



## Hypercalcemia and Parathyroidectomy

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**Abstract:** Hypercalcemia may prove to be deadly if decompensation occurs from a chronic state and if it is compounded by fluid depletion then the situation could possibly get out of hand. We present a case highlighting the above mentioned statement in a case of emergency parathyroidectomy where the wide variations in blood pressure caused due to insufficient patient preparation led to very unstable intra-operative course

**Case report:** An 84 year old frail lady was posted for an emergency parathyroidectomy. She was hypertensive on calcium channel blockers, osteoporotic on regular medications with a baseline BP of 150/90 and a resting pulse of 74/min. She also had glaucoma and depression in the background. A recent stress echo was normal and she had a history of tonsillectomy in childhood

A month before the admission she felt weak, had bouts of nausea and vomiting. She had similar episodes for approx 1 yr. On admission (2 days back) she showed borderline leukocytosis, normal liver function tests with elevated alkaline phosphatase levels, skeletal scintigraphy was normal with nonspecific spots near knee joint. There was hypercalcemia at 3.4 mmol/l, borderline hypokalemia with normal renal functions. A parathyroid level of 16.8 pmol/l was found. However there was no organ manifestation like peptic ulcers or renal stones. Extensive search for malignancy was negative. Ultrasound neck revealed hypoechogenic lesion. The endocrinologist thus defined the pt as "mild" hypercalcemic crisis due to decompensated primary hyperparathyroidism. Meanwhile she was started on IV fluids @120 ml/hr, pamidronate (90mg i.v), SC calcitonin (200 u), as per surgeons protocol. She was also started on a beta blocker, atenolol 50 mg, for hemodynamic support. All of this was initiated in the ward where there was not adequate provision for optimum care. However the above mentioned therapy had no response to calcium level.



Meanwhile the patient started getting extremely sick and dehydrated. Her fluid infusion was increased to 140 ml/hr. She became more polyuric with visits to the bathroom every 20 min. A catheter was not passed owing to the patient's refusal. A nephrology consult was taken in order to gauge the need of haemodialysis for reducing calcium. However dialysis was negated by the nephrologists. She was posted for a "semi-emergency" parathyroidectomy, as the first case the next day and anaesthesia consult was taken on late night before surgery.

At the time of pre operative visit by anaesthesiologist, the patient looked well hydrated, comfortable and had a blood pressure of 130/90 with a pulse rate of 70/min. However she did complain that she had to have frequent visits to the bathroom for passing urine. The blood biochemistry, haematology was unremarkable and x-ray did not show anything abnormal

On arrival to the theatre she appeared to be comfortable and had a heart rate of 82 with a blood pressure of 140/90. She did not show any clinical signs of dehydration while capillary refill was normal. Calcium on the morning of surgery was 3.3 mmol/l

An arterial line was inserted and blood gases showed a normal pH with a base excess of -5.8. A second large bore IV line was secured. She was pre-medicated with 1 mg of midazolam and induced with etomidate 20 mg and fentanyl 200 mcg, intubated with care without the use of neuromuscular blockade. Lidocaine 50 mg was given prior to intubation to prevent the response to laryngoscopy. Cefazolin was given as per protocol. Intubation was smooth and atraumatic.

However post intubation the blood pressure rose to 220/70 mm of Hg with a pulse rate which was unaltered, (possibly influence of beta blockade). This response was assumed to be related to patient being in lighter planes of anaesthesia. However shortly the blood pressure went on to 60/40 for a period of approx 2 min. (Not recorded in graph in the diagram as time intervals are 5 min intervals).

She was given a fluid bolus of 1 litre of hetastarch. Fearing a worse situation the surgery was withheld. Subsequently her blood pressure rose to 160/70 mm of Hg which was controlled with judicious use of isoflurane and fentanyl. For the next 30 min a central venous line was passed and noted to be 4 cms. Meanwhile her blood pressure continued to be extremely labile and was very difficult to control.

She was fluid resuscitated with a total of 3.5 litres of fluid which included total of 1 litre of hetastarch. Fluid challenges were continued till she was no longer fluid responsive. Repeated blood gases were done and the B.E was seen to be -3 with a normal ph. Approximately 45 minutes later her blood pressure remained more or less stable at 110/70mm of hg. Anaesthesia was maintained with isoflurane –nitrous oxide with fentanyl.

Surgery was satisfactorily completed with the intra op parathyroid levels corresponding very well with the removal of the gland. Post skin closure patient was breathing well, had very good respiratory efforts and had good return of muscle power, hence was extubated on table. Extubation



was uneventful and pt was discharged to the wards the subsequent morning with near normalization of calcium levels and parathyroid levels.

