

Perioperative steroids

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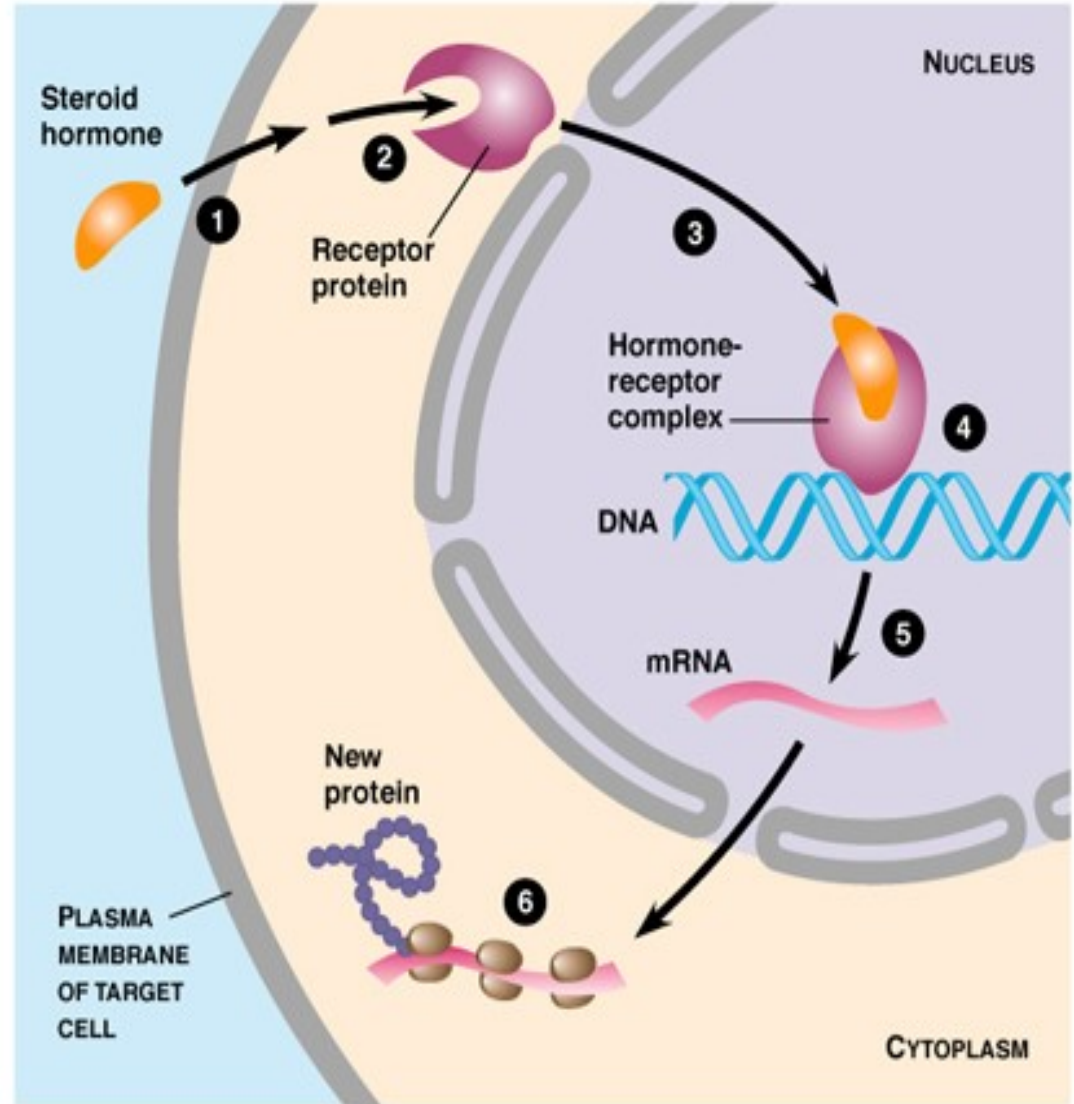
2nd December 2020

Objectives

- Physiology of corticosteroids and adrenal insufficiency.
- Perioperative management of patient with adrenal insufficiency.
- Other uses of steroids perioperatively.

