Atresia of the Jejunum and Ileum: What is the Difference?

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Background: *Atresia of the jejunum and ileum is one of the major causes of neonatal intestinal obstruction. Most affected newborn infants present with bilious emesis and abdominal distention. Traditionally, jejunal and ileal atresia have been grouped together as jejunoileal atresia.*
Objective: *To elucidate the difference between jejunal and ileal atresia.*
Material and Method: *A retrospective analysis of patients diagnosed with jejunal or ileal atresia, who were treated at the Department of Surgery, Queen Sirikit National Institute of Child Health during January 1988 to December 2007, was carried out.*
Results: *There were 74 patients with jejunal atresia and 68 patients with ileal atresia. The mean birth weight and gestational age of patients with jejunal atresia were significantly lower than those with ileal atresia. Antenatal perforation occurred more frequently in ileal atresia. Postoperative course was more prolonged and mortality was higher in jejunal atresia. Prolonged ileus and anastomotic dysfunction requiring long-term parenteral nutrition were the major causes of complications leading to death.*
Conclusion: *There were many differences between patients with jejunal atresia and those with ileal atresia. The more compliant jejunal wall allows massive dilatation upon obstruction with subsequent loss of peristaltic activity, thus poorer outcome in comparison with ileal obstruction. We suggest that atresia of the jejunum and ileum be considered differently.*

Keywords: *Intestinal atresia, Jejunoileal atresia*

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Atresia of the jejunum and ileum is one of the major causes of neonatal intestinal obstruction which requires surgical intervention. Atresia refers to a congenital obstruction with complete occlusion of the intestinal lumen[1]. Most affected newborn infants present with bilious emesis and abdominal distention. Traditionally, jejunal and ileal atresia have been grouped together as jejunoileal atresia. From our observation and experience, we found many differences regarding clinical features and outcome between these two groups. The purpose of this study is to elucidate the difference between jejunal and ileal atresia.

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Material and Method

A retrospective analysis of patients diagnosed with jejunal or ileal atresia, who were treated at the Department of Surgery, Queen Sirikit National Institute of Child Health during January 1988 to December 2007, was carried out. All data were analyzed using a computerized program (Epi Info version 3.4) and presented as mean $\pm$ SD or percentage. The differences between each group were compared, p-value of less than 0.05 was considered significantly different.

Results

Of the total 142 patients, 74 had jejunal atresia and 68 had ileal atresia. Obstetric data demonstrated no specific pattern. Maternal polyhydramnios was recorded in 7 patients, 6 of jejunal and one of ileal atresia. Antenatal ultrasonography demonstrated sign

of small inlestinal obstruction in 7 patients, 5 of jejunal and 2 of ileal atresia.

There was a preponderance of premature birth (62%) among patients with jejunal atresias. The mean birth weight in this group was significantly lower than that of patients with ileal atresia (2,264 ± 544 versus 2,804 ± 620 g, p = 0.01).

Of the 74 patients with jejunal atresia, 57 had single atresia and 17 had multiple atresias. Twelve patients had associated congenital anomalies: malrotation(4), cardiovascular anomalies(5), Down syndrome(1), vertebral anomalies(1) and occipital meningocele(1). Eight patients had antenatal intestinal perforation. Operative management consisted of resection and primary anastomosis in 60 patients, resection and enteroplasty in 12 patients, resection and temporary enterostomy in 2 patients. Postoperative complications consisted of anastomotic leak in 3 patients, anastomotic stricture in 5 patients, paralytic ileus in 6 patients, cholestasis in 3 patients and short bowel in 3 patients. Nine patients required reoperation. The indications for reoperation were anastomotic stricture in 5 patients, anastomotic leak in 3 patients and adhesive intestinal obstruction in one. Mortality was higher in multiple atresia, 8 out of 17 (47%), whereas the whole group mortality was 19 out of 74 (26%).

Of the 68 patients with ileal atresia, 56 had single atresia and 12 had multiple atresias. Eleven patients had associated congenital anomalies: malrotation(6), cardiovascular anomalies(3), Down syndrome(1) and vertebral anomalies(1). Fifteen patients had segmental ileal volvulus. Nineteen patients had antenatal perforation. Operative management consisted of resection and primary anastomosis in 58 patients, resection and temporary enterostomy in 9 patients, resection and enteroplasty in one. Of the nine patients who underwent resection and temporary enterostomy, 5 patients had antenatal perforation. The postoperative course was related to the type of atresia. The patients with single atresia made a quicker recovery than patients with multiple atresias. Postoperative complications consisted of anastomotic leak in 7 patients, anastomotic stricture in 3 patients, paralytic ileus in 3 patients, short bowel in 3 patients and cholestasis in 2 patients. Twelve patients required reoperation. The indications for reoperation were anastomotic leak in 7 patients, anastomotic stricture in 3 patients and adhesive intestinal obstruction in 2 patients. The mortality was higher in multiple atresias, 5 out of 12 (42%), whereas the whole group mortality was 15 out of 68 (22%).

