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Research Article

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Approaches to General Anesthesia without Airway Intervention in the Management of Surgery in Both Term and Preterm Infants

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ABSTRACT

Background: Anesthetic management in term and preterm infants poses unique challenges, especially when using general anesthesia without airway intervention. This approach aims to maintain effective anesthesia while minimizing respiratory compromise, which is crucial in neonates with underdeveloped respiratory systems. This review explores pharmacologic strategies, dosing considerations, and monitoring protocols to ensure safe anesthesia in neonatal surgeries. Special emphasis is placed on balancing anesthesia depth with respiratory preservation and adapting techniques based on the infant's gestational age. This approach could offer safer outcomes by reducing the risks associated with airway manipulation in this vulnerable population. Furthermore, we address the success rates, complications, and outcomes of general anesthesia without airway intervention.

Aims and objectives: Neonatal general anesthesia without intubation is very much challenging but its feasible for low resource country with very much effective for difficult airway intubation as like neonate.

Methods: This was a prospective type of observational study conducted in mymensingh medical college hospital, mymensingh, bangladesh from july 2022 to january 2024.

Results: Total 1500 patients were included among them 300 were preterm neonates. The age ranges upto 2 months. Follow-up by clinical examination, pre-operative assesment and per-operative close monitoring by advanced pulse oximetry. 5 patients was expired during operative procedure due to severly ill patients.

Conclusion: without airway intervention has revolutionized the management of anesthesia preterm and term infants, providing a reliable, safe, and effective method to treat in this age groups patients where neonatal airway intubation difficult and large number of neonates with very limited resources bangladesh like country. Its advantages may take it preferred approach for pediatric surgeons and anesthesiologist when dealing with this group of population.This article describes the common neonatal surgical emergencies and focuses on factors that affect the anaesthetic management of patients with these disorders without intubation.

Keywords: Pediatric Surgery, Anesthesia, Deep Sedation, Intubation, Emergency Neonatal Surgery

Introduction

A newborn necessitates ongoing attention, prompt detection of the situation, and prompt anesthesia action. The physiological immaturity of several body systems, poor anesthetic medication tolerance, related congenital abnormalities, and concerns about the use of high oxygen concentrations are the basis for the anesthetic considerations in neonatal surgical situations. The primary objective is to carefully evaluate the cardiorespiratory condition while titrating anesthetics to achieve the appropriate effects. It has been demonstrated that localized anesthesia is both safe and effective. The survival of premature and critically ill newborns has improved as a result of advancements in neonatology.

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Neonatal anesthesia involves a combination of proficiency in vascular access and airway preservation, as well as solid understanding of neonatal and transitional physiology. Because of their tiny stature and concomitant conditions including apnea and bronchopulmonary dysplasia, preterm newborns present more management challenges. The number of people who survived preterm birth is rising globally [1]. The doctor who performs anesthesia, neonates having emergency procedures pose a number of challenging situations. Numerous neonatal surgical situations are potentially fatal and are often associated with failure of several organ systems. It is crucial that the surgeons, physicians with anesthesia, and neonatologists, as well as the rest of the healthcare team, communicate and work together to make sure the newborn's best possible care. The effective identification and timely treatment of disease in The neonatal stage could save a life [2].

This evaluation presents a comprehensive approach to the recognition, stabilization and control of the more urgent frequent surgical emergency involving newborns [3]. availability of monitoring have steadily increased the safety of anaesthesia in these tiny patients. The cricoid cartilage is the narrowest portion of the larynx in a neonate. A 3.5 mm size internal diameter endotracheal tube (ETT) is usually appropriate for full-term neonates and 2.5-3 mm is used for smaller or premature infants. The commonly used blades for laryngoscope in neonates are Miller size 0, 1 and Wis–Hipple blades [1] and 000 face mask and 0-sized laryngeal mask airways should be available. The first 72 h of neonatal life is the risk for IVH.