Physiology:

- Steroid hormone from ovary and testis.
- Synthesized from cholesterol immediately and
- Mechanism of a

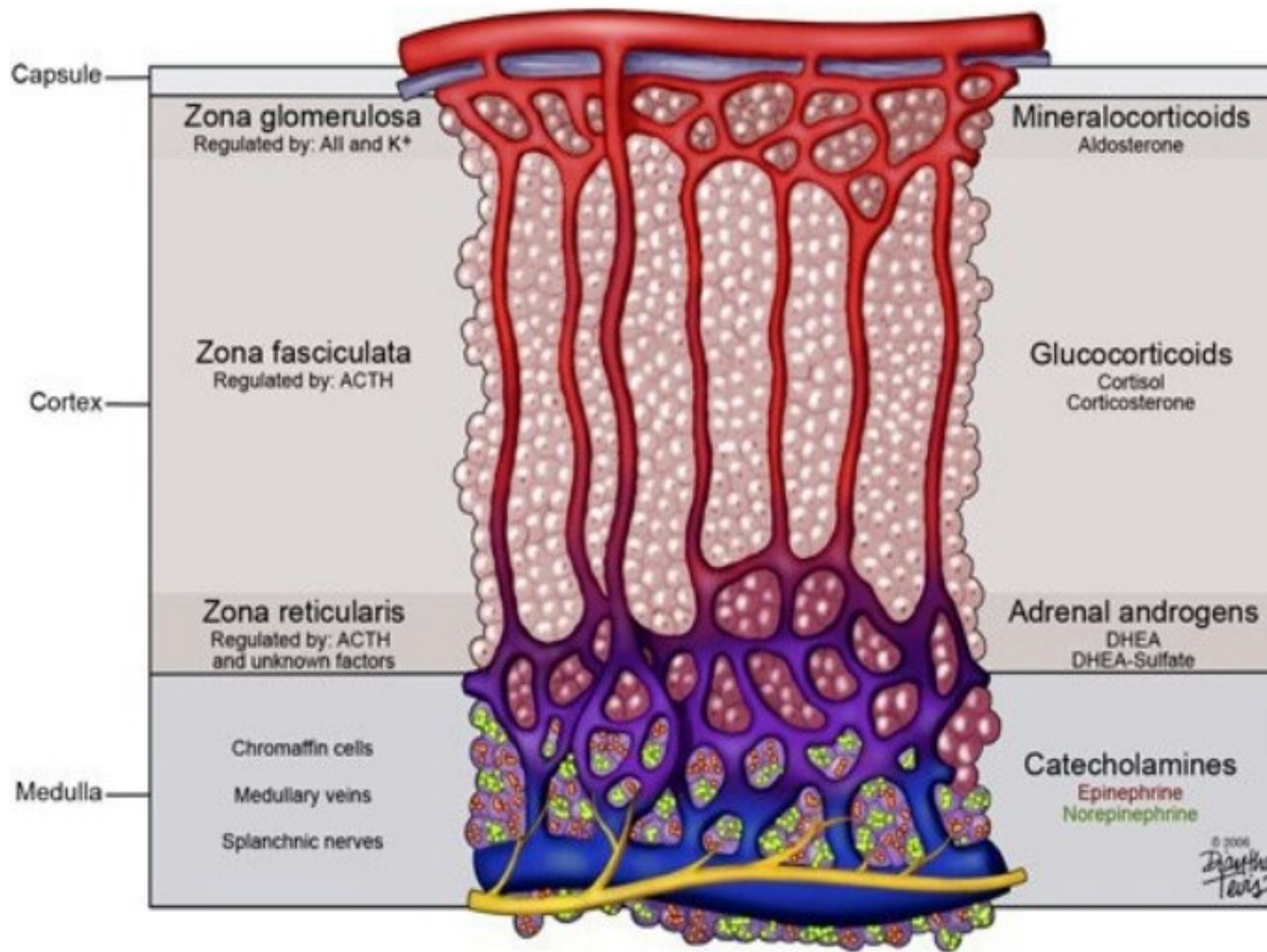


Adrenal Cortex

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graph