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Case Report

Successful management of a complex vascular surgical patient: Food for thought

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Introduction

Complex vascular surgeries are associated with increased morbidity and mortality [1]. Studies have shown complication rates of >20%, more in the open aortic compared to endovascular procedures [2]. The most frequent complications are major adverse cardiac events, respiratory and renal failure and local complications [3]. The latter include wound complications (3.3%), intestinal obstruction and ischaemia (2%), retroperitoneal bleeding (0.4%) and amputation (0.1%). A heightened awareness of perioperative complications is essential to identify the related complications early and to manage them by utilising organ support and multidisciplinary inputs [4]. This case report presents a patient who had a complex aorto-distal vessel bypass surgery with lengthy and complicated postoperative intensive care management.

Case Description

A 62-year-old male with a history of type 2 diabetes (reasonable control with insulin), hypertension, ischaemic heart disease, atrial fibrillation and bilateral peripheral occlusive arterial disease (American Society of Anaesthesiologists stage 2) and a body mass index of 34 kgm^2, underwent open bilateral aorto-iliac and right femoro-popliteal bypass under general anaesthesia and a thoracic epidural. Towards the end of a 9-hour surgery, his lactate levels were noted to rise (from 1 to 9mmol/L) with increasing vasopressor requirement (noradrenaline to 1mic/kg/min) despite receiving 5L of crystalloids and 950ml of cell saver blood (estimated blood loss 1.9L). The right limb was perfusing adequately with absent Doppler signals on the left foot.

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At the end of the surgery, the patient was admitted to the ITU, sedated and ventilated. He was acidotic with a pH of 7.1, bicarbonate 9 meq/L, lactate of 8 mmol/L, and hyperkalemic (K+ 6mmol/l). His blood sugar was 9.8mmol/l, and his haemoglobin was 73 g/L. A positive passive leg-raising test noted a swing in the arterial blood pressure trace. A bedside 2D echocardiogram illustrated hypovolaemia with good biventricular function and no other cardiac cause for hypotension. Blood and blood products were transfused per protocol.

A left internal jugular vascular catheter was inserted and continuous renal replacement therapy was initiated. Noradrenaline requirement gradually decreased. The left leg perfusion was not reestablished overnight despite optimal fluid resuscitation. The left calf was soft. The creatinine kinase level was 38900 U/L. Lactate level remained high, around 8mmol/L. A relook laparotomy the next day revealed a healthy bowel with no active bleeding. Four compartmental fasciotomies were performed on the left leg. He returned to the ITU, where supportive therapy continued. As absent flow to the left foot persisted, left above knee amputation was performed on postoperative day 3. He was started on IV heparin infusion to keep the APTT ratio between 2 to 2.5. He remained anuric, dependent on continuous renal replacement therapy. Lactate levels normalised. Following failed nasogastric feeding, a CT abdomen revealed features of ileus. Subsequently, total parenteral nutrition commenced.

Vasopressors were gradually tailed off and he was weaned off the ventilator. Heparin infusion was discontinued on day five and he was started on therapeutic enoxaparin renal dose. The epidural line was removed on day 6. Elective percutaneous tracheostomy was performed considering excessive secretions and a hyperactive delirious state on day 10. VAC dressings were applied to his surgical wounds and he was reviewed by the vascular surgical team regularly. The pain was managed with a supra-inguinal fascia iliaca catheter infusion and later with a fentanyl infusion (50mic/hr.) and regular paracetamol. Gabapentin and amitriptyline were added for phantom-type limb pain. The dietician team initiated a nutrition regimen with parenteral and nasogastric feeding. By the third week, he was weaned off the tracheostomy. He was decannulated on day 26. With stable metabolic parameters and native urine output, he was taken off the filter. During his ITU stay, the invasive lines were regularly inspected, adhering to bundle care, and antibiotics were de-escalated per microbiology guidance and sensitivity patterns of cultures. His delirious state improved. Regular physiotherapy was continued, and he was mobilised out of the bed. He received intermittent blood transfusions to keep the haemoglobin above 80g/L. He was stepped down to the ward on day 31.