Hypoxia, hypercarbia, fluctuations in blood pressure or venous pressure, high or low haemoglobin and pain increase the risk of IVH [4]. Pharmacokinetics and blood concentrations of bupivacaine were studied after intercostal nerve blocks were performed intraoperatively using 1.5 mg. kg-1 in 11 neonates (age 0-28 days) and 11 infants between age 1 and 6 months [5]. Induction of general anesthesia and muscle relaxation prior to tracheal intubation, rigid bronchoscopy, cautious tracheal tube placement below the TOF if feasible, and, in some high-risk instances, closure of the fistula with a Fogarty embolectomy catheter were all part of standard management [6]. without airway intervention has revolutionized the management of anesthesia preterm and term infants, providing a reliable, safe, and effective method to treat in this age.

Pharmacology

In neonates, immature liver function also leads to decreased biotransformation of several medicines (e.g., opioid/local anesthetics), and immature tubular function reduces the clearance of some drugs, particularly morphine. Before starting anesthesia, the dosages of all medications [Table 1] must be determined. In this study i am used intravenous drugs and volatile agent by face mask ventilation. intravenous drugs are - atropine, midazolam, fentanyl, paracetamol, vitamin-k used according to weight and standard dose, route lidocaine are used as a skin analgesia volatile agent are used as spontaneous ventilation and maintainance for long time operation, agents are- isoflurane in before used halothane, nitrous and oxygen used as a standard protocol [7].

Table 1: Neonatal Drug Dose

Name of drug	Action	Dose
Vitamin- K	Prevention of hemorrhage	1 mg/kg(I/M)
Atropine	Antisecretory / maintain HR	40 µg/kg(IV)
Midazolam	Induction/ sedation	i.v 0.5mg/kg
Thiopental	Induction	i.v. 6-7 mg/kg
Fentanyl	Analgesia	i.v. 1-2 µg/kg bolus
Paracetamol	Analgesia	i.v 20 mg/kg 6 hrly
5% glucose		(20 µg/mL)
Neostigmine	Reversal	i.v. 40-50 µg/kg

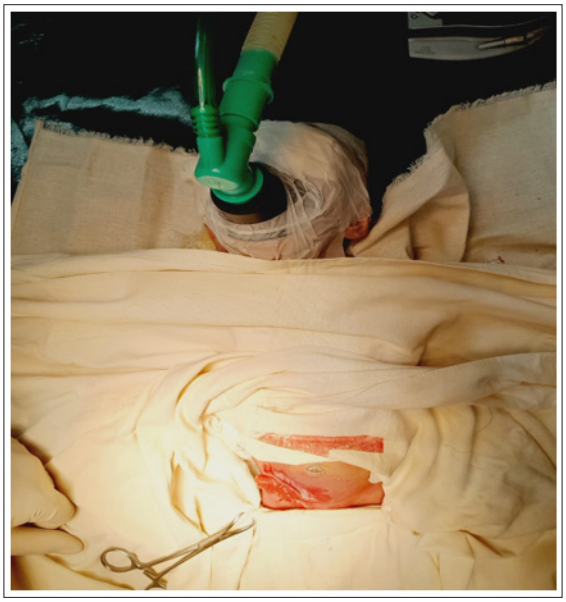

Figure 1: Deep sedation with ileostomy reversion

Figure 2: pulse oximetry to monitor saturation and heart rate

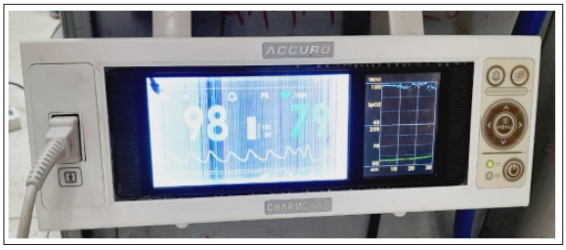

Figure 3: monitor patient under deep sedation

Materials and Method

This prospective type of observational study was conducted from July 2022 to January 2024 in the department of pediatric surgery, Mymensingh Medical College Hospital, Mymensingh, Bangladesh with the ethical clearance. Total 1500 patients among them 300 premature were included in this study [8]. After proper history taking, clinical examination, pre-operative routine laboratory investigations and per operative close monitoring was done by advanced pulse oximetry among them 5 patients was died preoperatively those who are very critically ill and all record are kept in future most challenging anesthesia establishment without intubation. very least number of neonate has developed per-operative cardiac arrest and doing intubation and are number was 9.

Figure 4: Deep Sedation with Primary Anastomosis

Figure 5: Without Intubation Pyloromyotomy

Figure 6: Ileostomy by Deep Sedation without Intubation.