TD; A[Adrenal Cortex] --> B["C19 Steroids  
Androgenic"]; A --> C["C21 Steroids  
Mineralocorticoid  
Glucocorticoid"]
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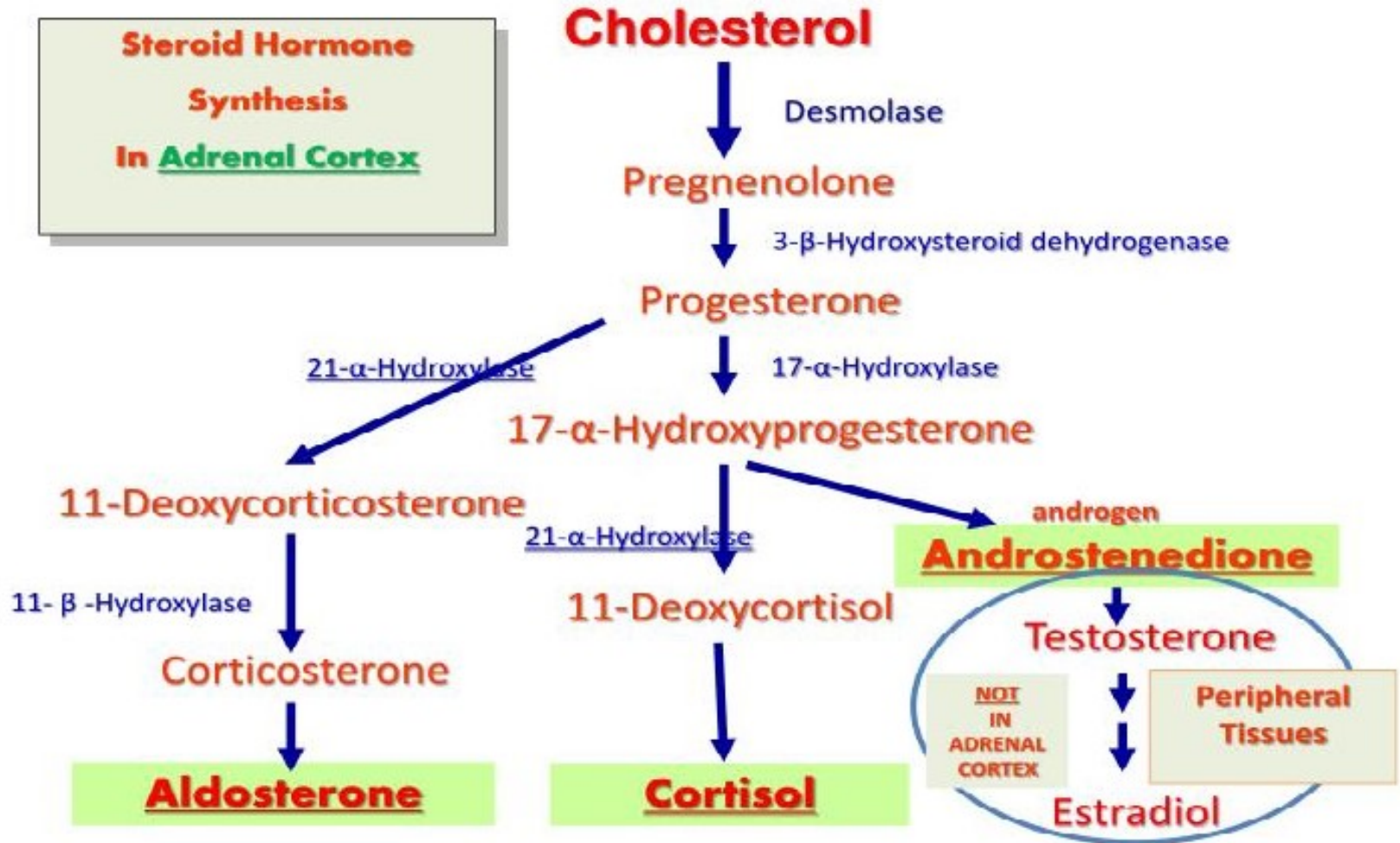
C19 Steroids
Androgenic

