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Anaesthetic management of right hepatectomy for a case of Hepatic haemangioma in accordance with Enhanced Recovery After Surgery (ERAS) guidelines: A Case Report

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Case Report

A 70 year old female, weighing 65 kilogram (kg) was admitted to our hospital with history of right sided abdominal pain, radiating to right shoulder and back since 6 months. Pain was intermittent in nature, not associated with nausea, vomiting, per rectal bleeding, constipation or malena. She was investigated and diagnosed to have giant hemangioma of right lobe of the liver and now posted for right lobe heptectomy.

Patient had no other comorbidities,was a tobacco chewer since 40 years, stopped for last 15 days. She had undergone an uneventful tubal ligation surgery 45 years ago under subarachnoid block.

On general examination patient was conscious, co-operative with baseline parameters: Pulse rate (HR): 90/min, Blood pressure(BP): 130/90mm of Hg,SpO2: 98% (room air).

Airway examination revealed loose and bucked upper incisors, multiple missing teeth in the lower jaw with Mallampati score (MPC) III. Neck movements were normal. Cardiovascular and respiratory systems were unremarkable. Her blood investigations were normal, two dimensional echocardiography (2D echo) revealed left ventricular hypertrophy with ejection fraction 55%, pulmonary artery systolic pressure 32 mmHg. Electrocardiogram (ECG) revealed sinus tachycardia and chest x-ray was normal.

Prior to surgery chest physiotherapy was given for 5 days with incentive spirometry to improve lung function according to ERAS guidelines

In view of major surgery, expected blood loss and possibility of intensive care unit (ICU) admission, patient and relatives were counselled and high risk consent was taken.

Preoperatively the surgical team had confirmed availability of blood and blood products.(Packed red blood cells: PRBC, Fresh frozen plasma: FFP, Random donorplatelets: RDPs, single donor platelets: SDP.)

On the morning of surgery, patient was shifted to operation theatre (OT) and monitors were attached. Baseline readings were noted:HR: 98/min, NIBP: 160/90mm of Hg, ECG: Sinus rhythm.

Thoracic epidural was avoided due to increased possibility of coagulation abnormalities post-operatively.

General anaesthesia with endotracheal intubation with central venous pressure (CVP) monitoring and invasive blood pressure monitoring (IBP)via arterial line was planned.Intra-operative pain management was planned by using Injection (Inj). Fentanyl infusion and Inj. Dexmedetomidine if required.

Patient was preoxygenated and induced with Inj. Fentanyl 2 microgram (mcg)/ kilogram(kg) intravenous(IV) & Inj. propofol 2mg/kg slowly. Trachea was intubated with 7.5mm cuffed portex endotracheal tube after muscle relaxation with Atracurium 0.05mg/kg and confirmed with end tidal carbon dioxide($EtCO_2$). Ryle's tube was inserted and patient was maintained on volume controlled (VCV) mode with tidal volume of-380ml, RR- 12, peak end expiratory pressure (PEEP)- 4, FiO_2-50%. Sevoflurane was maintained at 0.7 (minimum alveolar concentration) MAC. USG- guided central venous cannulation was done in right internal jugular vein and CVP was observed to be 4cm of water. Arterial line was inserted via seldinger technique with 20G cannula in the left radial artery. Inj. Tranexamic acid 1gm was given and Inj. Fentanyl infusion (300mcg in 50cc of NS) was started at 3ml/hr. Inj. Dexmedetomidine was given in the dose of 0.3 to 0.5mcg/kg/hour.

Post-induction parameters were recorded as Pulse rate- 102/min, IBP- 134/78mm of Hg, SpO_2 of 100% on FiO_2-50% and CVP- 4cm of water. Intraoperative BP was maintained between systolic of 120-130 mm of Hg and diastolic of 90-60mm of Hg.

Two hours into surgery blood loss estimated was 900ml with urine output of 100ml; and the surgery had progressed till resection of tumour. Pulse pressure variation (PPV) was 20%, patient responded to fluid bolus of ringer lactate. Packed red blood cells (PRBC) were called for. While dissecting around the tumour, a rent occurred in the inferior vena cava(IVC) and an acute blood loss of further 1500ml occurred. BP dropped to 60/40mm of Hg with pulse pressure variation (PPV) of 49% with HR of 124/min and CVP of 2cm of H_2O. Four PRBC, four FFPs and three platelet concentrates were called for. Colloid hetastarch 6% (130/0.4)& crystalloids boluses were given. PPV decreased to 25 but again showed a rising trend. Inj. Phenylepherine 25mcg boluses were given to maintain mean arterial pressure (MAP) >60. Inj. Noradrenaline (4mg in 50cc NS) was started at 5ml/hr. Immediately fentanyl infusion rate and sevoflurane MAC was reduced. Surgeons were able to stop the bleeding and suture the rent.

