https://doi.org/10.33472/AFJBS.6.10.2024.4326-4330

African Journal of Biological Sciences

Research Paper Open Access

Anaesthetic management of the patient posted for hepatic resection following Enhanced Recovery After Surgery (ERAS) guidelines

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Article History Volume 6,Issue 10, 2024

Received:28 Apr 2024

Accepted : 06 May 2024

doi: 10.33472/AFJBS.6.10.2024.4326-4330

ABSTRACT:

Enhanced Recovery After Surgery (ERAS) entails a multimodal perioperative management approach aimed at mitigating the body's response to surgical stress. ERAS has demonstrated effectiveness in reducing postoperative complications and shortening hospital stays. Liver resection risks, include, extended operative duration, intraoperative hemorrhage, accompanying hypotension, and substantial fluid shifts. Here we present a case of a 41-year-old female planned for liver resection under general anaesthesia for liver hemangioma of 7 cm × 7 cm × 5cm. Preoperative preparation included carbohydrate loading and venous thromboprophylaxis. Anaesthesia was maintained with propofol infusion, and central venous pressure (CVP) was kept below 4 mmHg to minimize blood loss, which was approximately 850 ml. Postoperatively, the pain was managed with local anesthetic wound infusion, and the patient was monitored in a high-dependency unit for 48 hours before an uneventful transfer to the ward. This case underscores the benefits of Enhanced Recovery After Surgery (ERAS) protocols and meticulous perioperative care in managing giant liver hemangioma resections, resulting in minimal complications and rapid recovery

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INTRODUCTION:

The liver, being a significantly vascularized organ, receives 20% of the cardiac output, with 30% delivered through the hepatic artery and 70% via the portal vein. Its venous drainage occurs through the right, middle, and left hepatic veins, which directly empty into the inferior vena cava (IVC). Structurally, the liver can be segmented into four lobes: the right and left lobes, demarcated by the falciform ligament, and the two posterior lobes, namely the caudate and quadrate lobes [1].

In the liver, the parenchyma possesses a distinctive capability for regeneration through the hyperplasia of hepatocytes. This regenerative process initiates within 24 hours following resection, and typically, the liver fully restores its original size within 6 months [2]. Major abdominal surgery induces substantial disruptions in physiological functions, encompassing a catabolic state, heightened oxygen requirements, compromised pulmonary capacity, retention of salt and water, lingering postoperative pain, occurrences of nausea and vomiting, delayed restoration of gastrointestinal functionality, hindered mobility, and an elevated susceptibility to venous thromboembolism. These factors collectively contribute to a prolonged recovery period following the surgery [3]. Liver resection represents a sophisticated surgical procedure with inherent risks, including extended operative duration, intraoperative hemorrhage, accompanying hypotension, and substantial fluid shifts. Postoperatively, patients may encounter complications such as coagulopathy, heightened susceptibility to bleeding, pulmonary issues, biliary leakage, post-hepatectomy liver dysfunction, and renal impairment [4].

An ERAS programme combines several elements that aim to enhance postoperative recovery, facilitate earlier discharge, and reduce the surgical stress response [5]. Enhanced Recovery After Surgery (ERAS) entails a multimodal perioperative management approach aimed at mitigating the body's response to surgical stress. ERAS has demonstrated effectiveness in reducing postoperative complications and shortening hospital stays [6]. The fundamental principle of the ERAS concept involves minimizing the extent of the surgical stress response through the reduction of invasive procedures. According to this paradigm, mitigating the severity of the stress response is imperative to diminish complications and expedite the recovery process [7].

CASE REPORT:

A 41-year-old female (height, 167 cm; weight, 55 kg) came with complaints of pain in the right hypochondrial region which was acute in onset. The patient has a history of weight loss of up to 14kg within 3 months and loss of appetite with normal bowel and bladder habits. Ultrasonography (USG) evaluation of the abdomen revealed a 7 cm × 7 cm × 5 cm hemangioma on the right lobe of the liver. Her complete blood count, coagulation, liver, and renal function tests were normal. The patient was diagnosed as a case of giant liver hemangioma and the patient was planned for liver resection under general anesthesia. Pre-assessment for risk adjustment was done and the patient was explained about pain assessment using visual analogue Scale. carbohydrate-loaded drink was given in the evening before surgery Overnight NPO was avoided and the patient was asked to have a meal 6 hours before the scheduled time of surgery. Hence the patient was not given any intravenous fluids preoperatively. Venous thromboprophylaxis was given with Compression stockings and low molecular weight heparin (LMWH) 12 hours before the surgery.

After proper consent, and a presurgical checklist for anesthesia, the patient was shifted inside the OR, routine monitors were connected, 1 18G venflon and 1 6G venflon were secured. Pre-anesthetic medications were avoided. Baseline arterial blood gas analysis (ABG) was obtained. General anesthesia was successfully induced with fentanyl 1μg/kg and propofol 2 mg/kg, vecuronium 0.1 mg/kg, followed by maintenance of anaesthesia with Target Controlled Infusion of propofol at Ce 5 μg/mL and ventilated with air and 40% FiO2 of oxygen. In addition to standard monitoring, invasive arterial blood pressure (IABP) via radial artery and Central venous pressure (CVP) via internal jugular vein were observed. Tramadol injection was given 1 mg/kg before incision. A train-of-four (TOF) count of 1 or less as the levels of neuromuscular blockade were maintained. CVP was maintained at less than 4 mmHg until resection of the lobe with goal-directed fluid therapy and titrated according to urinary output. The blood loss was less than a liter and was replaced with the colloid solution. Body-warming device was used throughout the procedure. Ondansetron 4 mg IV was given before extubation to prevent postoperative nausea and vomiting. Extubation was performed smoothly about 25 min after the operation. The patients were kept in a high-dependency unit for 48 h postoperatively and then were shifted to the ward. NRS was less than 4 through the second postoperative day. The rest of the postoperative course was uneventful.

