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Surgical and Anaesthesiology Management of Esophageal Atresia: What Are the Mortality Factors in a Developing Country?

Adjoba Manuela Ehua[1*], Martial Olivier Moulot[1], Privat Desire Ango[2], Kouame Soroboua Agbara[1], Jean-Marie Konan[1], Ibrahim Traore[1], Lohourou Franck Grah[1], Robert Boulleys[1], Alphamoye Haidara[1], Paule-Christine Ekobo[1], Sanni Roumanatou Bankole[1]

[1]Pediatric Surgery Department, University Hospital Center of Treichville, Abidjan, Côte d'Ivoire
[2]Resuscitation Department, University Hospital Center of Treichville, Abidjan, Côte d'Ivoire
Email: *ehuamanuela15@gmail.com

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Abstract

Esophageal atresia is an extreme neonatal surgical emergency whose mortality remains high in our country. We report 8 cases collected over 7 years in a tertiary hospital in Abidjan, Côte d'Ivoire. The purpose of the study is to identify the elements of surgical and anaesthesiological management in our department that influences mortality.

Keywords

Esophageal Atresia, Mortality, Developing Countries

1. Introduction

Esophageal atresia is an interruption in the continuity of the esophagus with or without tracheal fistula. It is a neonatal emergency with a frequency of 1/5000 live births. Since 1971, when Cameron Haigth's first successful surgical treatment was performed in the United States, the death rate has dropped considerably to 10% - 15% in developed countries. This improvement in the survival of these newborns with esophageal atresia is mainly due to advances in neonatal anesthesia and perioperative care [1]. The speed of diagnosis and the progress of surgical techniques are also factors in the reduction of mortality. However, mortality remains high in developing countries (75% - 100%). Thus, we carry out this study to identify the factors that have been good prognostics in the management of the newborn with esophageal atresia in order to reduce the mortality.

2. Patients and Method

We collected from January 2011 to June 2018, all newborns hospitalized for esophageal atresia in the pediatric surgery department of University Hospital Center of Treichville, Abidjan, Côte d'Ivoire. The variables studied in this retrospective study were presence of hydramnios, sex, birth weight, the term of pregnancy, the type of atresia, the pulmonary state, the presence or absence of associated malformations, the age at diagnostic, the time and type of intervention, the weight at admission, the perioperative management conditions and the evolution.

3. Results

During these 7 years, 8 newborns were admitted to the pediatric surgery department. There were 4 boys and 4 girls. The average age at diagnostic was 6.6-day-old with extremes ranging from 3-day-old to 11-day-old. The average birth weight was 2856 g with extremes ranging from 2150 g to 3900 g. None prenatal diagnosis was done. The antenatal ultrasounds had found a hydramnios in 2 cases. One patient was premature for 33 weeks of amenorrhoea.

Respiratory distress, wrong way, and hyper sialorrhea were the call signs of all our patients. The diagnosis of esophageal atresia was made by the probe test and the thoraco-abdominal x-ray of the face. In 1 case, administration and immediate aspiration of gastrograffin by the probe confirmed the diagnosis. This was a type 3 esophageal atresia in the 8 patients. In 2 cases, cardiac malformations were associated: atrial septal defects (ASD) and ventricular septal defects (VSD). All patients had bronchial congestion at admission. Table 1 presents the distribution of patients according to clinical factors.

Surgery, under general anesthesia, was performed in 6 out of 8 patients. The other 2 patients died before the procedure: severe dehydration and sudden cardiac arrest. End-to-end anastomosis was performed in 4 patients. 1 patient had a gastrostomy and 1 patient had a gastrostomy with ligation of the abdominal esophagus. The average time between diagnosis and surgery was 5.83 days. The average age at surgery was 13-day-old with extremes ranging from 6-day-old to 21-day-old. The perioperative complications were: the pleural tear (5 out of 6 cases), 2 deaths during surgery and immediate postoperative surgery. The 4 patients living post-operatively in the 6 operated patients were admitted to the intensive care unit. 1 patient died on day 2 postoperatively and 1 patient on day 4 postoperatively, both from sepsis. Resuscitation care consisted of sedation and parenteral nutrition with Perikabiven® in 1 patient and glucoside enriched with electrolytes associated with amino acids in other patients. Perikabiven® was administered at a dose of 4 mg/kg/day over 4 days using an electric syringe. The liver test before and after administration, and at 6-month-old, was normal. Extubation was done on day 2 postoperatively. The test of feeding by the trans-anastomotic probe was done on day 8 and day 10 postoperatively. After the successful attempt of the enteral feeding, the exit of the resuscitation was

Table 1. Clinical aspects of newborns.

N	Hydramnios	Term of pregnancy	Sex	Birth weight	Age at Diagnosis	Admission weight	Pulmonary state	Associated malformations
1	No	Term	M	2750 g	9-day-old	1770 g	Bronchial congestion	none
2	No	Preterm	F	2150 g	11-day-old	1800 g	Bronchial congestion	Peri membranous ASD: 3 mm VSD Large pulmonary artery
3	No	Term	F	3000 g	9-day-old	2400 g	Bronchial congestion	None
4	No	Term	F	3900 g	3-day-old	3700 g	Bronchial congestion	None
5	No	Term	M	3750 g	8-day-old	1700 g	Bronchial congestion	None
6	No	Term	F	2500 g	3-day-old	2000 g	Bronchial congestion	None
7	Yes	Term	M	2300 g	4-day-old	1900 g	Bronchial congestion	None
8	No	Term	M	2500 g	6-day-old	1600 g	Bronchial congestion	ASD VSD

done on day 15 and day 17 postoperatively. The postoperative complication was: anastomotic stenosis at 3-year-old in 1 patient. She was successfully reoperated. The follow-up is 3 years and 7 years. The mortality in our series was 75%. **Table 2** shows the distribution of newborns according to the therapeutic and evolutionary aspects.

