

Neonatal anesthesia in a country in sub-Saharan Africa

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Keypoints

Pediatric anesthesia and especially neonatal anesthesia is practiced by professionals who have not received specific training. It was important to make an inventory to establish perspectives.

Abstract

Introduction

The newborn is a particular ground for the anesthetist. In Africa, anesthesia for neonatal surgery is performed under precarious conditions. The aim is to study the practice of anesthesia in neonatal surgery in a francophone country of sub-Saharan Africa.

Materials and methods

This is 4-year retrospective descriptive study from January 2014 to December 2017 at Brazzaville University Hospital. All patients anesthetized for neonatal surgery aged from 0 to 28 days were included.

Results

The frequency of this surgery was 2.3%. The average age was 9.26 days (1 and 25 days). The average weight was 2672g (1580 and 4000g). Bowel obstruction (66%) and peritonitis (14%) were the most common diagnoses. Patients were ASA1, ASA2 and ASA3 in 45.8%, 39.6% and 14.6%, respectively. Anesthesia was general in all cases with intravenous induction in 84% and with halogenesis in 16%. Propofol and ketamine were used in 56% and 26%. Transfusion was performed in 34%. Intraoperative

incidents and complications (46.8%) were dominated by respiratory ones: bronchospasm 13.6%, hypoxia 4.5%, difficult intubation 18.2% and haemodynamic ones: tachycardia 27.3% and bradycardia 36, 4%. An anesthesiologist doctor was present in the operating room in 90%. Mortality rate was 22%.

Conclusion

Despite the difficult conditions of exercise in anesthesia, practices are relatively reliable, but mortality rate can be reduced by targeted training and the improvement of working environment.

Keywords

anesthesia, newborns, mortality, Africa

Introduction

Newborn is a special ground for the anesthesiologist (1). Knowledge of the anatomical, physiological and surgical features of neonatal period is useful for the anesthesia practice (1). In Africa, anesthesia in newborn with surgical condition is provided by polyvalent anesthesiologists who work in very difficult conditions (2-6). Indeed the exercise of anesthesia and surgery are practiced in an environment of severe lack of materials and consumables.

Preoperative assessment is limited. In addition, delays in treatment are common because the distances to reach specialized center are important and the technical platform of neonatal resuscitation department is deficient.

In sub-Saharan Africa, neonatal emergencies account for 1.31% and 4.22% of surgical hospitalizations in the Democratic Republic of the Congo and Guinea respectively (7,8). Anesthesia activity in neonatal surgical emergencies in Ile-Ife, Nigeria is estimated at 21.8% (9).

In Congo, a first evaluation of pediatric anesthetic practice was made and identified practices that did not comply with the recommendations (10). This study did not specifically target newborns.

The aim of this study was to study the anesthetic practice in neonatal surgery at the Brazzaville University Hospital, the only Tertiary referral hospital in the country.

Materials and methods

This was a descriptive retrospective study of all newborns operated between January 2014 and December 2017 (4 years). This study was conducted at Brazzaville University Hospital, which has the largest number of ICU and anesthesiology physicians, pediatric surgeons and the country's only neonatology pediatrician. It also drains the largest number of newborns with surgical condition.

All children aged between 0 and 28 days who had surgery were included.

Data was collected from anesthesia records and files

The parameters studied were:

- General data: age, weight, term of pregnancy
- Preoperative data: diagnosis, urgency status, indicated surgical procedure, ASA classification, and preoperative assessment.
- Intraoperative data: anesthesia type, induction mode, used hypnotics, analgesia, myorelaxants, transfusion, complications, control of upper airways, duration of anesthesia, status of the anesthesiologist and surgeon.
- Postoperative data: evolution

Data entry and analysis was done using SPSS.20 software.

Results

During the study period, 2167 urgent and programmed acts were performed from which 50 were newborns aged from 1 to 25 days, with an average of 9.26 days. This constitutes a frequency of 2.3%.

The average weight was 2672g (1580g and 4000g), including 3 that weighed less than 2000g. There were 13 premature patients (52%).

