Diagnosis & Chronic Management of Adrenal Insufficiency

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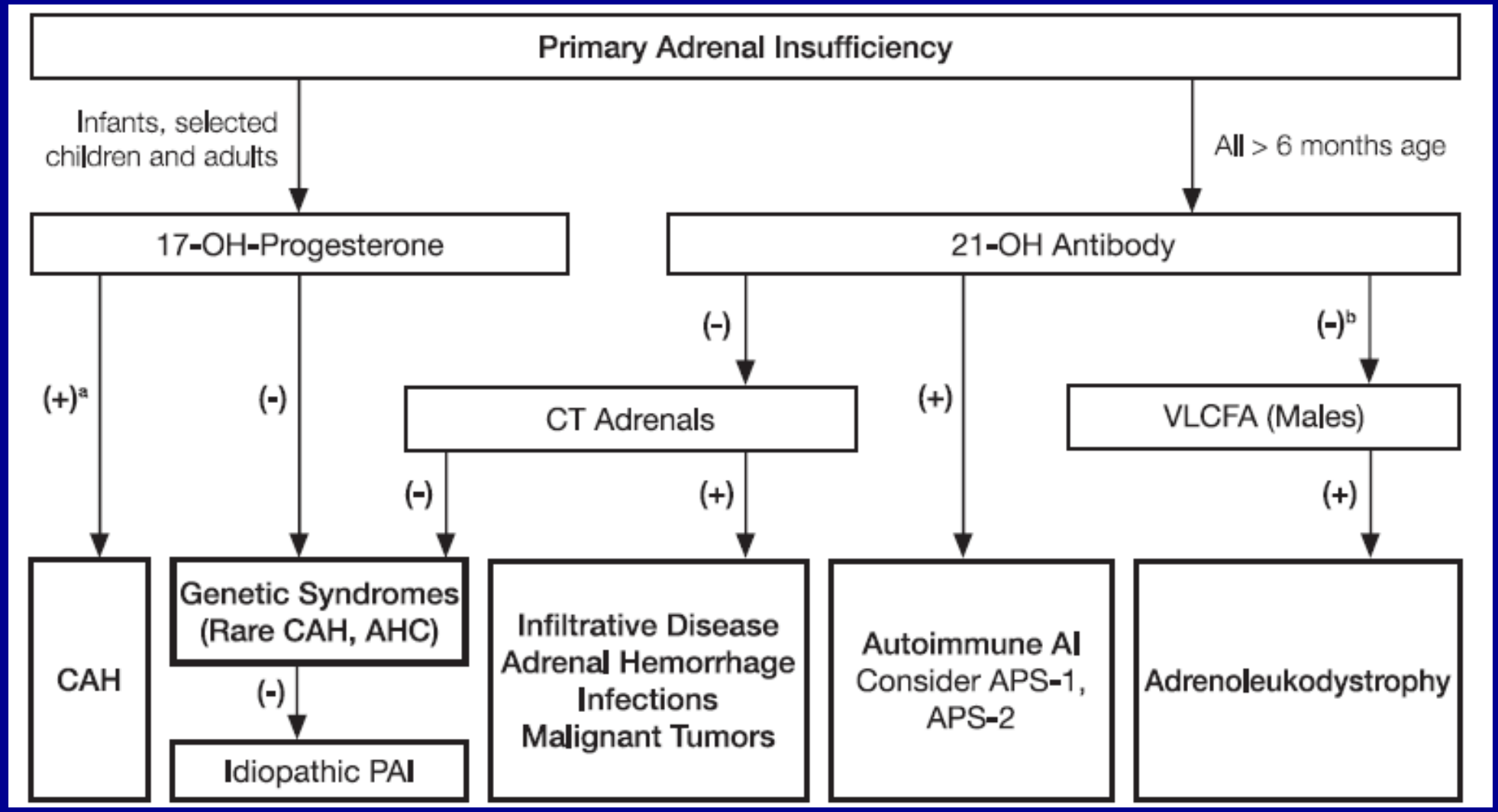
Adrenal Insufficiency

