Case Report

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Anaesthetic Management of an Infant Underwent Hepatoblastoma Surgery - A Case Report

Kara G*, Sivgin V and Isik B

Department of Anesthesia and Reanimation, Gazi University Medical Faculty, Ankara, Turkey

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* Corresponding Author

Kara G, MD, Department of Anesthesia and Reanimation, Gazi University Hospital, Ankara, Turkey, Tel: +90 5067195168, E-mail: gizemakbelenkara@gmail.com

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Abstract

Primary liver tumors are rare in childhood. The most common malignant liver tumors under the age of three are hepatoblastomas. Surgical resection is the main choice for the treatment of hepatoblastomas.

Anesthesia management of those cases are debilitating because of prolonged surgery time, impaired hepatic blood flow, bleeding, acute hemodynamic changes, liver ischemia, deterioration of hemostatic mechanisms due to the size of the resected liver tissue, and hemorrhage are the main problems complicating the anesthesia applications in those cases.

In this case report, we aimed to present and discuss the challenges of anesthesia management in a case of a 7-months-old infant who was planned for liver resection due to hepatoblastoma in the light of current literature.

Keywords: Hepatoblastoma; Anesthesia Management; Infant

Introduction

Primary liver tumors are rarely encountered in children. Only 1% of childhood tumors are liver tumors, and a significant portion of them are benign. More than 90% of malignant primary liver tumors seen under the age of five, especially between the ages of 6 months and 3 years, are hepatoblastomas. In recent years, the relationship between hepatoblastoma and VLBW (Very low birth weight) has been pointed out, and it has been suggested that the general increase in the incidence of hepatoblastoma may be related to the increased survival rates of premature babies due to medical care [1]. Infertility treatment, preeclampsia, high maternal pregnancy weight, oligohydramnios/polyhydramnios, parent's tobacco use or occupational exposure to petroleum and its products, paint and pigment products, iron, lead, tin, and copper have been reported as risk factors [1,2]. Smoking during pregnancy is shown to increase the frequency of hepatoblastoma indirectly by causing low birth weight and directly by its teratogenic effects. Oxygen therapy and the use of furosemide have been reported as perinatal risk factors that predispose infants to the development of hepatoblastoma in very low-weight infants (VLBs) [3].

Hepatoblastoma is an embryonal liver tumor and is thought to develop from liver stem cells. It is known that the frequency of hepatoblastoma increases in patients with Beckwith-Wiedemann syndrome, hemihypertrophy, Trisomy 18 (Edward's syndrome), and familial adenomatous polyposis [4].

Hepatoblastoma in children is often noticed during health check-ups or by the family because of swelling in the right quadrant. Although a palpable mass can be detected when it is small, with a careful examination in the early period, since it grows rapidly, the mass and swelling in the abdomen become obvious in a short time. Whereas nonspecific symptoms such as loss of appetite, nausea, vomiting and weight loss may be seen in some hepatoblastoma cases, jaundice is a rare finding. Blood tests reveal high AFP (α-fetoprotein) levels in 90% of cases [5].

The treatment of hepatoblastomas is surgical resection [6]. Surgery aims to maintain sufficient healthy liver tissue and to ensure a clean surgical margin with minimal blood loss. Complete resection of the liver is the first-line treatment in early-stage hepatoblastoma with localized lesions. However, a significant proportion of patients with unresectable lesions require preoperative chemotherapy.

Since the liver takes 25% of the total cardiac output, it provides volume support to the heart in severe hemorrhagic and hypovolemic conditions. Therefore, it is difficult to maintain stable hemodynamic conditions in liver surgeries [7]. Moreover, liver function can be adversely affected, in terms of carbohydrate, fat, protein, mineral and vitamin metabolism, synthesis of plasma proteins, conversion of excess amino acids to urea, bile synthesis and secretion, detoxification of toxic substances, and hematopoiesis. In these cases, long surgical time, ischemia due to long clamp times in the liver, acute and excessive blood loss, postoperative hemorrhagic syndrome, bile leakage, and liver failure need to be managed by anesthetists.

In this case, we aimed to present the anesthesia management of an elective liver resection due to hepatoblastoma and to discuss the challenges in light of the current literature.

