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PERI-OPERATIVE CHALLENGES IN SUPERIOR MESENTERIC ARTERY THROMBOSIS WITH ATRIAL FIBRILLATION: ANAESTHETIC MANAGEMENT IN A METABOLIC CATASTROPHE

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ABSTRACT Superior mesenteric artery (SMA) thrombosis is a rare but catastrophic abdominal vascular emergency associated with mortality rates approaching 50–80% (1–3). When complicated by bowel ischemia, sepsis, atrial fibrillation, and major electrolyte and hemodynamic disturbances, peri-operative anesthetic management becomes extremely challenging. These physiological derangements-combined with abdominal distension and the presence of a large hiatal hernia-significantly compromise respiratory mechanics and increase aspiration risk. (4–7). We present the case of a 73-year-old woman with SMA and SMV thrombosis, severe bowel ischemia, atrial fibrillation, sepsis, uncontrolled diabetes, and a large hiatal hernia requiring emergency laparotomy and extensive small bowel resection, an individualized anesthetic strategy focusing on rapid sequence induction, hemodynamic optimization, aggressive electrolyte correction, lung-protective ventilation, and careful airway management resulted in a successful outcome. The patient underwent resection of 180 cm of non-viable bowel and made an uneventful recovery. This case highlights the critical importance of individualized, vigilant anesthetic care in complex abdominal vascular emergencies.

KEYWORDS : Superior Mesenteric Artery Thrombosis, Hiatal Hernia, Atrial Fibrillation, Lung Protective Ventilation, Rapid Sequence Intubation

INTRODUCTION

Acute mesenteric ischemia (AMI) remains one of the most lethal abdominal emergencies, with SMA thrombosis and embolism representing the majority of cases (1,2). Mortality remains high due to the rapid progression from arterial occlusion to transmural necrosis, overwhelming inflammation, and septic shock (3–5). Patients often present late, with severe metabolic derangements, hypovolemia, and hemodynamic instability.

Anesthetic management during emergency laparotomy is particularly difficult due to a combination of hypovolemia, electrolyte abnormalities, aspiration risk, arrhythmias, sepsis-induced vasodilation, and altered pulmonary mechanics due to abdominal distension or diaphragmatic elevation (6,7,13–15). These factors necessitate a cautious and balanced approach during induction, ventilation, fluid therapy, and postoperative care.

This case demonstrates these challenges and describes a physiology-based anesthetic plan for a high-risk elderly patient undergoing emergency surgery for SMA thrombosis.

Case Report

A 73-year-old woman presented with a nine-day of worsening abdominal pain, persistent vomiting, constipation, and passage of black stools(Malena), accompanied by intermittent fever for six days. Her medical history included recently diagnosed atrial fibrillation, uncontrolled type 2 diabetes mellitus (HbA1c 9.24%), mild left ventricular systolic dysfunction (EF 45–50%), and a known large hiatal hernia. On admission, she appeared toxic and dehydrated.

Investigation Profile

Vital Signs

- Blood Pressure (BP): 100/60 mmHg
- Heart Rate (HR): 136 beats/min, irregularly irregular (atrial fibrillation)
- SpO_2: 96% on 6 L/min oxygen via Hudson's mask
- On examination: The abdomen was grossly distended with absent bowel sounds, and auscultation of the chest revealed reduced basal air entry.