C21 Steroids
Mineralocorticoid
Glucocorticoid

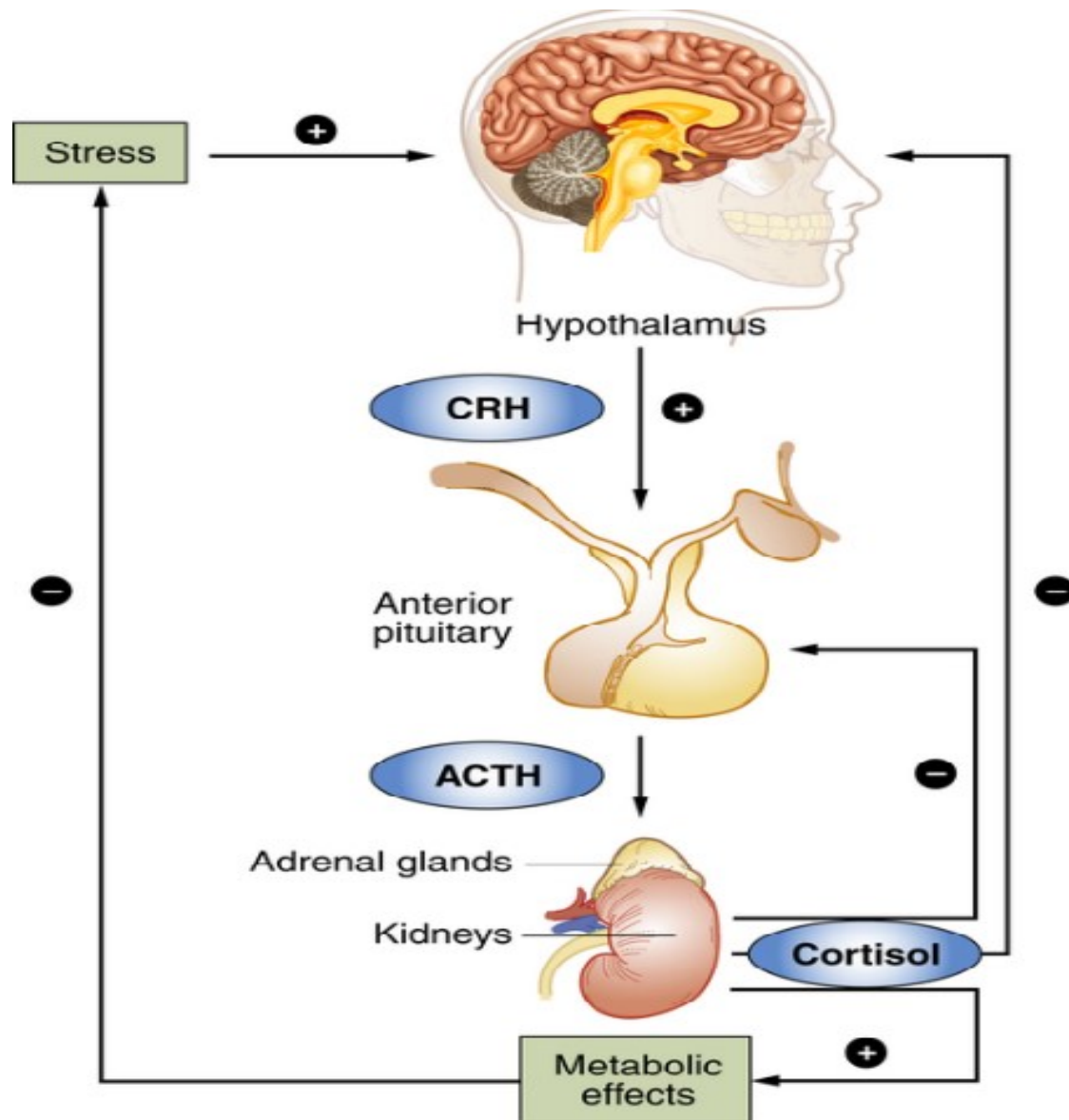


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**Steroid Hormone
Synthesis
In Adrenal Cortex**



Hypothalamic-Pituitary-Adrenal axis



Physiological effects

- Metabolic.
- Cardiovascular.
- Musculoskeletal.
- Immune system.
- Connective tissue.
- CNS.
- GIT

- ↑ production & sensitivity CA
- Modulation of β -receptors synthesis & function → maintenance of COP, contractility & enhancement of vascular tone

- **Primary Adrenal insufficiency (PAI):**

Disease of the adrenal gland.

- **Secondary Adrenal insufficiency (SAI):**

Failure of regulatory centres (ACTH or CRH deficiency)

- **Tertiary adrenal insufficiency**

Suppression of HPA-axis due to steroid therapy.


Prednisolone $\geq 5\text{mg/d}$ (adult) or Hydrocortisone equivalent $\geq 10\text{-}15\text{ mg/m}^2$ (child)

≥ 1 month

By oral, inhaled, intranasal, intra-articular or topical routes.

Risk continues up to a year after stopping steroid Rx.

