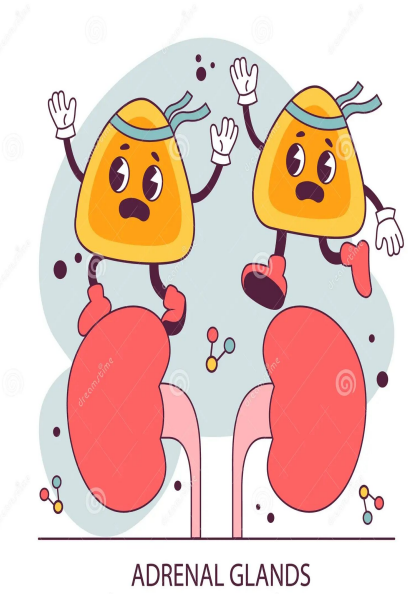
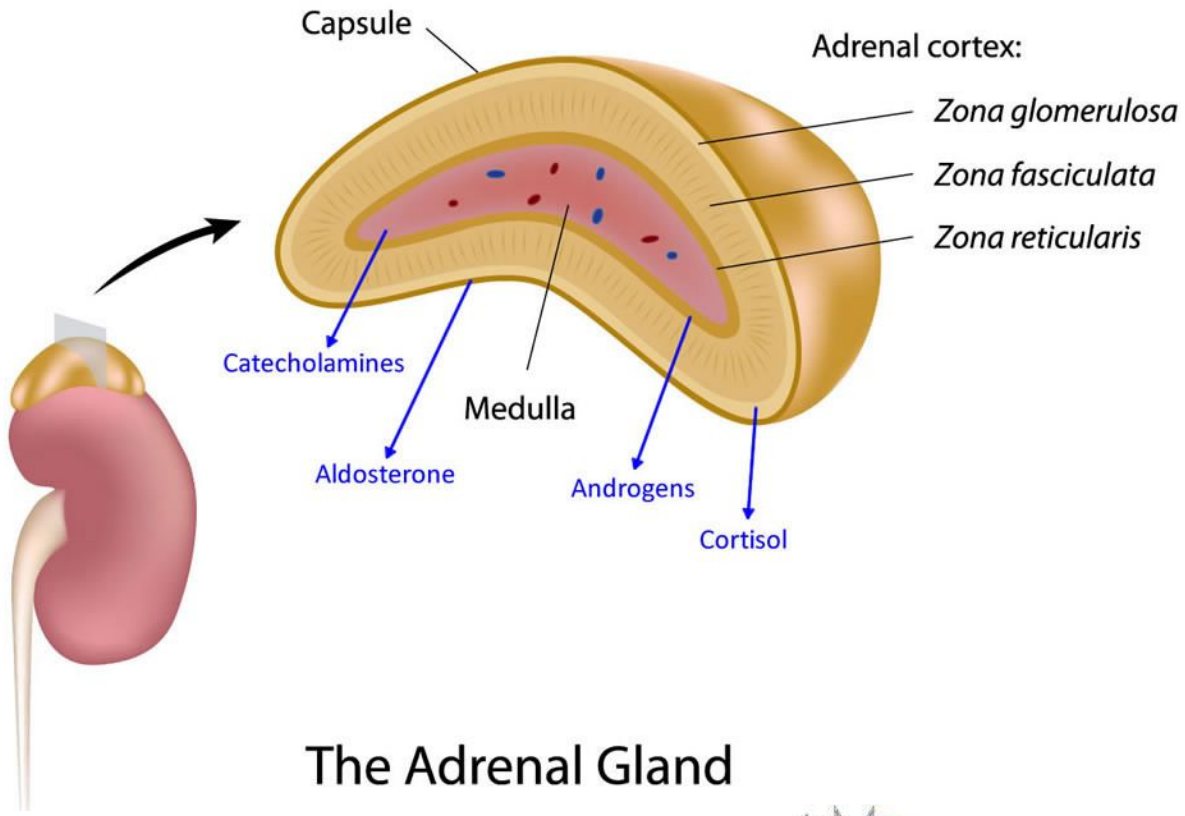