Case Report

Our patient was scheduled for liver resection with the diagnosis of hepatoblastoma; A 7-month-old baby girl weighing 7 kg. When she was 1 month old, it was noticed that there was a palpable mass in the liver in her routine control. The pre-diagnosis of hemangioma was made with USG and she was followed up. At the age of six months, liver biopsy was performed because the mass grew very rapidly and the alpha-feto protein (AFP) level was very high (991 ng/mL). The diagnosis of epithelial pattern hepatoblastoma was made in Tru-cut biopsy and she was referred to Gazi University, Department of Pediatric Surgery. Preoperative liver ultrasonography revealed a 62x61 x45 mm mass in segment 6 and its relationship with the right portal vein (Figures 1 and 2). On computed tomography imaging, in segments 5 and 6 localization, "a mass lesion with a volume of 95 cc with exotic extension to the inferior, 70x50 mm in size at its widest point, with intense contrast in the early arterial phase and wash-out in the late phase, and whose borders can hardly be separated from the parenchyma." tracked. It is noted that the mass lesion springs the right hepatic vein posteriorly and the inferior branch of the right hepatic artery extends into the mass (Figures 3 and 4).

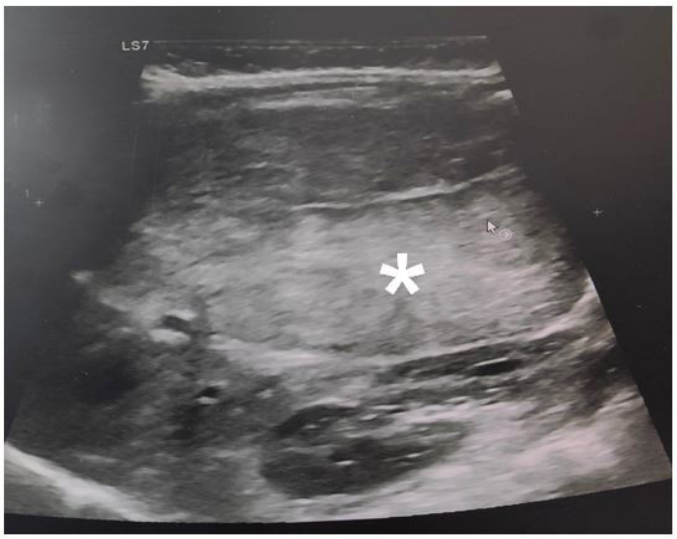

Figure 1: B mode liver ultrasonography image, the asterisk indicates the mass

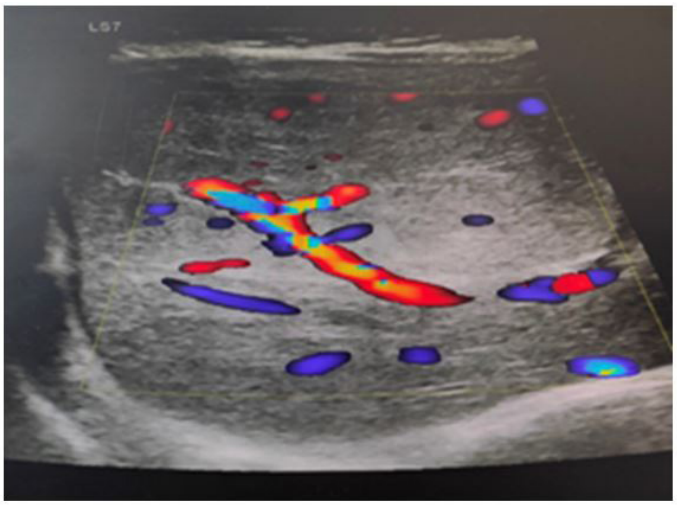

Figure 2: Doppler mode liver ultrasonography image

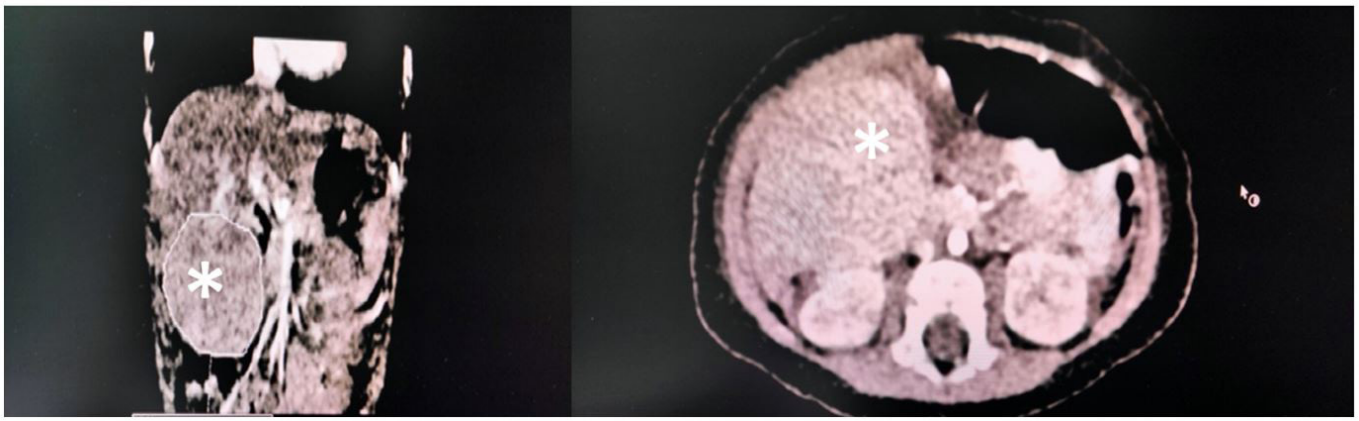

Figure 3: Computed tomography images of the mass, asterisks indicate the mass in coronal and axial planes

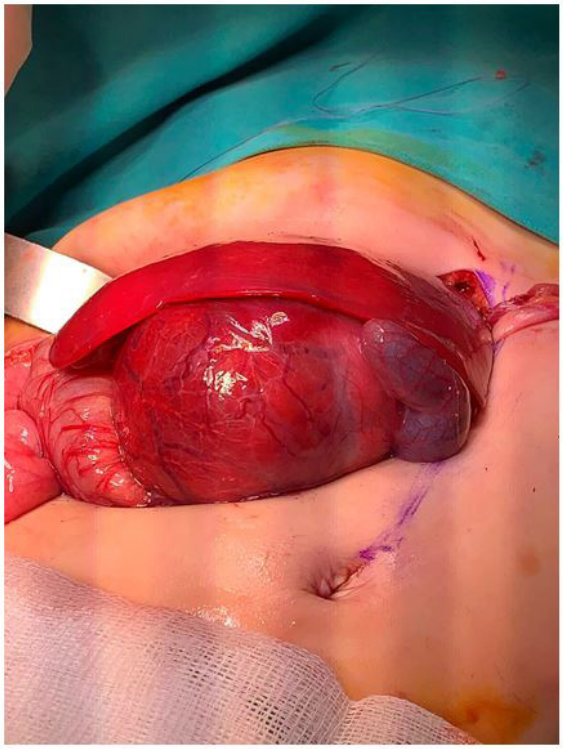

Figure 4: The appearance of a mass that completely fills the left lobe of the liver

Organ system functions, complete blood count (CBC), functional liver biomarkers, coagulation parameters, and fasting blood sugar were found within normal limits in the patient who was evaluated in the anesthesia outpatient clinic after right hepatectomy was planned by pediatric surgeons. It was evaluated as ASA-III according to ASA (American Society of Anesthesiology) clinical risk classification system.