Addisonian Crisis

- Adrenal crisis, Acute adrenal insufficiency.
- Incidence 5.2-8.3 % , ↑ with age, concomitant health condition
- Mortality 0.5%
- Presentation: 
- **Management:** Parenteral glucocorticoids, Rehydration, management of hypoglycaemia & correction of electrolytes imbalance.
Children: more prone to hypoglycaemia. Doses based on BW.

Corticosteroids equivalent doses

Drug	Dose equivalent to 5 mg of prednisolone
Betamethasone	750 micrograms
Cortisone acetate	25 mg
Deflazacort	6 mg
Dexamethasone	750 micrograms
Hydrocortisone	20 mg
Methylprednisolone	4 mg
Prednisone	5 mg
Triamcinolone	4 mg

Anaesthetist Association guidance:

10 mg hydrocortisone is roughly
 ≈ 2.0 mg prednisolone
 ≈ 0.1 mg dexamethasone

This table does not take into account mineralocorticoid effects or variations in duration of action of the corticosteroids.

Topical corticosteroid equivalence, wide variations + factors altering absorption

Perioperative management

- Period of fasting should be minimised.
- patients should be prioritised on routine surgical operating lists.
- Hydrocortisone 100mg IV at induction , then continuous infusion of hydrocortisone at 200 mg/24 h, until the patient can take double their usual oral glucocorticoid dose by mouth. Alternatively Hydrocortisone 50mg IM 6h⁰
- Taper to usual maintenance dose within 48 h, or up to a week if surgery is more major/complicated.
- Dexamethasone, no mineralocorticoid action.

Intra- and postoperative steroid cover in adults with PAI and SAI

	Intra-operative steroid replacement	Postoperative steroid replacement
Surgery under anaesthesia (general or regional), including joint reduction, endoscopy, IVF egg extraction	Hydrocortisone 100 mg intravenously on induction, followed by immediate initiation of a continuous infusion of hydrocortisone 200 mg.24 h ⁻¹	Hydrocortisone 200 mg.24 h ⁻¹ by i.v. infusion while nil by mouth or for patients with postoperative vomiting (alternatively, hydrocortisone 50 mg every 6 h by i.m. injection) Resume enteral – double hydrocortisone doses for 48 h or for up to a week following major surgery. With rapid recovery Resume enteral – double hydrocortisone doses for 24 h
Bowel procedures requiring laxatives/enema.	Bowel prep under clinical supervision. Consider i.v. fluids and injected glucocorticoid during preparation, especially for fludrocortisone or vasopressin-dependent patients. Hydrocortisone 100 mg intravenously or intramuscularly at the start of procedure	Resume enteral – double hydrocortisone doses for 24 h
Labour and vaginal delivery	Hydrocortisone 100 mg intravenously at onset of labour, followed by immediate initiation of a continuous infusion of hydrocortisone 200 mg.24 h ⁻¹ Alternatively, hydrocortisone 100 mg intramuscularly followed by 50 mg every 6 h intramuscularly	Resume enteral – double hydrocortisone doses for 48 h
Caesarean section	See surgery under anaesthesia	

Intra- and postoperative steroid cover in adults receiving adenosuppressive doses of steroids

	Intra-operative steroid replacement	Postoperative steroid replacement
Major surgery	<p>Hydrocortisone 100 mg intravenously at induction, followed by immediate initiation of a continuous infusion of hydrocortisone at 200 mg.24 h⁻¹;</p> <p>Alternatively, dexamethasone 6–8 mg intravenously, if used, will suffice for 24 h</p>	<p>Hydrocortisone 100 mg.24 h⁻¹ by i.v. infusion while nil by mouth (alternatively, hydrocortisone 50 mg every 6 h by i.m. injection)</p> <p>Resume enteral glucocorticoid at pre-surgical therapeutic dose if recovery is uncomplicated. Otherwise continue double oral dose for up to a week</p>
Body surface and intermediate surgery	<p>Hydrocortisone 100 mg, intravenously at induction, followed by immediate initiation of a continuous infusion of hydrocortisone 200 mg.24 h⁻¹</p> <p>Alternatively, dexamethasone 6–8 mg intravenously, if used, will suffice for 24 h</p>	<p>Double regular glucocorticoid dose for 48 h, then continue usual treatment dose if uncomplicated</p>
Bowel procedures requiring laxatives/enema	<p>Continue normal glucocorticoid dose. Equivalent i.v. dose if prolonged nil by mouth</p> <p>Treat as per primary adrenal insufficiency if concerned about hypothalamo-pituitary-adrenal axis function, and risk of adrenal insufficiency</p>	
Labour and vaginal delivery	<p>Hydrocortisone 100 mg intravenously at onset of labour, followed by immediate initiation of a continuous infusion of hydrocortisone 200 mg.24 h⁻¹</p> <p>Alternatively, hydrocortisone 100 mg intramuscularly followed by 50 mg every 6 h intramuscularly</p>	
Caesarean section	See major surgery	

Intra- and postoperative steroid cover in children with adrenal insufficiency.