Laboratory Investigations

Hematology: Hemoglobin: 8.7 g/dL (Low – anemia) Total Leukocyte Count (TLC): 24,300 /mm³ (Marked leukocytosis Platelet count: 232,000

Renal Function: Serum Creatinine: 1.5 mg/dL (Mildly elevated)

Coagulation Profile: Prothrombin Time (PT): 16.6 seconds INR: 1.54 (Prolonged)

Serum Electrolytes: Sodium (Na^+): 124 mmol/L (Hyponatremia). Potassium (K^+): 2.8 mmol/L (Hypokalemia). Chloride (Cl^-): 84.9 mmol/L (Hypochloraemia)

Arterial Blood Gas (ABG) Analysis: pH: 7.41 (Normal) HCO_3^-: 22.4 mmol/L (Low–normal) PaO_2: 80.2 mmHg (Mild hypoxemia) Pco2: 33.8

ABG Interpretation: Primary metabolic acidosis with Superimposed respiratory alkalosis

Electrocardiography (ECG) Findings: Atrial fibrillation (AF) with RVR (rapid ventricular response)

2D Echo Findings: LVEF: 45–50%, Calcified mitral annulus, Sclerotic aortic valve, Trivial tricuspid regurgitation, Inferior Vena Cava (IVC): 6 mm collapsing on inspiration. Other structures are Within normal limits

Laboratory findings showed leukocytosis, anemia, acute kidney injury, severe hyponatremia, hypokalemia, and compensated metabolic acidosis.

Contrast-enhanced CT of the abdomen revealed complete thrombosis of the SMA and SMV, dilated and poorly enhancing small bowel loops, and a large hiatal hernia.

Anesthesia Management

Patient was transferred to the ICU for immediate resuscitation. A right internal jugular central venous catheter and right radial arterial line were inserted, and controlled crystalloid resuscitation with ringers lactate was initiated. Electrolyte correction of Potassium and Magnesium (Inj.$MgSO_4$ 2 g IV; Inj.KCl infusion at 4 mL/hr) initiated due to the risk of arrhythmias in the context of atrial fibrillation (18,19). Broad-spectrum antibiotics started according to sepsis guidelines (11,23), anticoagulation with therapeutic low-molecular-weight Heparin was initiated for bridging therapy. Inj.Amiodarone infusion was given for rate control (9). Blood and blood products were reserved (Six units FFP and four units PRBC were cross-matched). After high-risk consent, the patient was taken for emergency laparotomy.

Pre-induction challenges include a full stomach (severe aspiration risk), hemodynamic instability (AF+sepsis+dehydration), hypokalemia increased risk of peri induction arrhythmias, hiatal hernia caused difficult mask ventilation. Rapid sequence induction was required to minimize aspiration risk (17). Pre-oxygenation with 100% FiO_2 for 3 minutes with avoidance of positive pressure ventilation before intubation and readiness for a difficult ventilation(due to low lung compliance). Induction with Inj.fentanyl (1 µg/kg), Inj.propofol (0.8–1 mg/kg), and Inj.Succinylcholine (1–1.5 mg/kg). Succinylcholine was selected for its rapid onset despite concerns about potassium shifts, as the patient was hypokalemic and expected to tolerate it safely. A gentle laryngoscopy performed with avoidance of sympathetic surge and endotracheal tube size 7.0 mm cuffed was used for intubation. Cricoid pressure applied and released post intubation after cuff inflation.

Anesthesia was maintained with inhalational anesthetic (Sevoflurane) and Inj.Atracurium boluses for muscle relaxation.Continuous arterial pressure and CVP monitoring was done. Inj.Noradrenaline(8/50) infusion titrated from 8 to 14 mL/hr to maintain MAP ≥ 65 mmHg to ensure mesenteric perfusion as recommended in sepsis management (11,12). Goal-directed fluid therapy using CVP, MAP, and dynamic parameters with Two units PRBC and four units FFP transfused and Crystalloids for maintenance while avoiding fluid overload (risk: pulmonary oedema, reduced diaphragmatic movement) while optimize oxygen-carrying capacity and correct coagulopathy. Inj.Amiodarone chosen for hemodynamic stability in case there was recurrence of AF in the course of the surgery. Atrial fibrillation significantly increases the risk of embolic SMA occlusion due to stasis in the left atrial appendage, contributing to sudden onset and extensive ischemia once the artery becomes blocked (8–10). Intra-operatively, AF complicates anesthetic management by reducing diastolic filling, creating susceptibility to tachyarrhythmias, and increasing myocardial oxygen consumption.

