



Anesthetic Management of a Child with Severe Intestinal Obstruction

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Abstract

A 4-year-old child was diagnosed with intestinal obstruction and was scheduled to undergo exploratory laparotomy. Anesthesia evaluation, preparation, airway management, and intraoperative circulation maintenance were thoroughly addressed. This case report discusses the key points of anesthesia management in children with intestinal obstruction and provides a reference for the anesthesia management of children with abdominal distension.

Keywords

Intestinal Obstruction, Abdominal Distension, Anesthesia Management, Case Report

Introduction

Intestinal obstruction is a significant and life-threatening condition, particularly in pediatric patients, characterized by the failure of intestinal contents to pass through the intestines smoothly. This condition can lead to both anatomical and functional changes within the intestinal tract and systemic physiological disorders. The following case involves a 4-year-old female child weighing 7 kg, presenting with severe and prolonged abdominal distension lasting over three years, with a recent aggravation of symptoms including constipation and increased abdominal distension over the past two days.

Upon admission, the child exhibited severe malnutrition and an extremely distended abdomen, which was markedly higher than her head height when lying down. Physical examination revealed visible varicose veins on the abdominal wall, tense and tender abdomen with compression and rebound pain, and weakened bowel sounds. Abdominal CT scans

indicated significant swelling and dilation of the intestines, with large amounts of gas and fluid accumulation, suggesting a possible intestinal obstruction. Laboratory tests showed anemia, potential metabolic disorders, and indications of hypothyroidism.

Due to the child's critical condition and severe abdominal distension, immediate exploratory laparotomy was necessary. The anesthesia management for this case was complex and high-risk, involving thorough preoperative evaluation, careful induction, and maintenance of anesthesia, and vigilant intraoperative monitoring to manage potential complications such as reflux aspiration, circulatory collapse, and respiratory difficulties.

This report discusses the anesthesia management challenges and strategies in pediatric patients with severe intestinal obstruction, providing insights and references for handling similar cases in the future. The

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child's critical state and prolonged duration of symptoms highlighted the necessity for meticulous preparation and execution of anesthesia protocols to ensure the best possible outcomes.

Case Presentation

The child, female, 4 years old, 7 kg, was admitted to the hospital with "abdominal distension for 3 years +, accompanied by abdominal distension and constipation aggravated for 2 days."

Physical Examination

General condition was very poor, severe malnutrition, the abdomen was extremely distended, obviously higher than the head height when lying down, the abdominal wall veins were obviously varicose, palpation of the whole abdomen was tense with compression pain and rebound pain, the whole abdomen was drumming on percussion, and the bowel sounds were weakened on auscultation.

Imaging and Laboratory Findings

Abdominal CT showed that part of the abdominal intestinal tract was obviously swollen and dilated, with a large amount of gas and fluid accumulation, and a wide and large air-fluid level could be seen, suggesting the possibility of intestinal obstruction. Laboratory tests: Hb 102g/L, TSH 5.580 Mlu/L, FT3 3.49pmol/L, rt3 0.63nmol/L, FT4 10 pmol/L. Admission diagnosis: extreme abdominal distension to be diagnosed: metabolic diseases? Hypothyroidism, severe malnutrition.

Surgical Plan

Due to the child's critical condition, a caesarean section was proposed for a limited period of time.

Anesthesia Procedure

The child was admitted to the room, crying, with an extremely distended abdomen, unable to lie flat, and obvious varicose veins visible on the abdominal wall. Cardiac monitoring showed HR 126 beats/min, BP 73/53 mmHg, SpO₂ 97%. The child's shoulders were elevated, the position was adjusted to head-high-foot-low position, and the child was given high-flow mask oxygen for 3 min/min, static midazolam 0.75 mg, fentanyl 10 µg. The child tended to be quiet, and

