



## Creation of Ventral Hernia vs. Silo Staged Closure of Gastroschisis, When Primary Closure is Impossible, Which is Suitable and Applicable

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### Abstract

**Background:** management of gastroschisis patients is still a challenge in our community due to relative delay in presentation of cases to our hospitals that leads to delay of operation timing, limited facilities in our locality and high rate of infection.

The aim of the work is to compare outcome of gastroschisis cases after skin flap coverage versus placement of an alternative silo bag (blood bag or sterilized urine collection bag), when unavailable.

**Study Design:** it is a retrospective study comparing the outcome of operated gastroschisis cases by skin flap coverage vs. gradual reduction by an alternative silo bag, when primary closure is difficult, in the period between January 2013 and July 2018 in Zagazig University Hospitals.

**Results:** 35 cases of gastroschisis were presented to our hospital, 15 of them were in-born and 20 were out-born, 20 females and 15 males.

Primary closure was done in 5 cases (14.3%), skin flap coverages were created in 21 cases (60%) and coverage with an alternative silo bag with gradual reduction was done in 9 cases (25.7%).

Mortality rate was 37.1% (13 cases).

**Keywords:** Gastroschisis; Skin flap coverage; Ventral Hernia; Silo; Abdominal wall defects

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### Introduction

Gastroschisis is a challenging problem in developing communities due to high incidence and poor facilities. Gastroschisis is defined as a congenital defect in the anterior wall of the abdomen to the right side of the umbilical cord, with intestine expelled through a small defect without any peritoneal coverage [1].

The amniotic fluid causes severe irritation to the exposed bowel causing their thickening and adhesions due to its content of fetal urine and growth factors [2].

Gastroschisis has high incidence in preterm babies (28%). Also there a higher incidence of intrauterine growth retardation for gastroschisis fetuses [3].

Gastroschisis infants usually have prolonged hospital stay and high incidence of nutritional complications and infection [4-10].

There is no benefit from enhancing delivery; delivery at  $\geq 37$  weeks has the same outcome as 35-36 weeks. It is better to wait for spontaneous onset of labor to balance the effects of prematurity and possible ongoing in utero bowel affection [11-16].

Early delivery of fetuses with gastroschisis was found to cause prolonged parenteral feeding and hospitalization, and a higher incidence of sepsis [7].

### Patient and Methods

It is a retrospective study comparing the outcome of skin flap closure as a first stage for gastroschisis management and staged closure by bags, alternative to silo, when primary closure is difficult, in the period between January 2013 and July 2018 in Zagazig University Hospitals.

Urine collection bags and blood collection bags, sterilized in Activated Glutaraldehyde solution pre-operatively, are used instead of silo bags which are not available in our locality.

**Table 1:** Number of in-born and out-born cases.

|                | Number | %      |
|----------------|--------|--------|
| In-born cases  | 15     | 42.90% |
| Out-born cases | 20     | 57.10% |
| Total          | 35     | 100%   |



**Figure 1:** A neonate with Gastroschisis.



**Figure 2:** Gastroschisis infant primary closed.

**Exclusion criteria:** complicated gastroschisis; liver herniation, intestinal necrosis, intestinal atresia, etc. were excluded from the study.

## Results

Thirty-five cases of gastroschisis were presented to our hospital, 15 (42.9%) were in-born and 20 (57.1%) were out-born. 20 (57.1%) females and 15 (42.9%) males (Table 1).

Primary closure was done in 5 cases (14.3%) (Figure 1 and 2) all of them were from the in-born cases.

The incidence of primary closure in in-born cases was 33%, while the incidence of primary closure in out-born cases was 0%.

Skin flap coverages were created in 21 cases (60%) (Figure 3 and 4) and coverage with a silo with gradual squeezing was done in 9 cases (25.7%) (Figure 6 and 7), according to surgeon preference (Table 2).

Mortality rate was 37.1% (13 cases), 6 cases out of 9 cases (66.7%) with silo repair and 7 cases out of 21 cases (33.3%) with skin flap coverage creation (Table 3).

