with oestrogens or biophosphates can be useful if their bone mineral density has been affected. The focus is on preventing bone loss and normalising calcium levels. Where these methods are contraindicated the calcimimetic cinacalcet can be useful, but Fraser (2009) suggests further research should be undertaken to establish the long term benefits of this approach.

Regular monitoring of renal function, calcium levels and bone mineral density is required to ensure the patient’s condition does not deteriorate. If this does occur, parathyroidectomy can be offered; this is often undertaken as a day case, depending on the patient’s condition.

**PRESENTATION AND MANAGEMENT IN CRISIS**

A small percentage of people with the disease can have life threatening symptoms related to hypercalcaemia (Inabnet et al, 2006). Patients who present in crisis often are acutely confused or psychotic and, in rare cases, this is initially attributed to mental health problems (see Box 1). Acute arrhythmias are often seen due to high calcium levels and other symptoms such as dehydration, abdominal pain, vomiting and poor urine output may also be present. These can be attributed to more common conditions, which is why it is easy to overlook the possibility that the patient might have primary hyperparathyroidism. Initial management of hyperparathyroid crisis involves correcting plasma calcium levels to safe limits. Depending on presentation, this takes different forms. Lewis (2009) suggests four approaches to restoring normal calcium levels: lowering intestinal absorption; decreasing bone resorption; increasing urinary excretion of calcium; and, in excessive hypercalcaemia, dialysis.

High levels of plasma calcium can be addressed in several ways. Fluid management with intravenous saline to correct dehydration and stimulate the kidneys to excrete calcium is often first line management (Fraser, 2009; Inabnet et al, 2006). In the non-dehydrated patient, IV furosemide can be given as this increases urine production and assists the kidneys to excrete excess calcium (Lewis, 2009; Inabnet et al, 2006). Regular biochemical assessment is needed due to the risk of overhydrating the patient.

If calcium levels are extremely high, further medical management may be required with biophosphonates, such as pamidronate, to reduce the calcium level further and reduce bone turnover, thereby improving bone mineral density.

**SUGICAL TREATMENT**

Once a diagnosis has been made, surgery is curative in 97% of patients (Adamek, 2007). The surgical approach is decided by criteria set by the National Institute of Health in 2002 (Bilezikian et al, 2002); the criteria, which are being updated, include:

- Serum albumin adjusted calcium levels >0.25mmol/L above local laboratory ranges;
- Urine calcium levels >10mmol in 24 hours;
- Younger than 50 years of age;
- A T score of ≤-2.5 at any site on a bone mineral density scan;
- A reduction of 30% or more in creatinine clearance;
- Patient request, especially if follow-up may prove to be challenging.

Fraser (2009) suggests that 85% of cases have one adenomatous gland, while up to 15% have multiple adenomas. For this reason, surgical procedure depends on diagnosis. The most common surgical approaches consist of the following:

- A total parathyroidectomy – a traditional approach comprising a bilateral exploration of all four glands, where the surgeon can see and remove them. If the affected glands can be identified, one or more may be retained;
- A total parathyroidectomy with auto transplant – all four glands are removed and a small amount of parathyroid tissue is transplanted into the forearm. Placement here has the benefits of ready access should the transplanted tissue begin to enlarge and require surgery to reduce its size;
- A subtotal parathyroidectomy – minimally invasive, targeted surgery that can be done under a local anaesthetic for single localised enlarged glands.

Imagining the enlarged glands can facilitate minimally invasive, targeted surgery. This