone 50-100mg q6-8 hrs
    • Taper after 24 hours
    • Dexamethasone (o.1 mg/kg)
      – Advantage of not interfering with cortisol measurement
Sources

Kairam V. Sepsis in the ED. Presentation given on 17 Mar 2011.