After resection of tumour, surgeons proceeded for right hepatectomy. Small bleeders lead to a further blood loss of 1litre. Blood transfusion was started after the cauterization of bleeders. Four PRBCs, four FFPs, three RDPs were transfused and further two PRBCs and FFPs were called for. At the same time 2nd colloid was started. As the fall in BP was controlled, PPV reading was recorded to be 13-15%. Through the intra-operative period, 4 PRBCs, 4FFPs, 3RDPS, 2 colloids and 4 crystalloids were given.

Patient's total blood loss was calculated to 3.8 to 4 litres with urine output of 300ml over a span of 6 hours. The resected tumour weighed 3.3kgs. As patient became hemodynamically stable, noradrenaline infusion was gradually titrated till 2ml/hr. Inj. Furosemide 5mg was given and urine output monitored. Extubation was planned after arterial blood gas analysis (ABG).

Sample for ABG analysis was taken on VCV mode with tidal volume of-380ml, RR- 16, PEEP-4 at FiO_2= 60% consisted of pH- 7.329, PCO_2-43.1 mm of Hg, pO_2- 314.3 mm of Hg, HCO_3-22.2 mmol/L, Hb- 8.9 gm/dL, Na- 135.5 mmol/L, K- 4.08 mmol/L, Cl-105 mmol/L and Ca- 0.72 mmol/L.

Decision to extubate the patient on table was taken after noting the ABG. Inj. Calcium gluconate 100mg in 100ml NS was given slowly over 30mins. Inj. Bupivacaine 0.125%,was injected at the incision site for post-operative analgesia. Extubation done after reversal with glycopyrrolate & neostigmine, confirming adequate breathing efforts & complete return of motor power without any complications.

Post-extubation patient was conscious, oriented and comfortable. She was shifted to ICU on 4lit/min O2 and Inj. Noradrenaline at 1ml/hr.

In the intensive care unit, post-operative routine blood investigations were sent. She was transfused with 2 more units of PRBCs and platelet concentrates. On post-operative day 2 she was started on fluid diet and slowly mobilized. Deep Venous Thrombosis(DVT) stockings were applied as prophylaxis for prevention of thromboembolic episodes.

Discussion

Hepatectomy is a major surgery which results in massive blood loss intra-operatively. Hepatic resection is carried out along the functional segments of liver, which are divided based on the blood supply. Right hepatectomy involves resection of segments V-VII.[1] Mortality and morbidity rates are impacted by extent of resection. Patients undergoing partial hepatectomy have 30 day mortality and morbidity rates of 1.9% and 13.1% respectively.

Anaesthetic management for a patient undergoing hepatectomy for a vascular tumour like Hemangioma should include strategies for minimizing blood loss. Maintaining a low CVP (<5mm Hg), administration of tranexamic acid prior to surgery, maintaining hypotensive anaesthesia and surgical interventions which specifically cause decrease in blood loss are the main crux of the management.[2]

Various definitions of massive blood transfusions have been published in medical literature such as; replacement of one entire blood volume within 24 hrs; transfusion of >10 units of PRBCs in 24 hours; transfusion of >20 units of PRBCs in 24 hours; transfusion of >4 units of PRBCs in 1hr when ongoing need is foreseeable; replacement of 50% of total blood volume within 3 hours.[5] Massive Transfusion Protocols are designed to interrupt the lethal triad of death that develops with massive transfusion thereby improving outcome.

In this case, total blood loss at the end of the surgery was estimated as 3.8- 4L. In our case volume replacement was guided by PPV and fluid response was seen with corresponding changes in PPV.Volume replacement was given according to massive blood transfusion protocol in a ratio of 1:1:1.[6] Hemodynamic parameters were maintained throughout the surgery to prevent acute kidney injury.

In this case, ERAS guidelines for liver surgery, according to the best of the resources available, were followed. Epidural anaesthesia is one of the key elements in the ERAS pathway for abdominal surgery.[2] Epidural helps in blunting the perioperative neuroendocrine stress response, provides opioid free postoperative analgesia and aids in early mobilization and postoperative rehabilitation. However, one of the main concerns in liver resection surgeries is the postoperative coagulopathy and safety regarding removal of epidural catheter. Postoperative coagulopathy may delay removal of catheter and/or correction of coagulopathy with FFP or platelet transfusion and their associated risks.[2]

Another concern related to the use of thoracic epidural analgesia, is sympathetic blockade or vasodilatation. The decrease in mean arterial pressure can impair renal perfusion and may lead to acute kidney injury.[2-4]Studies have shown that patients with epidural analgesia received increased infusions of fluids and vasopressor support.[2]Due to these concerns ERAS society recommends against epidural use in favour for alternative modalities.[2] We used fentanyl and dexmedetomidine infusions intraoperatively.

Preoperative cardiopulmonary optimization of the patient was done in this case with chest

physiotherapy which consisted of breathing exercises, incentive spirometry and limb physiotherapy. The pre-operative optimization of cardiopulmonary status helped in extubation and early mobilization of patient.[4]

In conclusion, a well planned anaesthesia management in accordance with ERAS guidelines to prevent predicted possible complications, can give better outcomes in major surgeries.

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