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Case Report

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Pediatric anesthesia management in abdominal tumor with massive ascites

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Abstract

Pediatric anesthesia in a complex abdominal tumor with massive ascites is challenging both due to the abdominal compression effect and pediatric physiology. During perioperative preparation and surgery, anesthesia plays a crucial role. We present anesthesia management in pediatric abdominal tumors with massive ascites.

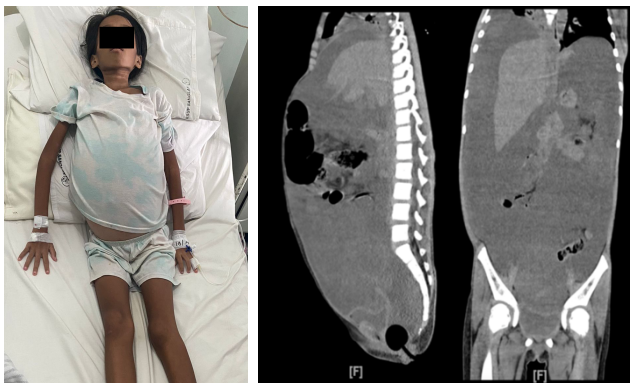
Keywords: pediatric anesthesia, anesthesia management, abdominal tumor, massive ascites

1. Introduction

Abdominal tumors in pediatric age have a wide range of differential diagnoses. These lesions may be classified as solid or cystic based on their site of origin. The most common intraabdominal solid tumor in children is neuroblastoma (30%). Intraabdominal cysts can be categorized based on their location in either the solid organs, retroperitoneum, mesentery, or omentum. Ovarian cysts are the most frequent of all. The symptoms in children can vary from abdominal distension, abdominal pain, palpable mass, and small bowel obstruction. Abdominal distension causes cardiopulmonary disturbance, especially in pediatric patients (1-3). The anesthesia goal in pediatric patients with high abdominal pressure is maintaining respiratory and cardiovascular reserve that has been compromised by abdominal pressure. Close monitoring for hemodynamic, intraoperative bleeding, hypoglycemia, hypercarbia, and hypothermia is mandatory. Meticulous patient preparation needs to be carried out to optimize intraoperative monitoring and minimize the risk of complications.

2. Case Presentation

We present a case report of a girl, 9 years old, with a large ovarian tumor and ascites, who will undergo tumor removal. The abdominal circumference was 82 cm, and the patient was in moderate respiratory distress, especially in a flat position. The patient was comfortable in a 45-degree position with slight right lateral decubitus, the patient's respiratory rate was 26 times per minute, and peripheral oxygen saturation was 92-96% with nasal oxygen supplementation of 4 liters per minute. The patient also had mild right pleural effusion. Examination of Congenital VACTREL (vertebral defects, anal atresia, cardiac defects, tracheo-esophageal fistula, renal anomalies, and limb abnormalities) was normal. The patient lost 8 kg within one one-month period and the patient's body weight was 27 kgs with height 138 cm and BMI 14.2 kg/m2. Her food intake was very limited due to , and she could only swallow fluid and soft food. The patient also complained that defecation and urination have been lessened for the past month but no vomiting history. The patient was moderately dehydrated on admission and already resuscitated with IV fluid. The laboratory revealed anemia with hemoglobin 9.6 g/dl and the rest of the laboratory test was within normal limits. In the abdominal CT Scan, a mass with a combination of lobulated cyst, septal, and solid components, pressing the rectosigmoid colon and bladder was found, which explained gastrointestinal and urology symptoms (Fig.1).



a **b**

Fig. 1. a. Patient's picture, b. Abdominal CT Scan

In the operating theatre, the patient's contact was adequate, and she felt comfortable with a 45° head-up position (Fowler position) (Fig.2). The patient was preoxygenated with a 10 lpm face mask for 10 minutes without positive pressured ventilation

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to avoid increasing the abdominal pressure during preoxygenation. We used fentanyl 3mcg/kgBW, ketamine 1 mg/kg, and sevoflurane for induction. We are using a titrated dose while carefully observing the hemodynamic response using arterial line monitoring. After ensuring adequate ventilation, a muscle relaxant using rocuronium 1.2 mg/kg was given. No cricoid pressure was used. After 1 minute, using a video laryngoscope and still in a Fowler position, the patient was intubated. Anesthesia maintenance using Sevoflurane 1-2 MAC, compressed air, oxygen, and intermittent fentanyl and rocuronium. We were using pressure control to avoid barotrauma due to the high pressure of abdominal compression in the supine position. The inspiratory pressure is increased from 15 (in the Fowler position) to 22 (in the supine position) to achieve a volume tidal of 5-6ml/kg, so we increase the respiratory rate to achieve the minute volume and normal CO2. The ETCO2 can be maintained within 38-40 during the surgery.