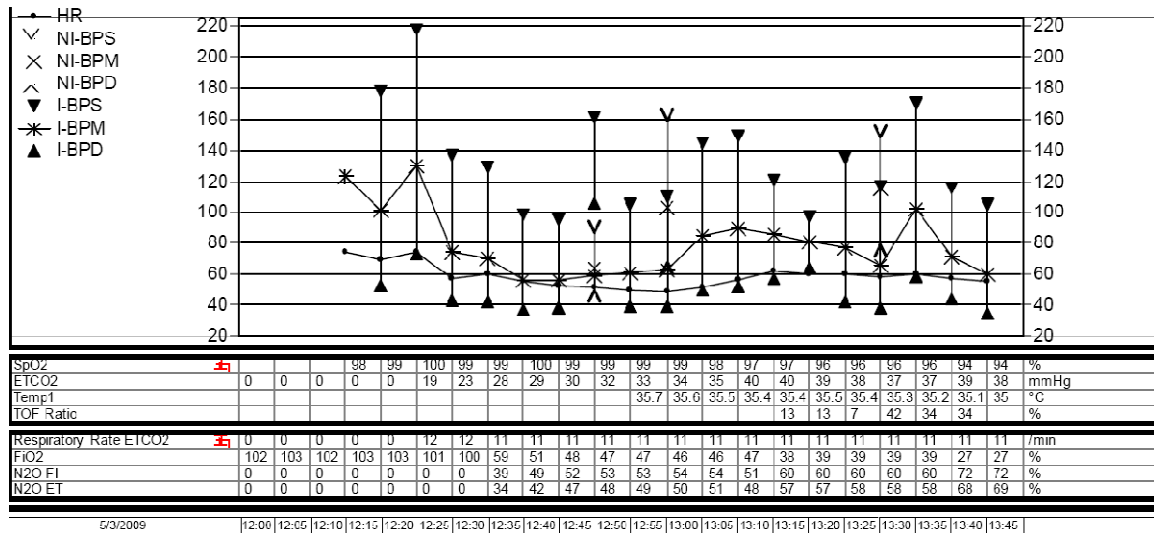


Fig: Haemodynamics chart slaved from the metavison (clinical information system) screen

**Discussion:** It is known that hypercalcemic crisis does not have an exact definition. Most cases of hypercalcemic crisis are attributable to decompensating primary hyperparathyroidism. They sometimes do require neck surgery performed by an experienced endocrine surgeon.

Surgery for hyper or hypo functioning endocrine organs present a number of perianaesthetic challenges, parathyroidectomy being no exception.<sup>1</sup> The most common cause of hyperparathyroidism is a single parathyroid adenoma.<sup>2</sup> Criteria for surgery include significant hypercalcaemia (> 1 mg/dl above upper limit of normal), marked hypercalciuria (> 400 mg/day), low bone density, unexplained renal insufficiency and episode of acute primary hyperparathyroidism. Elderly patients with primary hyperparathyroidism who are Vitamin D deficient should also be considered for surgery.<sup>3</sup>

Within very short time, two problems must be solved. On one hand, a short diagnostic program should lead to the exclusion of neoplasias producing hypercalcemia. On the other hand, those hours should also be used to lower serum calcium levels. One method is forced diuresis (for which there is an extreme paucity of evidence) combined with the use of highly potent bisphosphonates. In cases of impaired renal function, calcium-free haemodialysis is the treatment of choice.<sup>4</sup> It is imperative to say that hypercalcemic crisis should be treated in a unit with appropriate expertise.

Careful attention to control of hypercalcemia, perioperative hydration, and evaluation of renal functions are necessary for cases of parathyroidectomy. But there is very less data on



“emergency” or “semi emergency parathyroidectomy”. Optimal control of BP is known to cause reduction in the mortality and markedly improved cardiovascular prognosis. Incidence of hypertension in hyperparathyroidism is 20-50%. The reasons for which are obscure like hypercalcemia,<sup>5</sup> hyperparathyroidism, dehydration, enhanced vascular response to angiotensin 2<sup>6</sup>, increased activity of sympathetic nervous system,<sup>7</sup> ? Direct vasoconstrictor effects,<sup>8</sup> Increase in ACTH and Arginine vasopressin.<sup>9</sup>  $\beta$ -blocker use in the preoperative preparation for general anaesthesia significantly increases cardiovascular stability and decreases the frequency and severity of hemodynamic disturbances during the surgical procedure.<sup>10</sup> Also  $\beta$  blockers may cause hypocalcemia and help in the control of blood pressure.<sup>11</sup> There is also an increased incidence of Cardiac dysrhythmias (early after-depolarization, shortening of action potential, shortening of the effective refractory period, precipitation of re-entry)<sup>12,13</sup> which need to be kept in mind while dealing with the anaesthesia of such patients.

However in cases of emergency parathyroidectomy the time for optimization of the patient is much shorter and thus proves a problem. A seemingly normal looking patient might prove extremely difficult to control intra operatively if not optimized pre operatively. The extremely labile nature of the blood pressure noted intra operatively might be due to combination of hypovolemia and hypercalcemia. Such wide swings in blood pressures might prove detrimental in patients with co-morbid conditions. It is extremely difficult to actually denote any end point of fluid infusion and hence preoperatively or hours before surgery careful repeated aliquots of fluid boluses with close monitoring of central venous pressures would seem the right option. There should be a strong consideration for a preoperative dialysis with calcium free dialysate in such a subgroup of patients and a trial in this regard is warranted. This would involve admitting the pt to a high dependency unit or an intensive care unit with experience in the hemodynamic management of such type of patients. Frequent determination of electrolytes and treatment of the same cannot be overemphasized. Appropriate guidelines based on evidence in managing pts of emergency parathyroidectomy are required

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