Surgical Treatment for Congenital Duodenal Obstruction

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Abstract

Thirty-four congenital duodenal obstructions (19 duodenal atresia, 7 duodenal web, 7 annular pancreas and one duodenal stenosis) were surgically treated in Siriraj Hospital between 1990 and 1999. Eleven per cent of duodenal atresia had no bile-stained vomiting. Duodenal web which received web excision and duodenoplasty in 43 per cent of cases, also presented with bile-stained vomiting. Duodeno-duodenostomy, duodeno-jejunostomy and web excision with duodenoplasty were performed in 29, 2 and 3 patients respectively. Duodeno-duodenostomy and web excision with duodenoplasty had no difference in the feeding capability. There was no statistically significant difference in duration of TPN, ability to be early fed, post-operative onset of full feeding and hospital stay between diamond-shaped (n = 18) and side-to-side (n = 11) duodeno-duodenostomy. Although transanastomotic feeding tube (n = 4) decreased a percentage of TPN requirement and made early feeding possible, the onset of full feeding, duration of TPN and hospital stay were not different from those who had no transanastomotic tube (n = 30).

Key word : Duodenal Obstruction, Duodenal Atresia, Pancreas, Suture Techniques, Anastomosis, Postoperative Complications, Treatment Outcome, Child, Infant, Newborn

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The treatment of congenital duodenal obstruction has changed frequently in the past three decades. First, the standard procedure was to create a by-pass route from the duodenum proximally to the proximal part of the small bowel. Duodeno-jejunostomy was the favorite surgical treatment at that time. After the complication of retention of duodenal content in the blind end of the duodenum, in spite of patent duodeno-jejunostomy anastomosis, having been recognized[1], side-to-side duodeno-duodenostomy was the following most preferred operation. Side-to-side duodeno-duodeno-

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stomy has stood as a standard procedure of choice for any type of congenital duodenal obstruction for a long time with good results and a low complication rate[2]. However, an alternative surgical treatment for duodenal web has been developed. The principle of pyloroplasty has been modified to this malformation and the procedure which opens the duodenal wall longitudinally, resects a duodenal web and sutures the duodenal wall back horizontally, has been popularized. The controversy arises from the question, what is the best surgical procedure for duodenal web between side-to-side duodeno-duodenostomy and excision of the web with duodenoplasty. Recently, Kimura et al, has popularized diamond-shaped duodeno-duodenostomy[3,4], an alternative treatment for all duodenal obstructions except annular pancreas. The claimed advantages of diamond-shaped duodeno-duodenostomy over side-to-side duodeno-duodenostomy are early feeding and early discharge. The advantage of a transanastomotic feeding tube either *via* gastrostomy or *via* a long naso-gastric tube to enhance the capability to earlier feed the patient, has to be examined. All these questions have been the objective purposes of this retrospective study.

MATERIAL AND METHOD

This retrospective study was performed by collecting all information of all congenital duodenal obstructions admitted to Siriraj Hospital between February 1990 and August 1999. Because there was an alternative surgery to treat a duodenal web by web excision and duodenoplasty, in this study, we categorized a duodenal web as a separated entity from a duodenal atresia. Duodenal atresia associated with an annular pancreas was categorized as "duodenal atresia". Only pure annular pancreas without an associated duodenal atresia/ stenosis/ web was grouped as an "annular pancreas". Duodenal stenosis was defined as an intrinsic duodenal obstruction which was not associated with annular pancreas and had no duodenal web.

In order to study the outcomes following the operative treatments for duodenal obstruction clearly, we excluded a combination of duodenal obstruction and oesophageal atresia, profound major genetic disorders and moribund complex anomalies which made it impossible for the patient to survive. Oesophageal atresia impeded the ability to feed the patient with duodenal atresia and it would be difficult to interpret the pure outcome of the surgical treatment for duodenal atresia.

The data were collected from medical records. All data included clinical presentations, diagnosis methods, operative treatments, post-operative courses and outcomes of treatment for congenital duodenal obstruction. Non-parametric data were compared by Fisher's exact test whereas comparable parametric data were compared by Student's *t* test. The statistical significance was $p < 0.05$.

