

The Anesthetic Management of a Child with Chronic Hypotension for Renal Transplantation

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Case Report

A 2 year-old boy weighing 14 kg underwent cadaveric renal transplant. Past medical history was significant for ESRD secondary to obstructive nephropathy at birth, bilateral nephrectomies for refractory hypertension, a stroke secondary to hypotension, and a recent hospitalization for status epilepticus due to hypotension. Evaluation by the renal and cardiology services yielded no cause for the severe hypotensive episodes or the chronic hypotensive state in the 80s/40s mmHg.

Inhalation induction using routine ASA monitors proceeded uneventfully. After induction, the systolic blood pressure (SBP) dipped to the 60s mmHg, requiring volume resuscitation with 0.9% NaCl and 25% albumin. Anesthesia was maintained with air-oxygen and Isoflurane. A dopamine infusion was started, which ranged from $7.5 \mu\text{g}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$ to $15 \mu\text{g}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$. However, SBP remained only in the 80s mmHg. A unit of packed RBCs was transfused along with 0.9% NaCl and 5% albumin. The estimated blood loss up to the time of blood transfusion was 100 mL. Central venous pressure remained in a range of 8-13 mmHg, with a CVP of 12 mmHg prior to reperfusion. Because the blood pressure remained suboptimal the dopamine infusion was discontinued and phenylephrine infusion was titrated for effect. SBP increased to a range of 95-110 mmHg with $15 \mu\text{g}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$ of phenylephrine. Additional fluid boluses of 0.9% normal saline solution and 5% albumin were given.

The transplant proceeded uneventfully and the child's SBP remained stable above 100 mmHg. The child was awakened and extubated without any significant response in blood pressure. The urine output over the last three hours of the 8-hour operation was 20 mL. Total EBL for the surgery was 120 mL. Total IV fluids infused were 1,300 mL of 0.9% NaCl, 40 mL of 25% albumin, 150 mL of 5% albumin, and one unit of pRBC's. The last arterial blood gas (during phenylephrine infusion) showed: hemoglobin-12.3 g/dL, pH-7.43, bicarbonate-22 mmol/L, acid-base excess- 2 mmol/L and lactate-5.4 mmol/L

In the PACU, the child continued to require phenylephrine at $15 \mu\text{g}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$ to maintain systolic blood pressures in the 100-110 mmHg range, even while awake and complaining of pain. Within the next hour, the phenylephrine was reduced to $0.5 \mu\text{g}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$, while dopamine was restarted at a rate of $5 \mu\text{g}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$. A renal scan showed mild renal dysfunction. The urine output increased to 100 mL in the two hours post transplant. Over the next 48 hours the phenylephrine and dopamine drips were discontinued. Urine output continued to improve to $>1.5 \text{ mL}\cdot\text{kg}^{-1}\cdot\text{hr}^{-1}$ and serum creatinine decreased from 7.2 mg/dL preoperatively to a two-day post operative value of 1.6 mg/dL.

Discussion

Children with end-stage renal disease typically experience hypertension, rather than hypotension. We report this case because of the unique medical condition of the child and the anesthetic management employed to improve the chances for a successful outcome. Intraoperatively, the patient's blood pressure was artificially supported to ensure adequate perfusion of the adult cadaveric kidney. After careful deliberation with the nephrologist, it was agreed an SBP greater than 100 mmHg was paramount. Dopamine was incrementally increased, until the alpha constricting properties were reached. At this point, dopamine was replaced with phenylephrine, because of its more direct acting alpha effect. Phenylephrine proved more successful at sustaining SBP in the 100s mmHg, without relying on more fluid boluses. Post-operatively, the child's SBP stabilized above 100 mmHg, even after withdrawal of vasopressors. This was attributed to the side effects of cyclosporine and solumedrol, the effects of renin, and the presence of a functioning transplanted kidney.^{1,2} The child underwent two more operations, which included the removal of the peritoneal dialysis catheter, and was discharged on postoperative day 21 with a blood urea nitrogen of 24 mg/dL and a creatinine of 0.4 mg/dL.

References

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