

# ANAESTHETIC MANAGEMENT IN HEPATIC RESECTION – A CASE REPORT

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## Abstract

This case report describes the anesthesia management of a 60-year-old female undergoing scheduled right hepatectomy for a multilocular hydatid cyst. Preoperatively, the patient presented with abdominal pain, fever, and a history of systemic hypertension, classified as ASA II. Anesthesia was induced using a combination of intravenous agents and supplemented with thoracic epidural analgesia for intraoperative pain control. Continuous monitoring of hemodynamic parameters was performed, and adjustments were made to maintain stable blood pressure. Intraoperatively, the patient experienced hypotensive episodes requiring noradrenaline infusion and received blood transfusions due to significant blood loss. A diaphragmatic tear was noted during surgery, necessitating intercostal drainage tube placement. Postoperative analgesia was provided through epidural infusion, and the patient was extubated on postoperative day 1 in the Surgical Intensive Care Unit (SICU) before being transferred to the general ward after a three-day recovery period. This case underscores the importance of comprehensive perioperative management in hepatic surgery, including effective pain control, meticulous hemodynamic monitoring, and prompt recognition and management of intraoperative complications.

**Keywords:** General anesthesia, liver resection, Hepatectomy, Analgesia.

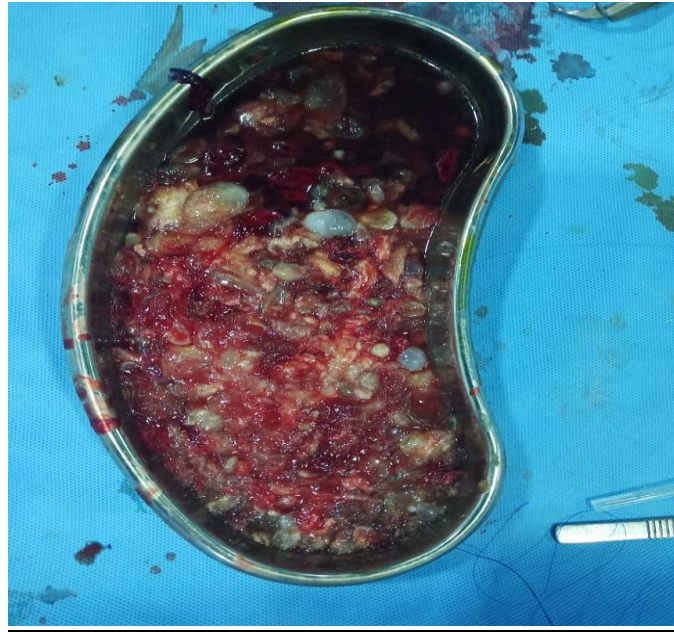
## INTRODUCTION

Liver resection, a significant abdominal surgical procedure, is accompanied by its fair share of perioperative complications. Historically, during the 1970s, the perioperative mortality rate for liver resection was alarmingly high, hovering around 20%.<sup>1</sup> This grim statistic was primarily attributed to challenges such as uncontrollable bleeding and postoperative liver failure. However, with the evolution of medical science and surgical techniques, there has been a noteworthy transformation in the landscape of liver resection outcomes. The pivotal role of a multidisciplinary team cannot be overstated in the successful management of liver resection cases.<sup>2</sup> This entails a collaborative approach involving surgeons, anesthesiologists, hepatologists, and other allied healthcare professionals. The cornerstone of this approach lies in meticulous preoperative planning, which lays the foundation for a streamlined perioperative course and optimal patient outcomes.<sup>3</sup> Advancements in surgical techniques have played a pivotal role in mitigating the once ominous perioperative mortality rates associated with liver resection. Thanks to these advancements, the mortality rate has plummeted to as low as 3%, marking a remarkable improvement in patient safety and postoperative recovery.<sup>4</sup> This paradigm shift underscores the significance of embracing innovation and staying abreast of cutting-edge developments in the field of liver surgery. One of the defining features of liver surgery lies in striking a delicate balance between adequate resuscitation and meticulous surgical technique. Ensuring proper end-organ perfusion is paramount, necessitating careful attention to fluid management and hemodynamic optimization. However, this must be juxtaposed with the imperative to maintain a low central venous pressure (CVP) during the parenchymal transection phase. This serves to minimize hepatic venous back bleeding, a critical consideration that underscores the intricacies of liver surgery. This

