AMERICAN COLLEGE OF EMERGENCY PHYSICIANS
SCIENTIFIC ASSEMBLY
1999

The Adrenals in the Emergency Department

We do not often consider the adrenal gland, but dysfunction in that small gland can and does wreak havoc. The lecturer will review both hyperadrenalism and hypoadrenalism with an emphasis on diagnosis and emergency management.

- List the signs and symptoms of adrenal excess and deficiency.
- List the diagnostic criteria for Cushing's disease.
- List the diagnostic criteria for Addison's disease
- Outline a practical diagnostic approach to adrenal abnormalities

TU-116
Tuesday, October 12, 1999
5:00 PM - 5:55 PM
Room # N223
Las Vegas Convention Center

FACULTY

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Adrenal Emergencies

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ACEP Scientific Assembly 1999

Objectives:
1. Describe the physical findings associated with adrenal insufficiency and adrenal hyperactivity
2. Describe the laboratory abnormalities associated with adrenal insufficiency and adrenal hyperactivity
3. Describe the emergency treatment of adrenal insufficiency and adrenal hyperactivity

Adrenal Gland and the Hypothalamic - Pituitary - Adrenal Axis

- Adrenal medulla secretes:
  - Epinephrine
  - Norepinephrine

- Adrenal cortex secretes:
- 15-20mg per day of **cortisol**
  - Maintains blood sugar
  - Liver glycogen
  - Gluconeogenesis
  - Stabilizes lysosomes
  - Has minor MC functions
- Aldosterone
  - Maintains extracellular fluid balance
  - Conserves sodium
- Androgen

Adrenal Insufficiency

Definition:
Inadequate hydrocortisone secretion to meet the body's needs during stress

- Primary Adrenal Insufficiency Etiologies:
  - Anatomic gland destruction
  - Addison's Disease: idiopathic
  - Autoimmune atrophy
  - Surgical removal
  - Infection - AIDS/CMV/TB
  - Hemorrhage

Metastatic invasion
Metabolic failure in hormone production:
Congenital adrenal hyperplasia
Enzyme inhibitors
Cytotoxic agents
Ketoconazole

- Secondary adrenal insufficiency
  Hypopituitarism
  Suppression of hypothalamic - pituitary axis from steroids (exogenous/endogenous)

Adrenal Crisis

- May be precipitated by rapid and overwhelming intensification of:
  Chronic adrenal insufficiency
  Acute adrenal hemorrhage
  Rapid steroid withdrawal
  Untreated patient under stress (pregnancy, surgery, trauma infection, dehydration)

- Symptoms of Cortisol Deficiency
  Cortisol Deficiency
  Anorexia
  Nausea
  Vomiting
  Lethargy
  Abdominal pain
  Malaise
  Myalgias

- Symptoms of Aldosterone Deficiency

Dehydration ... primary only

- Signs
  Sodium depletion
  Orthostatic---hypotension---shock
  Hyperkalemia
  Shock
  Mental status changes
  Tachycardia
  Hyperpigmentation (not seen in secondary AI)
  Vitiligo
  Muscle wasting
  Fever

- Clues In the Laboratory Evaluation That Point to Adrenal Deficiency
  - Hyponatremia
  - Hyperkalemia
  - Hypoglycemia
  - High BUN
  - High calcium
  - Low serum cortisol level
  - Eosinophilia

  - EKG -
    - T wave changes
    - prolonged PR
    - QRS
  - Chest x-ray
    - narrow cardiac silhouette
  - Search for precipitating cause !!!!!!
- Differentiating between primary and secondary AI requires extensive endocrine evaluation

<u>Treatment</u>

- Fluid and volume replacement
- Volume deficit = 3 liters
- Rapid D5 NS IV infusion
- Glucocorticoid replacement
  - Dexamethasone phosphate:
    - 4mg IVP
  - ACTH 250 units - ACTH stimulation test or
  - 100-200mg hydrocortisone IVP
  - Repeat 4-8 hours or
  - continuous IV infusion ...10mg / hour hydrocortisone or
  - 50-100mg cortisone acetate IM
- Correct hypotension
- IV hydration
- Pressors if necessary (dopamine)
- Correct hypoglycemia
- D5 NS
- D50W if needed
- Correct hyperkalemia
- Normalize temperature
- Identify and treat precipitating cause

Adrenal Hyperactivity ("Cushing's Disease")

- Definition:

Metabolic abnormalities induced by excessive amounts of the adrenocortical glucocorticoid steroids, principally cortisol

- 9x more common in women

- Primary Adrenal Hyperactivity Etiologies:
  - Adrenal cortex hyperplasia

- Secondary Adrenal Hyperactivity Etiologies:
  - Overproduction of ACTH
  - Pituitary
  - Non-endocrine tumor (bronchial, small cell)
  - Exogenous ingestion

- Symptoms of Excess Cortisol
  - Change in menstrual cycle----eventual amenorhea
  - Weight gain
  - Lassitude
  - Loss of muscle strength
  - Emotional disturbances
  - Backache (osteoporosis) / bone pain

- Signs of Excess Cortisol
  - Hypertension
  - Moon facies
  - Increased fat supraclavicular fossa
  - Buffalo hump
  - Fat around girdle
  - Thin limbs
  - Atrophic skin
    - easily torn
    - ulcerations
  - Connective tissue weakness
    - easy bruising
    - Striae
  - Mild hirsutism (face and shoulders)
  - True virilization uncommon
  - Immunocompetence problems
  - Thromboembolic phenomena

- Clues in the Laboratory Evaluation That Point to “Cushing’s Disease”
  - High cortisol levels
  - Lack of diurnal variation
  - Not suppressed by dexamethasone
  - Exaggerated response to ACTH
  - High urinary free cortisol
  - Impaired glucose tolerance
  - Adrenal Hyperactivity: Laboratories
  - Leukocytosis
  - Relative lymphopenia
  - Relative eosinopenia
  - Hypokalemic alkalosis
  - Only in primary disease:
    - High Factor VIII, V, prothrombin
  - EKG
    - changes due to low K (even with normal K)
  - CXR
    - cardiac enlargement
    - osteoporosis
  - CAT
    - ? increased adrenal size
    - ?pituitary tumor

Treatment

- Dependent on cause-- leave to endocrinologist

Morbidity and Mortality

50% within 5 years if untreated

In Summary

- Adrenal emergencies are uncommon
- The signs and symptoms overlap with many conditions
- Left untreated, adrenal disease is lethal

- References:

1. Cydulka RK: Adrenal Insufficiency in The 5 Minute Emergency Medicine Consult (Rosen P, Barkin RM, Hayden SR, Schaider J, Wolfe R eds). Williams and Wilkins Publication. in press.

2. Holmes L, Lakshmanan M in Emergency Care of the Compromised Patient (Herr RD and Cydulka RK, eds) Philadelphia. Lipincott, 1994. 123-133.

3. Oelkers W: Adrenal Insufficiency. NEJM.1996;355:1206-1212.

4. Bondy, P: Disorders of the Adrenal Cortex in Textbook of Endocrinology (Wilson JD and Foster DW, eds) Seventh Edition. Philadelphia, 1997

5. Hankin ME, et al. An Evaluation of Laboratory Tests for the Detection and Differential Diagnosis of Cushing's Syndrome. Clin Endocrinol . 1977, 6:185-96.