Diagnosis

- **Basal (0800) Hormones Very Useful**
  - **Cortisol: <4 µg/dL (100 nmol/L) Low; >14 (400 nmol/L) Normal**
  - **DHEA-S: >65 µg/dL (>1700 nmol/L) Normal**
  - **ACTH: Low (<10 pg/mL) or High (>100 pg/mL)**
  - **Renin & Aldosterone**
    - **Primary AI: High Renin, Low Aldosterone**
    - **Secondary AI: Both Generally Normal & Track Together**
- **Cosyntropin Stimulation Test**
  - **250 µg $ACTH^{1-24}$ IM/IV**
  - **Cortisol@30-60 min: >14 µg/dL (>400 nmol/L) Current Assays**

Primary Adrenal Insufficiency

Diagnostic Algorithm



Bornstein J Clin Endocrinol Metab 2016;101:364

Adrenal Insufficiency

Treatment - Chronic

- **Glucocorticoids: Hydrocortisone Best**
  - **Maintenance 10-12 (maybe 6-8) mg/m^2/d = 10-20 mg/d**
  - **10-15 mg AM/5 mg 1400 – Clinical Titration**
  - **Double Dose: Vomiting, Diarrhea, High Fever**
  - **(Methyl)prednisolone 4-6 mg/d**
  - **Dexamethasone 0.25-0.375 mg/d**
- **9α-Fludrocortisone Acetate: 0.1-0.4 mg/d**
  - **Primary AI Only**
- **?DHEA Replacement in Women**