4. Discussion

This work illustrates the difficulties of management of esophageal atresia in an african context. In order to optimize the post-natal management of newborns with esophageal atresia, to search for associated malformations, technological progress is being made for antenatal diagnosis. This antenatal diagnosis is based on a reference ultrasound with research of the pouch sign, a fetal MRI and the measurement in the amniotic fluid digestive enzymes. However, this antenatal diagnosis remains difficult. Less than 50% of esophageal atresia is identified in antenatal [2]. In our series, only 2 cases of hydramnios were found. None information was found on the stomach or any dilated upper esophageal dead end (Pouch sign). Although the predictive value of the association of the hydramnios and not visible or small stomach is weak [2], the discovery of this hydramnios should provoke further investigations. None antenatal diagnosis could be performed in our series. This state is almost constant in african studies [3] [4]. The absence of antenatal diagnosis is due to the lack of expertise in the ultrasound monitoring of pregnancies, and the lack of knowledge of malformative pathologies.

Although, antenatal diagnosis, even in developed countries, is done only in 50% of cases, the diagnostic time after birth rarely exceeds 20 hours [2] [5]. In our series, the diagnostic time was 6.6-day-old. It is superimposable to the delays found in other regional studies [5] [6] [7]. Even though 9 years have elapsed since Bandre [5] study in our hospital and one in the region, the diagnostic delay

Table 2. Distribution of newborns according to the therapeutic and evolutionary aspects.

N	Age of surgery	Time between diagnosis and surgery	Type of atresia	Type of surgery	Pre anesthetic conditions	Post-anesthetic conditions	Evolution
1	21-day-old	12 days	3	Gastrostomy+ ligation of distal esophagus	Dehydration Denutrition Parietal abcess	Admission to intensive care unit	Death on day 4 post-operatively
2	16-day-old	5 days	3	End-to-end esophageal anastomosis	Dehydration Denutrition	Admission to intensive care unit	Death on day 2 post-opertively
3	11-day-old	2 days	3	End-to-end esophageal anastomosis	Dehydration (Admission to intensive care unit)	Admission in intensive care unit	Reoperation of Anastomotic Stricture (3-year-old) Survival Follow-up: 7 years
4	6-day-old	3 days	3	End-to-end esophageal anastomosis	Dehydration	-	Death on per-operatively
5	15-day-old	7 days	3	End-to-end esophageal anastomosis	Dehydration (Admission intensive care)	Admission to intensive care unit: enteral nutrition	Survival Follow-up: 3 years
6	9-day-old	6 days	3	Gastrostomy + End-to-end oesophageal anastomosis	Dehydration	-	Death on immediate post operatively
7	-		3	-	Dehydration	-	Death at 10-day-old
8	-		3	-	Dehydration	-	Death at 8-day-old

has remained the same. Staff training in the careful examination of the newborn in the birth room remains inefficient. The absence of prenatal diagnosis coupled with a high age at diagnosis explains the precariousness of the clinical condition of newborns during diagnosis. This exposes to more preoperative constraints on the anesthetic level: possible prematurity, inhalation pneumopathy (saliva, feeding, gastric contents by the fistula) and gastric distension altering the ventilatory mechanics.

The average surgery time is also high, 5.83 days. It is due to the difficulties to perform urgent malformative assessment including cardiac ultrasound. The acquisition by our hospital of morphological exploration's equipment would contribute to the improvement of the infant mortality index by reducing the wandering time to achieve the paraclinical assessment. The combination of these pejorative factors in management may explain the high mortality in our series (75%). However, in view of factors that have for decades been prognostic factors in the Waterston and Spitz classifications: the term of pregnancy and average birth weight of our patients were good [8] [9]. Some authors question the influence of these factors on survival [10] [11].

Like the others, the 2 surviving patients have had a long diagnostic delay (8 and 9 days) and a bronchial congestion. But a particularity was noted in their management: the involvement of the resuscitators as the diagnosis was made. This was shown by an admission to intensive care in pre-operative period for both patients to correct dehydration, and parenteral nutrition with Perikabiven®

post-operatively for one of the patients. This administration of Perikabiven® was done outside the Marketing Authorisation (MA). The administration that product has been done because of the absence of neonatal parenteral nutrition in our country. Both patients did not have cardiac malformations.

Nine years after Bandre's study [4], mortality remained practically the same, 74% in their series against 75% in ours, whereas the French national register shows 95% survival rate [12]. This mortality is influenced by the low level of training of practitioners in malformative diseases, the diagnostic wandering due to under equipment of our hospitals and the lack of collaboration between radiologists, neonatologists, resuscitators and pediatric surgeons in our current practices. The improvement of the prognosis of the esophagus atresia will pass by an admission in resuscitation as soon as the diagnosis is made in order to treat possible pneumopathies, to ensure the parenteral nutrition and the rehydration. This improvement will also include admission to intensive care unit in the immediate post-operative period and follow-up until enteral feeding is resumed.

5. Conclusion

The neonatal mortality rate is a real development index. The mortality of esophagus atresia is influenced by the low level of training of practitioners in malformative diseases, the diagnostic wandering due to under equipment of our hospitals and the lack of collaboration between radiologists, neonatologists, resuscitators and pediatric surgeons in our current practices. The reduction of this mortality is mainly due to the close collaboration between pediatric anesthesiologists and pediatric surgeons, by the creation of neonatal resuscitation department and the equipment of our hospitals.

Limits of the Study

A prospective study with a larger number of cases would allow a better analysis of the prognostic factors of our series.

Consent

Consent was not obtained. This report does not contain any personal information that could lead to the identification of the patient.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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