Surgical conditions are summarized in Table 1. They were urgent in 98% (n = 49) of cases.

The operating procedures indicated as well as the classification of the American Society of Anaesthesiologists (ASA) were respectively collected in Tables 2 and 3. A preoperative assessment was performed in 16 patients (32%).

Anesthesia was general in 100% of cases and was induced intravenously in 42 (84%) patients or inhaled (for hypnotics) in 8 (16%) patients. Analgesia was used in 68% (n = 34) and myorelaxation in 56% (n = 28). Table 4 provides an outline of the used products for anesthetic induction, analgesia, and myorelaxation.

Diagnostic	n (%)
Bowel obstruction	33 (66)
Anorectal malformation (10)	
Strangulated hernia (6)	
Atresia of the duodenum (2)	
Atresia hial (8)	
Jejuno-ileal diaphragm (1)	
Annular Pancreas (1)	
Hirschsprung's disease (2)	
Common mesentery (3)	
Peritonitis	7 (14)
Gastric perforation (3)	
Intestinal perforation (4)	
Abdominal wall abnormalities	1 (2)
Laparoschisis (1)	
Esophageal atresia	2 (4)
myelomeningocele	1 (2)
Posterior urethral valve	3 (6)
Parietal abscess	2 (4)
Spermatic cord torsion	1 (2)
Total	50 (100)

Table 1. Diagnosed surgical diseases

Surgical indications	n (%)
Resection anastomosis	14 (28)
colostomy	8 (16)
anoplasty	4 (8)
Esophageal anastomosis	2 (4)
Closing the wall	1 (2)
Duodeno-duodenostomy	2 (4)
Gastrorrhaphy	3 (6)
Hernia cure	5 (10)
Drainage - evacuation	2 (4)
External ventricular bypass	1 (2)
Laying of urinary catheters	3 (6)
Exploratory Scrototomy	1 (2)
Intestinal anastomosis	4 (8)
Total	50 (100)

Table 2. Surgical indications

ASA Class	n (%)
ASA1	22 (45,8)
ASA2	19 (39,6)
ASA3	7 (14,6)
Total	48 (100)

Table 3. ASA classification

Used drugs for anesthesia	n (%)
Anesthetic induction	
- Propofol	28 (56)
- Ketamine	13 (26)
- Halothane	8 (16)
- Thiopental	1 (2)
Analgesia	
- Fentanyl	34 (100)
muscle relaxation	
- Suxamethonium	26 (92,9)
- Rocuronium	2 (7,1)

Table 4. Drugs used for anesthesia

Blood transfusion was required in 17 (34%) cases. Intraoperative complications occurred in 22 (46%) patients. These complications were; bronchospasm 3 (13.6%), hypoxia 1 (4.5%), bradycardia 8 (36.4%), tachycardia 6 (27.3%) and difficult intubation 4 (18.2%). None of these intraoperative complications resulted in death on table.

The upper airways were controlled either by tracheal intubation 47 (94%) or laryngeal mask 3 (6%).

The anesthetist was present in the room in 90% (n = 45) and a nurse anesthetist in only 10% (n = 5). The surgeon was almost always a pediatric surgeon 49 (98%).

The mean duration of anesthesia was 83.71 minutes with extremes of 14 and 235 minutes. Thirty-two patients had an anesthetic time of less than 2 hours. Only 2 (4%) newborns stayed in multipurpose intensive care units after surgery. The postoperative mortality was 22%, ie 11 newborns died.

Discussion

During our study period, we performed 50 anesthesia on newborns from 2167 anesthesia in pediatric surgery department that is a frequency of 2.3%. The Republic of Congo is a sparsely populated country (11) without medical insurance and prehospital medicine with regularization to facilitate the inter-hospital transport of patients. These factors may explain the low number of newborns operated in the study period compared with other developing countries: Zaria in Nigeria 39.7% (12), Ile-Ife in Nigeria 21.8% (9), and Eldoret in Kenya 10% (3).