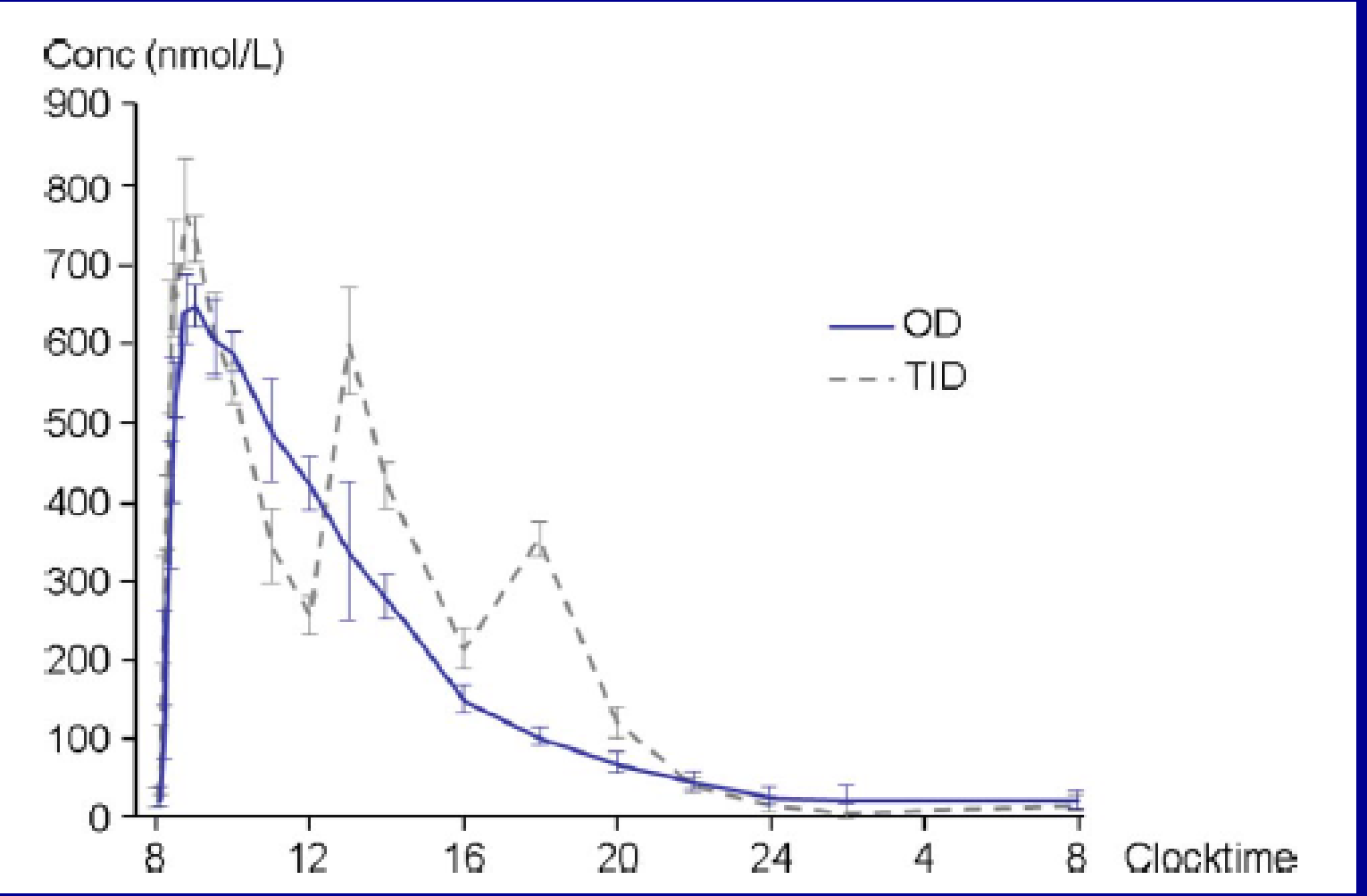
Adrenal Insufficiency

Treatment – Chronic Titration

- **Glucocorticoid**
  - Cushingoid Features: Bruising, Striae, Skin Thinning, Fat Pads
  - Underdosing: Weigh Loss, Anorexia, Afternoon Fatigue
  - Dose Distribution: Trial & Error, Symptoms Improve Post-Dose
  - Exposure: Measure Cortisol 1-2 h Post-Dose (Peak)/Pre-Dose
- **Mineralocorticoid**
  - Standing BP Most Important
  - Serum K Not High
  - Plasma Renin Not High

