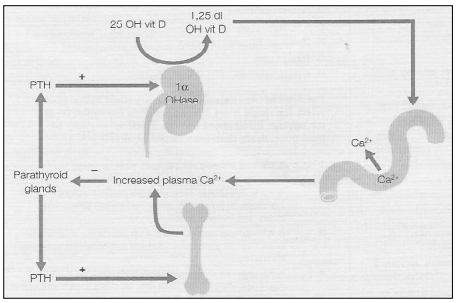
Emergency Management of Hypercalcaemia and Hyponatraemia

Jeremy Turner
Consultant Physician
Elsie Bertram Diabetes Centre

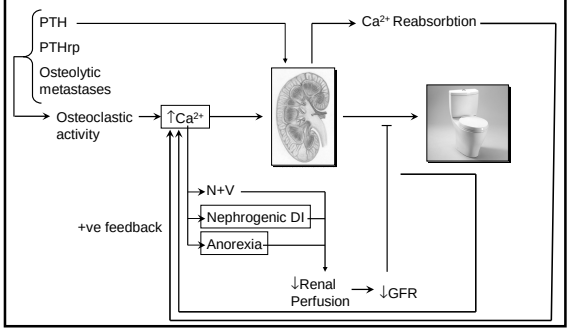
Calcium Homeostasis



Hypercalcaemia - Aetiology

- Malignancy
  - Humoral Hypercalcaemia of Malignancy (HHM), PTHrp
  - Osteolytic
  - 1,25$(OH)_2$D – dependent i.e. lymphoma
  - Ectopic PTH (Vanishingly rare)
- PHPT
- (Sarcoidosis)

Hypercalcaemia - Management



Hypercalcaemia Management 1. Rehydrate

- Normal saline
- 3 – 6 litre/24 hours
- Catheterise
- May need central monitoring

2. Promote Calciuresis

- See “1” (rehydration)
- IV Furosemide, ONCE fully hydrated
- In practice, not often useful
- Risks worsening situation by DEhydration

Hypercalcaemia Management 3. Inhibit Osteoclasts

- Bisphosphonates
  - Pamidronate 60mg if Ca<3.4 mmol/L in 250 ml NaCl
    90mg if Ca>3.4 mmol/L in 500 ml NaCl
  - Ca will start falling after 72 hours, nadir at 5 days, last 3 weeks
  - Ibandronate 4 mg IV 15 minutes, lasts ~ 10 weeks
  - Zolendronate 4 mg IV 15 mins

Hypercalcaemia Management 4. Treat Underlying Cause

- PHPT – Emergency parathyroidectomy or cinacalcet
- Malignancy – Anything to reduce tumour bulk
- Sarcoidosis – Steroids, 100 mg hydrocortisone IV TDS – QDS
- Lymphoma – Steroids again
- Addison's disease – Steroids again
- Stop contributing drugs - Thiazides

Hypercalcaemia Management Other Possibilities

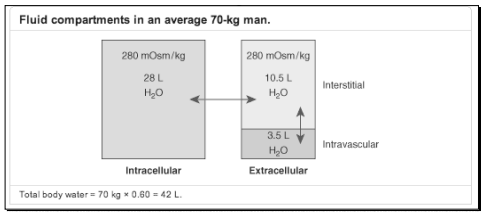
- Calcitonin – 400 IU IM QDS
- Haemofiltration
- Mithramycin
- Galium nitrate
- Denusomab, RANKL Ab

Hypercalcaemia Management Pitfalls

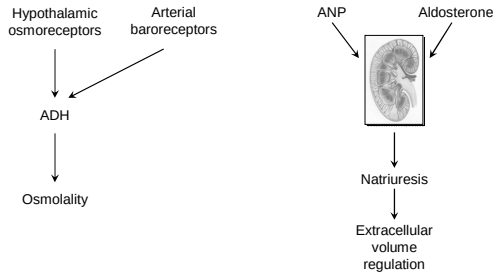
- Underdoing the rehydration
- Not waiting long enough for the bisphosphonate to work
- Repeat dosing the bisphosphonate
- Panicking!

Hyponatraemia – The Basics

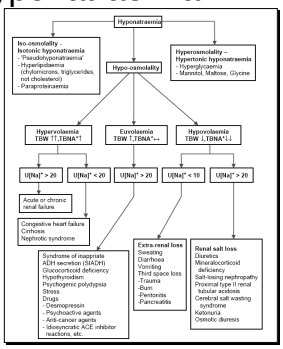
- Osmolality = $2[Na^+]$ + Urea + Glc
- Total Body Water:



Hyponatraemia - Physiology



Hyponatraemia - DDx



Hyponatraemia - DDx

1. **Pseudohyponatraemia**
2. Hypertonic Hyponatraemia – HONK
3. Hypotonic Hyponatraemia
   - Hypervolaemic — CCF, Cirrhotic, Nephrotic
   - Euvolaemic — SIADH, glucocorticoid deficiency, hypothyroidism, PP
   - Hypovalaemic — Extrarenal: D+V, stoma, burns; Renal: Na^+ losing nephropathy, Addison's

Hyponatraemia - Management

- Aim for correction of 0.5 mmol/L/hour
- Avoid hypertonic saline
- Treat the underlying cause
- Specifics…….

Hyponatraemia - Management

• Hypervolaemic	Cirrhotic, Nephrotic	Fluid restrict
	CCF	Diuretic, ? Vaptan
• Euvolaemic	SIADH	Fluid restriction
	Glucocorticoid deficiency	Steroids
	Hypothyroidism	T4
	PP	Fluid restriction
	Diuretic	Stop
• Hypovalaemic	D+V, stoma, burns	IV 0.9% NaCl
	Na^+ losing nephropathy	Stop diuretic
		Underlying cause
		IV 0.9% NaCl
	Addison's	Steroids
		IV 0.9% NaCl

SIADH

- Diagnosis:
  - Exclude prior diuretic use, pregnancy, Addison's and hypothyroidism
  - Inappropriately concentrated urine osmolality in the presence of hyponatraemia, with ongoing natriuresis.
  - Hyponatraemia
  - Plasma osmolality < 270 mOsm/kg
  - Urine osmolality > 300 mOsm/kg
  - Urine Na^+ > 20 mmol/L

SIADH

- Management:
  - Fluid restrict
  - Demeclocycline, 900 – 1200 mg daily in divided doses, then 600mg daily for maintenance
  - ? Vaptans
  - Hypertonic saline ONLY IN EXTREMIS!!!
    - Na^+ < 110
    - Fitting or coma
    - 1.5ml/Kg of 3% NaCl IV over 1 hour BUT in BNF 1.8% is maximum strength available
    - (If really really stuck, use normal saline (150 mmol/L), 500ml over 2 hr, should bring Na^+ up by approx 4 mmol/L)

Summary

- Hypercalcaemia
  - Rehydrate, rehydrate, rehydrate
  - This is not a disorder of bisphosphonate deficiency!
  - Measure a PTH
- Hyponatraemia
  - Work out the cause (not difficult!)
  - Treat the cause
  - USE HYPERTONIC SALINE ONLY IN EXTREMIS
  - NO SALT TABLETS PLEASE!!!!!!!!