

Total serum  $[Ca^{2+}] < \sim 2.1 \text{ mmol/L}$ .  $\sim 50\%$  as biologically active ionised  $[Ca^{2+}]$ .

Corrected  $[Ca^{2+}] = [Ca^{2+}] + 0.02 \cdot (40 - [\text{albumin}]) \text{ mmol/L}$  for  $[\text{albumin}]$  of 20-45 mmol/L

## Causes

### Spurious:

- Hypoalbuminaemia
- Hyperventilation  $\rightarrow$  alkalosis  $\rightarrow$   $\uparrow$  protein binding (exchanges for  $H^+$ )

### Low PTH (hypoparathyroidism $\rightarrow$ low PTH & high $PO_4^-$ ):

- 1° HypoPTH: Parathyroid agenesis - e.g. Di George syndrome
- 2° HypoPTH: Parathyroid destruction - surgery, DXT, metastases, amyloidosis, autoimmune, burns, hypo/hyperMg, drugs (chemo, EtOH, cimetidine), sepsis
- $\downarrow$  PTH secretion - gene defects, neonatal hypocalcaemia, hungry bone disease (post-parathyroidectomy), Ca-sensing receptor mutation

### High PTH (secondary hyperparathyroidism $\rightarrow$ high PTH & low $PO_4^-$ ):

- Vit D deficiency/resistance - nutritional lack, malabs, liver disease, receptor defects, RF or tubular dysfn (Fanconi's syndrome), sepsis, hypoMg, phenytoin, ketoconazole
- PTH resistance - pseudohyperparathyroidism
- Conn's syndrome

### Calcium chelation:

- Citrate (blood transfusions), fluoride (HF poisoning).
- Drugs: bone resorption inhibitors (bisphosphonates, calcitonin, plicamycin); foscarnet
- Hyperphosphataemia: acute rhabdomyolysis, malignancy (tumour lysis or osteoblastic mets [e.g. prostate and breast Ca])
- Bicarbonate, FFA (from acute pancreatitis, acute EtOH)

## Presentation

*Symptoms:* uncommon unless  $[Ca^{2+}] < 2.0 \text{ mmol}$ , paraesthesia (peripheral/circumoral), tetany, carpopedal spasm, muscle cramps

*Acute signs:* Chvostek & Trousseau's signs, seizures, bradycardia, laryngo-/bronchospasm, muscle fasciculations,

*Chronic signs:* cataracts, abnormal teeth, papilloedema, dementia/confusion

## Investigations

*Urine:* 24hr  $Ca^{2+}$

*Blood:* CMP, Albumin, LFT, UEC, Lipase/amylase, CK, PTH, Vit D

*EKG:* Prolonged QT (without U waves), heart block may occur

## Management

### Acute symptomatic hypocalcaemia

- 10% Calcium gluconate 10-30ml or calcium chloride ( $\uparrow Ca^{2+}/ml$  but  $\uparrow$  phlebitis so normally in central line) 5-10ml IV slow IV. **CI if possible digoxin toxicity.**
- Alternatives: calcium gluconate/ascorbate/lactate PO
- Correct hypomagnesaemia

### Persistent hypocalcaemia

- Oral supplements calcium ( $CaCO_3$  500mg bd-qds)
- Vit D: Calcitriol (oral  $1,25(OH)_2D_3$ ) or precursors (Vitamin D2-ergocalciferol and Vitamin D3) which require renal activation. Usual dose is 1-2 $\mu$ g or 1000 U OD.