Results

Total 1500 patients were include in this study among them 300 are premature and 9 patient has developed preoperative cardiac arrest and managed by intubation and 5(.33%) patient had expired due to extremely critically ill and rest of them has uneventful recovery. Those patient are deep sedation all of them under close monitoring without any intervention only face mask oxygen are used [9].

Table 2: Age distribution in premature baby (N=300/1500)

Premature (300)	percentage
All of them before 35 weeks	20%

Table 3: Disease patient who undergone deep sedation (N=1500)

Name of disease	Percentage (%)
Meconium ileus	20%(300)
Jejunal atresia	10%(150)
Jejunoileal atresia	15%(225)
NEC	3%(45)
Anorectal malformation	37%(555)
Hirschsprung disease	10%(150)
IHPS	5%(75)

Discussion

The use of general anesthesia without airway intervention in surgical management for neonates, particularly term and preterm infants, presents unique challenges and risks. This study focuses on evaluating outcomes for procedures such as meconium ileus, anorectal malformation (ARM), Hirschsprung disease, and intestinal atresia. Outcomes and Challenges in Preterm and Term Infants. From the total cohort of 1,500 neonates (300 preterm and 1,200 term), five infants expired during the procedure, and nine experienced perioperative cardiac arrest. The higher proportion of preterm infants in this study highlights their vulnerability due to immature physiological systems, particularly respiratory and cardiovascular. These results align with existing literature showing that preterm neonates have a higher risk of complications under general anesthesia due to factors such as underdeveloped pulmonary function, increased sensitivity to anesthetic agents, and hemodynamic instability [10].

Feasibility of Anesthesia without Airway Intervention. Avoiding airway intervention in neonatal anesthesia is desirable as it minimizes airway trauma, reduces ventilator-associated risks, and decreases postoperative complications such as pulmonary injury and infection. However, this approach requires precise monitoring and management to ensure adequate oxygenation, ventilation, and hemodynamic stability throughout the procedure. The relatively low rate of severe complications in this cohort suggests that with proper preparation, experienced teams, and appropriate anesthetic techniques, general anesthesia without airway intervention can be a viable option for neonatal surgery. The inclusion of advanced monitoring tools and the use of less invasive anesthetic agents or regional anesthesia as adjuncts may also contribute to these outcomes. Surgical Context and Disease-Specific Considerations.

The nature of the surgeries in this study—meconium ileus, ARM, Hirschsprung disease, and intestinal atresia—represents complex neonatal conditions often requiring prompt intervention. These surgeries often involve significant physiological stress, requiring the anesthetic approach to be tailored to the infant's unique condition. Preterm infants undergoing surgery for conditions such as meconium ileus or atresia may experience additional complications due to their fragile gastrointestinal systems and immature immunity. Mortality and Cardiac Arrest- The mortality (5 cases) and perioperative cardiac arrest (9 cases) highlight the need for further optimization of anesthesia protocols. While the overall numbers are relatively low given the high-risk population, each adverse outcome underscores the critical need for meticulous preoperative evaluation and intraoperative management. Factors contributing to mortality and cardiac arrest may include underlying comorbidities, hemodynamic fluctuations, or hypoxemia during the procedure [11].

Implications and Future Directions:

The findings emphasize the importance of a multidisciplinary approach in managing high-risk neonatal surgeries, particularly in preterm infants. Future research should focus on:

1. Refining anesthetic protocols to enhance safety while minimizing airway intervention.
2. Developing more precise predictors for perioperative risk stratification.
3. Exploring newer anesthetic agents and technologies to improve outcomes in preterm infants.

Ultimately, while the results indicate that general anesthesia without airway intervention can be successful in many cases, its application requires careful consideration of the infant's gestational age, clinical condition, and the nature of the surgery.

Conclusion

General anesthesia without airway intervention can be a feasible approach for managing surgeries in neonates, including term and preterm infants, with conditions such as meconium ileus, anorectal malformations, Hirschsprung disease, and atresia. While the overall complication rates, including five mortalities and nine perioperative cardiac arrests, were low relative to the high-risk nature of these cases, preterm infants remain more vulnerable. These findings highlight the importance of meticulous anesthetic planning, multidisciplinary collaboration, and tailored protocols to optimize safety and outcomes in this fragile population.

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