Case Report

DOI: 10.7860/JCDR/2024/70916.19723

Anaesthetic Challenges in Paediatric Hepatoblastoma Resection: A Case Report

Anaesthesia Section

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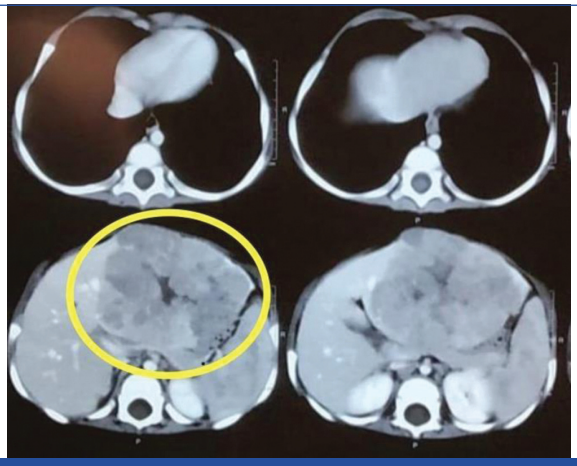
ABSTRACT

The most common primary liver tumour in children is hepatoblastoma, which is often diagnosed in the first three years of life. While the majority of hepatoblastomas are sporadic, some associations are reported with genetic disorders like Beckwith-Wiedemann syndrome and familial adenomatous polyposis. The annual incidence of hepatoblastoma in children has gradually increased during the past three decades. Babies born prematurely, weighing <1 kg, have been found to be significantly more likely to acquire hepatoblastoma. The most common symptoms with which children present are abdominal discomfort, easy fatigability, loss of appetite, and anaemia. The choice of treatment is surgical resection of the mass or surgical resection coupled with chemotherapy. Present case is of a seven-month-old, 7 kg infant who presented with a gradually increasing abdominal mass diagnosed as hepatoblastoma. Left hepatectomy was done under general anaesthesia and epidural analgesia. Liver resection is one of the major surgical procedures that carries a risk of blood loss and pulmonary embolism, but improved expertise in paediatric anaesthesia and surgical skills have reduced operative risk. The challenges in this case were securing vascular access, maintaining blood volume with considerable fluid and blood loss, and assuring haemodynamic stability. Maintenance of normothermia, glucose levels, and effective pain management were all crucial, necessitating careful planning and a multidisciplinary approach to maximise results and guarantee patient safety.

Keywords: Anaesthesia, Epidural analgesia, Hepatectomy

CASE REPORT

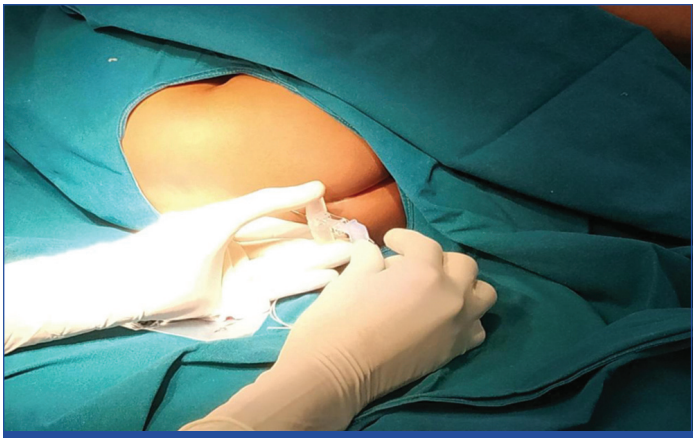
A seven-month-old male infant, weighing 7.2 kg and with a height of 67.2 cm, born at term, presented with a complaint of progressively increasing upper abdominal swelling over the past month. On examination, the infant was alert and active. General physical examination revealed pallor but no other physical or airway abnormalities. Abdominal examination suggested a palpable mass in the epigastrium and right hypochondrium, 8 cm below the right costal margin. Contrast enhanced Computed Tomography (CECT) revealed a lobulated hypodense lesion measuring 74×64×75 mm involving almost the entire left lobe of the liver with heterogeneous enhancement on arterial, portal, and venous phases, as well as splenomegaly with enlargement to 7-9 cm [Table/Fig-1]. The serum alpha-fetoprotein level was elevated to more than 20,000 ng/mL. The infant was scheduled for a left hepatectomy. Preoperative assessment revealed anaemia (Hb 6.3 gm/dL). After receiving a preoperative transfusion of 10 mL/kg of Packed Red Blood Cells (PRBC) in two aliquots over 72 hours, the Hb level increased to 10.3 gm/dL. Airway, systemic examination, and other parameters, including liver function tests, coagulation profile, and blood sugar levels, were within normal limits. Preoperative Echocardiography was normal. The infant was classified as American Society of Anesthesiologists (ASA) grade 3 with high-risk for left hepatectomy.



