Original Article

Evaluation of the Management of Gastroschisis in Aristide Le Dantec University Hospital Center in Dakar: A Cross Sectional Study

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Abstract

Introduction: The management of gastroschisis remains problematic in low- and middle-income countries with high perioperative mortality. The objective of this work was to make an initial assessment of our management of gastroschisis. **Materials and Methods:** This was a monocentric and cross-sectional study including all newborns with gastroschisis between January 2017 and December 2021 in the Pediatric Surgery and Anesthesia Resuscitation Department of the Aristide Le Dantec University Hospital Center from Dakar. The socio-demographic, diagnostic, therapeutic and evolutionary parameters were studied. **Results:** Eighteen cases of gastroschisis (11 males and 7 females). The mothers' mean age were 23.1 ± 5.7 years old. Only one antenatal diagnosis was made. The mean gestation age were 36.5 ± 1.5 weeks. On admission, the mean age was 16.8 ± 6.3 h and the mean weight 2244 ± 260.3 g. Gastroschisis was complex in four patients. Primary bowel reintegration was performed in 8 cases (44.4%) and progressive reintegration using an Applied Alexis retractor in 9 newborns (55.6%). Main complications were respiratory distress (28.3%) and sepsis (22.2%). The mean duration of return of oral feeding was 5.1 ± 1.9 days. Mortality was 94.4% (17/18). **Conclusion:** Reducing gastroschisis-related mortality in our low-income countries remains a major challenge.

Keywords: African environment, enteral feeding, gastroschisis, high mortality

Introduction

Gastroschisis is a congenital anomaly characterised by exteriorisation of the abdominal viscera through an anterior parietal defect generally located to the right of the umbilical cord.[1] Gastroschisis can be simple or complex. It is said to be complex when it is associated with atresia, necrosis, intestinal perforation or volvulus.[2,3] It is an absolute neonatal surgical emergency whose evolution in the absence of treatment is incompatible with life.

Over the past three decades, there has been a steady increase in its incidence recently estimated at 1 in 2000–4000 live births.[1,4] The development of antenatal diagnosis and neonatal resuscitation has considerably improved the prognosis of this malformation in developed countries.[1,2]

Comprehensive management remains difficult in low- and middle-income countries, with mortality ranging between 33% and 100%.[5-7] In contrast, survival rates in high-income countries are over 95%.[8-10]

In Senegal, no study has been carried out to date to take stock of the management of this malformation.

The objective of this work is to carry out the first evaluation of the management of gastroschisis at the Center Hospitalier Universitaire Aristide Le Dantec in Dakar in order to improve their prognosis.

Materials and Methods

This was a cross-sectional study conducted over a period of 5 years, from January 2017 to December 2021 in the Pediatric

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Surgery and Anesthesia and Resuscitation Department of the Center Hospitalo-Universitaire Aristide Le Dantec in Dakar. The hospital ethics committee gave its approval for this study. The patients came from all regions of Senegal. We included all newborns with gastroschisis seen in our hospital. No case was excluded.

Data were collected from medical consultation, hospitalisation, operating theatre and prenatal consultation registers.

We studied the epidemiological parameters, the history of pregnancy and the clinical, paraclinical, therapeutic and evolutionary data.

Pregnancy history data included maternal age, parity, notion of drug use, prenatal consultation, prenatal diagnosis and pregnancy term.

Perinatal variables included mode and place of delivery, sex, age at admission, birth weight, mode of transport and nature of initial management.

Clinically and radiologically, the characteristics assessed were the general condition of newborns, temperature, location and diameter of the parietal defect, the appearance of the eviscerated viscera and the existence of an associated malformation.

The appearance of eviscerated viscera on admission was assessed according to the Lefort and Borde classification.

It divides digestive lesions into four types of increasing severity.

Type I: Small bowel and colon are pink with little or no corky membrane; there is no atresia, and the length of the hail and colon is significant.

Type II: Small intestine and colon are poorly vascularised, covered with corky membrane, no atresia, long small intestine and large colon.

Type III: Small intestine and colon are poorly vascularised, covered with corky membrane, presence of atresia of the small intestine, the colon or both or necrosis or perforation lesions; the length of the hail and the colon is reduced but compatible with a hope of survival.

Type IV: Necrosis of almost the entire digestive tract, incompatible with any hope of survival.

The therapeutic parameters considered were the time of surgery, the duration of anaesthesia, the monitoring of abdominal pressure, the duration of the intervention and the surgical procedure performed. Surgical treatment consisted in intestinal reintegration in one step or progressive reintegration using an Applied Alexis.

Furthermore, the delay in oral nutrition, the duration of hospitalisation, morbidity and mortality were studied.

Data was analyzed using Statistical Package for the Social Sciences (SPSS) version 23.0 software, IBM® Company.

