CASE REPORT

Central Venous Pressure Guided Fluid Management During Anesthesia of a Pheochromocytoma Patient with End Stage Renal Disease

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A 42-year-old male with a 2-year history on dialysis for renal failure was admitted for adrenalectomy. We applied central venous catheter for this pheochromocytoma case before the induction of anesthesia. Although he had no weight change in his last dialysis, he was suffering severe volume depletion despite high arterial blood pressure. There was deep discrepancy between central venous and arterial blood pressure before and during anesthesia of this patient. We strongly recommend central venous guided fluid management started before the induction of anesthesia in these cases despite controversial studies.
Keywords: pheochromocytoma; renal failure; central venous pressure

Anaesthesia management of patients with pheochromocytoma has been well documented [1-2]. However, only few cases of accompanying end-stage renal disease have been reported [3-8]. It is strongly recommended to access central vein during anesthesia for pheochromocytoma patients [1-2]. However, after the emergence of laparoscopic approach some authors have questioned its need [9] and others have also scrutinized its value for guiding fluid therapy [10-11] and some others accept its implementation after the induction of anesthesia [12]. In many concomitants reported cases of pheochromocytoma and end-stage renal disease, underestimating the fluid volume caused episodes of hypotension [3,8]. Therefore, in our case we accessed central vein as a monitoring tool before the induction of anesthesia and managed the fluid intake based on that instead of focusing merely on blood pressure. There was no episode of hypotension and amazingly, there was deep discrepancy between arterial and central venous pressures contradicting some previous reports [13].

Case Description

A 42-year-old male patient was admitted to our hospital for adrenalectomy. After being fully informed about his rare condition and after discussing that his case is going to be published, the patient signed the written informed consent. He had episodes of hypertension for many years for which he received medications. Two years ago, he became anuric and underwent hemodialysis. He was a candidate for renal transplantation, and during his screening evaluations for that surgery it became apparent that his free serum metanephrine was more than twice the normal range [14] and computed tomography showed a six-centimeter right adrenal mass with high probability for pheochromocytoma. His sister underwent adrenalectomy for typical episodes of pheochromocytoma some months earlier. He became a candidate for adrenalectomy and received phenoxybenzamine for six days (starting 30 mg day^{-1} and reaching 80mg day^{-1}) and metoral 25 mg twice a day (started two days after the initiation of alpha-antagonist). Routine dialysis every other day was continued for the patient till the day before surgery. In his pre-operative visit on the day before surgery, he had stable normal-range blood pressures with no severe orthostatic hypotension or electrocardiogram changes. He mentioned that during the last month he lost about three kilograms, however, he did not lose nor gain any weight during his last hemodialysis.

Before the Induction of Anesthesia:

On the day of surgery, at the operating theatre the patient was monitored by ECG, pulse oximetry, non-invasive and invasive arterial blood pressure (implemented under local anesthesia). Sonographic evaluation revealed completely distorted right neck anatomy (probably due to previous attempts for dialysis catheterization). Therefore, we accessed the left internal jugular vein under local anesthesia and intravenous sedation with 150 micrograms of fentanyl and 2 mg of morphine despite the arterio-venous shunt on his left hand.

After the insertion of internal jugular catheter, arterial blood pressure was 185/112 mmHg while his central venous pressure (CVP) was near zero. Three litres of normal saline were freely infused in an hour for the patient (utilizing CVP monitoring) till a CVP of 8 CmH2O was reached. Meanwhile, the patient received anti-hypertensive medication (reaching a total amount of 200 micrograms of glyceryl trinitrate, 20 mg of hydralazine and 10 mg of labetalol).

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Induction, Maintenance and Recovery from Anesthesia:

At the time of induction, he was awake, cooperative and in no distress. He had an arterial blood pressure of 135/95 mmHg and a CVP of 8 CmH2O. Sodium thiopental, cisatracurium, lidocaine and fentanyl were administered and he was intubated. Anesthesia was maintained with isoflurane 1% and blood loss (about 500 cc) was compensated by packed red blood cell (400 cc) and normal saline (1200 cc). Arterial systolic blood pressure was in a range of 110 till 170 mmHg during laparoscopic surgery and recovery, while he experienced two episodes of low (about 3 CmH2O) CVP during surgery (with a short time lag from the episodes of bleeding) which was rapidly corrected by crystalloid replacement. He had the same range of arterial blood pressure in his one-day stay in intensive care unit, and underwent routine hemodialysis the next day with no problem. He was discharged 72 hours after the surgery.

Discussion

We present a pheochromocytoma patient on hemodialysis. Pheochromocytoma causes vasoconstriction and subsequently these patients are usually volume depleted [2]. And probably require considerable fluid replacement to maintain normal CVP especially when on phenoxybenzamine [2]. On the other hand, renal failure necessitates meticulous fluid management as these patients may be at risk for all-cause mortality with an increased CVP [15]. Before the induction, our patient had high arterial and low venous pressure. Volume depletion was corrected based on CVP before the induction, to prevent hypotension. Meanwhile anti-hypertensive medications were administered. We experienced great discrepancy between CVP and arterial blood pressure at the induction and maintenance of anesthesia. However, Weingarten and others [13] found strong correlation between central, peripheral and arterial pressure in their pheochromocytoma patient. Presumably, renal failure and co-existing conditions have affected arterial and venous pressure and tone in our case.

We assume that our patient benefited from CVP guided fluid management, despite some recent studies which underestimate the value of CVP for this purpose [10-11]. It seems, after many years of utilization of CVP, there are still fundamental questions in this field that need to be researched.

Learning points:

1- We recommend CVP monitoring before the induction of anesthesia in pheochromocytoma patients with concomitant renal failure.

2- Patients with pheochromocytoma who are on hemodialysis may suffer severe volume depletion despite high arterial blood pressure.

3- Arterial blood pressure and CVP are not essentially correlated in pheochromocytoma patients with end-stage renal disease.

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