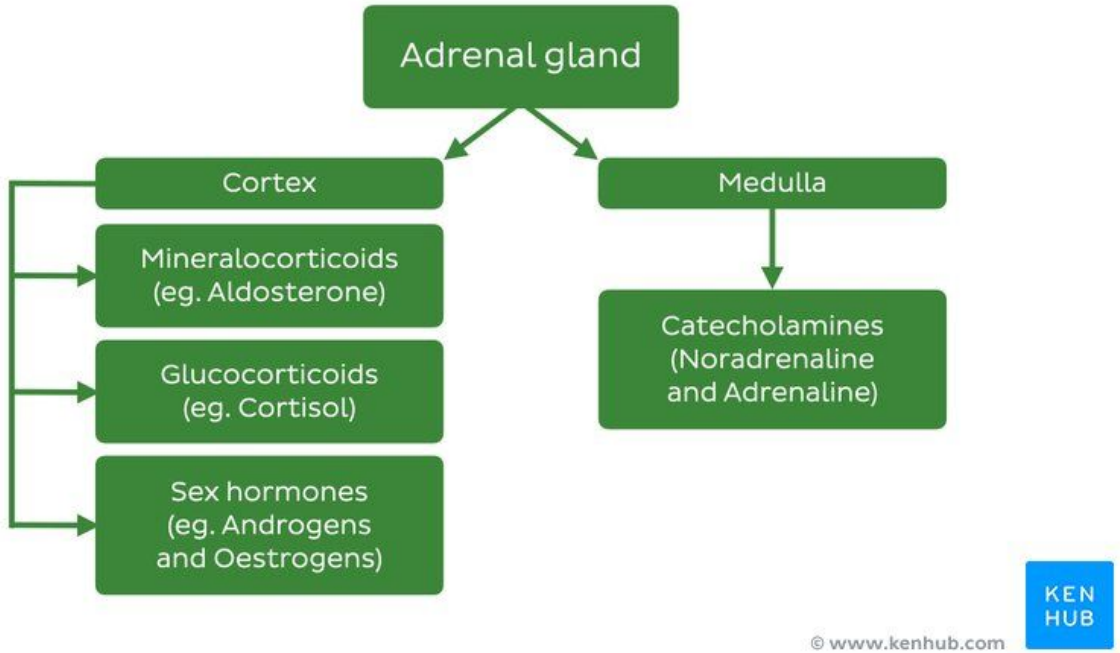
Adrenal and Pituitary Emergencies