continued to mask preoxygenation for 2-3 minutes, and was slowly given 20 µg of fentanyl in small increments, 5 mg of esklopramide, and 1%-3% of sevoflurane by inhalation. The child went to sleep, and the lower airway was clear under voluntary breathing, and the jaw was supported with force. When the child had no obvious resistance and the depth of anesthesia was confirmed to be appropriate, propofol 20 mg was rapidly injected to deepen the anesthesia, and a 4.0# common single-lumen endotracheal tube was inserted through the mouth to a depth of 12 cm, and the patient was given manually-controlled ventilation, with an airway pressure of 15 mmHg and a Vt of 8-9 ml/kg. Cis-atracurium was added to the tube to make the patient's spontaneous respiration disappear, and the parameters of the ventilator were adjusted according to the oxygenation and the end-expiratory carbon dioxide partial pressure, and the patient was put on a ventilator.

After open abdominal decompression, the child showed a rise in HR (up to 136 beats/min) and a fall in BP to 65/41 mmHg, and the cis-atracurium 0.1 mg was added, the rehydration rate was accelerated appropriately, and the cerebral oxygen saturation was maintained at 70%-80% during the operation. Intraoperative fluid accumulation of 50 mL in the abdominal cavity, abdominal intestinal insufflation, fluid accumulation is obvious, the diameter of the small intestine reaches 3.5 cm, the whole small intestine is dilated, the whole small intestine is probed, and it is considered that it may be a serious intestinal malrotation. The operation lasted 258 minutes, with a total of 550 mL of crystalloid infusion, 50 mL of urine output, and about 10 mL of bleeding. Intraoperative vital signs: cerebral oxygen saturation 70%-80%, BP 60-91/26-70 mmHg, HR 91-136 beats/min. He was transferred back to the pediatric intensive care unit with a tube at the end of the operation.

Discussion

Intestinal obstruction is the failure of intestinal contents to function normally and pass through the intestines smoothly due to various reasons, which can not only cause anatomical and functional changes in the intestinal canal itself, but also lead to systemic physiological disorders. In this case, the child's

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intestinal obstruction was long and serious, and the abdomen was severely distended, which limited food intake and digestion and absorption, resulting in severe malnutrition, which is extremely rare among pediatric patients. In addition, due to the long-term intestinal obstruction, the intestinal contents were stagnant, and a large number of bacteria reproduced and produced a large number of toxins, which had obviously affected the function of the organs of the organism, and it was life-threatening if it could not be lifted in time to restore the function of the intestinal tract, and the life of this child was not affected by this obstruction. Because of the seriousness of his condition, unclear diagnosis and high risk of surgery, he was transferred to Shanghai, Chongqing and other hospitals for conservative treatment without significant relief, and was admitted to the Department of Pediatric Surgery through the Emergency Department of our hospital.

Preoperative Assessment

At the time of admission, the general condition of the child was extremely poor, high intra-abdominal pressure, measurement of the abdominal circumference of the three transverse fingers above the umbilicus has reached 65.5 cm, critical condition, anesthesia risk is very great, preoperative assessment of the child's risk:

1. High risk of reflux aspiration, in the perianesthesia period of the child may occur, especially in the process of induction of anesthesia, once anesthesia after the weakening of protective reflexes or disappearance of the most likely to occur, serious cases of asphyxiation can be a direct life-threatening;
2. During open abdominal decompression, the sudden decrease of abdominal pressure leads to the collapse of circulation;
3. After the obstruction is lifted, the abdominal pressure decreases, the diaphragm shifts downward, and pulmonary atelectasis or pulmonary edema occurs;
4. Due to the extreme weakening of the child and the increase of the sensitivity to anesthetics, respiratory and cardiac arrests may occur at any time in the period of peri-anesthesia. Therefore,

the following points should be paid attention to in anesthesia.

Anesthesia Management

Emergency Medicine Preparation:

The child's condition is critical and respiratory arrest may occur at any time during induction of anesthesia. Vasoactive drugs, such as epinephrine, atropine, mesocarbamate, scotrimin, etc., should be prepared.