Survived cases were the 5 cases with 1ry repair, 14 cases out of 21 cases (66.7%) with skin flap coverage and 3 cases out of 9 cases (33.3%) with silo management (Table 4).

Closure of the abdominal wall for cases with skin flap coverage creation was done at age ranging between 36 and 60 months old. With mean age for closure 50.5 months (Figure 5).

Two cases with 36 months age needed post-operative admission to ICU for 14 days due to dyspnea that has a slow gradual improvement.



**Figure 3:** Two weeks after skin flap coverage.



**Figure 4:** 4 years after skin flap coverage.



**Figure 5:** After repair of ventral hernia.



**Figure 6:** A case with silo alternative staged closure.

The least period for ICU admission was for the older age group (60 months) only one night for post-operative assurance without considerable dyspnea.

## Discussion

Outcome of gastroschisis is still low in our locality when compared to the developed countries this low outcome usually attributed to the poor facilities related to prenatal diagnosis, site of delivery, difficulty and time lapsing till transplantation to the tertiary hospital for definitive management, poor equipment of the tertiary



Figure 7: During closure after removal of silo alternative.

Table 2: Methods of closure of gastroschisis.

|                               | Number | %      |
|-------------------------------|--------|--------|
| 1ry closure cases             | 5      | 14.30% |
| Skin flap coverage cases      | 21     | 60%    |
| An alternative silo bag cases | 9      | 25.70% |
| Total                         | 35     | 100%   |

Table 3: Mortality rate of different methods of closure.

|                    | Number | %      |
|--------------------|--------|--------|
| Primary closure    | 0      | 0%     |
| Skin flap coverage | 7      | 33.30% |
| Silo closure cases | 6      | 66.70% |
| Total              | 13     | 37.10% |

Table 4: Survival rate of different methods of closure.

|                               | Number | %      |
|-------------------------------|--------|--------|
| 1ry closed cases              | 5      | 100%   |
| An alternative silo bag cases | 3      | 33.30% |
| Skin flap coverage cases      | 14     | 66.70% |
| Total                         | 22     | 62.90% |

Table 5: The average hospital stay in neonatal period.

| Type of closure;   | Average hospital stay (days) |
|--------------------|------------------------------|
| Skin flap coverage | 45                           |
| Silo alternatives  | 62                           |

For cases with an alternative silo bag was 62 days while that for skin flap coverage creation was 45 days.

Table 6: The average period for resuming full enteral feeding.

| Type of closure;   | Average period for resuming full enteral feeding (days) |
|--------------------|---|
| Skin flap coverage | 21  |
| Silo               | 25  |

hospital and high infection rate.

This study was done retrospectively in our tertiary hospital serving a wide number of populations and included 35 infants born with gastroschisis, the total mortality rate was 37.1% (13) cases.

Naomi et al. [16] stated that there is a wide variety in the outcome of gastroschisis; mortality reaches 100% in many low income countries. Causes of these bad outcomes include absence of antenatal diagnosis, deficient pre-hospital care, insufficient neonatal resuscitation and venous access, limited intensive care facilities, difficult pre-operative preparation and deficiency of safe neonatal anesthesia, and paucity of neonatal parenteral nutrition. Gastroschisis has considered a

bellwether condition for evaluating the outcomes of neonatal surgical care worldwide.

In an old study for Fonkalsrud [14], Based on 14 years' experience with the surgical repair of gastroschisis in 32 infants many aspects have reduced the overall long-term mortality to 6.2%.

In-born infants had bowel coverage and definitive closure sooner with fewer days of parenteral nutrition and shorter length of stay. Birthplace appears to be important and should be considered in to improve the outcome of gastroschisis [5].

Our study included thirty-five cases of gastroschisis were presented to our hospital, 15 (42.9%) were in-born and 20 (57.1%) were out-born. 20 (57.1%) females and 15 (42.9%) males, The incidence of primary closure in in-born cases was 33%, while the incidence of primary closure in out-born cases was 0%. Complicated gastroschisis were excluded from the start in our study.