Dr Baluka Connie EM



Functional Anatomy of the adrenal gland

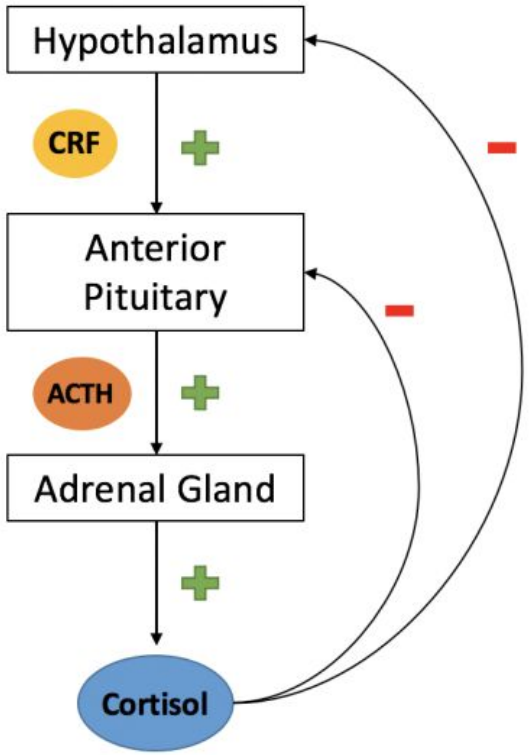


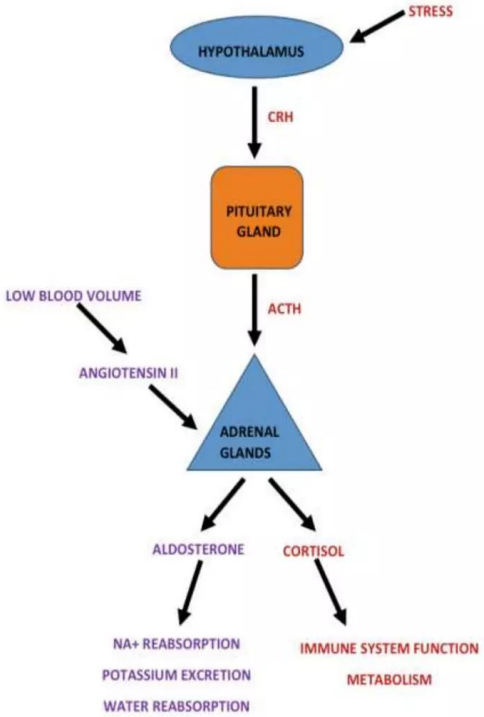


Functional anatomy contn…

Hypothalamus Adrenal Axis & RAAS

Activation
Inhibition
Secretion





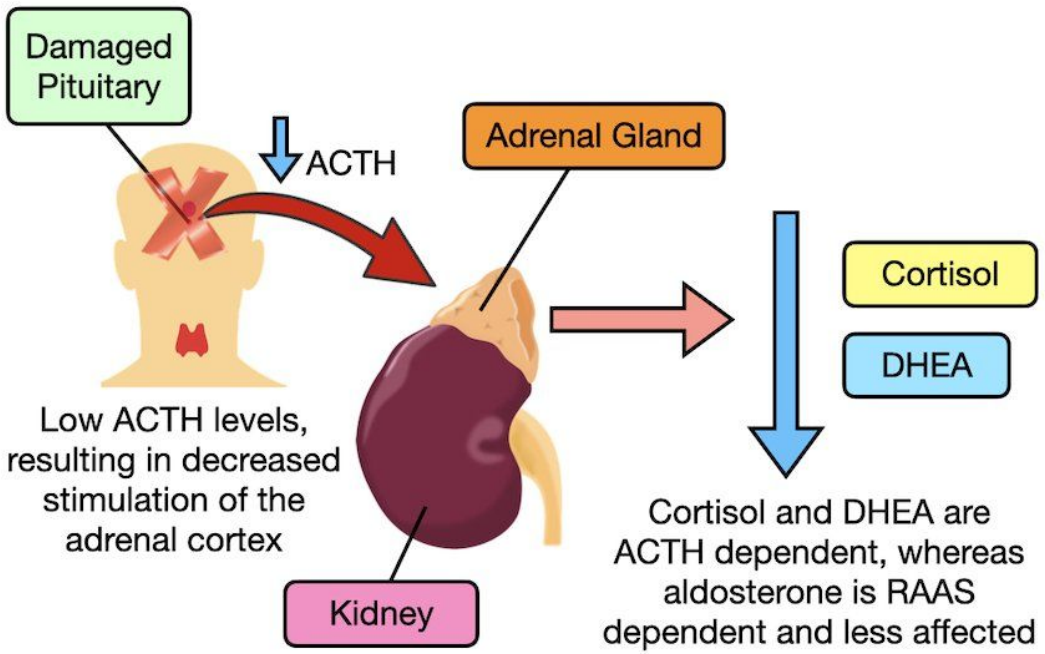
- Adrenal glands are responsible for secreting hormones that regulate;
- Metabolism
- Blood pressure regulation
- Immune system
- Sympathetic nervous system
- Body’s response to stress

Adrenal Insufficiency

- Deficiency of adrenal cortex hormones
- **Addison's disease**; primary adrenal insufficiency-autoimmune disease
- Secondary adrenal insufficiency; Decreased levels of ACTH and CRH
- **Causes;**
- Autoimmune destruction of the adrenal gland
- Infections(TB, HIV, syphilis)
- Drugs (ketoconazole, fluconazole, etomidate)
- Adrenal hemorrhage, pituitary hemorrhage
- Tumors (pituitary, adrenal)
- **Note:** A separate pathway regulates aldosterone called the renin-angiotensin-aldosterone-system (RAAS) therefore much less affected by the HPA axis

