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Case reports of anaesthesia in paediatric cases posted for intraabdominal tumour excision

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Abstract
Laparotomy in pediatric age group possess many challenges to Anaesthesiologist. This is several fold higher when it is done for the purpose of excision of huge intraabdominal masses. Here we have discussed about three different case scenarios operated along with anaesthetic implications with regard to perioperative preparation and management.

Keywords: laparotomy, intraabdominal mass, paediatric tumours

Introduction

Case Report 1:-A

3 months old, male child weighing 4kg was diagnosed to have huge abdominal mass (?nephroblastoma). Child came with h/o partial rejection of intake, weight loss, vomiting and abdominal distension since 15days, O/E Huge abdominal mass was felt in all quadrants and abdomen was tense. CT scan revealed a large abdominal mass of 12cm*8cm*8.5cm encompassing mesentery displacing aorta and inferior vena cava,left kidney couldn't be made out separately. All investigations were within normal limits.

After thorough preanaesthetic evaluation the risks pertaining to intraoperative complications and the probability of requirement of mechanical ventilatory support was explained to patient attenders. Blood and FFP were arranged.

Procedure:- 22G IV cannula were secured in both upper limbs and IV fluids started. Ryles tube was inserted. Patient was preoxygenated with 100% oxygen, Induction was done with sevoflurane, morphine (0.5mg/kg) and relaxation with succinylcholine (1.5mg/kg) intubated with ET tube size 3.5mm. Anaesthesia was maintained with a mixture of oxygen-nitrous oxide 50%-50%, isoflurane, vecuronium (0.05mg/kg) intermittently and Intermittent positive pressure ventilation. In the middle of the surgery during manipulation of the tumour there was sudden bradycardia and cessation of cardiac activity which was immediately noticed and CPR started. The surgeon was asked to stop manipulating the tumour which had caused IVC compression. Inj.atropine 0.15mg and Inj. adrenaline 1cc (1 in 100000 dilution) and anterior chest compressions given. Cardiac activity returned within few seconds. Crystalloids and FFP was infused to maintain cardiac output. After haemodynamics were stabilized, surgery was continued and tumour was excised. Intraoperatively blood loss was around 120ml. 40ml of NS, 20ml of DNS,50ml of packed cells and 40ml of FFP was transfused =. Total urine output was 25ml.After completion of the surgical procedure, child was shifted to PICU for elective mechanical ventilation. Vitals were stable. Post-operative analgesia was maintained with Inj.morphine(0.05mg/kg) 6thhrly, and child was extubated after 24hrs. Postop period was uneventful and child was discharged on 8th postop day. Histopathological report confirmed as Nephroblastoma (Wilms tumour).

Case Report 2:-A

5 months old, male child weighing 5.5kg was diagnosed to have huge abdominal mass (?nephroblastoma). Child came with h/o rejection of intake, vomiting and abdominal distension since 20days, O/E Huge abdominal mass was felt in all quadrants. CT scan revealed a large abdominal mass of 10cm*9cm*8.5cm displacing aorta and partially inferior vena cava. All investigations were within normal limits.

After thorough preanaesthetic evaluation the risks pertaining to intraoperative complications and the probability of requirement of mechanical ventilatory support was explained to patient attenders. Blood and FFP were arranged.

Procedure:- 22G IV cannula were secured in both upper limbs and IV fluids started. Ryles tube was inserted. Patient was preoxygenated with 100% oxygen, Induction was done with sevoflurane, morphine (0.5mg/kg) and relaxation with succinylcholine (1.5mg/kg) intubated with ET tube size 3.5mm. Anaesthesia was maintained with a mixture of oxygen-nitrous oxide 50%-50%, isoflurane, vecuronium (0.05mg/kg) intermittently and Intermittent positive pressure ventilation. During manipulation of the tumour there was sudden bradycardia and cessation of cardiac activity which was immediately noticed and CPR started. The surgeon was asked to stop manipulating the tumour which had probably caused IVC compression. Inj. atropine 0.15mg and Inj. adrenaline 1cc (1 in 100000 dilution) and anterior chest compressions given. Cardiac activity returned within few seconds. Crystalloids and FFP was infused to maintain cardiac output. After haemodynamics were stabilized, surgery was

continued and tumour was excised. Intraoperatively blood loss was around 150ml. 50ml of NS, 30ml of DNS,50ml of packed cells and 50ml of FFP was transfused. Total urine output was 35ml. After completion of the surgical procedure, child was shifted to PICU for elective mechanical ventilation. Vitals were stable. Post-operative analgesia was maintained with Inj. morphine (0.05mg/kg) 6thhrly, and child was extubated after 24hrs. Postop period was uneventful and child was discharged on 9th postop day. Histopathological report confirmed as Nephroblastoma (Wilms tumour).

Case Report 3

5 months old female child weighing 5kg, came with h/o vomiting, excessive cry and partial rejection of food since 20days and diagnosed to have large intraabdominal mass. (Retroperitoneal teratoma). CT scan showed a large retroperitoneal mass of 10cm*10.5cm*8.5cm extended upto left dome of diaphragm superiorly and crossing midline inferiorly. All other investigations were within normal limits.

