Sepsis and Endocrine Emergencies

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Objectives

- Pathophysiology of sepsis and septic shock
- How sepsis affects the endocrine system
- Pathophysiology of adrenal insufficiency
- Clinical manifestations of relative adrenal insufficiency
- History of treatment for relative adrenal insufficiency, use of corticosteroids and the cosyntropin stim test
- Current treatment of adrenal insufficiency
- Pathophysiology and clinical manifestations of hyperglycemia
- Treatment of hyperglycemia and how insulin protocols have changed and why

Sepsis Ladder

(DeRinger et al., 2013)

Sepsis
SIRS + presence of a confirmed or suspected infection

Severe Sepsis
Sepsis + Signs of end organ damage
Hypotension
Lactate level > 4 mmol

Sepsis Shock
Severe sepsis with persistent hypotension
Signs of end organ damage
Lactate level > 4 mmol

Inflammation
Sepsis and Septic Shock

- Inflammation
  - Vasodilation
  - Decreases afterload
- Increased capillary permeability
- Decreases preload
- Activation of the clotting cascade
- ↓ Oxygenation

B/P and CO

Sepsis and the Endocrine System

How does sepsis effect the endocrine system?
**Endocrine System**

**Hypothalamic-Pituitary-Adrenal Axis**

Inflammation from sepsis suppresses the HPA axis altering the feedback loop

Resistance to steroids related to altered feedback loop

Thrombotic necrosis of the adrenal gland

(Sole, Klein, & Moseley, 2013)

Circulatory collapse
- Refractory hypotension
- Tachycardia
- Dehydration
- Fever
- A/N/V/D/abdominal pain
- Fatigue and muscle weakness

*Very vague in critically ill patients!!!*

(Whiteman, 2009)
Cosyntropin Stim Test

- Baseline cortisol level, cosyntropin administration and repeat cortisol level (Whiteman, 2009)
- No longer recommended to assess for relative adrenal insufficiency
(Dellinger et al., 2013)

Treatment: Corticosteroids

- Why steroids?
  - Originally thought to reduce inflammation
  - Currently—treats relative adrenal insufficiency
- History of steroid use in sepsis
  - High doses increased mortality rate (Bone et al., 1987)
  - Low doses improved mortality rates (Annan et al., 2002)
  - CORTICUS –reduction in organ failure rates but not mortality (Moreno et al., 2011)

Corticosteroid Therapy

- Patients with refractory hypotension despite vasopressor administration
- Recommend a dose of 200 mg/day
- Recommend a continuous infusion
(Dellinger et al., 2013)

Hyperglycemia

- Can occur in critically ill patients without a history of diabetes
- Due to increased stress response
- Can lead to complications
  - Abnormal immune function
  - ↑ Infection rates
  - Hemodynamic instability
  - Dysrhythmias

(Dellinger et al., 2013)
**Hyperglycemia Management**

- What is a normal blood glucose?
- What should the target blood glucose be?

**Insulin Protocols**

- Blood glucose goal of < 180 mg/dL
- Van Den Berghe et al., (2001)
  - 80-110 mg/dL
- Used to be <150 mg/dL (2008 guidelines)
  - NICE SUGAR Trial
    - Hypoglycemia = ↑mortality rates
  
  (NICE SUGAR Trial, 2008; Dellinger et al., 2008 & Dellinger et al., 2013)

**Insulin Protocol (Cont)**

- Treat two consecutive BG readings of > 180 mg/dL
- Insulin infusion goal BG of < 180 mg/dL
- Monitor BG every 1-2 hrs until stable, then every 4 hours
- Caution with Point of care testing

**Insulin Protocol (Cont)**

- Nurse controlled protocols
  - Safe
  - Better target outcomes

(Kleinpell, Aitken, & Schorr, 2013)
G.S. is a 46 year-old female with a past medical history of HTN and an acute appendicitis. She developed septic shock after her appendix ruptured...

She is currently intubated, ventilated and sedated and receiving antibiotics.

After receiving multiple fluid boluses, she also has a continuous infusion of norepinephrine at 20 mcg/min and vasopressin of 0.03 units/min

Despite this, her MAP is at 65mmHg

Is she a candidate for corticosteroids?

Yes

She has received multiple fluid boluses to correct volume loss and she is currently on multiple pressors for a MAP of 65mmHg

What is the recommended daily dose?
G.S.

- Her morning blood glucose is 200 mg/dL and her afternoon blood glucose is 192 mg/dL.
- What should the nurse anticipate?

G.S.

- An insulin infusion is started, what is the target glucose level?
- How should the insulin infusion be managed?

G.S.

- G.S. is started on hydrocortisone at 200 mg/day and an insulin infusion.
- Gradually, she was weaned off norepinephrine and vasopressin.
- Eventually she was weaned off mechanical ventilation and extubated.

G.S.

- She eventually made a complete recovery.

The End
References


