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RESEARCH ARTICLE

Primary Closure in the Management of Gastroschisis

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Abstract

Background: Gastroschisis is a major abdominal wall defect in pediatric surgery. Complete reduction and primary closure of the defect can be done quickly sometimes, but sometimes, the majority portion of the gut and other organs, when eviscerated, cannot be returned immediately to the abdominal cavity. This situation is a significant contributor to the outcome of the treatment of gastroschisis in our region. In our efforts to improve the outcomes of gastroschisis.

Methodology: Primary closure did the patient reach the hospital within 2 to 12 hours, and eviscerated gut was found to be less edematous and less contaminated.

Results: Fifteen cases were included in the study. Primary closure was done in all cases.

Conclusions: Primary closure in managing gastroschisis may be the best option. If a patient is diagnosed prenatally, come to the hospital as early as possible.

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

1. Introduction

Gastroschisis is one of the significant 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 contrasts with the scenario in 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, intestinal perforation, 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 is from nutritional support, which presents infection, and ventilator support. This inability to ultimately reduce the viscera in gastroschisis is related to the edema and matting of the bowel loops 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 that some authors recommend early or premature delivery of these babies to reduce the duration of contact with

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amniotic 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 silos 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.

2. Methodology and Materials

A proforma was designed to retrospectively obtain data from the Hospital records of consecutive gastroschisis cases managed in our institutions' units from June 2017 to May 2022. 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 of 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 organs come out. The patient comes within the designated time, and primary closure is done with continuous nasogastric suction given two hourly and continuous accessible drainages.

We can close the gap quickly sometimes; sometimes, umbilical cord flaps are used to close the gap. After closing the abdomen, the patient required mechanical ventilator support for 48 hours to 72 hours. The distension of the abdomen was reduced at this time, and extubation of the endotracheal tube was done. Blood losses were minimal, and nutritional supports were given. We use fresh frozen plasma for three days. Data collected from the records of the patients seen before 2022 included gender, age at presentation and intervention, viscera seen on the outside, method of repair, nutritional support, and outcome.

3. Results

A total of 15 neonates with gastroschisis were seen in the study period. Two Neonates were excluded due to incomplete records and discharge against medical advice. Thirteen patients were included in the study. There were 10 (66.6%) females and 5 (33.34%) males. Prenatal diagnosis was made in 5 (33.34%) patients. The mean age at presentation was three h (± 4.2) for the primary closure group. None of the patients received standard parenteral nutritional support. All patients whose oral feeds could not be established within seven days received an amino acid infusion and fresh frozen plasma.

All patients went through similar protocols of evaluation resuscitation and general treatment. Six (40%) patients were seen within five h of delivery (Table-1) with less edematous bowel (Fig.-A), Whereas the rest were seen later (Fig.-1b). The most common viscera exposed were the small and large bowels (Table 2).

There was a complete reduction and primary fascial closure of the defect in 13 (86.66%) patients, and of these, four died (30.77% mortality), and 9 (69.23%) patients survived. 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.

Two patients who had a simple reduction and primary closure developed intestinal obstruction six 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	0-3		3-6		7-9		10-12	
	n	%	n	%	n	%	n	%
Patients at presentation (n=13)	5	38.46	4	30.74	2	15.37	2	15.37
Patients at the time of intervention (n=13)	4	30.74	5	38.46	2	15.37	2	15.37

Table 2. *Viscera exposed at presentation*.

Exposed viscera	Patients (n = 13)	Percentages (%)
Small bowel	13	100
Large bowel	10	76.92
Stomach	8	61.53

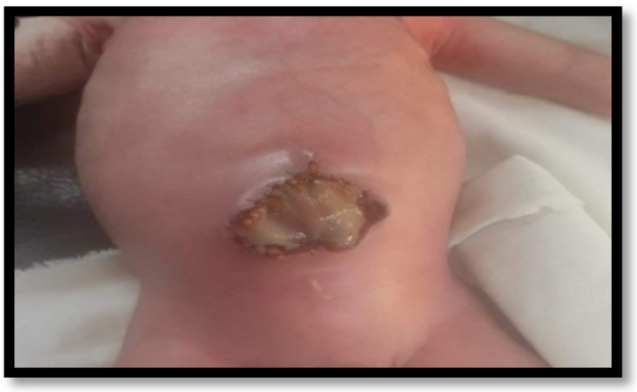

Figure A. *Gastroschisis seen early.*

Figure B. *Primary umbilical flap closure.*

4. Discussion

There has been a rising incidence of gastroschisis worldwide in the last three decades. Gastroschisis ranks among the severe congenital anomalies that continue to pose a challenge to pediatric surgeons. The challenges that 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 the 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 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 use 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.

In our practice, prenatal diagnosis was five. 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 presentation and intervention of patients present within 12 hours, and primary closure was performed on all the patients with skin or facial closure and umbilical flap closure. Ventilatory support was given to all patients.

Ten patients were removed from ventilatory support within 48 hours, three took ventilatory support for four days, and two required ventilatory support for six days. In addition to a lack of parenteral nutrition, functional neonatal intensive care units, and pediatric ventilators, other researchers in our region have reported these challenges. Delayed presentation to tertiary pediatric surgery centers is a major problem in managing gastroschisis in low-resource settings. In this study, most patients (53.33%) were delivered to tertiary-level health centers.

About six of the patients had a prenatal diagnosis, and the mean age at presentation to our hospital was within 6 hours. Other patients were delivered in primary or secondary health care centres and transferred to our center within our time framework. As a result, the neonates were delivered outside a tertiary health care center (private hospital, primary health care center, or home delivery) that can manage neonates with gastroschisis. These Babies were transported without adequate initial resuscitative care, usually within a limited time and distance.

The patients who reached our hospital after 12 hours required surgical silo and delayed closure. A Study by Stevens and colleagues showed that poor resuscitation predicts mortality more than postnatal transfer time. Although not statistically significant in this study, delay in transfer time, coupled with the attendant poor initial medical care, may have played a role in the eventual outcome.

The majority of our patients had improvised silo application as the initial modality of treatment; this was because most babies were not fit for closure under general anesthesia, as the immediate 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 have the capacity for neonatal mechanical ventilation adequately, and studies have shown that primary closure with skin or umbilical flap closure requires ventilation, reduced time to feeding, lower infection rate, and lower risk of abdominal compartment syndrome. In our study, a total of 69.23% of patients were survived.

Though this does not match the results reported by authors in high-income countries, we consider it a significant advancement in managing gastroschisis. We recognize the limitations of this study because of the small volume of patients.

A large-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 the potential to turn around the tide in the outcome of the treatment of gastroschisis in our region.

5. Conclusion

This study has demonstrated that gastroschisis remains a significant challenge in pediatric surgical practice in our region. Late presentation, delayed intervention, high infection rate, lack of parenteral nutritional support. Given these peculiarities of our circumstances regarding human and material resources in the care of these patients, and given the improved outcome. Our recommendation is to improve the outcome of gastroschisis prenatal diagnosis improvement, and most of the patients require delivery in the tertiary care center and near the pediatric surgical center.

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