Letters to Editor

Hypotension associated with high cardiac output and low systemic vascular resistance in a patient with hyperparathyroidism and hypercalcemia

Dear Editor,

Hyperparathyroidism and hypercalcemia are usually associated with hypertension.[1-2] We report a case of parathyroid adenomas with severe hypercalcemia, in which the patient had normotension with high cardiac output and low systemic vascular resistance which is an unusual presentation. Written informed consent was obtained from the patient for publication of this report.

A 28-year-old woman was planned for parathyroidectomy. Her corrected serum calcium was (Ca) >3.5 mmol.L^{-1} (2-2.5 mmol.L^{-1}) and serum intact-parathormone (iPTH) >2000 pg.mL^{-1} (10-65 pg.mL^{-1}). She had persistent tachycardia of 110 to 130 bpm and blood pressure of 90-110/60 mmHg during the hospital stay, while sepsis and anemia were ruled out. Due to refractory hypercalcemia, before the surgery, she required hemodialysis thrice and serum calcium on the morning of surgery was 3.05 mmol.L^{-1} [Table 1]. She had episodes of giddiness and orthostatic hypotension after dialysis sessions, treated as hypovolemia, and was advised bed rest.

Baseline vitals were: HR 133 bpm, blood pressure 108/74 mmHg, and SpO2 99%. Continuous cardiac output monitoring (Vigileo, Edwards Lifesciences, USA) was done, established via a cannula placed in the left radial artery. Baseline cardiac parameters were as follows: cardiac output (CO) 9.5 L.min^{-1}, stroke volume (SV) 70 ml, stroke volume variation (SVV) 4% and systemic vascular resistance (SVR) of 522 dyn.s.cm^{-5}. Intraoperative hemodynamic parameters were as follows - HR: 114 to 140 bpm, cardiac output (CO): 6.5 to 7.9 L, stroke volume (SV): 57 to 70 ml, stroke volume variation (SVV): 4 to 8%, systolic blood pressure of 90 to 100 mmHg and mean arterial pressure of 65 to 70 mmHg. SpO2 remained 99 to 100% and EtCO2 between 32 to 36 mmHg. SVR started improving in the post-operative period along with decrease serum iPTH and serum Ca levels [Table 1].

Hypercalcemia results generally in hypertension,[1-2] but here arterial pressure remained low normal with high cardiac output and low SVR. There was no evidence to suggest other causes of low SVR like sepsis or autonomic dysfunction in this patient. The use of 'low calcium hemodialysis' for hypercalcemic crisis or refractory hypercalcemia is well known.[3] But the effect of dialysis on the cardiovascular system in primary hyperparathyroidism using advanced cardiac output monitoring has not been documented in the literature. Parathormone is a direct vasodilator and can decrease SVR by the endothelial release of nitric oxide (eNO).[4,5] This patient had very high serum iPTH and the decrease in blood pressure was correlating with a decrease in serum Ca levels following dialysis [Table 1], suggesting the possibility of unopposed action of parathormone on the arteriolar tone, causing a fall in SVR. The resultant increase in reflex sympathetic activity could have caused tachycardia and high cardiac output. Desensitization of G-coupled receptors in vascular smooth muscle cells due to chronic hypercalcemia is another possible mechanism that can explain these findings.

Further studies are needed to confirm these hypotheses. In the meantime, we suggest that patients with similar clinical findings should be monitored aggressively with advanced hemodynamic monitors like continuous cardiac output measurement, to decrease perioperative morbidity.

Table 1: Timeline of Serum iPTH, Serum Calcium and Patient Events

Timeline	iPTH (pg.mL^{-1})	Serum Calcium (mmol.L^{-1})	Events
28-Feb-19	>2000	>3.5	On Presentation
1-Mar-19		>3.5	Dialysis 1
2-Mar-19		2.95	Giddiness
4-Mar-19	>2000	3.45	Dialysis 2
5-Mar-19		2.02	Giddiness and Orthostatic Hypotension
6-Mar-19		3.3	
7-Mar-19		>3.5	Dialysis 3
8-Mar-19	578*	3.05	Day of Surgery
9-Mar-19		2.5	Post-op day 1
18-Mar-19	16.5	2.3	Post-op day 10

**on the evening of surgery, after parathyroidectomy*

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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