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CASE REPORT **ANESTHESIA & CONCURRENT DISEASE**

Perioperative challenges in the management of a Jehovah's Witness patient undergoing parenchyma sparing hepatectomy

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Abstract

Jehovah's Witness patients presenting for liver surgery pose challenges to the anesthetists as well as the surgeons, due to their abstinence from receiving blood products. Despite this, surgery is the only curative option for operable colorectal liver metastases (CRLM). We report a case of a Jehovah's Witness with multiple comorbidities who had a parenchyma sparing hepatectomy (PSH) complicated by intraoperative bleeding. A 52-year-old ASA II patient with hypertension, diabetes and ischemic heart disease on dual antiplatelet therapy was scheduled for open PSH for multiple bilobar CRLMs. He was prehabilitated with an emphasis on enhancing erythropoiesis and improving his functional capacity. PSH was done using a Cavitron ultrasonic surgical aspirator (CUSA) with intermittent Pringle maneuver, a low central venous pressure and restricted intravenous fluids. His postoperative recovery was complicated by a minor upper gastrointestinal bleed that was managed conservatively.

The authors certify that informed written consent has been obtained from patient for publication.

Keywords: Jehovah's Witness; Liver surgery; Anesthesia; Hepatectomy

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1. Introduction

Jehovah's Witness (JW) is a Christian denomination that abstains from transfusion of allogenic whole blood and its components as per their religious belief.[1] It poses challenges during major surgery with the potential for increased morbidity and mortality.[2] The clinician is confronted with the clinical and ethical dilemma of simultaneously respecting the patient's autonomy while ensuring safety and standard of care. [3,4]

Surgery is the only curative option for colorectal liver metastases (CRLM) with good long-term survival. Although technically challenging and time consuming, parenchyma sparing hepatectomy (PSH) is increasingly being used for CRLM,[5,6] especially in the presence of bilobar, multi-segmental disease.

Preoperative optimization of erythropoiesis, improvement of functional reserves, review of medication and meticulous planning of surgery, help

minimize the need for transfusion. Clarification of patient requirements, documentation of acceptable interventions and obtaining informed consent are essential preoperative tasks. The advance directive in the possession of the Jehovah's Witnesses guides decision making.[3,4]

Elective liver resections in JW patients have been performed in high volume liver surgery centers with good outcomes.[2,7] This case report highlights the successful outcome of a PSH for multiple CRLMs in a JW patient with cardiovascular risk factors, in a resource limited, low volume hepatobiliary surgical unit, during the Covid-19 pandemic.

2. Case Report

A 52-year-old, ASA II male, with bilobar CRLM presented for a PSH after 6 months of neoadjuvant chemotherapy (NAT). While on NAT he sustained a non-ST-elevation myocardial infarction (NSTEMI) and was started on dual antiplatelet therapy. He was also on treatment for hypertension and type II diabetes for two years.

His BMI was 27.6 kg/m^2 and exercise tolerance was more than 4 metabolic equivalents. Preoperative blood pressure was 116/80 mmHg and pulse 68 beats per minute on beta blockers. Systemic examination was unremarkable.

His preoperative hemoglobin was 13.2 g/dl and the platelet count was 145,000/mm^3. His 2D-echocardiogram revealed an ejection fraction of 50-55% with antero-septal dyskinesia and mild apical septal hypokinesia.

Anesthetic review was done six weeks prior to surgery. He was commenced on oral iron supplements and a prehabilitation protocol. A detailed discussion regarding his JW status and possible consequences of abstinence from blood transfusion in the event of perioperative hemorrhage was explained. The advance directive and a JW document detailing acceptable products and modes of treatment were studied. Blood and products, other than cryoprecipitate, human albumin and pharmacological agents such as tranexamic acid, were barred. He refused acute hypervolemic hemodilution but accepted normovolemic hemodilution. Although he consented for cell salvage, but this facility was not available at the time of surgery.