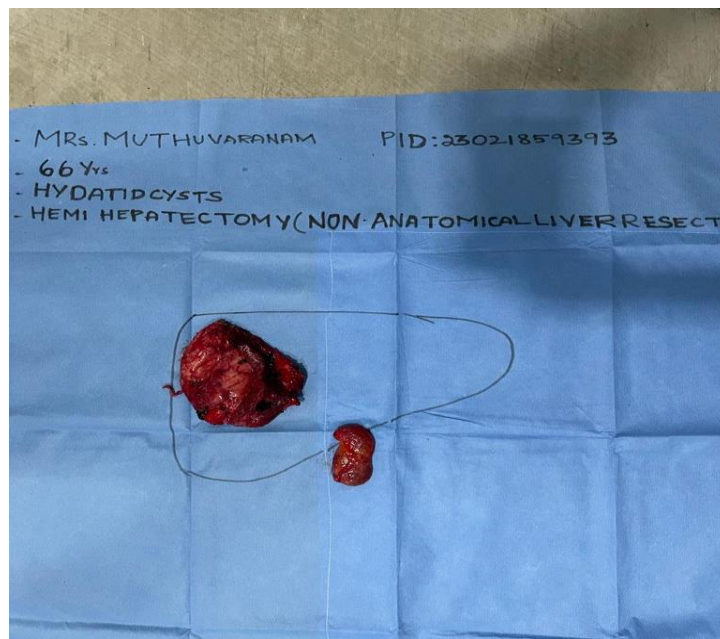
case report provides valuable information about the intricacies of anesthetic management specific to this procedure.

## CASE REPORT

A 60-year-old female underwent a scheduled right hepatectomy procedure for the management of a multilocular hydatid cyst. Upon presentation to the surgical gastroenterology department, she reported symptoms of abdominal pain accompanied by fever. The patient had a medical history of systemic hypertension and was classified as ASA II according to the American Society of Anesthesiologists Physical Status Classification System. Surgical intervention was planned under the administration of general anesthesia with adjunct thoracic epidural analgesia. Following the transfer of the patient to the operating theatre, electrocardiogram (ECG), non-invasive blood pressure (NIBP), and pulse oximetry monitors were affixed. Intravenous access was established using two 18 G cannulas in each upper limb. Employing aseptic techniques, an epidural catheter was inserted at the T10-T11 interspace and positioned 7.5 cm within the epidural space. Following negative aspiration for blood and cerebrospinal fluid, a test dose consisting of 3 ml of 2% lignocaine with adrenaline was administered. Subsequently, 8 ml of 0.5% bupivacaine was injected five minutes post the test dose. Preceding anesthesia induction, the patient received pretreatment comprising intravenous administration of midazolam (1 mg) and glycopyrrolate (0.2 mg). Anesthesia induction was initiated with the intravenous administration of fentanyl (100 mcg), propofol (120 mg), and vecuronium (6 mg), followed by endotracheal intubation utilizing a 7.0 endotracheal tube (orotracheal). Continuous blood pressure monitoring was facilitated through left radial artery catheterization employing a 20G cannula, while a central venous catheter was inserted into the right internal jugular vein for central venous pressure monitoring, maintaining it below 5 cm H<sub>2</sub>O. Anesthesia maintenance was accomplished utilizing a combination of oxygen, nitrous oxide, and isoflurane. Vecuronium bromide was administered for muscle relaxation as needed. Intraoperatively, the patient experienced episodes of hypotension necessitating the initiation of noradrenaline infusion at a concentration of 0.08 mg/ml, with dose adjustments made to maintain a mean arterial pressure (MAP) of 70 mmHg. Additionally, blood products including 3 units of packed red blood cells (PRBC), 2 units of fresh frozen plasma, and 2 units of platelets were transfused due to an intraoperative blood loss of 2500 ml. Notably, a diaphragmatic tear was observed during the surgical procedure, prompting the placement of an intercostal drainage tube. The duration of the surgical intervention lasted approximately 6 hours. Given the protracted duration of surgery and substantial blood loss, the decision was made to forego extubation, and the patient was transferred to the Surgical Intensive Care Unit (SICU) for postoperative management. Postoperative analgesia was provided through the administration of epidural infusion. The patient was successfully extubated on postoperative day 1 while in the SICU and was subsequently transferred to the general ward after a three-day recovery period. Figure 1 shows the specimen with multiple daughter cyst. Figure 2 shows the resected liver specimen.