Before the operation, a 4-hour fasting period was provided for breast milk and concentrated formula, and hydration was started with fluid containing 1% dextrose from the peripheral intravenous line. A single dose of 1 mg of vitamin K was administered.

When the patient is taken to the operating room, vital functions were monitored by ECG and pulse oximetry. Underfloor heating was used to avoid hypothermia. After inhalation induction with sevoflurane, muscle relaxation was achieved with 5 mg of rocuronium. For analgesia, 0.2 mcg/kg/min remifentanil infusion was started, and EtCO2 was monitored by orotracheal intubation with a number 4 cuffed tube. Tidal volume: 70 mL; respiratory rate per minute:30, PEEP:4cmH2O, Ti/TE :1/1.9 Mechanical ventilation was started with FiO2: 45% and Flow: 2 mL/min. Anesthesia was maintained with sevoflurane and remifentanil.

After right radial artery cannulation, invasive blood pressure monitoring was started. Central venous access was achieved with ultrasound-guided right internal jugular vein catheterization. The bladder was emptied by inserting a urinary catheter, and hourly urine monitoring was started.

After the surgical sterilization procedures, the abdomen was opened with a right subcostal incision. A mass of 8x8 cm in diameter, completely filling the left lobe of the liver, adherent to the gallbladder, extending to the liver parenchyma with unclear borders was observed (Figure 3). The liver was freed by excision of the falciform ligaments and triangular ligaments. The gallbladder was freed from the mass and Callot's triangle was exposed. Cholecystectomy was performed, after which the right hepatic vein and hepatic artery were clamped. The mass was excised with a solid margin of 1 cm. Right hepatectomy, including liver segments 5, 6, 7, and 8, was performed.

