Original Research Article

Outcome of management of gastroschisis: Comparison of primary closure and silo followed by delayed primary closure

Gajendra Nath Mahato[1*], Ayub Ali[2], Ipshita Biswas[3], Md. Hasanuzzaman[4], Gourango Bose[5]

[1,4]Assistant Professor, [2,3]Associate Professor, Department of Pediatric Urology, Bangladesh Shishu Hospital And Institute, Dhaka, BANGLADESH.
[5]Assistant Professor, Sheikh Hasina Medical College, Tangail, BANGLADESH.
Email: dr.gnmahato@yahoo.com

Abstract

Background: Gastroschisis is one of the major abdominal wall defects found in pediatric surgery. Complete reduction and primary closure of the defect can be done easily sometimes, but sometime the majority portion of the gut and other organs when eviscerated cannot be returned immediately to the abdominal cavity. This situation is a major contributor to the outcome of the treatment of gastroschisis in our region. In our efforts to improve outcomes, we have adopted the technique of silo followed by delayed primary closure for cases where complete reduction and primary abdominal wall closure are otherwise not possible. **Methodology:** primary closure did the patient reach the hospital within 4 to 12 hours and eviscerated gut was found less edematous and less contaminated. Silo procedure introduced in patient reached in hospital after 12 hours and gut was found edematous and much more contamination. **Results:** Nineteen cases were included in the study. Simple closure could not be achieved in twelve cases. Primary closure was done in five cases. **Conclusions:** The modified silo closure may be the option for the treatment of gastroschisis patients where reduction of the whole gut and primary closure is not possible.

Keywords: Gastroschisis, Modified silo, Closure, Morbidity, Mortality.

***Address for Correspondence:**
Dr Gajendra Nath Mahato, Assistant Professor, Department of Pediatric Urology, Bangladesh Shishu Hospital And Institute, Dhaka, BANGLADESH.
Email: dr.gnmahato@yahoo.com

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INTRODUCTION

Gastroschisis is one of the major abdominal wall defects commonly found in pediatric surgery. It is one of the most challenging defects requiring emergency surgical correction. Treatment of this condition in Bangladesh Shishu Hospital and Institute has been met with high morbidity and mortality rates in the range of 30–100%. This is in clear contrast with the scenario in the high-income countries where mortality rates are as low as 4% in many institutions. The amount of viscera outside the abdomen varies from one case to the other. Also, associated anomalies like intestinal malrotation and bowel atresia are common. Whereas complete reduction and abdominal closure are achieved sometimes, a critical situation arises when the eviscerated bowel loops and other viscera cannot be returned immediately into the abdominal cavity. A need to house the viscera temporarily outside becomes imperative. This from nutritional support present infection and ventilator support. This inability to completely reduce the viscera in gastroschisis is related to the edema and matting together of the loops of the bowel due to prolonged exposure to amniotic fluid. Post-delivery, the edema is worsened by desiccation and minor trauma due to handling and infection. This is the basis some authors recommend early or premature delivery of these babies to reduce the duration of contact with amniotic

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fluid. However, whether early delivery reduces mortality in gastroschisis is yet to be scientifically tested. In our circumstance, many of these patients come in already exposed to the assaults of contamination, hypothermia, hypoglycemia, and sometimes desiccation of some parts of the viscera, and neonatal intensive care facilities and resources are limited. The use of silo in these circumstances is therefore often met with discouraging results. We aimed in this study, to assess the management outcome using a surgical silo and performing a primary closure in the treatment of gastroschisis.

