Scientific Research Publishing

Open Journal of Pediatrics, 2023, 13, 669-675
https://www.scirp.org/journal/ojped
ISSN Online: 2160-8776
ISSN Print: 2160-8741

# Gradual Bedside Reduction of Gastroschisis in a Resource Constrained Setting: Preliminary Results from 32 Cases

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**How to cite this paper:** Dorcas, N.B., Tobie, N.E., Raymond, N., Nadine, K.T.I., René, N., Horline, B.T., Clémence, V., Paule, K.S., Guy, N., Paul, O.E., Agnès, E. and Henri, S. (2023) Gradual Bedside Reduction of Gastroschisis in a Resource Constrained Setting: Preliminary Results from 32 Cases. *Open Journal of Pediatrics*, **13**, 669-675.
https://doi.org/10.4236/ojped.2023.135075

**Received:** July 2, 2023
**Accepted:** September 15, 2023
**Published:** September 18, 2023



## Abstract

**Introduction**: Gastroschisis is one of the neonatal pathologies with bad prognosis in developing countries due to a lack of equipment. We aim to report one way of managing this malformation that could be practised everywhere, constituting an alternative approach to surgery in poor areas. **Patients and Methods**: This observational and descriptive study included newborn babies with gastroschisis who underwent gradual bedside reduction at the Paediatric Surgery Department of the Yaounde Central Hospital. **Results**: Our cohort was constituted by 32 newborn babies with a mean age of 18.12 hours on admission. The Lefort type 2 was the most frequent in 81.25% of cases. The mean time for oral feeding after complete reduction was 17.4 days and the duration of hospital stay was 24.91 days. Survival rates were at 40.63%, with a residual hernia after healing in 38.46% of cases. **Conclusion**: Despite the high rate of mortality, gradual reduction of gastroschisis at the bedside seems to be an opportunity for resource constrained areas and can be an alternative solution to surgery.

## Keywords

Gastroschisis, Lefort Type 2, Gradual Reduction, Limited Resources

## 1. Introduction

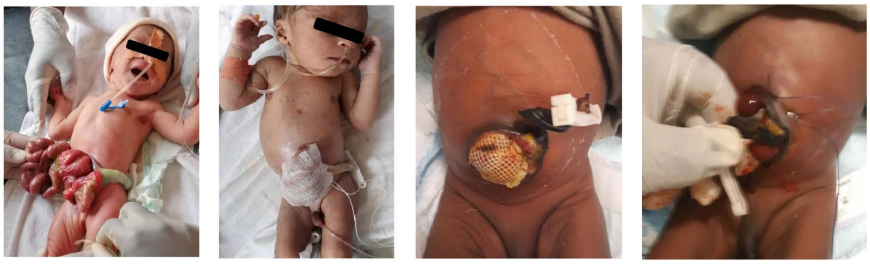
Gastroschisis is a congenital malformation of the anterior abdominal wall around

the umbilicus. It appears as a defect in the closure of the abdominal wall during embryogenesis with exteriorisation of all or some intra-abdominal organs such as intestine, stomach, liver etc., with a normally inserted umbilicus [1]. This constitutes a surgical emergency; but the prognosis of such babies is usually bad in resource constrained settings. In sub-Saharan Africa especially in Cameroon, such cases lead usually to death due to the lack of neonatologists, the absence of good resuscitation equipment, and inadequately developed transportation and transfer systems towards reference hospitals [2]. In order to reduce the rate of mortality due to gastroschisis and bring some support to those families who cannot afford access to reference hospitals, we came up with a simple, cheap method that could save lives at the bedside of the baby without needing to transfer patients to a reference hospital. This method consists of gradual reduction of initially exposed organs into the abdominal cavity. Recently in 2020, a similar work has previously been done by A. Wesonga, *et al.* In Uganda, and brought down the mortality rate of gastroschisis from 98% to 59% after bedside reduction [3]. For the past few years, this method was experimented at the Paediatric Surgery Department of the Yaounde Central hospital, and this paper presents our preliminary results.

