

# Surgical conditions in gastroschisis with feeding intolerance after abdominal closure

## ORIGINAL ARTICLE BY

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## ABSTRACT

### OBJECTIVE

To identify the surgical conditions in patients with gastroschisis with feeding intolerance after abdominal closure.

### METHODS

This study was a retrospective case review by verifying and reviewing medical record of those with the diagnosis of gastroschisis between January 2014 and December 2016 at Khon Kaen Hospital, Thailand. All were identified using the hospital inpatient inquiry system with the International Statistical Classification of Diseases and Related Health Problems (ICD) 10 with the code Q79.3. The patients with feeding intolerance were later identified. The surgical conditions and their managements were described.

### RESULTS

There were 37 gastroschisis patients; 24 males and 13 females. Their median gestational age was 35 weeks (range, 23 to 39), and median birth weight was 2,200 grams (range, 1300 to 3460). Nineteen of them underwent the primary closure of abdominal wall defects while 17 patients had two-stage repair with silo operation. There were five cases with feeding intolerance requiring additional operations following the abdominal closure. All were caused by mechanical gut obstruction including adhesion band, Hirschsprung's disease, neuronal intestinal dysplasia, jejunoileal atresia and intestinal necrosis at birth.

### CONCLUSION

In gastroschisis patients with feeding intolerance after the abdominal closure, mechanical gut obstruction were suspected, additional operations were applied.

## INTRODUCTION

Gastroschisis is a congenital abdominal wall defect in which eviscerated stomach and midgut through the defect without membrane coverage.<sup>1-3</sup> The standard treatments are the primary closure of the abdominal wall defect in simple cases and placement of prosthetic silo in the complicated cases.<sup>1-6</sup> The average time from abdominal closure to feeding is approximately 30 days and the average length of hospital stay is about 42 days.<sup>1-3</sup> The condition has a good prognosis with overall survival rate approximately 97.8%.<sup>7</sup> Sepsis is a significant predictor of mortality<sup>7</sup> with only one study describing the mechanical cause of feeding intolerance.<sup>8</sup> This study aimed to identify the surgical conditions related to feeding intolerance in the gastroschisis patients following abdominal closure. Surgical interventions to promote full enteral feeding and some patients' characteristics were also described.

## METHODS

### STUDY DESIGN

This was a retrospective case review by identifying all medical records of patients with gastroschisis admitted at Kaen Hospital, Thailand between January 2014 and December 2016. The protocol of this study was approved by Khon Kaen Hospital Institute Review Board in Human Research with the approval number of KE60051.

### PATIENT RECORDS

All medical records of the patients with gastroschisis were retrieved using the hospital

inpatient inquiry system with the International Statistical Classification of Diseases and Related Health Problems (ICD) 10 with the code Q79.3. Later we identified those with feeding intolerance after the abdominal wall defect closure from operation schedule in the operating theater at the hospital and patient medical records. We had no specific exclusion criteria.

### DATA COLLECTION

Data regarding basic demographic characteristics e.g., sex, gestational age, birth weight, birth place, mode of delivery, initial procedure for closing the abdominal wall defect were extracted from medical records. The outcomes of treatments including complications, length of hospital stay and discharge status were also collected. Any intra abdominal surgical procedures other than procedures to close the abdominal wall defects were summarized.

### STATISTICAL ANALYSIS

All data were entered into a spreadsheet and statistical analysis was performed using Stata 14 software application. For descriptive statistics, categorical variables were summarized using number and percentage. For non-normally distributed variables, they were described using median and range.

## RESULTS

Overall, there were 37 gastroschisis patients eligible for the review. There were 24 males and 13 females. Their median gestational age was 35 weeks (range, 23 to 39), and their median birth

<b>Table 1. Characteristics of the patients</b>	
<b>Characteristic</b>	<b>Value of 37 cases of gastrochisis</b>
Male-no.	24
Gestational age in week-no.	
23	1
33	5
34	4
35	9
36	6
37	7
38	3
39	2
Median gestational age in weeks (range)	35 (23-39)
Birth weight (grams)-no.	
<1,500	3
1,501-2,000	12
2,001-2,500	12
>2,501	10
Median birth weight in grams (range)	2,200 (1,300-3,460)
Place of birth	
Khon Kaen Hospital	14
Outside Khon Kaen Hospital	23
Route of delivery	
Normal delivery	32
Cesarean section	5
Closing methods	
Primary closure	19
Two stage repair	17
Surgical complications	
No postoperative complications	5
Medical conditions	27
Surgical condition	5
Length of hospital stay(days)	
Median (range)	23.5 (22-40)