The average age in this study is slightly high compared to the work of Tengue-Keremu (3) and Sowande (13) in Nigeria, which had an average age of 3 and 6.62 days, respectively. The average weight is similar to other African studies (9, 12).

The surgical conditions of our series were dominated by congenital digestive pathologies that were therapeutic emergencies (1). This long observed delay in treatment (average age of 9 days) may be related to the absence of antenatal diagnosis, the late reference and the lack of universal medical insurance. The late arrival of these newborns in a tertiary care hospital is a major challenge added

to the management because they come with hydroelectrolytic problems, anemia, sepsis and undernutrition (5). Indeed, our patients were admitted for the most part in the operating room with an anesthetic risk ASA2 and ASA3. Faponle in Nigeria found a higher ASA3 rate of 36.8% (9). In the majority of cases, anesthesiologists were confronted with urgent digestive disorders (intestinal occlusions 66%, peritonitis 14%, esophageal atresia 4%, and Laparoschisis 2%). This trend is similar to other series (3, 5, 9, 12-14). General anesthesia with intravenous induction with propofol is a usual practice in pediatric anesthesia in our department (10) as well as for newborns as observed in our study. This is despite the lack of marketing authorization for children below the age of 30 days. Ketamine has been used in newborns with hemodynamic instability as recommended in literature (1). The intravenous induction method was preferred because most newborns that arrived in the operating room were already perfused. In Nigeria induction was by inhalators (95%) with halothane (9). Whatever the induction technique and the drugs used, the important thing was to make a choice based on the pharmacological properties of the drug, the field and the perioperative strategy (15).

Analgesia was not systematic (68%) although 47 patients (94%) were intubated. Good management of perioperative neonatal pain is intended to relieve but also protect the developing nervous system from permanent sensitization of pain pathways (16). Similarly, premature infants receiving fentanyl have an endocrine response to lower surgical aggression (17). Muscle relaxation was more frequently practiced in Nigeria (9). Curarization has few indications in neonatal surgery. Cisatracurium and atracurium, which are eliminated by the Hoffman pathway, independently of renal and hepatic functions, are the most appropriate (1). Intraoperative incidents and complications are probably underestimated because of the retrospective collection of data. Intubation was difficult forcing the team to use a laryngeal mask. It is known that the anatomical particularities of the newborn in the upper airways are sometimes a source of difficult intubation.

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The newborn is not an adult in miniature. He has physiological peculiarities and presents affections that are specific to this period of life (1), in an environment of insufficient preparation (18), and under equipped atmosphere (5). The digestive emergencies as for them are providers of hemodynamic instability. As a result, the intensive care physician and the pediatric surgeon have been in the forefront of the operating room. No deaths on the table have been recorded as in Ile-Ife (9). The duration of the anesthesia could be reduced by training and better coordination of teams. Sowandé in Nigeria found more deaths for surgeries longer than one hour (13). Also, some research has reported on the possible neurotoxicity of anesthesia on premature and newborns (19, 20). The mortality observed at the end of the surgical process was less than the continent's Neonatal Urgent Surgeries Mortality that is more than 50% (21). It is also below the mortality observed in certain African cities: In Nigeria in Ile-Ife (59 deaths / 110 urgent acts and 39 deaths / 76 cases) (9, 13), Zaria (30,5%) (12) and Democratic Congo in Bukavu (43.3%) (8). It was similar to that observed in Kenya at Eldoret (3). Our patients were for the most part ASA1 or ASA2; moreover the combination of an ICU anesthesiologist with the perioperative management as well as the weak sample can explain this rate.

Conclusion

The anesthesia in the neonatal period practiced in a difficult environment was a real challenge. The advanced age of management of congenital and urgent diseases, the insufficiency of preoperative investigations, the limited choice of drugs, the absence of a pediatric ICU department to supervise the management of the most difficult cases; have been real challenges for the actors involved despite the encouraging results. Specialized training of anesthesiologists and improved working conditions can help reduce mortality.

Ethics: Our study did not require approval by the Ethics Committee

Conflict of interest: none

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