RESULTS

Thirty-four (M 13, F 21) congenital duodenal obstructions without associated oesophageal atresia were surgically treated in Siriraj Hospital between February 1990 and August 1999. Twenty-one patients (AGA 17, SGA 4) were term neonates and 13 newborns were delivered prematurely (AGA 10, SGA 3). The average birth weights +,- SD were 2352 +,- 550 g. Most of the neonates were delivered by the normal vaginal route (n = 21), however, caesarian section, vacuum extraction, forceps extraction were performed in 7, 3, 1 respectively. Two patients had no delivery record. Six patients had birth asphyxia (Apgar 1 < 6). Thirteen duodenal obstructions had no associated anomaly but the others (61.8%) had some. Down's syndrome (n = 13) and congenital heart disease (n = 12) (ASD 6, PDA 5, VSD 1, Tetralogy of Fallot 1, unknown 3) were the most common associated anomalies. Other associated anomalies were 3 Meckel's diverticulum and one each for ectopic pancreatic tissue at the jejunum, ileal duplication, anorectal malformation, persistent omphalomesenteric duct, polysplenia, preduodenal portal vein, posterior urethral valve, craniosynostosis, hydrocephalus, hemivertebrae and ribs fusion.

Duodenal atresia, duodenal web, annular pancreas and duodenal stenosis were found intraoperatively in 19, 7, and 7, 1 respectively. The clinical manifestations of each type of pathology are revealed in Table 1. Although bile vomiting at birth was the most common manifestation of duodenal atresia, eleven per cent of duodenal atresia had no bile vomiting. Partial duodenal obstruction, such as duodenal web and duodenal stenosis, tend to vomit later in life. This caused partial duodenal obstruction cases, i.e., duodenal web, annular pancreas and

Table 1. Clinical manifestations, investigations and operative treatments.

	Duodenal atresia*		Duodenal web		Annular pancreas**		Duodenal stenosis		Total (n = 34)	
	n	%	n	%	n	%	n	%	n	%
Clinical manifestation	(19)		(7)		(7)		(1)		(34)	
Bile vomiting at birth	14	73.7	6	85.7	6	85.7	0		26	76.5
Bile vomiting at a later date***	1	5.3	1	14.3	0		0		2	5.9
Non-bile vomiting at birth	1	5.3	0		1	14.3	0		2	5.9
Non-bile vomiting at a later date****	1	5.3	0		0		1	100	2	5.9
Blood vomiting at birth	1	5.3	0		0		0		1	2.9
Anorectal malformation	1	5.3	0		0		0		1	2.9
Plain abdominal X-Ray	(19)		(7)		(7)		(1)		(34)	
Double bubble	19	100	5	71.4	3	42.9	0		27	79.4
Partial duodenal obstruction	0		2	28.6	3	42.9	1	100	6	17.6
Single bubble	0		0		1	14.3	0		1	2.9
Upper GI study	(0)		(2)		(2)		(1)		(5)	
Partial duodenal obstruction	0		2	100	1	50.0	0		3	60.0
Duodenal obstruction	0		0		1	50.0	0		1	20.0
No definite obstruction	0		0		0		1	100	1	20.0
Midgut malrotation	6	31.6	0		0		0		6	17.6
Age at operation +,- SD (days)	3.79 ± 4.17		6.00 ± 5.54		5.71 ± 6.21		25		5.26 ± 5.94	
Operation	(19)		(7)		(7)		(1)		(34)	
Duodeno-duodenostomy	17	89.5	4	57.1	7	100	1	100	29	85.3
- Diamond-shape	10		1		6		1		18	
- Side-to-side	7		3		1		0		11	
Duodeno-jejunostomy	2	10.5	0		0		0		2	5.9
Web excision and duodenoplasty	0		3	42.9	0		0		3	8.8

* excluded duodenal web.
** had no associated duodenal atresia.
*** the onsets were 3 days and 6 days.
**** the onsets were 2 days.

duodenal stenosis, to be operated on at an older age than duodenal atresia. (6.00, 5.71 and 25 days *vs* 3.79 days respectively).

From Table 1, double bubble sign was a pathognomonic sign only for complete duodenal obstruction and it was not an accurate sign for incomplete duodenal obstruction, such as duodenal web, annular pancreas and duodenal stenosis. The standard recommendation to take an upper GI study in an incomplete duodenal obstruction was followed in this study. Although upper GI studies were performed in 5 incomplete duodenal obstructions, accurate anatomical details of pathology were still not answered. Duodeno-duodenostomy was the most common operation for congenital duodenal obstruction. However, in the duodenal web, excision of the web and duodenoplasty was applied in 43 per cent of cases.