Secondary Adrenal Insufficiency

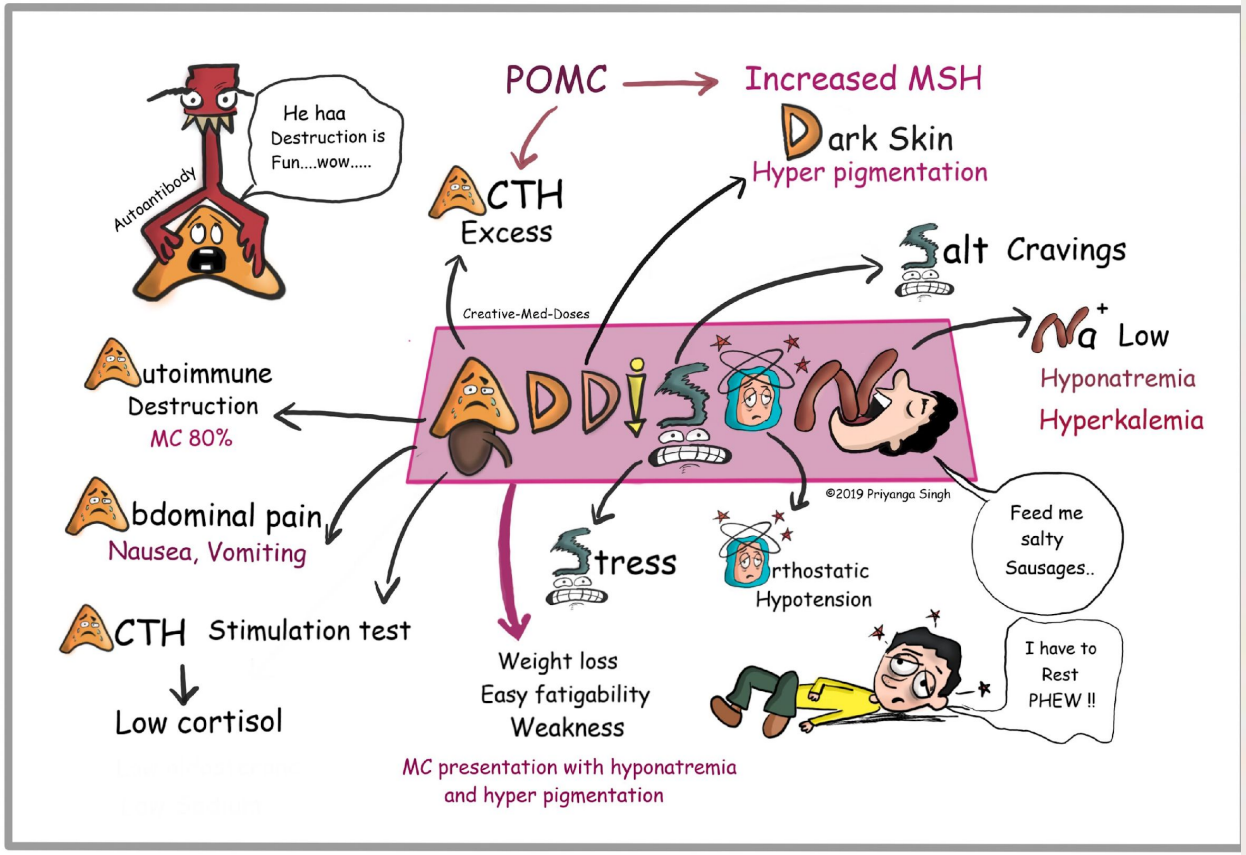
Secondary Adrenal Insufficiency: Damage or dysfunction to the pituitary gland, or stopping chronic steroid use, resulting in deficient ACTH, cortisol, and DHEA levels.



Causes

- **Pituitary disease**
  - Pituitary tumor
  - Infection (tuberculosis)
  - Autoimmune (lymphocytic hypophysitis)
  - Pituitary trauma
- **Exogenous corticosteroid use**
  - Corticosteroids act like cortisol
  - Suppress CRH and ACTH over time
  - Adrenal glands atrophy over time
  - Adrenals can no longer produce cortisol when corticosteroids are discontinued

Clinical features



Spectrum of severity of adrenal insufficiency

Adrenal insufficiency (AI)	Incipient adrenal crisis	Adrenal crisis
-Fatigue -Anorexia, weight loss -Postural diziness	-Fatigue, anorexia -Fever -GI: N&V, diarrhea -Postural diziness -Syncope -Abdominal pain -Delirium	Shock state: 🔴Hypotension 🔴Tachycardia 🔴SI>1 ✅Plus other features of AI

Still about the clinical features

CLINICAL AND LABORATORY FEATURES OF ADRENAL CRISIS

- Dehydration, hypotension, or shock out of proportion to severity of current illness
- Nausea and vomiting with a history of weight lost and anorexia
- Abdominal pain, so-called acute abdomen
- Unexplained hypoglycemia
- Unexplained fever
- Hyponatremia, hyperkalemia, azotemia, hypercalcemia, or eosinophilia
- Hyperpigmentation or vitiligo
- Other autoimmune endocrine deficiencies, such as hypothyroidism or gonadal failure