In a study by Dalton et al. [6], 2017 in Children's Mercy Hospital Kansas City, 79 patients with GS were included, 53 were in-born and 26 were out-born. Sixteen patients were excluded for complicated gastroschisis. The rate of complicated gastroschisis was higher in the out-born group (32%) compared to the in-born infants (11%). Duration of stay and duration of TPN (Total Parenteral Nutrition) were significantly decreased for in-born patients.

In a study for Fonkalsrud he assumed that the severity of gastroschisis defects is mostly related to the length of time of exposure of intestine to amniotic fluid and the degree of compression on the visceral vasculature. No specific operative technique for all infants with this malformation, the choice of the best surgical repair depends on the degree of disproportion between the size of the eviscerated intestine and the size of celomic cavity. Three of the 32 patients with minimal disproportion underwent primary skin and muscle closure followed by early recovery. Twenty-seven who had primary skin flap closure later underwent secondary skin flap coverage repair within 6 to 12 months. Two of the 32 infants had severe viscero-abdominal disproportion and required temporary prosthesis coverage in addition to extensive skin flaps during the primary repair. Prosthetic materials should be reserved for more complex abdominal wall reconstruction in infants who have severe viscero-abdominal disproportion [14].

In our current study primary closure was done in 5 cases (14.3%) while skin flap coverages were created in 21 cases (60%) and coverage with a silo with gradual squeezing was done in 9 cases (25.7%), according to surgeon preference.

Closure of the abdominal wall for cases with skin flap coverage creation was done at age ranging between 36 and 60 months old. With mean age for closure 50.5 months.

Two cases with 36 months age needed post-operative admission to ICU for 14 days due to dyspnea that has a slow gradual improvement.

The least period for ICU admission was for the older age group (60 months) only one night for post-operative assurance without considerable dyspnea.

IN a study for Stanger et al. [13] 2014, included 679 infants, 372 infant (55%) underwent a trial for PR (primary closure), of them 300 (81%) were successful, while 307 (45%) had an intended silo placement. Patients prone to PR were in-born, in most cases and admitted in daytime. Outcomes in the successful PR and intended silo groups were comparable.

Staged repair of gastroschisis has longer hospital stay [9].

Delayed closure of gastroschisis is associated with longer hospital stay and longer duration of TPN even after excluding complicated gastroschisis [11].

In the current study the average hospital stay in neonatal period for cases with an alternative silo bag was 62 days while that for skin flap coverage creation was 45 days. And full enteral feeding was achieved in an average 21 days in skin flap closure cases and 25 days in silo closure cases, the cause of the delay in having full enteral feeding may be due to the delay in time before arriving operating theatre which leads to edema and rigidity of the intestinal wall that take long time to resolve after pushing it back into a cavity.

In a study for Muraji et al. [15], gastroschisis cases were treated at Kobe Children's Hospital. One patient died and 22 survived (96%). In ten patients primary fascial closure was done, eight managed by skin flap technique with secondary closure of the created ventral hernia, and five cases managed by the silastic sac technique. Post-operatively, nine patients required Total Parenteral Nutrition (TPN) but 13 tolerated oral feeding by the days 3 to 11 (average, 6.0 days), intravenous fluid therapy was discontinued till the eleventh day.

The leading cause of death in our study is sepsis that occurs especially in cases closed with silo alternatives.

Schlueter et al. [8], 2015 concluded that the risk of infection following gastroschisis repair is high and causes of this increased risk include silos, preterm delivery, low birth weight, and sutured repair, so, they recommended avoiding routine use of silos, using it only for cases when primary closure is impossible.

## Conclusion

Gastroschisis in our locality is still a highly challenging congenital anomaly. Early intervention greatly improves the outcome so, antenatal diagnosis is extremely important and delivery should be planned in a well-equipped center ready for immediate pediatric surgical intervention. Primary repair for the defect, when possible carries the best chance for survival. Skin flap coverage creation, when possible, carries a better outcome than gradual reduction using silo bag alternatives.

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