Formulary Guidance for the Management of Acute Hypocalcaemia in Adults

This guidance summarises the management of adult patients with acute hypocalcaemia. The use of calcium for other indications (chronic hypocalcaemia, chronic renal insufficiency, post-parathyroidectomy, and complex medical problems) is beyond the scope of this guidance and specialist advice should be sought.

Definition

The reference range used locally for serum adjusted calcium is 2.20 to 2.60mmol/L.

The severity of hypocalcaemia is defined as:
Mild – serum adjusted calcium 1.90 to 2.20mmol/L and asymptomatic
Severe – serum adjusted calcium <1.90mmol/L and/or symptomatic

Signs and Symptoms

Mild hypocalcaemia is usually asymptomatic. Signs and symptoms of hypocalcaemia may include:

- Pins and needles (paraesthesia), especially of the fingers, toes and face
- Chvostek and Trousseau signs
- Tetany and muscle cramps/weakness
- Cardiac disturbances – arrhythmias, bradycardia, hypotension, prolonged QT interval
- Changes in mental state – anxiety, confusion, irritability
- Seizures
- Bronchospasm/Laryngospasm

Causes

Hypocalcaemia may be associated with:

- Inadequate dietary calcium intake
- Calcium malabsorption
- Hypomagnesaemia
- Large volume blood transfusion
- Severe acute pancreatitis
- Septic shock
- Drug-induced i.e. Proton Pump Inhibitors, some Anticonvulsants, Bisphosphonates, Calcitonin, Phosphate, Foscarnet, Ketoconazole, Colchicine (in overdose), some Antineoplastic agents, and Radio Contrast Dye
- Rhabdomyolysis
- Post-parathyroidectomy
- Hypoparathyroidism or Pseudohypoparathyroidism
- Malignant disease
- Chronic renal insufficiency
- Vitamin D deficiency

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Management of acute hypocalcaemia

Initial management

- Establish the underlying cause of hypocalcaemia and treat if possible.
- Check serum magnesium levels and correct low magnesium first (see LINK for further guidance). Without replenishing the magnesium, any increase in calcium will be transient.
- Baseline parathyroid hormone (PTH) and vitamin D levels should ideally be checked. Do not delay treatment for hypocalcaemia whilst awaiting the results.
- Hypocalcaemia may be a symptom of refeeding syndrome especially when it occurs in the presence of other electrolyte deficiencies (low potassium, magnesium, or phosphate). Consider this diagnosis and correct any electrolytes and vitamins deficiencies according to the Trust's guidance (see link for further guidance). Do not attempt to reintroduce nutrition without first obtaining guidance from a dietitian (see PAT/T 43 v2 Nutrition and Hydration Policy for more information).

Treatment summary

Mild hypocalcaemia (serum adjusted Ca^{2+} 1.9–2.2mmol/L and asymptomatic)

In simple deficiency states, calcium salts may be given orally or enterally when oral or enteral access is available, usually in doses of 10 to 50mmol (400mg to 2000mg) of calcium daily titrated to the individual patient's requirements (see Table 1). The need for therapy should be reviewed on a daily basis. Initially a three day course should be prescribed. Consider a repeated course if serum calcium levels remain sub-therapeutic. Calcium salts are predominantly absorbed in the duodenum and proximal jejunum, and to a reduced extent in the distal parts of the small intestine. Absorption may be decreased if calcium salts are administered directly into the jejunum. Refer to Endocrinology if no further improvement is seen despite treating underlying cause.

Calcium preparation	Calcium content per dose unit	Daily dose
First line		
Calvive effervescent tab	25mmol (1000mg)	1 tablet (dissolved in 200ml of water) TWICE daily
Second line (when the first line oral preparation unavailable)		
Calci-D chewable tab (unlicensed for hypocalcaemia)	25mmol (1000mg) (also contains 1000unit Vitamin D_3) May be used even if not depleted in 25-OH vitamin D	1 tablet TWICE daily

Table 1: Oral calcium preparations of choice in DBTH

Oral calcium may decrease the absorption of a number of medicines (i.e. Quinolones, Tetracyclines, Iron, Bisphosphonates and Levothyroxine). The interaction may be minimised by separating the time between doses.

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If the patient is nil-by-mouth or not absorbing through the gut, there is little evidence to support use of intravenous calcium therapy. Monitor serum adjusted calcium regularly and treat if serum adjusted calcium level less than 1.9mmol/L or patient becomes symptomatic.

Severe hypocalcaemia (serum adjusted Ca^{2+} < 1.9mmol/L and/or symptomatic)

In severe deficiency states and/or hypocalcaemic tetany, oral or enteral calcium therapy may be not appropriate. Calcium salts is recommended to be given intravenously via a central line or a large peripheral vein as undiluted calcium is highly irritant to the veins and may cause tissue damage if extravasation occurs.

Calcium Gluconate 10% w/v injection is the preparation of choice in DBTH. Each ampoules containing calcium 2.25mmol (95mg) in 10ml. AVOID using Calcium Chloride for routine replacement.

The preferred method is to administer 20ml (4.5mmol) Calcium Gluconate 10%, diluted in 100ml Sodium Chloride 0.9% or Glucose 5%, as IV infusion slowly over 10–20 minutes.

Under emergency situation (i.e. tetany or cardiac resuscitation), 20ml (4.5mmol) Calcium Gluconate 10% can be given undiluted by slow IV bolus injection over 5–10 minutes.

ECG monitoring is recommended during IV bolus administration and especially for patients with underlying cardiac disease at risk of arrhythmias or on digoxin therapy. Avoid rapid intravenous administration as this may be associated with peripheral vasodilation, hypotension, cardiac depression and arrhythmias.

Check serum calcium levels 2 hours after dose. The treatment (as above) can be repeated as necessary according to serum calcium levels. Senior review should be sought at this stage.

If serum calcium levels persistently low or patient remains symptomatic, consider continuous IV infusion to prevent recurrence. The preparation can be prepared by adding 100ml (22.50mmol) Calcium Gluconate 10% into 900ml sodium chloride 0.9% or Glucose 5%. Initial rate starting at 50ml/hr.

In fluid restricted patient, 100ml (22.50mmol) Calcium Gluconate 10% can be added into 400ml sodium chloride 0.9% or Glucose 5%. Initial rate starting at 25ml/hr.

Check serum calcium levels every 4–6 hours and adjust to response accordingly until serum calcium levels are within normal range.

When serum calcium levels have normalised, consider switching to oral calcium therapy as soon as possible if oral and enteral access is available.