Comparison patients with jejunal atresia and those with ileal atresia, the mean gestational age and birth weight of patients with jejunal atresia were significantly lower. Antenatal perforation occurred more frequently in ileal atresia. The postoperative course was more prolonged in jejunal atresia. Details are shown in Table 1.

Table 1. Differences between cases of jejunal and ileal atresia

	Jejunum	Ileum	p-value
Number of patients	74	68	
Single atresia	57	56	
Multiple atresias	17	12	
Prematurity (n)	46 (62%)	12 (18%)	<0.005
Birth weight (g)	2,264 ± 544	2,804 ± 620	0.01
Antenatal perforation	8 (11%)	19 (28%)	0.01
TPN (days)	31 ± 35 (2-200)	26 ± 36 (1-229)	0.01
Complications	20	18	0.94
Anastomotic leak	3	7	
Anastomotic stricture	5	3	
Paralytic ileus	6	3	
Cholestasis	3	2	
Short bowel	3	3	
Reoperations	9	12	0.35
Mortality	19 (26%)	15 (22%)	0.61

TPN: total parenteral nutrition

Discussion

Congenital atresia of the jejunum and ileum represents the most frequent cause of intestinal obstruction in neonate. Multiple theories regarding the etiology of jejunal and ileal atresia have been studied in many animal models, including puppies, ewes, rabbits and chick embryos[2-5]. Recent work in a mouse model suggests that some forms of atresia may be hereditary and result from dysregulation of proliferation and apoptosis of the developing intestine through the fibroblast growth factor pathways[6]. To date, the most accepted theory regarding the etiology of jejunal and ileal atresia is that of an intrauterine vascular accident resulting in necrosis of the affected segment, with subsequent resorption, rather than the previously accepted theory of inadequate recanalization of the intestinal tract[3,7]. Since then, other factors such as in utero intussuseption, intestinal perforation, segmental volvulus, and thromboembolism have also been shown to cause jejunal and ileal atresia[8]. The site of obstruction was located by intraoperative finding. An atretic site which is less than 60 cm from duodenojejunal junction represents jejunal atresia and an atretic site which more than 60 cm from duodenojejunal junction represents ileal atresia.

In this study, we found more differences than similarities between patients with jejunal and with ileal atresia (Table 2). The obstetric data of patients with jejunal atresia showed a significantly lower gestational age and birth weight compared to patients with ileal atresia.

In atresia of the small intestine, the jejunum and ileum are equally affected[1,8,9] (Table 3)[8,10-15]. The jejunum is the site of atresia in 51% of cases and the ileum in 49% of cases[1]. In more than 90% of patients, the atresia is single, but multiple atresias are reported in 6-20% of patients[1,16-20]. Multiple atresias occurred more frequent in jejunal atresia than in ileal atresia[11,21]. This is the same finding as in our study. The incidence of multiple atresias in our series is high compared to the other observations[16-20]. The cause of multiple atresia is unknown, and theories range from multiple ischemic infarcts, possibly from amore global placental insufficiency, to an early embryonic defect of the gastrointestinal tract, to an inflammatory process occurring *in utero*[5,22,23]. Antenatal perforation occurred more frequently in ileal atresia. A difference in compliance of the bowel wall between the jejunum and ileum may explain this finding[11]. The jejunum appears capable of massive dilatation in the case of atresia, whereas the ileum is never much dilated but tends to perforate. Associated congenital malformations occurred equally in each group and higher than the other observations[8,24].

The postoperative course in jejunal atresia was more prolonged than in ileal atresia. This also can be explained by the difference in bowel wall compliance[11]. The very dilated jejunum lost its peristaltic activity and required more time to regain its function. In ileal atresia, where the bowel is never dilated to the same degree, the function is restored much sooner. Although more cases of antenatal perforation occurred in ileal atresia, this did not influence the outcome.

In conclusion, we found many differences between patients with jejunal and ileal atresia. Jejunal atresia is characterized by a lower gestational age and birth weight. There were more cases of multiple atresias in jejunal atresia. Postoperative course was more prolonged and mortality was higher in jejunal atresia. Prolonged ileus and anastomotic dysfunction requiring long-term parenteral nutrition were the major causes of complications leading to death. The more

Table 2. Differences between jejunal and ileal

Characteristic	Jejunum	Ileum
Gestational age	Lower than that of ileal atresia	Low
Birth weight	Lower than that of ileal atresia	Low
Atresias	May be multiple	Single
Antenatal perforation	Uncommon	Common
Postoperative course	Prolonged	Short
Mortality	Higher than that of ileal atresia	Low