A lung-protective strategy tailored to prevent volutrauma and barotrauma due to hiatal hernia and distended abdomen So there is adequate oxygen delivery to ischemia tissues and while providing low intra-thoracic pressure to preserve venous return and SMA flow(13-15)

Tidal volume: 6 mL/kg ideal body weight

PEEP: 5 cm H_2O (avoid. >8 cm due to mesenteric compromise)

Maintain Plateau pressure: <30 cm H_2O

$EtCO_2$ target: 30–35 mmHg (avoid large swings due to AF and acidosis)

FiO_2 increased to 100% during bowel manipulation

This strategy aimed to avoid aspiration, preserve oxygen delivery, and maintain mesenteric perfusion without excessive intra-thoracic pressure.

Serial arterial blood gases(every 30–60 mins) guided ongoing correction of electrolytes and acid-base disturbances with continuous K^+ and Mg^{2+} supplementation and Lactate-guided titration of perfusion and ventilation strategies.

Intraoperatively, 180 cm of non-viable, congested, ischemic bowel with areas of impending perforation with densely adherent omentum was found and resected. The surgery was prolonged due to severe ischemia and dense adhesions. At the end of the procedure, the patient developed bronchospasm requiring bronchodilators and controlled postoperative ventilation. She was transferred to the ICU and managed with bronchodilators, corticosteroids, and continued electrolyte correction. She was successfully extubated the following morning and made steady progress, ultimately being discharged on postoperative day 10.

Figure 1. Intraoperative ventilation and perfusion stratergies used.

Figure 2: Resected bowel, which initially had densely adherent omentum intraoperatively

DISCUSSION

SMA thrombosis is highly lethal, described by Bala et al. as "one of the most formidable emergencies" due to rapid necrosis and sepsis (1–4). Mortality remains "50–80%" (1–3). In this case, atrial fibrillation contributed significantly, as Watson et al. note AF-related embolism arises from "stasis in the left atrial appendage" (8). AF further complicates anesthesia by "reducing diastolic filling and promoting tachyarrhythmias" (9).

Sepsis-induced instability was expected, as Dellinger et al. describe "profound vasoplegia and capillary leak" requiring early vasopressors (11,23). Goal-directed fluids were used per Cecconi et al. (12).

The large hiatal hernia increased aspiration risk, in line with Marik et al. who states RSI is required when anatomy "increases the likelihood of aspiration during induction" (17). Ventilation had to avoid high intrathoracic pressures. Pelosi et al. emphasize that elevated airway pressures "reduce venous return and mesenteric blood flow" (13), and Futier et al. support a "protective lung ventilation strategy" in abdominal surgery (15) to prevent barotrauma, maintain venous return, and protect splanchnic perfusion. Severe hypokalemia increased arrhythmia risk, as highlighted by Gennari et al. (19). Succinylcholine was acceptable in hypokalemia (20–22).

Overall, the successful outcome in this elderly, metabolically unstable patient resulted from careful anticipation of complications, early hemodynamic control, cautious ventilation strategies, aggressive electrolyte and acid–base correction, and meticulous airway management during a high-risk emergency laparotomy (1-4).

CONCLUSION

SMA thrombosis represents a life-threatening abdominal emergency

where delayed diagnosis and sepsis significantly worsen outcomes. Anesthetic management becomes even more challenging in the presence of atrial fibrillation, electrolyte abnormalities, reduced cardiac reserve, and a large hiatal hernia. This case demonstrates that successful peri-operative care requires early and secure airway management, cautious fluid resuscitation, tailored vasopressor therapy, controlled ventilation strategies, and vigilant correction of metabolic disturbances. A coordinated multidisciplinary approach is essential to improving outcomes in patients undergoing emergency surgery for mesenteric ischemia.

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