[Table/Fig-1]: CT scan of a patient with hepatoblastoma in the left hepatic lobe.

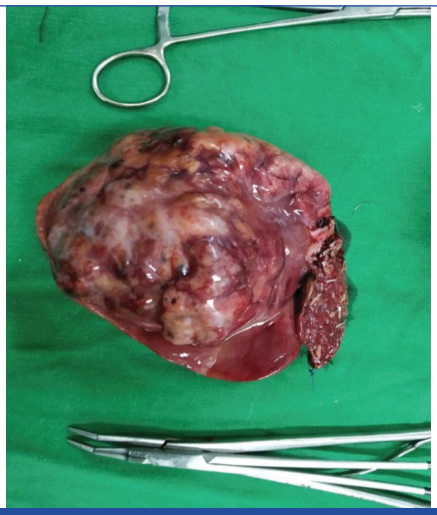
After a complete work-up, the parents were counseled in detail, explained about the rarity of the condition, the extent of the tumour, and the need for hepatectomy. Informed consent was obtained for the supra major surgical procedure, intraoperative haemodynamic compromise, and massive blood loss. In the operating theatre, all standard monitors were attached, and general anaesthesia was induced with the inhalational agent sevoflurane at 2-2.5 vol% plus oxygen in a 60:40 ratio with air. A peripheral line with a 22 G intravenous cannula was secured on the left hand. Injections of glycopyrrolate 4 µg/kg i.v., midazolam 0.01 mg/kg i.v., and fentanyl 2 µg/kg i.v. were administered, and endotracheal intubation was performed using a size 4 mm internal diameter uncuffed endotracheal tube after administering injection atracurium 3.5 mg (0.5 mg/kg). Central venous access using a 5 Fr triple lumen central line via the right internal jugular vein was established, and central venous pressure monitoring was initiated. The right radial artery was cannulated with a 22 G arterial catheter, and invasive arterial pressure monitoring was started. The baseline arterial blood gas was normal. A 21-gauge epidural catheter was placed using a 19 G Tuohy's needle in the caudal space and fixed at 7 cm from the skin, and an injection of Bupivacaine 0.25% 7 mL was administered [Table/Fig-2].

Balanced anaesthesia was maintained with O_2, air, and sevoflurane, intermittent injection of atracurium, and a 0.125% injection of bupivacaine at a rate of 4 mL/hr for epidural infusion intraoperatively. Hypothermia was avoided by using a warming mattress and warm i.v. fluids. During the liver resection, a low Central Venous Pressure (CVP) was maintained by restricting i.v. fluids. Blood sugar levels, urine output, and blood loss were monitored. A total blood loss of 200 mL, urine output of 200 mL, and other fluid losses were replaced with crystalloids and 130 mL of PRBC. No major haemodynamic



[Table/Fig-2]: Putting caudal epidural catheter after induction.

perturbations occurred intraoperatively. The resected part of the liver with a mass is shown in [Table/Fig-3]. The patient was extubated on the table after the reversal of neuromuscular blockade using injection neostigmine (0.05 mg/kg) and injection glycopyrrolate (0.008 mg/kg). Postoperatively, an epidural infusion was started with injection fentanyl at a rate of 4 µg/hour. There was an increase in liver enzymes and slight derangement of the coagulation profile (INR increased to 1.5) on postoperative day 1, which gradually normalised. The epidural catheter was removed after 72 hours upon confirmation of a normal coagulation profile and platelet count. The patient resumed oral feeds on postoperative day 4 and had an uneventful recovery.



[Table/Fig-3]: Resected mass of hepatoblastoma.