METHODOLOGY AND MATERIALS

A proforma was designed to retrospectively obtain data from the Hospital records of consecutive cases of gastroschisis managed in our units in our institutions from June 2017 to May 2021. Written consent was also obtained from the parents of the patients who were recruited prospectively. We added the use of silo and delayed primary closure from 2017 and prospectively obtained data from May 2017 to April 2021. We use a modified silo bag made by a plastic bag and a rubber initially we clean the gut and worm mop compression given then clean the surrounding area of the gap from where the gut and other organ come out. The ring of the silo bag enters in the gap and upper portion of the bag hang straight upward. Rectal irrigation was given regularly and squeezing of bag done. Day by day gut edema sub sided and gradually enter into the abdominal cavity. Continuous nasogastric suction given two hourly and continuous free drainages. After 5-7 days most of the guts enter into the abdominal cavity and we prepared the patient for closure. We can close the gap easily sometime and sometimes umbilical cord flap were use to close the gap. After closing the abdomen patient required mechanical ventilator support for 48 hours to 72 hours. The distension of the abdomen was reduced in this time and extubation of the endotrachial tube done. Blood losses were minimum and nutritional supports were given. We use fresh frozen plasma three days. Data collected from the records of the patients seen before 2021 included gender, age at presentation and intervention, viscera seen on the outside, method of repair, any nutritional support, and outcome.

RESULTS

A total of 21 Neonate with gastroschisis were seen in the study period. Two Neonates were excluded due to incomplete records and discharge against medical advice. Nineteen patients were included in the study. There were 12 (56.4%) females and 7 (43.6%) males. Prenatal diagnosis was made only in 1 (6.21%) patient. The mean age at presentation was 10.6 h (± 4.2) for the Silo group, and 8.7 h (± 3.1) for the primary closure group. None of the patients received standard parenteral nutritional support. All patients in whom oral feeds could not be established within 7 days received an amino acid infusion and fresh frozen plasma. All patients went through similar protocols of evaluation and resuscitation and general treatment. Four (20.5%) patients were seen within 5 h of delivery (Table-1) with less edematous bowel (Fig.-1a) whereas the rest were seen later (Fig.-1b). The most common viscera exposed were the small and large bowels (Table-2). Of the 19 patients analyzed, 1 (6.26%) died before any surgical intervention. There was complete reduction and primary fascial closure of the defect in 5 (26.32%) patients and of these 2 died (40% mortality). Skin closure could not be achieved in 12 (63.16%) cases. 12 patients managed with improvised surgical silos (Silo group). Four patients out of the 12 patients in the silo group survived giving 33.3% survival (66.66% mortality). Mortality in this improvised silo group was related to severe sepsis, premature detachment of silo, lack of nutritional support and respiratory failure. Primary closure was performed in 5 (26.32%) patients (Primary closure group). Three out of the 5 patients in this group survived giving a 60% survival. The morbidity and mortality in this group were related to severe sepsis and intestinal obstruction. All surviving patients were followed up for a mean period of 2 years. One patient who had a simple reduction and primary closure developed intestinal obstruction 6 months after closure and improved by conservative management. One patient in the primary closure group developed post-op adhesive bands obstruction which necessitated a second surgery. The outcome of the treatment options is shown in Table-3.

Table 1: Age of patients at presentation and at intervention

Age	0-6		6-12		12-18		18-24		24-48	
	n	%	n	%	n	%	n	%	n	%
Patients at presentation (n = 19)	4	21.5	11	57.89	3	15.78	1	5.26	-	-
Patients at time of intervention (n = 17)	2	11.7	3	17.64	7	41.17	3	17.64	2	11.8

Table 2: Viscera exposed at presentation.

Exposed viscera	Patients (n = 19)	Percentages (%)
Small bowel	19	100
Large bowel	18	94.74
Stomach	9	47.37

Urinary bladder	4	21.1
Liver and gall bladder	4	21.05

Table 3: Outcome of management of gastroschisis.

Treatment method	Number treated	Number survived	Number died	Percentage survival	Overall survival
Immediate reduction and closure	5	3	2	60	36.8
Improvised silo and delayed closure(silo group)	12	4	8	33.33	