Kronenberg - Williams Textbook of Endocrinology 11th ed

Investigations

- Routine labs; -RBS-hypoglycaemia
  -CBC-Eosinophilia,lymphocytosis +/-neutropenia
  -RFTs- Hyponatremia, Hyperkalemia
  - ABGs-metabolic acidosis
- ACTH levels; low or normal in secondary adrenal insufficiency
  High in primary adrenal insufficiency

Plasma cortisol levels- early am serum cortisol < 5µg is diagnostic

Adrenal Crisis

- Acute exacerbation of symptoms in someone with adrenal insufficiency and is associated with **absolute hypotension with a systolic < 100mmHg or a relative hypotension with a systolic ≥ 20mmHg lower than the patient's baseline**
- Also known as an Addisonian crisis
- It is a life threatening condition therefore early recognition is important for improved outcomes
- Rare condition

Precipitating factors

- Infections (bacterial,fungal,viral)
- Gastrointestinal illnesses
- Trauma
- Significant emotional distress
- Abrupt cessation of chronic corticosteroids
- Thyrotoxicosis (increases metabolism)

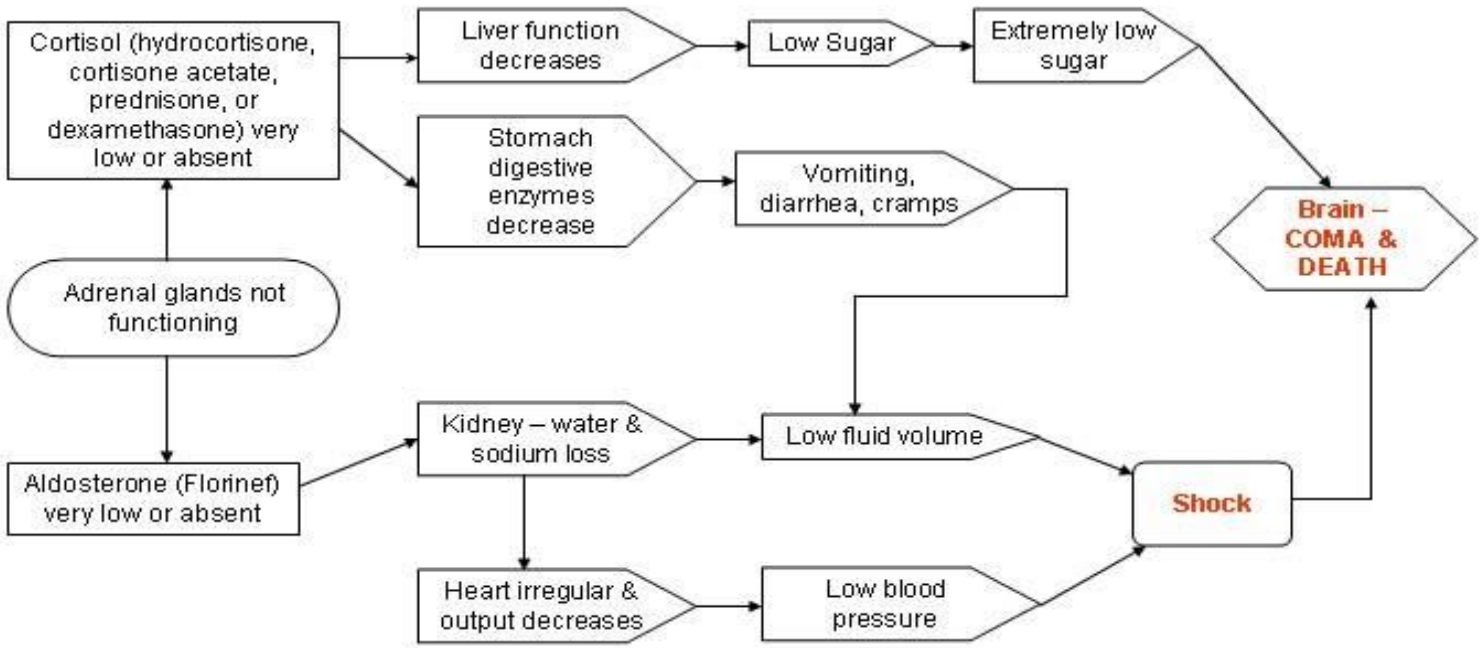
Risk factors

- Hx of Adrenal insufficiency
- Ongoing glucocorticoid therapy
- Anticoagulants (increased risk of adrenal hemorrhage

Pathophysiology

Addison Crisis Pathway

This is from a unknown Nursing Encyclopedia



From this you can see how once a crisis begins, it begins to affect vital organs.
The sooner you can use your injectable and receive IV fluids, the sooner you can halt the progress of the crisis.