Discussion

Open thoracic or abdominal aortic aneurysmal repair, infra-inguinal bypass procedures and renal or mesenteric reconstruction are considered high-risk surgeries [1]. While these are mainly associated with significant adverse cardiac events, local complications such as limb and intestinal ischaemia, compartment syndrome leading to rhabdomyolysis and acute kidney injury are uncommon yet potentially catastrophic consequences.

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Hyperlactataemia can have multiple origins in the postoperative period [5]. Type A lactic acidosis is due to tissue hypoxia, while type B is related to other causes. The higher the lactate, the poorer the outcome [6]. The high lactate levels could have been due to both types in our patient. Hypovolaemia and limb ischemia could have led to type A hyperlactatemia. Tissue trauma during the surgery may have resulted in type B hyperlactataemia. Renal replacement therapy (even using high-flux filters) does not cause a clinically significant lactate reduction [7]. His lactate levels normalised (<2mmol/L) by day three following fluid resuscitation and fasciotomies, suggesting that type A predominated.

Post-ischaemic compartment syndrome has been described, detailing the pathophysiology related to revascularisation for acute limb ischaemia [8]. In our patient, it is possible that similar mechanisms led to the development of compartment syndrome. Diagnosing compartment syndrome in an intubated patient needs a high index of suspicion as the clinical examination may not reveal classical manifestations of limb compartment syndrome. Compartment pressure measurement (>30mmHg) was not adopted in our patient as the surgeons initially considered bowel ischaemia as the cause for the elevated lactate levels and the left limb was soft and non-oedematous during repeated clinical examinations. The literature suggests that delayed decompression of acute compartment syndrome is associated with a fourfold rise in mortality and a twofold surge in amputation [9]. This reiterates the need for heightened awareness and continued communication between the intensive care and vascular surgical teams to avoid disastrous complications.

Acute kidney injury is the most common complication associated with rhabdomyolysis, with increased mortality rates up to 60% [10]. There exists controversy on the initiation of renal replacement therapy to prevent acute kidney injury related to rhabdomyolysis [11]. However, the best policy would be to decide on its use individually. A recent study has shown improved mortality with early renal replacement therapy [12]. In the case of our patient, the justification was persistent acidosis despite aggressive fluid resuscitation and resistant hyperkalemia and that the surgeons had a high degree of suspicion of rhabdomyolysis as the left lower limb had poor perfusion.

Phantom limb pain is seen in 50 to 80% of amputees [13]. The current evidence suggests drugs used for neuropathic pain and novel non-pharmacological therapies such as virtual reality and augmented reality mirror boxes [14]. Epidural and perineural analgesia are considered the gold standard therapy for stump pain and are effective in reducing phantom limb pain [15].

It is essential to have multidisciplinary inputs when managing complex patients in the ITU. Regular medication review is critical in multi-organ failure and supportive therapy such as renal replacement, alternating oral and parenteral medication with ileus, and recommencement of the patient’s routine medication. Our patient's dietician inputs were also invaluable in the background of persistent ileus as were physiotherapy and speech and language therapy during tracheostomy weaning and mobility. This resulted in the safe discharge of the patient from the ITU.

Conclusion

Postoperative care for complex vascular surgical patients presents a distinctive challenge to intensivists due to inherent preoperative morbidities and unique procedure-related complications. Continued monitoring in the postoperative period for bleeding, bowel ischaemia, compartment syndrome, and rhabdomyolysis is essential. Multidisciplinary management aids in improved outcomes. Once a patient has stepped down from ITU, a plan should be implemented for further rehabilitation to enhance the quality of life.

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Consent

The authors certify that informed, written consent was obtained from the patient before the manuscript was prepared.

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