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NEONATAL ANAESTHESIA FOR CONGENITAL ANTERIOR ABDOMINAL WALL DEFECT REPAIR IN UNIVERSITY OF BENIN TEACHING HOSPITAL, BENIN-CITY, NIGERIA: A CASE SERIES

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Abstract: **Congenital anterior abdominal wall defects repair is complicated by surgical and anaaesthetic challenges in developing countries like ours. It remains a major source of neonatal morbidity and mortality because of poor prenatal diagnostic tools and obstetric care, unavailable parenteral nutrition, poor neonatal intensive care unit with ventilatory management, unavailability of appropriate sized intraoperative anaesthetic gadgets and poor post-operative surgical care.**

We therefore report this series of three neonates with congenital anterior abdominal wall defect to draw attention to the challenges in the management.

Keywords: **Neonatal Anaesthesia, Defect, Congenital Abdominal Wall.**

1. INTRODUCTION

The two primary congenital abdominal wall defects are omphalocele and gastroschisis. Although often considered together, they are distinct and separate entities in every way from their etiology to management principles[1].

Omaphalocele is a spectrum of congenital anterior abdominal wall defect occurring at the midline as a result of failure of complete migration and closure of the embryonic body folds, thus leading to failure of the physiologically herniated small bowel to return to the abdominal cavity[2, 3]. Gastroschisis is a herniation of small bowel through a full thickness defect in the anterior abdominal wall, usually to the right of the umbilicus. The exact mechanism is unknown; the main hypotheses are a vascular accident of the right omphalomesenteric artery and abuse of vasoactive drugs[2, 3]

It remains a major source of morbidity and mortality in developing countries compared to developed centres with better prenatal diagnostic tools, obstetric care, parenteral nutrition, neonatal intensive care unit with ventilator management and surgical care[4].

The operative treatment of congenital anterior abdominal wall defects predisposes to haemodynamic and respiratory complications as a result of viscera-abdominal disproportion and associated cardio-respiratory anomalies[5,6]

We report a series of three neonates with congenital anterior abdominal wall defect to draw attention to the anaesthetic challenges in the management.

2. CASE SERIES

Case 1

2 days old male preterm neonate presented to our facility with protrusion of intestines through the anterior abdominal wall since birth. Baby was delivered to a 28year woman at 34weeks gestational age par vagina. Examination revealed weight of 2.7kg with midline anterior abdominal wall defect at the region of the umbilicus with eviscerated bowel. Had initial resuscitation with normal range vital signs, urine output and blood parameters as workup for surgery.Under general anaesthesia with orotracheal intubation. Anaesthesia was induced with inhaled sevoflurane and maintained with sevoflurane in air and oxygen. Fentanyl was used for intraoperative analgesia and atracurium was administered for neuromuscular blockade to facilitate abdominal wall closure.

Intraoperative management prioritized thermoregulation using a warming blanket and warmed intravenous fluids. Fluid resuscitation was administered with normal saline at 10 ml/kg. Continuous monitoring of oxygen saturation, electrocardiography, and non-invasive blood pressure was maintained throughout surgery lasting 45minutes.

Ventilatory parameters were closely observed following visceral reduction and primary repair of anterior abdominal wall defect for evidence of elevated peak airway pressures. Postoperatively, patient was transferred to the neonatal intensive care unit (NICU) on the endotracheal tube and was successfully extubated on the second postoperative day with good spontaneous respiratory effort and change of wound dressing by the third day post op with satisfactory wound healing. By the tenth day on admission, bowel activities had return and child commenced feeds with no features suggestive of intestinal obstruction and he was discharged two days later. He was seen weekly at the surgical outpatient clinic for evaluation and follow up. At the third clinic visit, wound edges have healed satisfactorily with complete closure of fascial defect.

Fig. 1: 2days old male neonate with anterior abdominal wall defect.

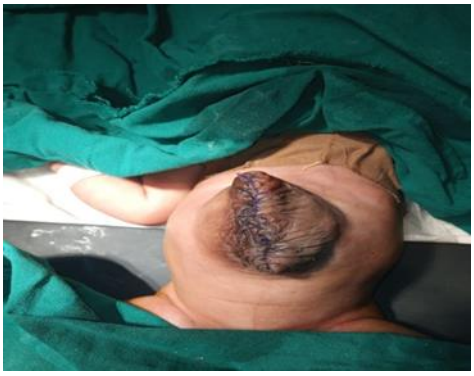

Fig. 2: Primary closure of anterior abdominal wall defect

Case 2

20 hours old female neonate presented to us with evisceration of bowel from the anterior abdominal wall following vaginal delivery at term to a 25year old petty trader with primary level of education**.** Examination showed female newborn weighing 1.7kg with a midline full thickness anterior abdominal wall defect 6cm x 5cm in the region of the umbilicus with eviscerated small bowel to the right of the umbilicus without a membrane covering. No grossly identifiable associated anomalies. Initial resuscitation done and hematological investigations were within normal range.

Subsequently had improvised silo application done with daily manual silo manipulation and reduction of silo content into the abdominal cavity. 7 days post silo application with satisfactory reduction of silo content. Patient required two separate anaesthetic exposures. The first was for silo application and the second, seven days later following satisfactory silo reduction, was for definitive anterior abdominal wall repair. Both procedures were performed under general anaesthesia with orotracheal intubation. Inhalational induction was used on each occasion, with opioid analgesia and neuromuscular blockade administered. Given the significant third-space fluid losses and bowel exposure characteristic of gastroschisis, aggressive fluid resuscitation with isotonic crystalloid was provided. Strict thermoregulatory measures were employed throughout. Ventilatory pressures and haemodynamic parameters were closely monitored following definitive closure to assess for abdominal compartment syndrome. Despite these measures, the patient developed a fatal cardiac arrest on the first postoperative day following definitive repair; all resuscitative efforts were unsuccessful.