Clinical presentation

- Predominant feature is shock usually out of proportion with the severity of the illness
- Other symptoms are non-specific and may include;
- Nausea and vomiting
- Abdominal pain “acute abdomen”
- Unexplained fevers
- Fatigue,lethargy,confusion,coma
- May have a background of longstanding lethargy,fatigue,anorexia
- May carry a medical alert card “in case of known insufficiency”

Symptoms	Signs	Routine Laboratory Tests
Adrenal insufficiency		
Fatigue	Hyperpigmentation (primary only), particularly of sun-exposed areas, skin creases, mucosal membranes, scars, areola of breast	Hyponatremia
Weight loss	Low blood pressure with increased postural drop	Hyperkalemia
Postural dizziness	Failure to thrive in children	Uncommon: hypoglycemia, hypercalcemia
Anorexia, abdominal discomfort		
Adrenal crisis		
Severe weakness		Hyponatremia
Syncope	Hypotension	Hyperkalemia
Abdominal pain, nausea, vomiting; may mimic acute abdomen	Abdominal tenderness/guarding	Hypoglycemia
Back pain	Reduced consciousness, delirium	Hypercalcemia
Confusion		

Labs

- Hypoglycaemia
- Hyponatremia
- Hyperkalemia
- Increased urea
- Other labs should be directed to possible precipitant
- Treat all febrile patients as those with infection until proven otherwise
- Other tests may include ACTH,cortisol levels.
- **Do not wait for labs initiate treatment immediately**

Management

- ABCDE
- Correct volume depletion

✔ IV D5NS 30ml/kg be cautious when using NS.If serum Na is <125 mmol/l avoid increases of plasma Na by > 10mmol/l/day

- Replace glucocorticoids

✔ IV hydrocortisone 100mg start then 100mg 4 times daily for the first 12-24 hrs

✔ Continue IV hydrocortisone 4 times daily until the patient is able to take oral therapy

Management contn….

- Correct other metabolic abnormalities

✔ Hypoglycemia-IV 10% glucose

✔ Hyperkalemia – usually responds to fluid resuscitation however, may require specific treatments

- Identify and treat underlying cause

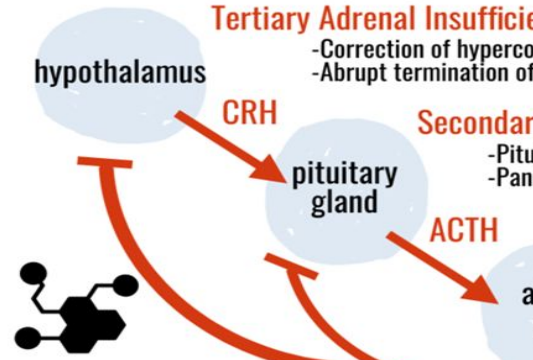
✔ Start antibiotics

✔ Consider specific treatment for adrenal or pituitary pathology

Summary

Adrenal Crisis for the EM doc.

[a K$ production]



Tertiary Adrenal Insufficiency:
-Correction of hypercortisolism/Cushing's syndrome
-Abrupt termination of prolonged glucocorticoid therapy

Secondary Adrenal Insufficiency:
-Pituitary disease (tumor, necrosis, hemorrhage, autoimmune)
-Panhypopituitarism or isolated ACTH deficiency

Primary Adrenal Insufficiency:
>80% of cases of adrenal crisis
Genetic (CAH) and Autoimmune (Addison's) most common
Adrenal glands can also be harmed by drugs, infection, trauma

Presentation of Addison's:
-presents age 30-50
-hyperpigmentation
-history of autoimmune disease

>50% of patients presenting for adrenal insufficiency will have no history of adrenal disease!

Presentation of any cause adrenal insufficiency:
-chronic, vague complaints
-Weakness, aches, AMS, GI sx
-hypotension, dehydration

Adrenal Crisis:
...is a LIFE THREATENING emergency due to deficiency of cortisol & aldosterone
...classically presents as hypotension REFRACTORY to IV fluids & vasopressors

Crisis (depleted cortisol) is most often precipitated by trauma, infection, surgery, strenuous exercise, or even emotional stress.