Results

During the 5 years o f study, 513 newborns with with congenital malformations including 18 gastroschisis were seen in our centre. The annual hospitalization prevalence was 3.6. They were 11 males and 7 females. They were 11 boys and 7 girls. The mothers were on average 23.1 ± 5.7 years old. Those aged under 18 accounted for 38.9% and those aged over 35 (5.5%). The average parity was 1.3 ± 1.2. The average number of prenatal consultations was 3 ± 0.57. Antenatal diagnosis was made in one case using obstetrical ultrasound performed at the 34th week. The term of pregnancy was on average 36.5 ± 1.5 weeks. The number of premature births was 6 cases (33.4%). Delivery was vaginal in 17 cases (94.4%). It took place in a university hospital (11.1%), in a regional hospital (44.4%), in a health centre (16.7%) and in a health post or hut (27.8%). All newborns were evacuated by medical transport. On admission, the mean age was 16.8 ± 6.3 h. Most of the patients (88.8%) were received within the first 24 h. The mean weight was 2244 ± 260.3 g with 27.8% hypotrophy. Hypothermia was observed in 44.4% of newborns. The seat of the paraumbilical defect was on the right in all cases with an average diameter of 2 ± 1.2 cm. This was Type I gastroschisis in 6 cases, Type II in 8 cases, Type III in 3 cases and Type IV in 1 case [Figure 1]. The eviscerated viscera were normal in appearance (6 cases); cyanotic (8 cases) and necrotic, perforated or atretic (4 cases). Seven associated malformations (38.9%) were diagnosed. These were 3 congenital heart diseases, 2 cryptorchidism and 2 small bowel atresias.

Therapeutically, the time to surgical treatment was 32.3 ± 4.9 h. Its average duration was 55 ± 10 min with extremes of 40 min and 3 h. All had undergone surgery under general anaesthesia for an average duration of 2.2 ± 0.36. The surgical procedure consisted of one - stage intestinal reintegration in 8 cases (44.4%), progressive intestinal reintegration using an Alexis retractor in 9 cases (55.6%) [Figure 2].

Abdominal pressure was not assessed by monitoring intravesical pressure. None of the patients had received parenteral nutrition. The evolution was simple in one case. Post-operative complications were mainly respiratory distress and sepsis [Table 1]. Revision surgery was performed in six



Figure 1: Appearance of gutted loops. (a) Pink and viable intestinal loops, (b) necrotic intestinal loops



Figure 2: Surgical technique. (a) Primary intestinal reintegration, (b) Progressive intestinal reintegration using a retractor Applied Alexis

Table 1: Proportions of the different complications observed

Complications	Total	Amount (%)
Respiratory distress	13	28.3
Malnutrition + anaemia	5	11.1
Release of sutures + evisceration	6	13.3
Parietal suppuration	7	15.5
Intestinal necrosis + digestive fistula	4	8.9
Sepsis	10	22.2

patients (33.3%) for suture release complicated by evisceration. The mean delay of oral feeding was 5.1 ± 1.9 days. The average length of hospitalisation was 4.22 days with extremes of 1 and 19 days. Mortality was 94.4% (17/18) with an average survival of 3 days.

Discussion

Over the past three decades, the incidence of gastroschisis has increased.[4,6,11] Wright finds an average of 22 cases per year in low-income countries.[12] The annual incidence of 3.6 cases in our series does not reflect true local data. Epidemiological studies need to be conducted to determine the true incidence in Senegal. Some authors report a male predominance as in our series, while others mention a female predominance.[1,2] However, young maternal age, prematurity and active smoking are recurrent obstetrical contexts found.[13-15]

Antenatal diagnosis is the cornerstone of multidisciplinary consultation.[16,17] In high-income countries, 100% of gastroschisis is diagnosed antenatally compared to <10% in Africa.[9] In our series, we note a case diagnosed antenatally. In our countries, practitioners pay little attention to the detection of congenital malformations.[1] In case of prenatal discovery, the moment of delivery remains controversial.[16] Some recommend delivery at 35 weeks.[18] On the other hand, others question the usefulness of an early birth to protect the loops from possible lesions induced by prolonged exposure to amniotic fluid.[10] A narrow neck measured antenatally is potentially responsible for compression of the loops and ischaemic lesions.[10]

Similarly, there are no recommendations on the conditions and criteria for the extraction of foetuses with gastroschisis.[16] In low-income countries, late and often non-medical transport exposes these newborns to hypothermia, dehydration, intestinal pain and delayed treatment.[5,19] Reducing this delay requires educating and informing staff by teaching the classic rule of the three Rs 'Recognise-Resuscitate-Refer'.[9] The association of intrauterine growth retardation with gastroschisis does not affect the evolution of these children in terms of delay in parenteral nutrition, hospital stay and single-stage surgery.[16] According to the current literature, the prognosis seems guided by the character 'simple or complex'.[2,3,10] Complex gastroschisis has a longer hospital stay and more post-operative complications with a high rate of sepsis, digestive resection, stomia, respiratory complications and higher mortality.[3,10] For the majority of our patients (55.6%), we use the Applied Alexis retractors as a silo with handles under general anaesthesia for progressive reintegration.