**Figure 1: Specimen showing multiple daughter cyst**



**Figure 2: Resected liver specimen**

## DISCUSSION

This case report underscores the importance of a comprehensive anesthesia management approach in hepatic surgery, encompassing preoperative assessment, intraoperative monitoring, and postoperative care. Effective pain management, meticulous hemodynamic monitoring, and prompt recognition and management of intraoperative complications are essential elements in optimizing outcomes for patients undergoing hepatic resection. Further research and clinical experience are warranted to refine perioperative management strategies and improve outcomes in this patient population.

Throughout the surgical intervention, meticulous monitoring and management of hemodynamic parameters were crucial. Continuous monitoring of ECG, NIBP, pulse oximetry, and invasive blood pressure via radial artery catheterization facilitated prompt identification and management of any hemodynamic fluctuations. Additionally, central venous pressure (CVP) monitoring provided valuable information regarding the patient's volume status and guided fluid management strategies. Maintaining CVP below 5 cm H<sub>2</sub>O helped minimize venous congestion and optimize cardiac output, crucial considerations in hepatic surgery where fluctuations in blood volume and central venous pressure can impact hepatic blood flow and contribute to bleeding complications. The intraoperative course was marked by significant blood loss necessitating transfusion of blood products, including packed red blood cells, fresh frozen plasma, and platelets. The decision to transfuse was likely influenced by the magnitude of blood loss and the need to maintain adequate tissue perfusion and oxygen delivery. Despite aggressive resuscitative measures, the patient experienced episodes of hypotension, requiring the initiation of noradrenaline infusion to maintain a mean arterial pressure (MAP) of 70 mmHg. This highlights the delicate balance between optimizing tissue perfusion and minimizing bleeding risks in hepatic surgery, where maintaining stable hemodynamics is paramount to ensure adequate organ perfusion while minimizing blood loss.

The identification of a diaphragmatic tear during the surgical procedure underscores the potential for intraoperative complications in hepatic surgery and the importance of prompt recognition and management. Placement of an intercostal drainage tube facilitated the evacuation of any intra-abdominal air or fluid, reducing the risk of postoperative complications such as pneumothorax or pleural effusion. Given the prolonged duration of surgery and significant blood loss, the decision to defer extubation and transfer the patient to the Surgical Intensive Care Unit (SICU) for postoperative management was appropriate. Postoperative analgesia provided through epidural infusion contributed to effective pain control and improved patient comfort during the recovery phase. Successful extubation on postoperative day 1 and subsequent transfer to the general ward after a three-day recovery period highlight the patient's overall favorable postoperative course.

Liver resection represents a significant abdominal surgical intervention accompanied by inherent complications. The adoption of a multidisciplinary team approach alongside meticulous preoperative planning is paramount.<sup>3,4</sup> The evolution of anesthetic and surgical technologies, coupled with a deep understanding of pathophysiology, has contributed to enhancing the safety profile of liver resection, resulting in reduced morbidity and mortality rates. Notably, advancements in intraoperative bleeding management have significantly improved survival outcomes. Bleeding emerges as a prevalent and concerning complication in liver resection procedures, stemming from various factors such as the liver's considerable size, extensive vascular network, and the complexity of the surgical interventions.<sup>5,6</sup> The adoption of a standardized nomenclature for liver resection procedures, established through expert consensus, has facilitated communication and understanding within the medical community. Surgical interventions on the liver encompass various approaches, including lobar and segmental resections, each tailored to specific clinical scenarios. Indications for hepatic resection encompass both malignant and benign hepatobiliary tumors, living donor hepatic transplantation, and trauma. Despite advancements, surgical risks persist, including intraoperative hemorrhage,

