

**Please read this bit first**

The HPCSA and the Med Tech Society have confirmed that this clinical case study, plus your routine review of your EQA reports from Thistle QA, should be documented as a "Journal Club" activity. This means that you must record those attending for CEU purposes. Thistle will **not** issue a certificate to cover these activities, nor send out "correct" answers to the CEU questions at the end of this case study.

The Thistle QA CEU No is: **MT00025**.

Each attendee should claim **THREE** CEU points for completing this Quality Control Journal Club exercise, and retain a copy of the relevant Thistle QA Participation Certificate as proof of registration on a Thistle QA EQA.

## **June 2006**

### **HYPERCALCAEMIA**

#### **Case Study.**

A 56-year-old man, with a six-month history of an unproductive cough, presented at hospital with weight loss and haemoptysis. He had been a heavy cigarette smoker since the age of 18 years. Radiological examination and a bronchial biopsy revealed a poorly differentiated adenocarcinoma of the lung. His plasma analytes values were as follows:

Ca	3.90 mmol/L	(2.15 – 2.55)
PO <sub>4</sub>	0.52 mmol/L	(0.65 – 1.25)
Alb	36 g/L	(30 – 50)
ALP	240 U/L	(30 – 120)
Urea	5.5 mmol/L	(3.0 – 8.0)
PTH	5.1 U/L	(2 – 6)

#### **Comment.**

About 20% of patients with malignancy present at some time with hypercalcaemia, and the possible mechanisms involved include:

1. erosion of bone by secondaries
2. ectopic production of PTH
3. production of a PTH-like substance by the tumour
4. prostaglandin production by the tumour
5. production of an osteoclastic activating factor by the tumour
6. coincidence of hyperparathyroidism

NB. The biochemical features of this patient are similar to those found in hyperparathyroidism. This suggests the possibility of the ectopic PTH syndrome or the elaboration of a PTH-like substance by the tumour.

### **Management of hypercalcaemia.**

Treatment of hypercalcaemia involves resolution of the causative disorder and lowering of the plasma calcium level if it is very high (e.g. >3.5) mmol/L). There are a number of techniques available for lowering the plasma calcium concentration. These can be divided into acute and chronic regimes.

#### **Acute therapy.**

*Phosphate infusion:* The intravenous infusion of phosphate will rapidly lower plasma calcium (coprecipitation of calcium as calcium phosphate complexes) but runs the risk of precipitating renal failure; thus it should only be used in an emergency.

*Saline and diuretic diuresis:* Saline infusions expand the extracellular volume, which increases renal calcium excretion; the diuretic frusemide inhibits reabsorption of calcium in the ascending loop of Henle. This is the acute treatment of choice if renal and cardiac functions are normal. The normal procedure is to infuse two liters of saline and follow this by 40mg of frusemide. The procedure may be repeated if necessary.

*Calcitonin and glucocorticoids :* Calcitonin inhibits bone calcium resorption and the addition of prednisone augments this response by inhibiting absorption of calcium from the gut.

*Mithramycin :* This cytotoxic drug inhibits bone resorption but may have serious side effects (thrombocytopenia, haemorrhage, renal impairment). It should be reserved for cases resistant to other types of therapy.

#### **Chronic therapy.**

Having resolved the acute problem it is then necessary to maintain the plasma calcium at normal or near normal levels. This should be achieved, if possible, by treating the causative disorder. If this is difficult, e.g. malignant hypercalcaemia, the following may be helpful.

Oral phosphate therapy: Phosphates bind calcium in the gut and prevent absorption. However, this method should not be used if there is renal insufficiency.

Steroid therapy: Steroids probably act by decreasing calcium absorption. However, the administration of steroids as a long-term therapy is undesirable as it has serious side effects (e.g. Cushing's syndrome).

### **CPD QUESTION**

1. What techniques are available for lowering the plasma calcium concentration in patients suffering for hypercalcaemia?