During the operation, which lasted 190 minutes, the right hepatic artery and portal vein were clamped for 70 minutes. 200 mL of 1% dextrose and 250 mL of crystalloid were given. Erythrocyte suspension (ES) transfusion was started with the onset of surgical bleeding in the patient whose initial Hb value was 8.8 g/dL. Hemodynamic balance was maintained by intermittent replacement of a total of 55 mL of ES with monitoring of bleeding from the surgical field, Hb monitoring from arterial blood sample, and close invasive blood pressure monitoring. In order to keep the decrease in hepatic blood flow at a minimal level, pH and pCO2 monitoring was performed. (PH: 7.30, 7.28, 7.27,7.19 → 5 mL $NaHCO_3$ was given. CO2:33.5, 31.6, 38.7, 33.9).

Hemodynamic stabilization was achieved although it was a major surgical procedure with high hemodynamic concerns. Right hepatectomy and cholecystectomy surgery were performed successfully. In order to provide analgesia, IV 1 mg of morphine and 4 mL of 0.25% bupivacaine were administered to the incision line without terminating anesthesia.

The patient was extubated at the end of the operation and followed up in the recovery unit without any problem. He was discharged to the inpatient clinic of pediatric surgery department.

Discussion

Hepatoblastoma is a rare malignancy in childhood. The important and difficult surgery, the high risk of bleeding, the long ischemia time and the size of the mass make anesthesia applications difficult.

Acute and severe bleeding may occur in surgical resection of hepatoblastoma. For this reason, it is important to monitor both the surgical field and invasive arterial monitoring and "beat to beat" blood pressure. Central venous pressure (CVP) is used to monitor intravascular bed occupancy. However, it is not reliable for reasons arising from the nature of hepatic resection surgery [8]. The increase in intrathoracic pressure caused by mechanical ventilation, and the fluctuations that may occur due to the effect of the increase in intraabdominal pressure that may occur as a result of retractors or manipulations in the surgical field on the right atrium question the reliability of CVP. CVP was not used for follow-up due to its size and surgical manipulations. However, care was taken to keep the vascular bed full.

Although it is said that CVP can be kept at low levels (<5 cm H2O) as a technique to limit blood loss, the risk of air embolism increases in large hepatectomies, especially in right lobectomies, tumors located close to the vena cava, or when the tumor includes portal branching. There are opinions that the use of low CVP may increase air embolism [9]. During the monitoring phase, transesophageal echocardiography (TEE) can be used to evaluate preload, contractility, ejection fraction (EF), and embolism but it may cause bleeding in children with advanced liver disease and advanced esophageal varices [10].

It is rational to avoid hepatotoxic agents in the maintenance of anesthesia. Although isoflurane and sevoflurane at 1 MAC values of inhalation agents decrease hepatic blood supply very little, desflurane has been found to decrease hepatic blood supply more than isoflurane [11,12]. Unlike other agents, there is no evidence that metabolites of sevoflurane, including "Compaund A", cause hepatic damage [13]. In line with these data, anesthesia was maintained with sevoflurane in the presented case.

Although there was no difference in hepatic damage between continuous clamping (75 min) and intermittent clamping (15 min clamp and 5 min reperfusion period) techniques during the surgical phase, it is suggested that bleeding will be less with the continuous clamping technique [14]. The continuous clamping technique was used in this case. The right hepatic artery and vena port were surgically clamped for 70 minutes.

Epidural block can be used for perioperative and postoperative analgesia in upper abdomen surgeries. Hence, epidural catheterization and high-level (T5) neuraxial blocks were shown to reduce hepatic blood flow [15]. In addition, acute and excessive bleeding may occur during the operation which can lead to hemostatic disturbance. Thromboelastometric viscoelastic coagulation tests can also be used to evaluate coagulation disorders that may develop after resection. Coagulation profile, INR and platelet counts, in particular, may deteriorate after liver resection, and the severity of the disorder is proportional to the size of the resection. Although the coagulation profile deterioration is highest on the postoperative 1st and 2nd days, it is expected to improve on the 5th day. This issue makes epidural catheter application problematic and controversial. In the presented case, right hepatectomy was performed to include liver segments 5, 6, 7 and 8 due to the size and extension of the mass. Epidural catheterization was not considered because of the risk of epidural hematoma.

Conclusion

Hepatic resection surgeries can be debilitating in terms of anesthesia management due to the difficulty of maintaining hemodynamic balance and the high risk of bleeding, yet those have to be managed carefully for a successful organ-sparing surgery. Comorbid factors and genetic diseases accompanying hepatoblastoma are other important factors making anesthesia management more complicated and challenging. We believe that optimal surgical results can be achieved with close monitoring and appropriate hemodynamic management.

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