## 2. Patients and Method

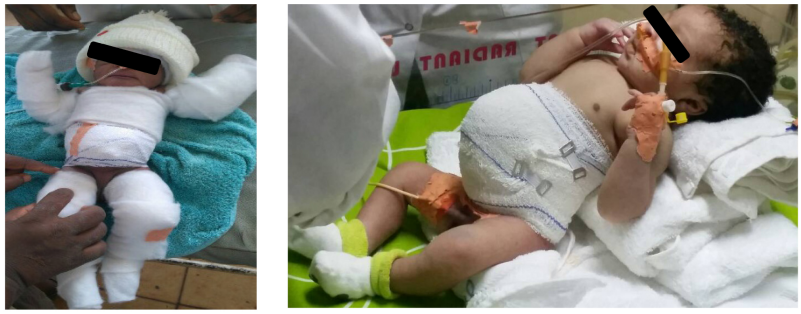
This study has been approved by the Ethical Committee of the Yaounde Central hospital. The study method was carried out in accordance with relevant guidelines and regulations. From January 2017 to May 2022, we conducted a descriptive and observational study on all newborn babies transferred from the obstetric ward to the Paediatric Surgery Department for gastroschisis. We included all newborn babies who have been admitted in our Department for gastroschisis during the period of study. We managed such cases with the Bianchi and Dickson's method that consisted of a sequential reduction of abdominal organs with immediate or delayed closure of the abdominal wall with surgical sutures [5] (**Figure 1**). The procedure first consisted to check vital parameters of the baby such as pulse rate, respiratory rate, and oxygen saturation. If one parameter was not normal, the reduction was delayed and the baby was stabilised before the procedure was attempted. The bandage dressing done in the labour room was removed and asepsis was done with normal saline initially warmed to body temperature. The Lefort and Borde classification [4] (**Table 1**) was used during careful stretching of the intestine followed by gradual and gentle reduction of organs using forceps, all under control of vital parameters. This procedure could be repeated every 3 days according to the baby's parameters (**Table 1**).

Once the sequence of reduction was achieved, the baby was laid down in a warm bed in an anti-reflux position (**Figure 2**). Intravenous medication including a painkiller (Tramadol and paracetamol) and 3 antibiotics was systematically associated to reduction because of pain and the risk of infection due to exposure of the bowel during delivery. These antibiotics included a 3$^{rd}$ generation cephalosporin, metronidazole and gentamycin. Sometimes, diazepam or ketamine



(a) (b) (c) (d)

**Figure 1.** (a) = patient conditioning (venous route, gastric, urinary and rectal empty). (b) = 1st reduction time + fatty dressing. (c) = 2nd reduction time. (d) = end of reduction + suture closure.



(a) (b)

**Figure 2.** (a) = dressing + heating of the newborn. (b) = dressing and heating under radiant table.

**Table 1.** Lefort and Borde classification for gastroschisis.

| Type | Aspect | Colon/small Bowel length | Atresia | Membrane |
|---|---|---|---|---|
| Type 1 | Good | Sufficient | Absent | |
| Type 2 | Poorly vascularised | Sufficient | Absent | Inflamed |
| Type 3 | Poorly vascularised | Reduced | Present: colon with or without small bowel | |
| Type 4 | | Quasi-total necrosis of the colon | | |

were used for sedation during reduction if the baby did not tolerate the procedure. Another sequence of reduction was planned when the baby's parameters were stable. The evolution of the abdominal circumference was observed. The emission of stool confirmed intestinal transit. The partial or complete closure of the abdominal wall was done with surgical sutures according to vital parameters and intra-abdominal pressure. The baby stayed admitted until stabilisation of vital parameters, introduction of oral feeding and effectiveness of intestinal transit. The baby was then discharged and follow-up planned after 2 weeks, after 1 month and eventually every 3 month. Apart from the vital parameters and the

baby's weight and height, we checked the quality of healing and the presence of a residual hernia. Data was collected and registered on a predesigned form. The parameters recorded included: clinical presentation of gastroschisis, proportion of bowel reduced, time interval to initiation of oral feeding, duration of hospital stay, outcome and the presence of a residual hernia (Figure 3). Data analysis has been done with Epi Info software version 3.5.4 for percentage, median, mean and ratio then we drew tables with Microsoft Office Excel 2022.

## 3. Results

We managed a cohort of 32 patients; their mean age was 18.12 hours on admission with extremes of 0.25 and 120 hours. The sex-ratio was 1.67 female for 1 male. Twelve (12) babies (37.5%) were premature and the diagnosis of gastroschisis was made in 5 cases (15.6%) during antenatal care with ultrasound exploration. The major clinical presentation was Lefort and Borde type 2 (Table 2).