Procedure

22G IV cannula were secured in both upper limbs and IV fluids started. Ryles tube was secured. After adequate preoxygenation with 100% oxygen, induction was done with sevoflurane, and relaxation with succinyl choline(1.5mg/kg) intubated with ET tube size 4.0mm,Anaesthesia maintained with a mixture of oxygen-nitrous oxide 50-50%,isoflurane, atracurium (0.05mg/kg) and Intermittent positive pressure ventilation. During the surgery, child developed pulmonary odema with pink froathy secretions in ET tube, the saturation dropped from 100% to 82%. On auscultation bilateral creptations noted in all the lung fields. Immediately IV fluids were tapered, Inj. Lasix 5mg given, gentle ET tube suctioning done and positive pressure ventilation with high PEEP was administered. Vitals stabilized. Surgery was continued and tumour excised. Intraopertaively blood loss was 150ml.40ml of DNS, 150ml of packed cells, 50ml of RL, 50ml of FFP was transfused. Total urine output was 35ml. Child was shifted to PICU in view of pulmonary odema. Post-operative analgesia was maintained with Inj.morphine(0.05mg/kg) 6thhrly and child was on ventilatory support for 2days. ABG was sent showed severe respiratory acidosis and correction done. Serum lactate and CRP levels were elevated. on the 3rd day child had sudden cardiac arrest and couldn't be revived, probably due to cardiogenic shock secondary to sepsis with associated pulmonary odema.

Discussion

The anaesthetic management of intraabdominal mass pose various perioperative challenges along with specific considerations which have to be dealt individually. The challenge of anaesthetizing paediatric patients pertaining to lengthy intraabdominal surgeries includes the risk of aspiration, thermoregulation, electrolyte imbalance, Compromised ventilation due to increased intraabdominal pressure, IVC compression due to surgical manipulation, potential for major hemorrhage, pulmonary odema and cardiac arrest [1].

Preoperative Considerations

Severe vomiting and restriction of intake results in dehydration, malnutrition, electrolyte imbalance, which may be associated with hypoproteinemia, which will alter the pharmacodynamics and pharmacokinetics of protein binding drugs. Dehydration and electrolyte imbalance need to be corrected preoperatively or else it may lead to CVS collapse, dysrrhythmias, delayed recovery, convulsions etc during induction, recovery and postoperative period. Due to increased intraabdominal pressure, there will be increased chances of regurgitation and aspiration during induction. Hence, ryles tube has to be secured to decompress the stomach. As there is anticipation of major hemorrhage, crystalloids, blood and blood components should be kept ready and two wide bore IV lines should be secured in the upper limb. Avoid securing cannula in the lower limb, as IVC compression during surgery may hamper transfusion of fluids. Due to increased intra-abdominal pressure, there will be splinting of diaphragm, decrease in FRC, lung compliance and decreased Oxygen stores. Therefore preoxygenation with 100% oxygen before induction is mandatory to avoid hypoxia [2]. Mild premedication with sedatives may also depress the ventilation. Hence better avoid them. Care must be taken with IV induction agents which may cause apnoea after the induction dose. Due to raised intraabdominal pressure, mask ventilation becomes difficult leading to rapid desaturation. Inhalational induction with titrated concentration is safer, where spontaneous ventilation can be maintained. Confirmation of mask ventilation before giving a relaxant is of prime importance. If mask ventilation is found to be difficult, avoid relaxant and intubate under deeper planes with spontaneous respiration. Hypothermia should be prevented by maintaining the ambient room temperature >21^{0}c and baby kept warm by using warming mattress, warm IV fluids, humidified gases as hypothermia leads to bradycardia, hypoglycemia, metabolic acidosis, prolonged recovery from muscle relaxants [3].

Intraoperative Considerations

Due to prolonged surgery, padding of pressure areas and eye protection is a standard protocol. Core body temperature monitoring is mandatory to prevent hypothermia. Intraopertively, warming mattress with forced air warmer should be used. Rapid sequence intubation is done to avoid aspiration due to increased intra-abdominal pressure. The peak airway pressures may be increased during ventilation due to cephalad displacement and splintage of diaphragm (decreased FRC and compliance) [4]. Tachyarrythmias should be expected due to electrolyte disturbances and frequently due to hypercapnia and increased levels of cathecolamines (due to stress

factor) [5]. We should be aware that caution is needed with intravenous fluid replacement, including blood and transfusion. Monitoring includes noninvasive and invasive method.

Mandatory Noninvasive monitoring includes:- pulse oximetry, noninvasive blood pressure, precordial stethoscope/ oesophageal stethoscope, temperature monitoring, urine output, NMT monitoring (optional). Invasive includes:-In adrenal medullary tumour- invasive blood pressure monitoring is necessary, Central venous pressure monitoring where large blood loss is anticipated.