hypotension, coagulopathy, renal failure, and cardiopulmonary complications. The liver's dual blood supply confers resilience to ischemic insults, enabling it to function adequately under challenging circumstances.<sup>7</sup>

Anesthesia management during hepatic resection requires meticulous attention to hemodynamic stability, with the maintenance of low central venous pressure (CVP) playing a crucial role in mitigating blood loss and optimizing outcomes. The Pringle maneuver, aimed at limiting hepatic blood flow, serves as a strategy to minimize intraoperative bleeding but poses risks of warm ischemia-reperfusion injury.<sup>7</sup> Various hepatic vascular control techniques, including inflow and outflow vascular occlusion, offer additional strategies to manage bleeding during liver resection.<sup>8</sup> Notably, the choice between intermittent clamping (IC) and ischemic preconditioning (IP) techniques remains debatable, with each offering distinct advantages in specific clinical contexts.<sup>9</sup> Recent studies have demonstrated the utility of stroke volume variation (SVV) and changes in systolic pressure as alternatives to central venous pressure (CVP) monitoring during surgery.<sup>10</sup> These parameters aid in maintaining stable hemodynamics by minimizing fluctuations. Fluid overload can exert pressure on the endothelial surface, potentially causing liver damage and impairing fluid and neutrophil passage. Additionally, it is advisable to avoid positive end-expiratory pressure (PEEP) and take measures to prevent hypothermia during major surgical procedures.<sup>11-14</sup>

Patients undergoing neoadjuvant chemotherapy require tailored anesthesia management due to potential cardiovascular compromise. Despite efforts to optimize surgical outcomes, perioperative complications persist, underscoring the importance of adherence to evidence-based protocols and continuous refinement of surgical techniques in liver resection surgeries.<sup>15</sup> Additionally, advancements in postoperative analgesia, such as thoracic epidural analgesia and intrathecal opioids, contribute to enhanced recovery after surgery (ERAS) protocols in liver resection patients.<sup>15</sup> It is imperative for anesthesia providers to remain updated on evolving surgical techniques and adhere to protocol-driven approaches to minimize morbidity and mortality in liver resection surgeries.

## CONCLUSION

The case report detailing the anesthesia management in hepatic resection underscores the complexity and challenges associated with this surgical procedure. Liver resection, a major abdominal surgery, demands a multidisciplinary approach and meticulous preoperative planning to optimize patient outcomes. Advancements in anesthetic and surgical technologies, coupled with a deep understanding of liver pathophysiology, have contributed to improved safety profiles and reduced morbidity and mortality rates in hepatic resection. The management of intraoperative bleeding, a common and feared complication, requires careful consideration of various techniques such as the Pringle maneuver, hepatic vascular control methods, and ischemic preconditioning. Anesthesia management plays a crucial role in maintaining hemodynamic stability, optimizing fluid management, and ensuring adequate pain control. Despite advancements, perioperative complications persist, highlighting the need for continuous refinement of surgical techniques and adherence to evidence-based protocols. Moving forward, further research and advancements in perioperative care are warranted to continue improving outcomes in hepatic resection surgeries.

## Patient Perspective:

### Informed Consent:

Informed consent was obtained from the patient described in this case report prior to the scheduled right hepatectomy procedure for the management of a multilocular hydatid cyst. The patient was provided with detailed information regarding the nature of the surgery, including its purpose, potential risks, benefits, and alternative treatment options. Additionally, the patient was informed about the anesthesia management plan, including the use of general anesthesia with adjunct thoracic epidural analgesia, and the associated risks and benefits.

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