Table 3. Occurrent comparison of jejunal and ileal atresia

Authors	Number of total cases	Jejunal atresia number of cases (%)	Ileal atresia number of cases (%)
de Lorimier AA, 1969[8]	587	299 (51)	288 (49)
Cywes S, 1990[10]	166	118 (71)	48 (29)
Heij HA, 1990[11]	45	21 (47)	24 (53)
Cywes S, 1996[12]	157	113 (72)	44 (28)
Millar AJW, 1997[13]	250	161 (73)	59 (26)
Kim IK, 1999[14]	143	72 (51)	71 (49)
Park J, 2004[15]	19	11 (58)	8 (42)
Present study 2008	142	74 (52)	68 (48)

compliant jejunal wall allows massive dilatation upon obstruction with subsequent loss of peristaltic activity, thus resulting in a poorer outcome in comparison with ileal atresia. We suggest that atresia of the jejunum and ileum be considered differently.

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ภาวะตีบตันของลำไส้เล็กส่วนกลางและลำไส้เล็กส่วนปลาย:แตกต่างกันอย่างไร

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ภูมิหลัง: *ภาวะตีบตันของลำไส้เล็กส่วนกลางและลำไส้เล็กส่วนปลายเป็นสาเหตุหนึ่งของภาวะลำไส้อุดกั้นในทารกแรกเกิด ผู้ป่วยจะมีอาการอาเจียนเป็นน้ำดีและท้องอืด ที่ผ่านมาภาวะตีบตันของลำไส้เล็กส่วนกลางและภาวะตีบตันของลำไส้เล็กส่วนปลายถูกเรียกรวมกันว่าภาวะตีบตันของลำไส้เล็กส่วนกลางและลำไส้เล็กส่วนปลาย*

วัตถุประสงค์: *ต้องการอธิบายให้เห็นถึงความแตกต่างของภาวะตีบตันของลำไส้เล็กส่วนกลางและภาวะตีบตันของลำไส้เล็กส่วนปลาย*

วัสดุและวิธีการ: *เป็นการศึกษาย้อนหลัง ในผู้ป่วยที่ได้รับการวินิจฉัยเป็นภาวะอุดกั้นของลำไส้เล็กส่วนกลาง หรือลำไส้เล็กส่วนปลาย ที่เข้ารับการรักษาในกลุ่มงานศัลยศาสตร์ สถาบันสุขภาพเด็กแห่งชาติมหาราชินี ตั้งแต่ มกราคม พ.ศ. 2531 ถึง ธันวาคม พ.ศ. 2550*

ผลการศึกษา: *ผู้ป่วย 74 รายมีภาวะอุดกั้นของลำไส้เล็กส่วนกลาง และ 68 รายมีภาวะอุดกั้นของลำไส้เล็กส่วนปลาย ผู้ป่วยที่มีภาวะอุดกั้นของลำไส้เล็กส่วนกลางมีอายุครรภ์ขณะคลอดและน้ำหนักแรกคลอดต่ำกว่าผู้ป่วยที่มีภาวะอุดกั้นของลำไส้เล็กส่วนปลายอย่างมีนัยสำคัญ การทะลุของลำไส้ขณะอยู่ในครรภ์พบได้บ่อยในผู้ป่วยที่มีภาวะอุดกั้นของลำไส้เล็กส่วนปลาย ผู้ป่วยที่มีภาวะอุดกั้นของลำไส้เล็กส่วนกลางจะใช้เวลาดูแลหลังผ่าตัดนานกว่าและมีอัตราตายสูงกว่าผู้ป่วยที่มีภาวะอุดตันของลำไส้เล็กส่วนปลาย ภาวะลำไส้อืดไม่ทำงานและการทำงานที่ไม่ปกติของลำไส้ที่ได้รับการตัดต่อ จำเป็นต้องได้รับสารอาหารทางหลอดเลือดเป็นเวลานาน เป็นสาเหตุหลักซึ่งนำไปสู่ภาวะแทรกซ้อนและเสียชีวิต*

สรุป: *ผู้ป่วยที่มีภาวะอุดกั้นของลำไส้เล็กส่วนกลางและภาวะอุดกั้นของลำไส้เล็กส่วนปลายมีความแตกต่างกันหลายประการ ผนังของลำไส้เล็กส่วนกลางที่เหนือต่อตำแหน่งที่มีการตีบตันจะมีการยืดขยายมาก ทำให้การกลับมาทำงานบีบตัวของลำไส้ช้า ส่งผลให้ผลการรักษาผู้ป่วยที่มีภาวะตีบตันของลำไส้เล็กส่วนกลางด้อยกว่าเมื่อเปรียบเทียบกับผลการรักษาผู้ป่วยที่มีภาวะตีบตันของลำไส้เล็กส่วนปลาย ดังนั้นภาวะอุดกั้นของลำไส้เล็กส่วนกลางและภาวะอุดกั้นของลำไส้เล็กส่วนปลายมีความแตกต่างกัน*