**Table 1. (Continued)**

Discharge status	
Uneventful	32
Eventful	4
Dead	1

weight was 2,200 grams (range, 1,300 to 3,460). Fourteen gastroschisis patients were born at Khon Kaen Hospital and 23 were referred from other hospitals. Thirty-two were vaginally delivered and five were delivered through cesarean section. The indications for the cesarean section were failed inhibition of delivery (1 case), fetal distress (2 cases), fetal gastroschisis (1 case), premature rupture of membrane (1 case). One case was born before the hospital arrival. Nineteen patients underwent primary closure of abdominal wall defects while 17 patients had two-stage repair with silo operation. One case had bowel gangrene at birth, small bowel resection was performed and palliative treatment was resumed.

Surgical conditions other than abdominal closure were found in five cases and some cases were undertaken additional operation more than one operation as described in Table 2. Initially, all of them had APGAR score 9 and 10 at 1 minute and 5 minutes after birth, respectively. Case 1 and Case 3 were born at Khon Kaen Hospital, the rest were referred from other hospitals.

**Case 1** was a male infant born from a primigravida mother. He was a 1,310-gram infant. He had gastroschisis and underwent placement of artificial sac due to there was a large amount of eviscerated contents followed by abdominal closure. He had a problem of feeding intolerance

after three weeks after the abdominal closure. He was diagnosed as having an adhesive small bowel obstruction and underwent the exploratory laparotomy with lysis of adhesion band and rectal biopsy at Day 31 after the abdominal closure as his third operation. However, he still unable to tolerate enteral feeding and his abdominal radiography showed the dilatation of the small bowel. The biopsy revealed no ganglion cells in the rectum. Then, he underwent the re-exploratory laparotomy with lysis of adhesion band and colostomy as his fourth operation. He was discharged with the length of stay 115 days. The Final diagnosis was gastroschisis with adhesive small bowel obstruction and Hirschsprung's disease. He was readmitted following 2 weeks of discharge due to diarrhea with salmonella septicemia. He died at Day 10 after the second admission.

**Case 2** was a male gastroschisis patient born from a G2P1001 mother. He was 2,680 grams. He had a problem of feeding intolerance after three weeks after the abdominal closure. From the abdominal radiography, it revealed dilatation of the small bowel. He was diagnosed having the adhesive small bowel obstruction. He later had an operation to release adhesion band and full-thickness biopsy was performed with ganglion cells presence from fresh-frozen examination as his third operation. Following the operation, he had

**Table 2. Characteristics of the patients**

Case	Characteristic	Method of closing abdominal wall defect	Investigation	Surgical conditions	Operation	Date*	Final diagnosis	LOS
1	Male, G1P0000, GA 33 week, birth weight 1,310 grams	Two-stage repair (1st: Silo operation and 2nd closure abdominal wall defect)	Abdominal radiography	Adhesion bands	3rd: Exploratory laparotomy, lysis adhesion band, rectal biopsy	41	Gastroschisis with Hirschsprung's disease	115
			Rectal biopsy	Hirschsprung's disease	4th: Re-exploratory laparotomy, serial biopsy and colostomy	56		
2	Male, G2P1001, GA 37 weeks, birth weight 2,680 grams	Two-stage repair (1st: Silo operation and 2nd closure abdominal wall defect)	Abdominal radiography, rectal biopsy with frozen examination	Adhesive small bowel obstruction	3rd: Exploratory laparotomy, lysis adhesion band with rectal biopsy (presence ganglion cells)	39	Gastroschisis with neuronal intestinal dysplasia	142
			Barium enema		4th: Re-exploratory laparotomy, lysis adhesion band	80		
				Neuronal intestinal dysplasia	5th: Exploratory Laparotomy, lysis adhesion band with colostomy	108		
3	Female, G1P0000, GA 37 weeks, birth weight 2,800 grams	Two-stage repair (1st: Silo operation and 2nd closure abdominal wall defect)	Abdominal radiography	Adhesive small bowel obstruction	3rd: Exploratory laparotomy, division of adhesion band	25	Gastroschisis with jejunoileal stenosis	66
				Jejunoileal atresia	4th: Segmental small bowel resection	43		
4	Female, G1P0000, GA 34 weeks, birth weight 1,700 grams	Primary closure		Bowel gangrene at birth between 10 cm distal to duodeno-jejunal junction and mid transverse colon	Bowel resection with end to end anastomosis (within the same operation of the primary closure the abdominal wall defect)	0	Gastroschisis with intestinal necrosis	17 (refer back)