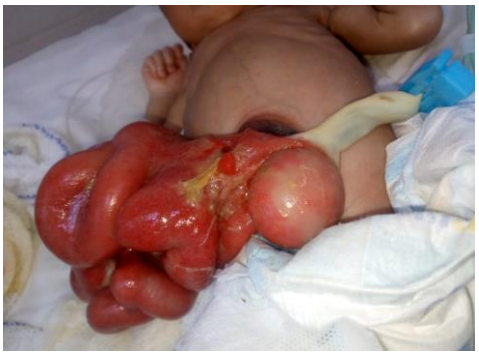

Fig. 3: 20hours old female neonate at presentation with envisceration of GUT

Fig. 4: Immediate post improvised silo application of the 20hours old neonate

Case 3

A 3-day-old female term 2.6kg neonate delivered by emergency caesarean section for fetal distress presented with anterior abdominal wall defect and exposed unprotected abdominal contents was initially planned for silo application; however, intraoperative assessment allowed for primary repair with respiratory compromise. Anaesthesia was induced by inhalational technique and maintained with sevoflurane. Opioid analgesia and neuromuscular blockade were administered. Thermoregulation was maintained throughout using standard neonatal warming measures. Intravenous fluid resuscitation was guided by haemodynamic response and urine output. A nasogastric tube was placed intraoperatively for gastric decompression. Peak airway pressures were monitored closely following abdominal closure. The patient was transferred to the NICU on the endotracheal tube and was extubated on the fourth postoperative day with satisfactory spontaneous respiratory effort. Wound healing was complete by the tenth postoperative day and the patient was subsequently discharged into paediatric care for nutritional optimization.

3. DISCUSSION

Neonatal anaesthesia for congenital anterior abdominal wall defects presents unique and significant challenges, particularly in resource-limited settings such as ours. All three neonates in this series were managed under general anaesthesia with endotracheal intubation, reflecting the need for a secured airway and controlled ventilation during visceral reduction and fascial closure.

A critical anaesthetic consideration in these cases is the risk of abdominal compartment syndrome (ACS) following primary closure, particularly when visceroabdominal disproportion exists.

In Cases 1 and 3, peak airway pressures and haemodynamic parameters were closely monitored following reduction; successful extubation on Days 2 and 4 respectively suggested acceptable intraabdominal pressures. In Case 2, however, the fatal cardiac arrest on the first post-repair day is consistent with the haemodynamic and respiratory consequences of ACS a known and devastating complication in gastroschisis repair, especially in low birth weight neonates where the abdominal domain is severely underdeveloped.

Thermoregulation represents one of the most demanding intraoperative challenges in neonatal anaesthesia. Neonates have a large body surface area to weight ratio, immature thermoregulatory mechanisms, and exposed viscera that dramatically increase insensible heat and fluid losses. In Case 2, the 1.7 kg preterm-equivalent neonate with gastroschisis and unprotected bowel exposure would have been at particularly high risk. The use of warming blankets, warm intravenous fluids, overhead warmers, and a warm theatre environment is imperative. The unavailability of forced-air warming systems and appropriate-sized monitoring equipment in our facility remains a significant limitation and likely contributes to adverse outcomes.

Fluid management in these neonates is complex. Gastroschisis, as seen in Case 2, is associated with greater third-space losses and inflammatory bowel oedema compared to omphalocele, necessitating more aggressive fluid resuscitation with isotonic crystalloids. However, excessive fluid administration risks pulmonary oedema, especially in premature and low birth weight neonates with immature cardiopulmonary physiology. The ideal intraoperative fluid regimen should balance replacement of ongoing losses with avoidance of fluid overload, guided by urine output, capillary refill, and available haemodynamic monitoring parameters.

The staged approach (silo application followed by delayed primary repair) employed in Cases 2 and 3 has well-recognised anaesthetic implications. Each surgical stage demands the use of a general anaesthesia, increasing cumulative exposure to anaesthetic agents in a population already vulnerable to apnoea, bradycardia, and neurodevelopmental effects of repeated sedation. Careful titration of inhalational agents, judicious use of opioids, and avoidance of agents with unfavourable neonatal pharmacokinetic profiles are therefore essential.

Postoperative ventilatory support is a critical component of the anaesthetic management. All three neonates were transferred to the NICU intubated. The availability and adequacy of neonatal ventilators, appropriately-sized endotracheal tubes, and trained NICU nursing staff are therefore integral to anaesthetic outcomes in this population. The absence of these resources in many Nigerian tertiary institutions remains a formidable barrier to improving mortality, as evidenced by the fatal outcome in Case 2.

In conclusion, the anaesthetic management of neonatal anterior abdominal wall defects requires meticulous preoperative optimization, secured airway management, vigilant intraoperative monitoring of ventilation and haemodynamics, rigorous thermoregulation, and robust postoperative intensive care. This case series highlights the persistent challenges faced by anaesthesiologists and surgeons in low-resource settings and underscores the urgent need for improved neonatal infrastructure, anaesthetic equipment, and multidisciplinary training to reduce morbidity and mortality from these congenital conditions.

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