Adrenal Insufficiency

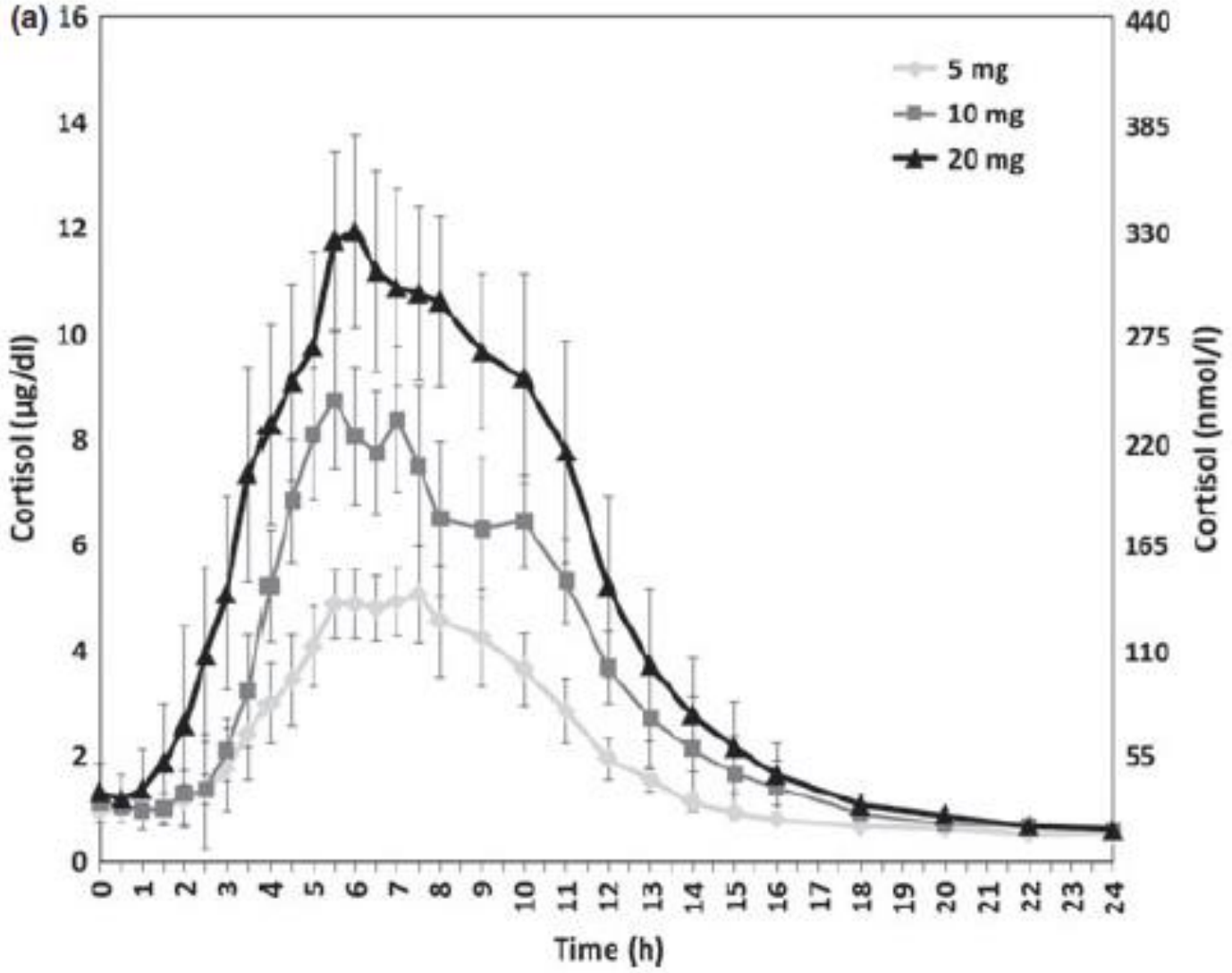
Modified-Release Hydrocortisone (Plenadren)