DISCUSSION:

Liver resection, a significant abdominal surgical intervention, comes with its set of potential complications. Bleeding, particularly from the dissected surface, stands out as the most prevalent and concerning complication in liver resection surgeries. Central venous pressure (CVP) plays a pivotal role as the driving pressure in pulmonary circulation. Various factors can contribute to blood loss during liver surgery. The liver, being the largest internal organ with a substantial blood volume, is intersected by major blood vessels, further complicating the surgical procedure [2,3]. Potential risks of surgery are intraoperative hemorrhage, hypotension, coagulopathy, renal failure, and cardiac and pulmonary complications [8]. The hepatic artery operates with a self-regulating mechanism, ensuring a consistent flow despite systemic pressure fluctuations. This enables the liver to function adequately, even under adverse conditions such as hypotension. However, hepatic resection poses the risk of rapid and substantial bleeding early in the surgical procedure. Therefore, it is advisable to maintain a low central venous pressure (CVP) during the resection phase, often achieved with nitroglycerine. [9]. The reduction in intraoperative bleeding allowed a high survival rate [2]. We managed intraoperative CVP of less than 4 mmHg for hepatectomy till the resection of the liver to minimize the blood loss from the surface. Low CVP helps to

decrease blood loss and the size of the inferior vena cava (IVC) [12]. In our cases, clamping of IVC did not result in hypotensive episodes as CVP was kept low. Communication with the surgeon helped in judging the timing of IVC clamping as well as judicious fluid management during this crucial step. The intraoperative blood loss in our cases was about 850 ml. The hemangioma location, size, and ease of surgery might also affect the amount of bleeding. The Pringle maneuver, employed during the resection phase, entails clamping the portal triad. While effective in reducing blood loss, this maneuver increases the risk of warm ischemia and subsequent reperfusion injury to the liver. Such complications can result in significant liver dysfunction and potentially lead to liver failure during the postoperative period. [9].

Monitoring should adhere to ASA practice guidelines. In addition to standard hemodynamic monitoring, specialized monitoring should encompass invasive arterial and central venous pressure (CVP) monitoring, along with cardiac output assessment. Where available, transesophageal echocardiography may also be utilized. Given the potential for rapid blood loss, precautions were taken, including establishing large-bore intravenous access and ensuring the availability of a rapid infuser. [10].

The guidelines advise against the utilization of epidural catheters due to the risk of postoperative liver failure and clotting disorders, which may persist for an extended duration. Consequently, we opted to refrain from using an epidural catheter in our case. Following resection, fluid administration should be managed in a goal-directed manner. [11].

While ERAS programs are not novel, their implementation in liver resection has progressed relatively slowly due to the intricate nature of the procedure and specific concerns requiring careful consideration. Given that ERAS principles for liver resection were initially derived from colonic surgery, further evidence is necessary to validate the advantages of ERAS in liver resection and to customize ERAS components accordingly. In open liver surgery, many ERAS programs employ thoracic epidural analgesia. However, patients undergoing liver surgery often experience temporary coagulopathy postoperatively, which may heighten the risk of spinal hematoma if epidural analgesia is utilized**.** [13]. In our case, we used continuous instillation of the wound with local anesthetics for pain control using an infusion pump, and the pain score was noted periodically with follow-up. This also reduces the pain at rest and helps the patient to perform spirometry for better post-operative lung compliance [14].

Recent studies suggest that the PT/INR are inadequate tests to evaluate coagulopathy in patients undergoing liver surgery [13]. Recent recommendations of ERAS guidelines for liver surgery suggest that a wound infusion catheter is a good alternative and routine thoracic epidural analgesia is not recommended [15]. Restrictive use of surgical site drains after operation is one of the key elements of most ERAS protocols to support early mobilization and reduce postoperative pain and discomfort [16]. Patients should receive venous thromboprophylaxis unless their coagulation profile indicates coagulopathy. Central venous cannulation serves dual purposes: facilitating venous access and addressing the requirement for postoperative parenteral nutrition. Eliminating overnight fasting and implementing carbohydrate loading could alleviate nutritional stress in these patients. Implementing the ERAS protocol is likely to substantially decrease hospitalization duration for the patient. [6].

CONCLUSION:

Liver resection presents challenges due to its complexity and potential complications, notably bleeding. Managing central venous pressure (CVP) is crucial for minimizing intraoperative bleeding risks. While Enhanced Recovery After Surgery (ERAS) protocols have been slow to integrate into liver resection, adapting ERAS principles could enhance perioperative care and expedite recovery. Avoiding epidural catheters and utilizing alternative pain management strategies, such as wound infusion catheters, are recommended. Adherence to ERAS guidelines, including venous thromboprophylaxis and carbohydrate loading, holds

promise for optimizing outcomes and reducing hospitalization duration. Multidisciplinary collaboration and ongoing research efforts are imperative for refining perioperative strategies in liver resection.

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