Children	Intra-operative steroid replacement	Postoperative steroid replacement
Major surgery under anaesthesia (general or regional)	<p>Hydrocortisone 2 mg.kg^{-1} at induction followed by immediate continuous i.v. infusion based on weight:</p> <p>Up to 10 kg; 25 mg.24 h^{-1} 11–20 kg; 50 mg.24 h^{-1} over 20 kg;</p> <p>- prepubertal 100 mg.24 h^{-1} - pubertal 150 mg.24 h^{-1}</p>	<p>Hydrocortisone 2 mg.kg^{-1} four hourly intravenously or intramuscularly</p> <p>Or continuous i.v. infusion based on weight:</p> <p>Up to 10 kg; 25 mg.24 h^{-1} 11–20 kg; 50 mg.24 h^{-1} over 20 kg;</p> <p>- prepubertal 100 mg.24 h^{-1} - pubertal 150 mg.24 h^{-1}.</p> <p>Once stable, should receive double usual oral doses of hydrocortisone for 48 h and then reduce to normal doses over up to a week. Add in fludrocortisone if appropriate when enteral feeding established</p>
Minor procedures requiring general anaesthesia	<p>Hydrocortisone 2 mg.kg^{-1} intravenously or intramuscularly at induction of anaesthesia</p>	<p>Double normal hydrocortisone doses once enteral feeding established, and continue on double doses for 24 h. Add in fludrocortisone if appropriate when enteral feeding is established</p>
Minor procedure NOT requiring general anaesthesia	<p>Double morning dose of hydrocortisone given pre-operatively</p>	<p>Normal dose of hydrocortisone</p>

Case studies

1. 30y parturient with UC and SAI on Hydrocortisone 25mg OD admitted to LW for NVD.

Case studies

2: Patient from Case 1 had failure of labour progression and underwent Cat II LSCS.

Case studies

3: 50y Female patient with RA on prednisolone 40mg OD undergoing emergency laparotomy for SBO.

Case studies

4: 8y child 20kg 118cm on topical Dioderm (Hydrocortisone 0.1%)cream for eczema 1/2 finger tip application BD for 3 weeks . Patient is admitted for tonsillectomy.

Other perioperative uses of corticosteroids

- Dexamethasone, antiemetic for PONV.

Mechanism? Prostaglandin? NC? Endorphins?

- Neuroprotection: BBB stabilisation, ↑ CSF absorption. ↓ vasogenic edema in 1ry and metastatic brain tumors. ↑ risk of death TBI.
- Severe sepsis. Weakly positive evidence.

- **Dexamethasone and Hydrocortisone in Covid19 :**

RECOVERY Trial

Offer GC Rx to Covid19 patients with:

- acute respiratory distress syndrome (ARDS)
- sepsis or septic shock
- other conditions that would normally need life-sustaining therapies such as ventilation or vasopressor therapy
- signs of severe respiratory distress
- oxygen saturation < 90% (or deteriorating) on room air.
- ↑ respiratory rate >30 breaths per minute in adults and children over 5 years).

The recommended dosage and duration of treatment for adults is:

- For dexamethasone: 6 mg once a day orally for 7 to 10 days.

or 6 mg once a day intravenously for 7 to 10 days.

- For hydrocortisone: 50 mg every 8 hours intravenously.

This may be continued for up to 28 days for patients with septic shock. Treatment should stop if the person is discharged from hospital before the 10 day course is completed. Note:

References

- **Guidelines for the management of glucocorticoids during the peri-operative period for patients with adrenal insufficiency.**
T Woodcock et al , Anaesthesia May 2020 , Volume 75, Issue 5
<https://doi.org/10.1111/anae.14963>
- **R Dineen et al , Adrenal crisis: prevention and management in adult patients. Therapeutic Advances in Endocrinology and Metabolism June 2019.** <https://doi.org/10.1177/2042018819848218>
- **BNF, Corticosteroids.**