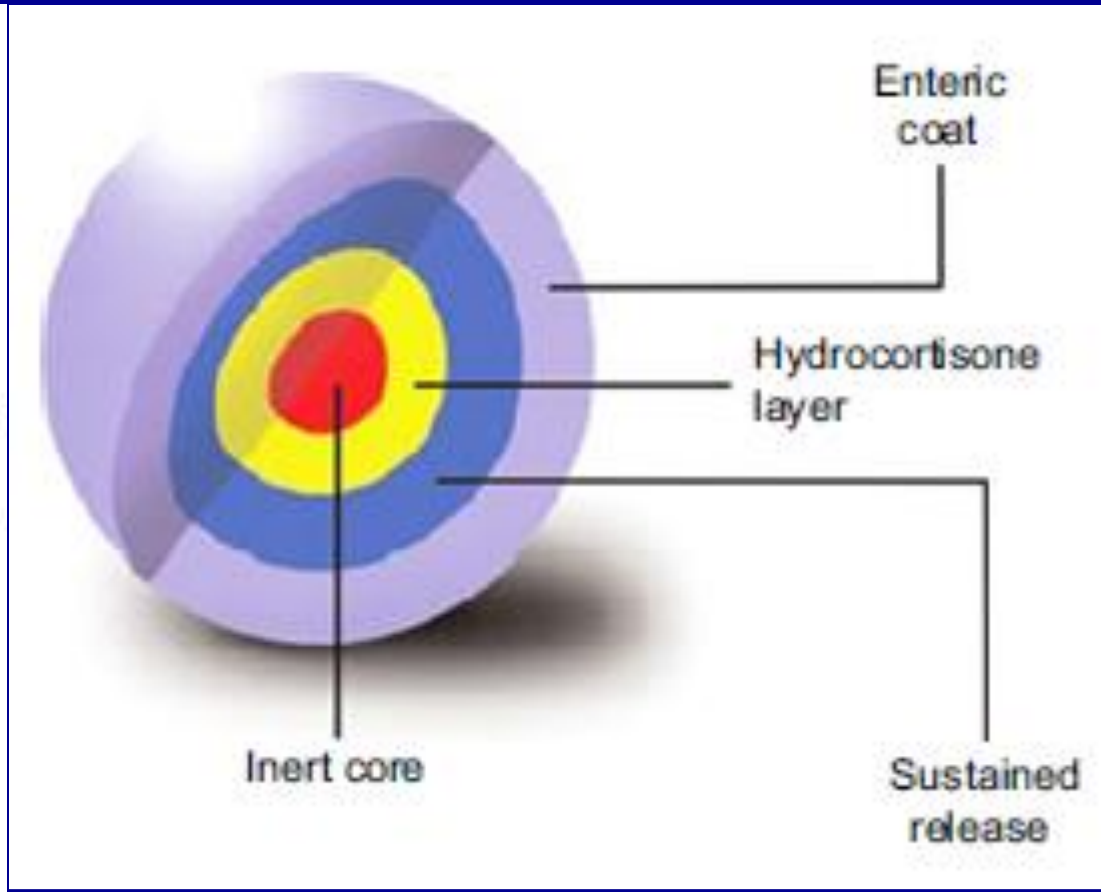


Johannson J Clin Endocrinol Metab 2012;97:473

Adrenal Insufficiency

Modified-Release Hydrocortisone (Chronocort)