**Table 2. (Continued)**

5	Male, G1P0000, GA 35 weeks, birth weight 1,440 grams,	Two-stage repair (1st: Silo operation and 2nd closure abdominal wall defect)	Abdominal radiography	Adhesive small bowel obstruction with jejunoileal atresia	3rd: Exploratory laparotomy with small bowel resection with end to end anastomosis	27	Gastroschisis with Jejunioleal atresia	40 (died from pneumonia and septicemia)
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LOS, length of hospital stay

\*Post operative day of operation after the abdominal closure

recurrence clinical of small bowel obstruction. The barium enema revealed normal study. He, then, underwent re-exploratory laparotomy with lysis adhesion band as his fourth operation. After the operation, he had clinical of small bowel obstruction again. Then, he was diagnosed as having neuronal intestinal dysplasia. He underwent the fifth operation as re-exploratory laparotomy with colostomy and was discharged at 142 days after his admission. He was scheduled for Soave pull through at 13 month-old as the definite surgery with uneventful results.

**Case 3** was a female infant diagnosed as gastroschisis. She born at gestational age 37 week from a primigravida mother. Her birth weight was 2,800 grams. Her abdominal wall defect was closed with two-stage repair. The abdominal radiography revealed dilatation of the small bowel. She was diagnosed as having adhesive small bowel obstruction and underwent exploratory laparotomy with lysis adhesion band as her third operation. However, intra-operative findings demonstrated the stricture of jejunoileal segment. Feeding intolerance was still persisted following the operation and the contrast study showed the obstruction at jejunoileal segment. She was later diagnosed as having jejunoileal atresia and

underwent segmental small bowel resection as her fourth and definite operation with the total length of stay 66 days.

**Case 4** was a female gastroschisis infant born from primigravida mother. She was born through the cesarean section at 34 week of gestational age due to prolong premature rupture of membrane and fetal tachycardia with a birth weight of 1,700 grams. She had gastroschisis with gangrene eviscerated small bowel between 10 centimeters distal to duodenojejunal junction and mid transverse colon. The gangrenous segment was resected with end-to-end anastomosis was performed. The patient was declared as incompatible with life and palliative care was introduced. The length of hospital stay at Khon Kaen Hospital was 17 days.

**Case 5** was a male gastroschisis infant born from a primigravida mother at 35 weeks of gestation. His birth weight was 1,440 grams. She was intubated due to respiratory distress since her birth. The two-stage repair was performed. He had wide anterior fontanel and hydrocephalus was diagnosed. At the age of 1-month old, he could not reach full enteral feeding and abdominal radiography showed small bowel dilatation and was diagnosed as having jejunoileal atresia and

underwent exploratory laparotomy with small bowel resection and end-to-end anastomosis as his third operation. He died due to pneumonia and septicemia at the age of 40 days old.

## DISCUSSION

This study shows five out of 37 infants with gastroschisis with feeding difficulty after the abdominal wall closure. All were from mechanical obstruction; adhesive small bowel obstruction, bowel necrosis, Hirschsprung's disease, neuronal intestinal dysplasia and jejunoileal atresia. These causes were somehow similar to the report by Florial et al with 185 gastroschisis patients.<sup>8</sup> There was 26% of patients had surgical intervention due to bowel obstruction, anastomotic stricture and bowel necrosis.<sup>8</sup> However, Hirschsprung's disease and neuronal intestinal dysplasia has never been reported together with gastroschisis with feeding intolerance elsewhere. The median time between the closure operation and following operation was found to be 33 days in our study while 60 days in the report by Florial et al.<sup>8</sup> From our findings, any patients with any feeding intolerance after 21 days

following abdominal closure should be suspected for other surgical conditions requiring further investigation to minimize parenteral related complications. We found a patient with Hirschsprung's disease presenting with clinical of adhesive small bowel obstruction. It is reasonable to keep in mind that Hirschsprung's disease might be the cause of the bowel obstruction and full-thickness biopsy should be performed. From literature, the overall survival rate is 99% for gastroschisis.<sup>1</sup> Postoperative complication related to wound problems, volvulus, sepsis and adhesion band. In the current study, bowel gangrene was found since birth in one case. Diagnosis of intestinal necrosis, while the fetus in utero was, however, is difficult. Most of the cases in the present study had clinical of adhesion band and contrast study could not clearly identify the point of obstruction.

In conclusion, it is advisable that any gastroschisis patients with prolonged bowel ileus with difficulty in enteral feeding at three weeks after abdominal closure, mechanical obstruction should be aware with further investigations or surgery to promote enteral feeding.

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