Figure 1 A: Gastroschisis seen early. **B:** Primary umbilical flap closure

Figure 2: Silo improvisation

DISCUSSION

There has been a rising incidence of gastroschisis worldwide in the last 3 decades. Gastroschisis ranks among the severe congenital anomalies that continue to pose a challenge to pediatric surgeons. The challenges which relate to morbidity and mortality include prematurity, low birth weight, compromised bowel, sepsis, and surgical complications. The majority of the patients in our study presented similar scenarios of low birth weight, viscera wrapped in an unclean wrapper, without proper warming of baby and moved over long distances to reach us. The picture is worse in the presence of atresia, bowel perforation, volvulus, or other anomalies. Despite advances in knowledge and technology, the outcome of treatment of gastroschisis is still less than expected for patients requiring surgical silo. Hence, we have tried and continue to try different maneuvers and techniques to further improve on what has been achieved. Presently, standard surgical modalities for the treatment of gastroschisis, include reduction and primary fascial or skin flap closure, or umbilical flap closure, partial reduction and use of silastic silo to allow for delayed fascial closure. Primary fascial closure is the preferred method provided the entire viscera can be returned to the abdominal cavity without the risk of abdominal compartment syndrome or compromise of respiration. These are the principles we also used for our patients. However, in our circumstance, patients requiring silo treatment could only be treated with improvised ones as this study shows. Some have recommended preterm delivery of these babies to reduce the deleterious effect of the amniotic fluid on the viscera. However, this method is not viable in our situation as prenatal diagnosis of gastroschisis is uncommon in our practice. Only One patients in this series were diagnosed prenatally. More so, the quality of neonatal intensive care available to us may not justify that mode of treatment. The crux of this study was to address the peculiar management challenges in our region where the option of use of silo is attended with unacceptably high mortality. This study highlights the lateness of presentation and intervention with only 21.05 % presenting within 6 h of birth and 11.7% being treated within that time frame. These challenges, in addition to lack of parenteral nutrition, functional neonatal intensive care units and pediatric ventilators have been reported by other researchers in our region. Delayed presentation to tertiary pediatric surgery center is a major problem in the management of gastroschisis in low resource settings. In this study, the majority of the patients (57.6%) were delivered in primary or secondary level health centers. None of the patients had a prenatal diagnosis and the mean age at presentation to our hospital was 12.6 h. as a result, the neonates were delivered outside a tertiary health care center, (private hospitals, primary health care center or home delivery) that can manage neonates with gastroschisis. This Babies are transport without adequate initial resuscitative care, usually over long distances. In this circumstances majority of patient required surgical silo and delayed closure. A Study by stevens and colleagues showed that poor resuscitation is a more significant predictor of mortality then postnatal transfer time. Although not statistically significant in this study, delay in transfer time, coupled with the attendant poor initial medical care may have had a role to play in the eventual outcome. The majority of our patients had improvised silo application is the initial modality of treatment, this was because most babies were not fit for closure under general anesthesia as the immediate post-

admission care was centered around proper resuscitation. Also, the presence of significant bowel edema and concomitant risk of bowel ischemia, compartment syndrome precluded attempts at primary closure. We do not have the capacity for neonatal mechanical ventilation adequately and studies have shown that the use of preformed silos is associated with lower requirements for ventilation, reduce time to feeding, lower infection rate and lower risk of abdominal compartment syndrome. An improvement from a survival rate of 33.3% in patients managed with our improvised silo to 60% in patients managed with immediate fascial closure is remarkable. Though this does not measure up with the results reported by authors in the high-income countries, we consider it a significant advancement in our management of gastroschisis. We recognize the limitations of this study because of the small volume of patients, and the fact that the improvised silos are not standardized. A larger-scale multicenter study is required to properly test the option of immediate fascial closure versus the use of surgical silo in the treatment of gastroschisis. However, our preliminary results in this study suggest that this technique has a potential to turn around the tide in the outcome of the treatment of gastroschisis in our region.

CONCLUSION AND RECOMMENDATIONS

This study has demonstrated that gastroschisis still remains a major challenge in pediatric surgical practice in our region. Late presentation, delayed intervention, high infection rate, lack of parenteral nutritional support, and unavailability of standard silos remain our bane in the management of gastroschisis. Given these peculiarities of our circumstances regarding human and material resources in the care of these patients, and given the improved outcome with the option of initial silo and delayed closure may be the second alternative option in the treatment of gastroschisis with late presentation.

Ethical approval: The study was approved by the Institutional Ethics Committee.

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