Diagnostic Studies:
-Random cortisol level is hard to interpret (<15 suggests insufficiency)
-ACTH stimulation test should be performed inpatient (and can also differentiate primary vs. secondary etiology)

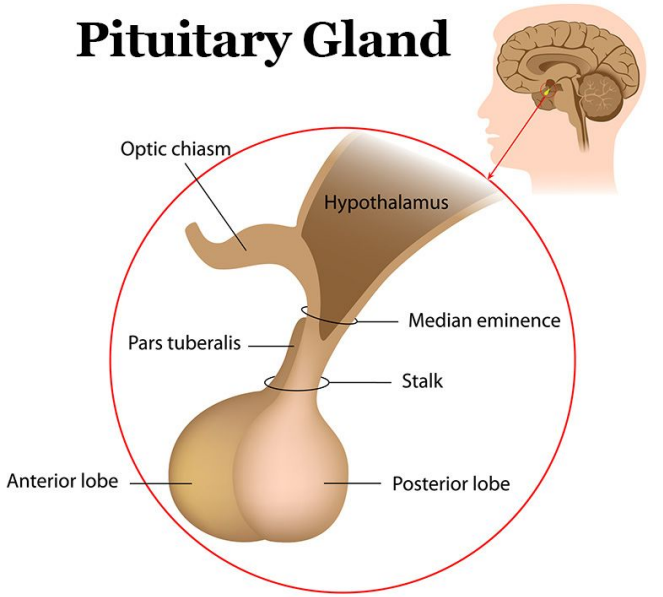
	1° AI	2°/3° AI
K+	High	Normal or Low
Na+	Low	High or Low
Cl-	Low	Normal
BUN	High or Normal	Normal
GLUCOSE	Normal or Low	Low

Treatment:
-Hydrocortisone preferred (both glucocorticoid + mineralcorticoid effects)
-Early Tx = less morbidity & mortality!
-Give D5NS to treat dehydration, slowly correct hyponatremia & hypoglycemia

Initial hydrocortisone dose:
Adults > age 12: 100mg IV
Peds age 3-12: 50mg IV
Peds < age 3: 25mg IV

Pituitary Apoplexy

- Acute life threatening infarct or hemorrhage into the pituitary gland
- Pituitary gland also known as the master gland is located in the sella turcica of the sphenoid bone
- It is divided into the anterior and posterior pituitary gland



Pituitary gland anatomy and physiology

- Anterior pituitary secretes-
  - Growth hormone (somatotropin)
  - Thyroid stimulating hormone (TSH)
  - Adrenocorticotropic hormone (ACTH)
  - Follicular stimulating hormone (FSH)
  - Luteinizing hormone (LH)
  - Prolactin
- Posterior pituitary secretes oxytocin and Vasopressin

Clinical Presentation

- Acute severe headache most common & earliest manifestation. Headache may be accompanied by nausea and vomiting
- Ocular palsies, most commonly a third nerve palsy, can occur due to involvement of the cavernous sinus
- Reduced visual acuity and visual field defects due to optic chiasmal compression
- Fever, neck stiffness, photophobia or reduced consciousness (similar to signs/symptoms of SAH or meningitis) may occur

- A diagnosis of pituitary apoplexy should be considered in all patients who have acute severe headache and any of the following:
- Patients in whom subarachnoid hemorrhage (SAH) & meningitis have been excluded
- Patients with neuro-ophthalmic signs
- Patients with pre-existing pituitary tumours

Precipitating factors

- Hypertension
- Major surgery, especially coronary artery bypass grafting,
- Anticoagulation therapy
- Coagulopathies
- Pregnancy
- Head trauma.

Management

- ABCDE
- Ensure hemodynamic stability
- Steroid therapy
- IV hydrocortisone 100-200mg
- Indications for empirical steroid therapy are
- Haemodynamic instability, altered consciousness level, reduced visual acuity and severe visual field defects. Steroid replacement is potentially lifesaving in these patients

- **Labs**
- Urea & electrolytes,
- CBC
- Renal and liver function tests
- Clotting profile
- **Imaging**
- CT brain
- MRI imaging of choice

References

- Davidson's Textbook of Internal Medicine
- Emergency Endocrine guideline; pituitary apoplexy
- Tintinalli's textbook of Emergency Medicine.

Thank you for listening