The mean time to oral feeding was 17.4 days with extremes of 11 and 37 days; this was motivated by the emission of stool by the baby. The duration of hospital stay was 29.9 days with extremes of 14 and 49 days. Nineteen (19) patients died, representing a mortality rate of 59.4%. Among the 13 patients who survived, the healing process came with a residual hernia in 5 patients representing 38.5% of cases.

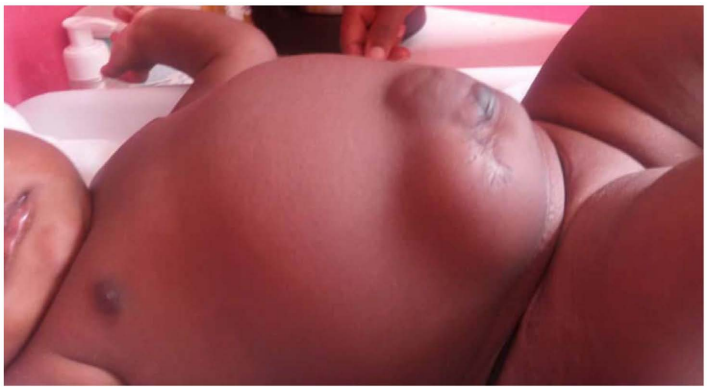


Figure 3. Healing by residual hernia.

Table 2. Frequency of reduction according to Lefort and Borde classification.

| Time of reduction | Failure of reduction | | Reduction with success | Total |
|---|---|---|---|---|
| | 1st time | 2nd time | 3rd time | |
| Lefort 1 | 0 | 0 | 5 (1) | 5 (1) |
| Lefort 2 | 0 | 1 | 15 (8) | 16 (9) |
| Lefort 3 | 3 | 2 | 6 (4) | 11 (9) |
| Lefort 4 | 0 | 0 | 0 | 0 |
| Total | 3 | 3 | 26 (13) | 32 (19) |

## 4. Discussion

Gastroschisis type 1 and type 2 according to Lefort and Borde classification, have been reported to have a good prognosis and good results after bedside reduction [5] [6]. Sequential reduction is less described in developed countries because of advances in surgical methods [7]. We could not perform our method on all patients especially type 4; however, our method has been an alternative to surgery for some patients: this, we consider as progress. A short term delay for oral feeding in our series was due to difficulties for the majority of families to support the cost of parenteral nutrition for a long period. This situation obliged physicians to start early breast feeding or artificial enteral feeding. Certainly, bedside reduction is an adjuvant for early nutrition in our series and many publications reported the importance of early oral feeding in the management of gastroschisis [8] [9] [10] [11]. We observed also that early oral feeding considerably reduces the duration of hospital stay and eventually the overall cost of management of these patients. The mortality rate was high in our series, when compared to cohorts using surgical techniques in developed countries [12] [13] [14]. This can be explained by the lack of paediatric resuscitation equipment. Also, 1/3 of cases were type 3 and type 4, recognised to have poor prognosis even in high income settings [15] [16]. With surgery, type 3 and type 4 can be better managed by surgical resection and anastomosis of atresia or the necrotic portion of the bowel. The mortality rate was high in patients unfit for early oral feeding and the lack of parenteral nutrition in our country has been a risk factor of mortality in this group of patients. The clinical evolution of such patients was characterized by the apparition of malnutrition signs, body weakness and death. Our survival rate was better than some studies in other developing countries [17] [18] [19]. The persistence of residual hernia after reduction has been also described in the literature; but we do not consider it as a major issue; given that plastic surgery can always be performed later [19] [20] [21]. This study was limited by the shortness of the sample size and we included type 3 and type 4 of gastroschisis that do not give good results with bedside reduction [18]. The duration of post-operative follow-up can't be considered as a great matter because this paper is presenting preliminary results.

## 5. Conclusion

Despite the high mortality rate in our series compared to other studies using surgical techniques, bedside reduction of gastroschisis constitutes an alternative to surgery in developing countries. This method can be practised everywhere in areas with low cost and few materials. Some progress can be made in these settings in order to reduce the mortality of patients who need surgery. Policy makers can and should push for provision of better equipment for surgery, improvement in transportation systems, and provision of medical resources including resuscitation and other equipment.

## Conflicts of Interest

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

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