However, in many settings in sub-Saharan Africa, surgeons have found that the defects can be closed at the bedside or the umbilical cord and a dressing can just be placed over the defect.

Oyinloye reported in his study in Nigeria that patients had improvised silo application by the bedside as the initial modality of treatment. This was because most babies were not fit for closure under general anaesthesia.[1]

Significant intestinal oedema, the concomitant risk of intestinal ischaemia and abdominal compartment syndrome prevent any attempt at primary closure. In addition, we do not have neonatal mechanical ventilation. Preformed silos are not available in the sub-region.[1,7,17,20] Manson finds a proportion of 77% of progressive closure by silo in Western countries against 26% in African countries.[9] Likely reasons for the limited use of preformed silos in low- and middle-income countries include non-availability, lack of expertise and high cost.[12] The use of the Applied Alexis retractor is also described by Kusafuka.[21] Furthermore, primary reintegration reduces the risk of infection but leads to a significant increase in intra-abdominal pressure.[22-24] Regardless of the surgical procedure adopted, gastroschisis is characterised by the frequent occurrence of complications. In our series, they are dominated by respiratory distress related to high abdominal pressure, early extubation, lack of qualified personnel and neonatal resuscitation service. A higher rate of complications is reported in African countries, and these are diverse in nature.[10,25] The unavailability of neonatal parenteral nutrition is a major concern encountered in our daily practice. Like Oyinloye[1] in Nigeria, we use amino acid injections. Only 19% of referral paediatric surgery centres in low-income countries have access to parenteral nutrition. The complex nature of gastroschisis and the delay in complete enteral nutrition are factors that lengthen the duration of hospitalisation.[5,26] Briganti observes a statistically significant reduction in the length of hospitalisation in the event of intestinal reintegration without general anaesthesia and early oral feeding.[27] The overall mortality related to gastroschisis

is now reduced to <5% in developed countries, especially in cases without chromosomal abnormalities or major organ malformations.[5,7,9,28]

Brebner observes 5.9% of deaths and identifies as mortality factors: poverty, obesity, gestational diabetes, birth weight <2500 g, term of pregnancy <34 weeks and associated malformations.[29] We report 94.44% mortality. Most deaths were due to respiratory distress related to abdominal compartment syndrome and sepsis. In sub-Saharan Africa, high mortality is due to infections and respiratory disorders. In Nigeria, Uganda and Ivory Coast, the authors report 57.1%, 98% and 100% mortality, respectively.[2,5,7] In order to reduce gastroschisis mortality in low- and middle-income countries, the authors propose the establishment of a preformed silo, antibiotic therapy protocols, parenteral nutrition, handwashing before treatment, training of the personnel involved and the establishment of paediatric and neonatal intensive care units.[1] Concerted local and international efforts can help improve the prognosis of gastroschisis in Africa so that morbidity and mortality more closely approximate international benchmarks.[5]

In order to reduce the mortality of gastroschisis in Senegal, our team adopts in a multidisciplinary consultation meeting a protocol for the overall care of our patients. This protocol includes initial care of the newborn with the application of a dressing with sterile compresses soaked in saline solution.

In order to reduce gastroschisis-related mortality in our context in Senegal, the pediatric surgery.

The pediatric surgery team at the Aristide Le Dantec University Hospital adopted a protocol. It includes the initial care of the newborn with wrapping of the intestines with sterile compresses soaked in saline serum, prophylactic antibiotic treatment, transfer and rapid surgical management in a pediatric surgery center within the first 24 hours. Finally, a central venous line and a nasogastric tube are systematically placed. Oral feeding is started early. Systematic hand washing with the wearing of sterile gloves during dressings is also established. A central venous line is placed. Parenteral nutrition is started as soon as the transit appears.

Systematic handwashing with the wearing of sterile gloves during dressings is also established. Complex gastroschisis will benefit from surgery under general anaesthesia.

Our study is limited by the small sample size and the retrospective nature of the research.

Conclusion

The management of gastroschisis remains a public health challenge in low-income countries such as Senegal where morbidity and mortality remain very high. Ultimately, improving the prognosis of this malformation in our country requires multidisciplinary consultation, systematic antenatal diagnosis, medical transport and early and appropriate perinatal care. It also involves the availability of neonatal parenteral nutrition, the elevation of the technical platform and the installation of a neonatal resuscitation unit.

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Conflicts of interest

There are no conflicts of interest.

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