Clopidogrel was withheld a week prior to surgery. He was prescribed oral paracetamol as pre-emptive analgesia and received his prescribed medication except the morning dose of oral hypoglycemics.

Following the surgical safety checklist and theatre brief, a 16G cannula was inserted and 500 ml of compound sodium lactate solution was infused slowly through the fluid warmer. Standard AAGBI monitoring was commenced. A thoracic epidural was inserted at T8 intervertebral space using an 18G Touhy needle. A test dose of 0.5% plain bupivacaine 3 ml was given through the epidural catheter. Following preoxygenation, anesthesia was induced with 100 μg fentanyl, 30 mg of ketamine, 130 mg of propofol and 40 mg of atracurium. He was intubated, and anesthesia was maintained with isoflurane targeting a MAC of more than 0.8. He received 7.5 mg morphine intraoperatively. Atracurium was repeated at 20–30 min intervals. Epidural bupivacaine was not commenced intra-operatively in anticipation of a drop in blood pressure secondary to vasodilatation.

A triple lumen central venous catheter was inserted into the right internal jugular vein under ultrasound guidance. The right radial artery was cannulated with a 20G catheter and invasive blood pressure and trend in central venous pressure (CVP) monitoring was commenced. Initial CVP was 12 mmHg. Core and peripheral temperatures were monitored throughout the surgery to maintain a core-peripheral temperature gradient of less than 2^0 C. Lungs were ventilated using tidal volumes of 6-8 ml/kg and a respiratory rate of 12 breaths per minute with volume-controlled ventilation and a positive end expiratory pressure (PEEP) of 5 cmH_2O. PEEP was set to zero at the time of resection.

Ten metastatic deposits confirmed by intraoperative ultrasonography in segments VII, VII, VI, VIA, IVB (Figure 1) and III were excised using the Cavitron ultrasonic surgical aspirator (CUSA) (Figure 2) with intermittent 15-min Pringle maneuvers and 5 min off.

The physiological response to the Pringle maneuvers was evident by an increase in blood pressure and the reverse was observed with the release of clamps accompanied by

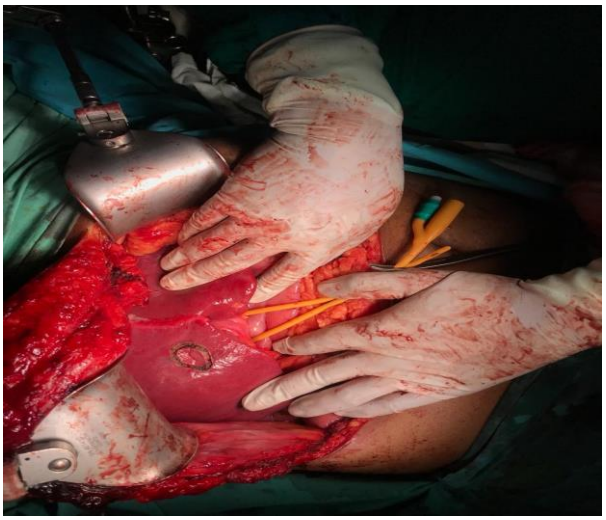

Figure 1: Pringle tape and segment IVB lesion marked with diathermy

an increase in end-tidal carbon dioxide. Inhalational agent concentration was increased during clamping and reduced with un-clamping. The respiratory rate was increased accordingly to maintain normocarbia. The total Pringle time was 120 min.