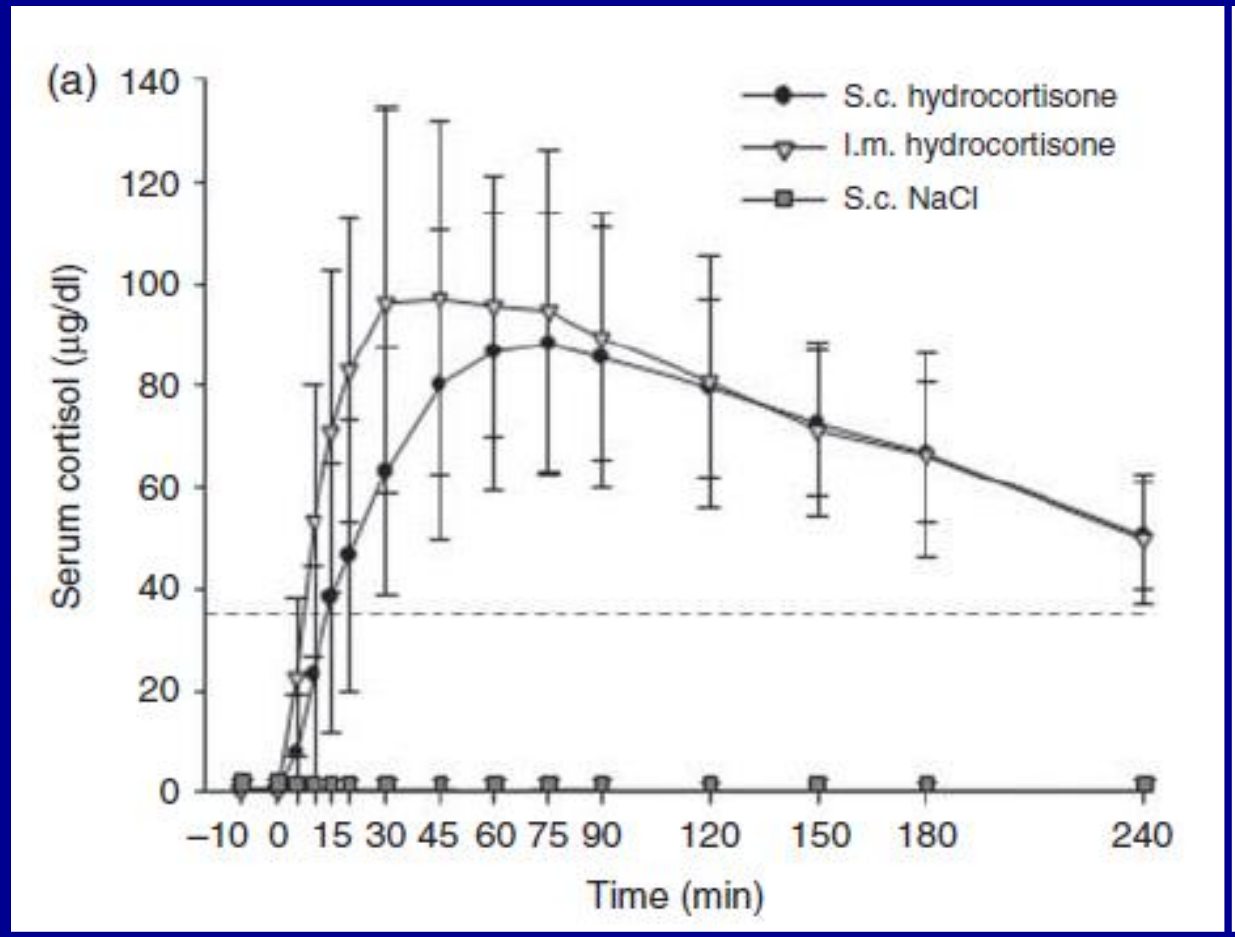
Whitaker Clin Endocrinol 2014;80:554

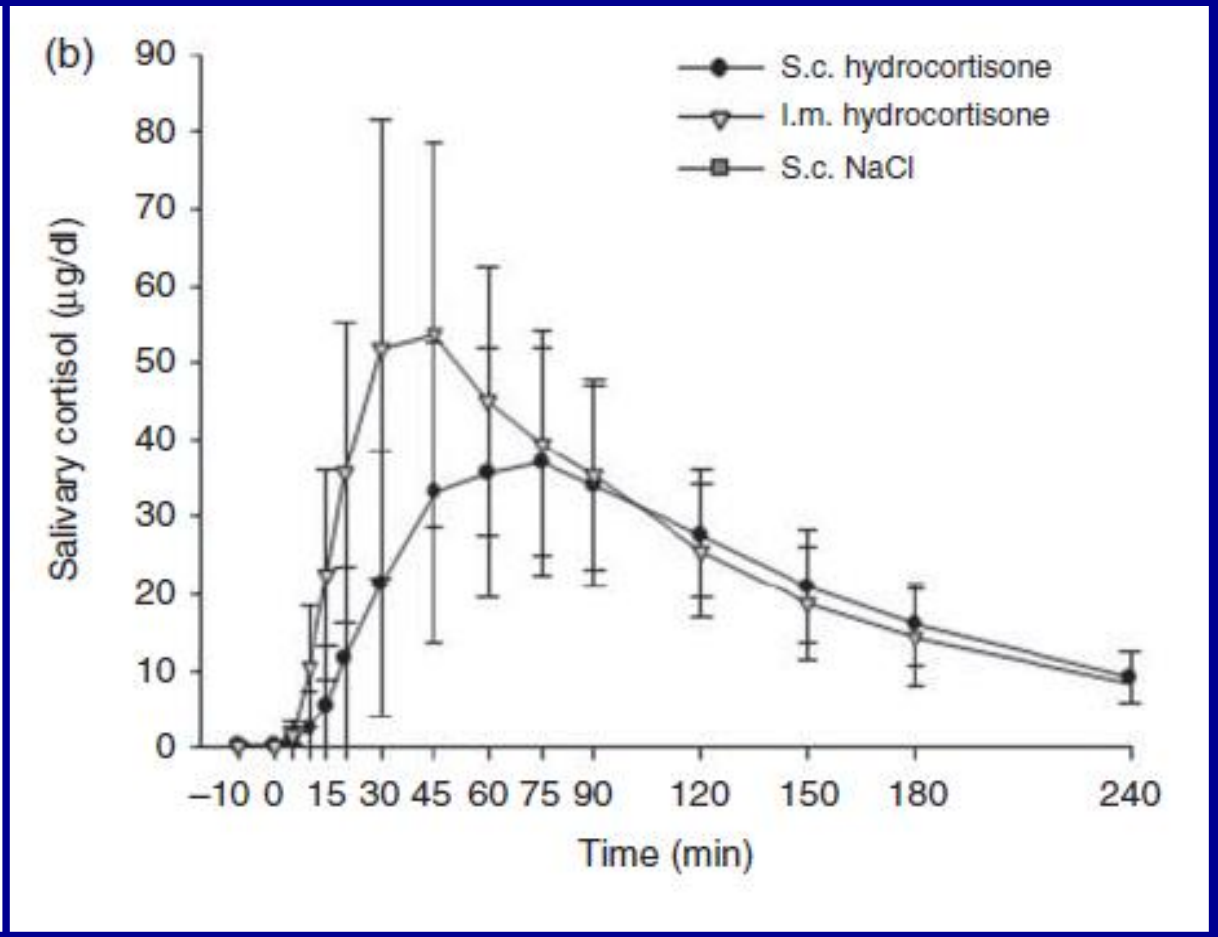
Precipitants for Adrenal Crisis

- Infection
- Other Intercurrent Illness (MI, PE, etc)
- Surgery
- Trauma
- Environmental Volume Depletion
- Drugs (Rifampin, Phenytoin)

Adrenal Insufficiency

IM vs SC Hydrocortisone





Hahner Eur J Endocrinol 2013;169:147

Salivary Cortisone

- How Best Monitor Adrenal Replacement?
- Cortisol/Cortisone Ratio in Serum 4:1; in Saliva 1:6
- Normal Volunteers
- AI Patients IV or PO Hydrocortisone
- Saliva Cortisone Correlates Best With Serum Cortisol