Due to the mechanical compression of Abdominal aorta /Inferior vena cava, higher levels of neurohumoral factors and activation of RAAS system leads to hypertension. Increased afterload, over judicious transfusion of fluids, malnutrition leading to hypoproteinemia, poor cardiac reserve, excessive sympathetic stimulation may lead to pulmonary odema [6, 7], which was seen in case scenario 2, and it was managed by taperring the IV fluids, Inj.Lasix, gentle suctioning of ET tube, Positive pressure ventilation with increased PEEP. Diuretic therapy may reduce lung water, but the adequate cardiac output and cerebral perfusion pressure must be maintained. Compression of renal arteries leads to impaired renal blood flow and decreased urine output. Hence perioperative urine output monitoring is important [8, 9]. Adequate depth of anaesthesia and analgesia should be maintained to prevent excessive sympathetic stimulation. There are various causes of cardiac arrest especially in intraabdominal mass excision. As the surgeon manipulates the mass it causes inferior vena cava compression, which decreases venous return and cardiac output leading to bradycardia and cardiac arrest, which was seen in case scenario 1 and 2. It was aggressively managed by immediate CPR with anterior chest compressions, Inj. atropine, Inj. adrenaline and by avoiding the compression by tumour. Intravascular volume was maintained with crystalloids, blood and blood products [10, 11]

The hypovolemic status can be assessed by capillary refill time, Jugular venous pressure by monitoring CVP, the trend in pulse rate and blood pressure, monitoring urine output. To maintain adequate tissue oxygenation, sufficient cardiac output and haemoglobin are required to ensure optimal oxygen delivery. Because cardiac output depends on cardiac filling pressures (monitored by CVP) meticulous monitoring of intravascular volume is mandatory. The CVP can be measured by any of these sites Internal jugular, Subclavian veins, femoral. It is the reflection of the right heart filling pressures, i.e, preload to the right ventricle, Normal CVP- 2-8 mm Hg. Continuous and accurate measurement of intravascular volume status in patients undergoing major surgery with the potential for massive hemorrhage is vital for facilitating the timely replacement of blood loss and maintaining stable hemodynamics.

The risks of CVP line insertion, include:

- Insertion of CVP catheter in paediatric population demands expertise.
- failure to find an open vein that will accept the CVL
- bleeding or bruising
- infection
- clotting
- air in the lungs or veins
- breaking a blood vessel
- abnormal heart rhythm
- breaking the catheter
- death (very, very rare)

we can overcome some of these complications by real-time observation of the procedure under ultrasound guidance, which may not be available in all hospitals..

Postoperative Considerations

High dependency unit will be required following the resection of most of large intrabdominal mass, especially if there are any intraopertive complications [9].The post-operative analgesia can be achieved with opoid analgesics like morphine or fentanyl and infiltration of the surgical site with 0.125% Bupivacaine, paracetamol suppository [12, 13]. Repeat serum electrolytes, CBC, coagulation profile and corrections given accordingly. Sepsis is a threatening postoperative complication especially in small infants. Regarding the advances in perinatal medicine, its incidence is unknown to date. Sepsis is a problem that presents a management challenge, however early recognition and intervention clearly improves the outcome for infants and children with infections that lead to sepsis. Most of them require monitoring and treatment in an intensive care setting. We should aim to investigate the incidence, risk factors, laboratory findings (serum lactate, CRP, Procalcitonin) and outcome of postoperative sepsis in infants especially younger than 6 months old. Initial focus should be on stabilization and correction of metabolic, circulatory, and respiratory derangements. Appropriate antimicrobial therapy should be started as soon as possible after evaluation occurs. The key to preventing sepsis is to prevent an infection from occurring in the first place. If an infection does set in, it must be treated as quickly and effectively as possible. Many illnesses can be and are prevented through regular childhood vaccinations, thorough hand washing and proper care of surgical wound. Ongoing reevaluation is essential. Active pain management in the postoperative period can improve the early recovery of the child.

Decision regarding on-table extubation or elective ventilation should be done on individual case basis.

Criteria for Immediate Extubation

1. Short duration of surgery
2. Stable haemodynamics

3. Normothermic
4. Normovolemic
5. Minimal to moderate blood loss
6. Good urine output atleast 0.5ml/kg/hr
7. Good respiratory efforts

Criteria for Elective Ventilation

1. Long duration of surgery
2. Unstable hemodynamics
3. Hypothermic
4. Hypovolemic
5. Significant blood loss
6. Pulmonary atelectasis as indicated by low saturation, increased airway pressures
7. Low urine output
8. Pulmonary odema
9. Inadequate respiratory efforts

Conclusion

Intraabdominal tumour in a child poses many anaesthetic and surgical challenges. All these are inter-linked and contributory to the risk factors. A thorough knowledge of all these factors help in framing goals for the anaesthesiologist namely preoperative stabilization, active intra-operative intervention, effective postoperative ventilatory and pain management. Managing all these factors individually will improve the outcome of such patients.

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