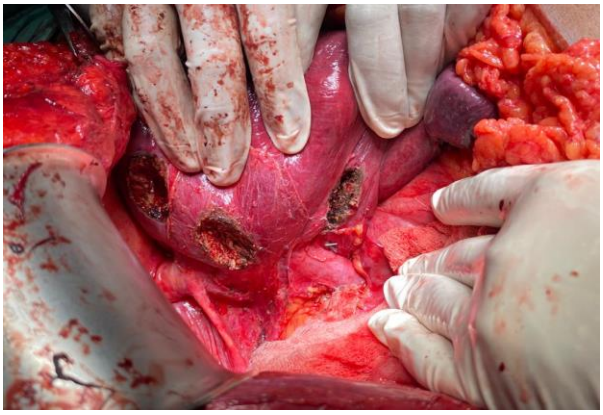

Figure 2: Parenchyma sparing multiple non-anatomical resections

The CVP was maintained below 5 mmHg by increasing the depth of anesthesia with isoflurane during parenchymal resection and restriction of intravenous fluid to a total of 500 ml. He required a noradrenaline infusion during resection to maintain a mean arterial pressure (MAP) of 80 mmHg. A venous bleed during surgery was managed by transfusing 10 units of cryoprecipitate and 500 ml of 4% albumin in saline solution, without significant changes in vital parameters. Blood sugar was maintained between 140-180 mg/dl with a variable rate insulin infusion.

Intra-operative blood loss was 1550 ml with an operative duration of 7 ½ h and total Pringle time of 2 h.

He was transferred to the intensive care unit and extubated 10 h later. Epidural bupivacaine and fentanyl infusion together with regular paracetamol was prescribed during the postoperative period.

He developed a minor upper gastrointestinal bleed on the 2nd postoperative day which was managed with an infusion of proton pump inhibitors and temporary withholding of aspirin and enoxaparin that had been commenced after surgery. To minimize iatrogenic blood loss an arterial blood gas analysis and a full blood count were the only investigations performed postoperatively. He had an otherwise normal recovery and was discharged from hospital on the tenth postoperative day.

3. Discussion

Preparation of a Jehovah's Witness patient presenting for major surgery can mitigate the risks of intraoperative bleeding.[8] A multidisciplinary approach and involvement of the patient facilitates preoperative optimization of hemoglobin and iron reserves and, minimizes the risk and consequences of intraoperative blood loss. While clopidogrel use is discontinued at least a week before surgery, continuation of low dose aspirin is cardio–protective with negligible effects on blood loss.

Although acute normovolemic hemodilution (ANH) is acceptable to JWs, it was not employed in this patient owing to his compromised cardiac status. Furthermore, derangements in platelet aggregation,[9] dilutional coagulopathy and higher CVP due to crystalloid replacement in ANH could increase blood loss during parenchymal transection.

A low CVP of less than 5 mmHg reduces hepatic venous bleeding.[10] This was achieved by increasing the inhalational agent concentration and restricting intravenous fluids.[11] Vasodilatation induced by volatile agents was counteracted by a low dose noradrenaline infusion to maintain systemic arterial perfusion.

Intermittent vascular inflow occlusion using the Pringle maneuver reduces blood loss. Despite the patient's cardiac status, he tolerated a total Pringle time of 120 min with five- minute Pringle free intervals. The MAP was increased by 15-20% during this maneuver in our patient. We reduced the infusion rate of noradrenaline during occlusion and increased the volatile agent concentration to obtund the rise in MAP.

As in this case, unexpected blood loss is not uncommon during liver surgery and in the absence of cell salvage, we utilized 10 units of cryoprecipitate and 500 ml of 4% albumin in saline solution to replace volume. His intraoperative fluid intake was restricted to 1500 ml to minimize a post-hemorrhagic dilutional coagulopathy secondary to excessive fluid administration.

4. Conclusion

Liver surgery in a Jehovah's Witness patient is a challenge, especially in low-volume, limited resource centers. However, meticulous planning and optimization of the patient's physiological reserves and judicious intraoperative care enables safe surgery. Shared decision making with the patient leads to good outcomes.

5. Conflict of Interest

The authors declare no conflicts of interest regarding the publication of this paper. No funding was involved in the management of this patient.

6. Authors' contribution

VD: concept, preparing the manuscript, editing, patient management

SS: revising the manuscript, patient management and final approval

DS, PP: patient management and editing

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