Fig 2. Fowler position during intubation

Intraoperative monitoring included 5 leads: ECG, non-invasive blood pressure (NIBP), Arterial line, blood oxygen saturation (SpO_2), and ETCO2. A central venous catheter was placed in the right jugular vein after intubation for fluid and emergency drug access. A nasogastric tube was also placed after intubation.

The patient was positioned slightly, head up 30 degrees, and the operation was started. The evacuation of 5 liters of ascite fluid was done slowly to maintain the hemodynamic. The tumor was inoperable, and the surgeon decided to do only left Salphingo-Oophorectecmy with bleeding of 200 ml. Fluid management using ringer lactate solution 450 ml and fluid warmer to maintain normothermia. Hemodynamic was stable, with no transfusion during the operation needed. The post-operative blood work showed that Hb was 10. After 3 hours of surgery, the patient was able to extubate and transferred to the pediatric intensive care for close monitoring. Post-operative pain management was using fentanyl continuous infusion 0.5mcg/kg/hour and paracetamol oral 10mg/kg every 6 hours.

3. Discussion

Perioperative anesthesia management in complex pediatric cases is one of the most challenging cases for anesthesiology. The inability to develop adequate compensation to overcome the anatomical or physiological changes caused by the diseases, made many pediatric patients come with distress symptoms. In this case, the massive and fast growth of the abdominal tumor causes distress, respiratory symptoms, dehydration, and gastrointestinal and urinary symptoms. The high abdominal pressure caused compression to the diaphragm lowered the patient's functional residual volume, and made them more prone to desaturation. The cardiac compression also can cause diastolic dysfunction, and the tumor/ ascites compression to the inferior vena cava will significantly reduce venous return. Pleural irritation and lymphatic blockage can also cause pleural effusion, which further reduces respiratory capacity. Anesthesia should also consider the metabolic effects of the cancer and chemotherapy effects, such as hypoalbuminemia, anemia, and electrolyte imbalance. [1,2,3] The use of invasive intraoperative monitoring is preferable for patient safety. The arterial line provides beat-to-beat hemodynamic information. Although the limited equipment in some hospitals may only use non-invasive hemodynamic monitoring, we recommend using it if available. The central access is also should be prepared if vasopressor and inotropic are needed to stabilize the hemodynamic. [4] Both intravenous and inhalation anesthesia can be used in this case. Ketamine may provide a more stable hemodynamic profile but may cause hypersalivation. Due to limited respiratory capacity, in a very severe case, we can consider the sleep non-apnea technique. In the case of obstructed gastrointestinal, we can use rapid sequence intubation (RSI) without positive pressure ventilation and using cricoid pressure to avoid aspiration. In this case, there is still good preservation of respiratory capacity, adequate fasting, and no significant abdominal obstruction, so we decided to use the sleep apnea intubation technique in a Fowler position with modified RSI. The monitoring of ETCO2 is also important to avoid hypercarbia, which can cause hemodynamic disturbance. The analgesia can be achieved using opioid, ketamine epidural, or caudal analgesia. The use of an epidural in high abdominal pressure should be done with caution due to the enlargement of the epidural venous plexus and increase the risk of epidural hematoma. Since the patient is a malnourished pediatric patient, there is also a high risk of hypoglycemia, a close monitoring for blood glucose is mandatory. [1,2,3,4]

Understanding the changes in pediatric physiology in a complex abdominal tumor with massive ascites case is mandatory. Close monitoring, especially during induction and ascites/ tumor evacuation, is the key point for successful anesthesia management.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient (patient's parents) consent forms. In the form, the patient's parents have given their consent for the patient's

images and other clinical information to be reported in the journal. The patient's parents understand that their names and initials will not be published, and due efforts will be made to conceal their identity.

Conflict of interest

Nothing to declare.

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None to declare.

Authors' contributions

Concept: P.K., S.P.S., B.J., I.W.S., Design: P.K., S.P.S., B.J., I.W.S., Data Collection or Processing: P.K., S.P.S., B.J., I.W.S., Analysis or Interpretation: P.K., S.P.S., B.J., I.W.S., Literature Search: P.K., S.P.S., B.J., I.W.S., Writing: P.K., S.P.S., B.J., I.W.S.

Ethical Statement

The patients/participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

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