DISCUSSION

Liver tumours in children represent a relatively small percentage of all childhood malignancies. The most common types are hepatoblastoma and hepatocellular carcinoma [1]. Hepatoblastoma typically affects Caucasian boys younger than two years old with low birth weight. It presents as an increasing abdominal mass, occasionally accompanied by anaemia, jaundice, and ascites. Liver function tests are usually normal [1]. There is a known association with Beckwith-Wiedemann syndrome and familial adenomatous polyposis [2].

In the present case, there were several noteworthy difficulties. It was extremely challenging to secure vascular access in an infant with small, fragile veins to place a central venous catheter, necessary for drug administration and central venous pressure monitoring. Precise haemodynamic regulation required invasive arterial blood pressure monitoring. Due to the potential for significant fluid and blood loss from liver resection, maintaining haemodynamic stability and managing blood volume were essential, requiring meticulous monitoring and replacement procedures. The infant's vulnerability to hypothermia and hypoglycaemia made maintaining normothermia and steady glucose levels significantly more important. Effective pain management was also a priority, achieved by the placement of an epidural catheter. Similar anaesthetic management difficulties were found in other studies in the literature [3]. Hussain SY et al., and Mogane PN and Motshabi-Chakane P have suggested that anaesthetic management for infantile hepatoblastoma involves several unique challenges, such as securing central venous and arterial access, intraoperative fluid management, managing massive blood loss, controlling postoperative pain, preventing hypothermia, and avoiding air embolism and post-resection liver failure [3,4].

Preoperative investigations include complete blood counts, liver enzymes, serum electrolytes, and alpha-fetoprotein. Radiological investigations include ultrasound, Magnetic Resonance Imaging (MRI), and CT scans. Hepatic resection is performed under general anaesthesia with epidural analgesia. General anaesthesia can be induced with an injection of propofol if i.v. access is present or with inhalational agents like sevoflurane [1]. Muscle relaxants such as cisatracurium, rocuronium, or atracurium are used. The effects of hepatic dysfunction on drug elimination and distribution are not fully understood [1].

Nitrous oxide should be avoided as it causes gut distension and increases the risk of air embolism [4]. The large surface-to-volume ratio of infants, coupled with immature thermoregulatory mechanisms, exposure of body cavities to low environmental temperatures, and ventilation with dry gases, increases the potential for hypothermia. Therefore, preventing hypothermia is crucial [1]. Blood glucose levels should be monitored frequently throughout the procedure [1]. Epidural anaesthesia is essential for both intraoperative and postoperative pain control and also limits the use of volatile anaesthetics during surgery [1].

Factors predisposing to vascular air embolism during liver resection include surgical technique, size, and site of the tumour, blood loss, and low CVP techniques [3]. Sophisticated equipment like the cavitron ultrasonic surgical aspirator is preferred for parenchymal resections in small infants. Perioperative fluid therapy involves the replacement of deficits and third-space losses along with maintenance. A low CVP strategy (less than 5 cm of H_2O) is advocated to minimise hepatic bleeding [5]. Care should be taken when intra-abdominal packs are placed while hepatic resection is underway as there may be i.v. compression resulting in compromised venous return and impaired cardiac output.

CONCLUSION(S)

Hepatoblastoma warrants suspicion in children presenting with symptoms such as an abdominal mass, diminished appetite, general weakness, and elevated alpha-fetoprotein levels. Prior to surgery, a comprehensive assessment, optimisation, and collaborative approach across multiple teams are important to enhance patient outcomes. The anaesthetic management of hepatoblastoma cases undergoing hepatic resections presents complexities, necessitating meticulous planning for intravenous and arterial access, intraoperative fluid administration, and postoperative pain relief. Achieving a delicate equilibrium between organ-protective anaesthesia and stable haemodynamics is paramount for optimal postoperative results. Rigorous monitoring, precise blood transfusion, and recognition of the infant's susceptibility to cardiac arrest, coupled with an understanding of surgical technique, are pivotal for successful outcomes in paediatric hepatic surgery.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Apr 03, 2024
- Manual Googling: Apr 22, 2024
- iThenticate Software: Jun 19, 2024 (10%)

ETYMOLOGY: Author Origin

EMENDATIONS: 6

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Apr 03, 2024**
Date of Peer Review: **Apr 19, 2024**
Date of Acceptance: **Jun 20, 2024**
Date of Publishing: **Aug 01, 2024**