Anesthesia Special Items:

The child is a high-risk patient for difficult ventilation and difficult intubation. In order to prevent difficult ventilation and failure of intubation, a pediatric oropharyngeal airway, pediatric visual laryngoscope, Glide Scope, 3.5#, 4.0#, 4.5# common endotracheal tubes were prepared before the induction of anesthesia.

Intraoperative Airway Management

In this case, the child's abdomen was extremely distended, intra-abdominal pressure was extremely high, and reflux aspiration was very likely to occur during the induction of anesthesia, and the anesthesia evaluation regarded it as a suspected ventilation difficulty and intubation difficulty, and the elevated intra-abdominal pressure caused the child's diaphragm to rise, the intrathoracic pressure to increase, and thoracic and pulmonary compliance to decrease. For patients with increased intra-abdominal pressure, the anesthesia induction modes can be rapid sequential induction and preservation of spontaneous respiration tracheal intubation. Although the intra-abdominal pressure of the child in this case was extremely high, due to the long duration of the disease, the risk of regurgitation and aspiration was lower than that of acute abdomen, and the child's oxygen reserve was poor, so if rapid sequential induction was used to interrupt spontaneous respiration, the patient might be unable to ventilate and other critical situations might occur. Therefore, in this case, a small amount of sedative and analgesic drugs were given slowly and in small doses, so that the child could inhale sevoflurane under the premise of maintaining spontaneous respiration, tolerating mask closure, and adequate preoxygenation, and then propofol was given to the

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child after he fell asleep, and then he was rapidly intubated. To ensure a successful one-time intubation, this child was intubated by an experienced anesthesiologist using the Glide Scope. After successful intubation, in order to prevent the child from being unable to be mechanically ventilated due to the enormous intra-abdominal pressure after the disappearance of spontaneous respiration, hand-control ventilation was used first, and then inotropic drugs were added to interrupt spontaneous respiration after confirming that the child could be ventilated under the state of hand-control ventilation. If ventilation is not possible during the induction process, propofol and skelaxin can be given to exclude whether the patient has breath-holding or not by deepening the anesthesia appropriately, and a small dose of epinephrine can be given to exclude whether the patient has bronchospasm or not. If the patient is still unable to ventilate after the above treatments, the patient is considered to have high abdominal pressure, which makes it difficult to ventilate with positive pressure, and the patient should be decompressed by opening the abdomen immediately.

Intraoperative Circulatory Management

Increased intra-abdominal pressure compresses the abdominal cavity and inferior vena cava, venous return decreases, cardiac preload decreases, cardiac output decreases, tissue perfusion decreases; peripheral vascular resistance decreases [1-3]. When the compression is lifted and the intra-abdominal pressure returns to normal, there may be a transient increase in return blood volume, cardiac overload, leading to acute heart failure. Anesthesia focuses on slow surgical decompression, maintaining circulatory stability, correcting electrolyte disorders, and avoiding hypothermia. In this case, the child's temperature was continuously monitored during the operation, and a blower insulation blanket was used to keep the child's temperature above 35.5°C, while cerebral oxygen saturation was continuously monitored to maintain the cerebral oxygen saturation at 70%-80%. During the decompression process, the child's circulation fluctuated, and after active symptomatic treatment, the intraoperative vital signs were stable.

Improvement of Systemic Conditions

Before induction of anesthesia, the cause and degree of increased intra-abdominal pressure should be clarified to reduce abdominal distension, improve respiratory conditions [4] and reduce the incidence of reflux aspiration, and gastrointestinal decompression should be performed before surgery. In this case, an anal tube was placed after admission to reduce abdominal distension. At the same time, these children are often combined with different degrees of dehydration, acidosis and electrolyte disorders, so preoperative and intraoperative should be corrected as much as possible dehydration, acidosis, electrolyte disorders, and give anti-shock treatment. After surgery, these children are often transferred to ICU for further symptomatic supportive treatment.

Conflict of Interest

The author has read and approved the final version of the manuscript. The author has no conflicts of interest to declare.

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