

SECONDARY ADRENAL INSUFFICIENCY

Stress Dose Steroids For Surgery

Hypothalamic-Pituitary Axis (HPA)

- Hypothalamus (CRH) → pituitary (ACTH aka corticotropin) → adrenal glands (cortisol)
- Adrenal cortex: mineralocorticoid, glucocorticoid, androgens
- ACTH stimulates glucocorticoid > mineralocorticoid
- Physiologic cortisol: 10-20mg per day

Glucocorticoid equivalent doses:

	equivalent doses (mg)	relative potency
Cortisol	20	1
Cortisone	25	0.8
Prednisone	5	4
Prednisolone	5	4
Dexamethasone	0.75	30-150

- Cortisone is precursor of cortisol, the active form
- Prednisone is precursor of prednisolone, the active form. Therefore prednisolone better in liver disease
- Hydrocortisone is the soluble, exogenous form of cortisol
- Hydrocortisone (cortisol) and cortisone have short duration of action, not commonly used therapeutically
- Hydrocortisone has mineralocorticoid effects at doses above 100mg. Others in list have only glucocorticoid effects
- Dexamethasone and prednisone have longer duration of action, therefore smoother physiologic effect.
- Fludrocortisone is a mineralocorticoid

Primary vs. Secondary adrenal insufficiency

- Signs & Symptoms of both: malaise, orthostatic hypotension, anorexia, GI symptoms- cramps, nausea, vomiting, diarrhea
- Primary
 - Mineralo and gluco deficiency
 - Hyperpigmentation (increased ACTH)
 - Etiology- Addison's, AIDS, TB, antiphospholipid syndrome
 - Diagnosis: corticotropin stimulation test (ACTH should cause cortisol >18ug/dL)
- Secondary
 - Only glucocorticoid deficiency
 - Hypotension not because decreased aldosterone.
 - Rather because cortisol has permissive effect on vascular tone, inhibits vasodilating prostacyclin.
 - Pale skin
 - Etiology- Long-term glucocorticoid therapy, sarcoidosis, pituitary pathology

- Diagnosis: Insulin induced hypoglycemia (insulin should cause increased cortisol when hypoglycemia)

Long-term corticosteroid use

- HPA suppression vs secondary adrenal insufficiency
- HPA suppression
 - No life-threatening hypotension
 - Symptoms of adrenal insufficiency (malaise, GI Sx, orthostatic) if withdrawn
 - Doses: Occurs at 20mg prednisone x5 days, or at just above physiologic equivalent (> 5mg) if treated for >1 month. No suppression if getting 5mg in the AM.
 - Corticosteroid withdrawal
 - Decrease by no more than 5mg increments
 - Supplement symptoms with minimal hydrocortisone
- Secondary adrenal insufficiency after long-term corticosteroid use
 - Life-threatening hypotension when stress (critically ill, sepsis, surgery)
 - Difficult to predict (vs HPA suppression), although longer, higher doses correlate to insufficiency > suppression
 - Treat with hydrocortisone 100mg bolus, then 100-200mg drip over 24 hours

Surgical stress-dose steroids

- Physiologic cortisol: 10-20mg per day
- Stress-induced cortisol, normal subject
 - Minor surgery/ procedure- 50mg
 - Major operations- 75-100mg
 - Severe stress- 200mg
- Principle of stress-dose for patients on chronic corticosteroids
 - Give only the normal physiologic response

Bromberg JS et al, 1994

Minor stress	Local anesthesia, less than 1 hr	Hydrocortisone 25mg
Moderate stress	eg: lower extremity vascular surgery, joint replacement during surgery	Patient's usual dose plus hydrocortisone 50mg IV
Major stress	Major abdominal surgery, cardiopulmonary bypass	Patient's usual dose 2 hours before surgery, plus hydrocortisone 50mg IV every 8 hours for 48-72 hours

Salem M, Tainsh RE Jr, Bromberg JS, et al. Perioperative glucocorticoid coverage. A reassessment 42 years after emergence of a problem. Ann Surg 1994. 219:416-425.

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