Dibono et al J Clin Endocrinol Metab 2016;101:1469

Noninvasive Adrenal Testing

Intranasal Cosyntropin + Saliva Cortisone

Figure 3a

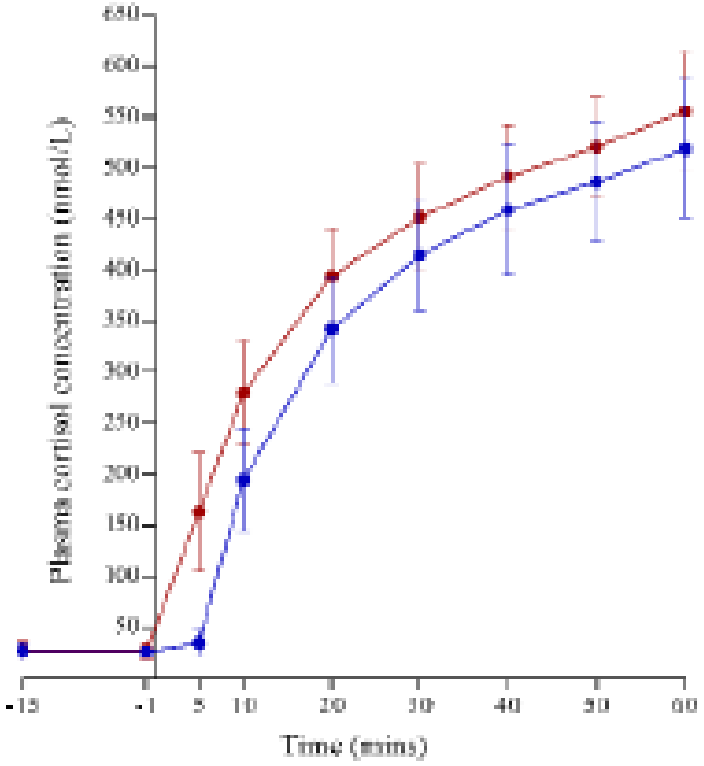


Figure 3b

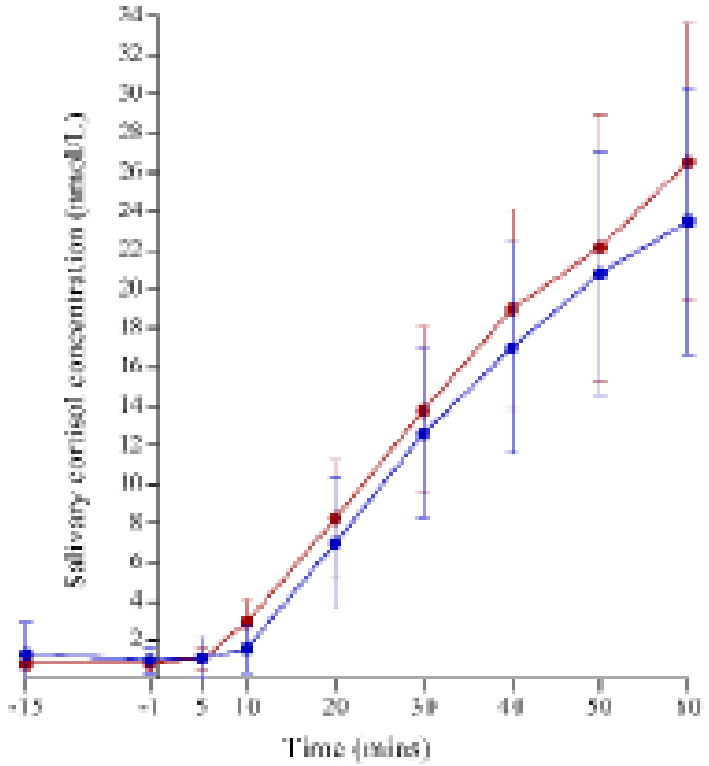
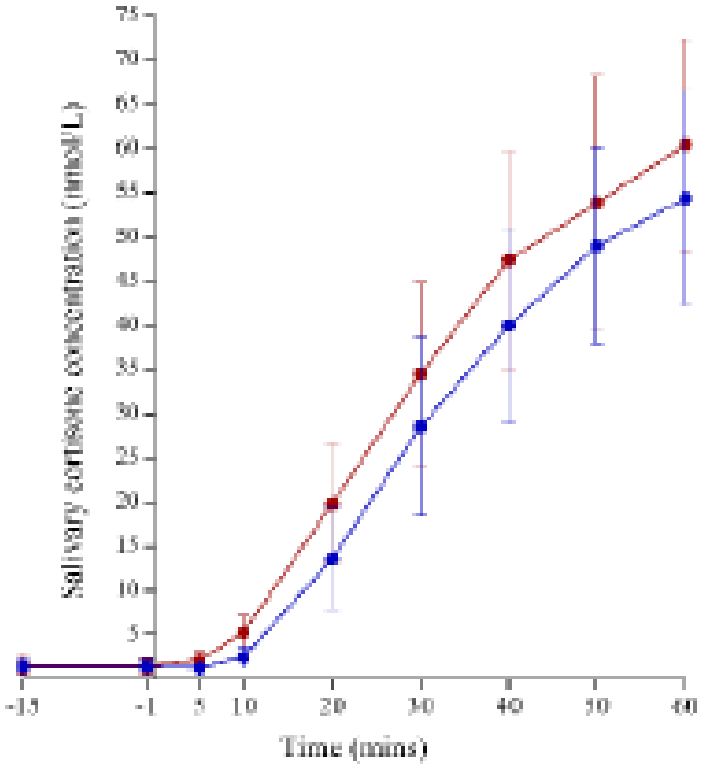


Figure 3c



Nasacthin®03 (500 µg)

Intravenous synacthen (145 µg/m²)

Elder et al J Clin Endocrinol Metab 2020;105:2692

Adrenal Insufficiency Summary

- Cortisol >14 µg/dL (400 nmol/L) is Plenty
- DHEAS Very Useful Measure Of Adrenal Function
- Salivary Cortisone Better Than Cortisol (For AI)
- Non-Invasive Testing is Coming
- Determine Etiology for Adrenal Insufficiency
- Do Not Forget to Titrate Fludrocortisone Well
- Review Sick Day Rules at Every Visit
  - AI Patients Still Die of Adrenal Crises
  - GI Disease is the Major Precipitator