Three methods of surgical treatment for duodenal obstruction, i.e., duodeno-duodenostomy (n = 29), duodeno-jejunostomy (n = 2) and web excision with duodenoplasty (n = 3), were compared and revealed in Table 2. Ability to early enteral feeding of patients and the efficacy to withdraw TPN were the points of interest. In this study, 2 patients did not require TPN, therefore we compared an ability to withdraw TPN in the remaining 32 cases. In this study, two patients in the duodeno-duodenostomy group survived after the first feeding but did not survive afterward and died eventually. Therefore, in the comparison in Table 2, we excluded the data of "full feeding" and "discharge" of these two dead cases. It seemed that duodeno-jejunostomy group required a prolonged course of TPN and was not able to be early fed and had difficulty in obtaining full feeding. It was noticed that this group of patients had a much lower birth weight than either the duodeno-duodenostomy group or the web excision with duodenoplasty group and could not be compared. The average age at operation and the average body weight of the duodeno-duodenostomy group were comparable with the web exci-

Table 2. Comparison between three methods of surgical treatment for congenital duodenal obstruction.

	Duodeno-duodenostomy (n = 29)	Duodeno-jejunostomy (n = 2)	Web excision and duodenoplasty (n = 3)	Total (n = 34)
Age at operation +,- SD (days)	5.00 ± 5.85	9.00	5.33	5.26 ± 5.94
TPN*	n = 27	n = 2	n = 3	n = 32
Pre-operative TPN (cases)	5	1	2	8
Post-operative TPN (cases)	22	1	1	24
Duration of TPN +,- SD (days)	11.81 ± 6.07	21.5	15.00	12.72 ± 7.87
Duration of post-op TPN +,- SD (days)	11.04 ± 5.97	19.00	11.67	11.59 ± 6.89
First feeding	n = 29	n = 2	n = 3	n = 34
Post-operative interval +,- SD (days)	7.17 ± 3.55	9.00	8.67	7.41 ± 3.66
Age +,- SD (days)	12.17 ± 6.66	18.00	14.00	12.68 ± 6.98
BW +,- SD (g)	2,288 ± 502	1,373	2,315	2,237 ± 534
Full feeding**	n = 27	n = 2	n = 3	n = 32
Post-operative interval +,- SD (days)	15.07 ± 6.74	23.50	13.67	15.47 ± 7.72
BW +,- SD (g)	2,486 ± 491	1,595	2,595	2,441 ± 526
Discharge**	n = 27	n = 2	n = 3	n = 32
Post-operative interval +,- SD (days)	19.89 ± 12.78	30.00	17.00	20.25 ± 12.69
BW +,- SD (g)	2,542 ± 450	1,680	2,492	2,483 ± 485
Mortality	n = 2	n = 0	n = 0	n = 2
Morbidity				
1. Sepsis	5	0	0	5
2. Heart failure and bronchospasm	1	0	0	1
3. Apnea	1	0	0	1

* excluded 2 cases who received no TPN.
** excluded 2 non-survival cases.

sion with duodenoplasty group. There was no statistically significant difference ($p > 0.05$) in all parameters, i.e., duration of TPN post operatively, ability to be early fed, ability to be fully fed and hospital stay between the duodeno-duodenostomy group and web excision with duodenoplasty group.

The most suitable method for duodeno-duodenostomy anastomosis between diamond-shaped duodeno-duodenostomy (n = 18) and side-to-side duodeno-duodenostomy (n = 11) was also examined in our study. The results of each type of duodeno-duodenostomy anastomosis are revealed in Table 3. There was no statistically significant difference ($p > 0.05$) between the two types of anastomosis in every aspect, such as duration of TPN (either in total duration or post-operative duration), age at the first feeding, ability to be early fed, post-operative onset of full feeding and hospital stay. Moreover, diamond-shaped duodeno-duodenostomy seemed to have higher morbidity and mortality rates than the side-to-side method ($p < 0.1$).

Transanastomotic jejunostomy tube could be inserted either from an extended position of a nasogastric tube or a gastrostomy tube passed through the gastrocutaneous tract. The purpose of this tube was early feeding. The results of placement of a transanastomotic jejunostomy tube (n = 4) were compared with those without any transanastomotic tube (n = 30). Table 4 reveals this comparison. Transanastomotic tube decreased the requirement of TPN and 25 per cent of cases had no need of TPN, whereas only 3.3 per cent of the other group who had no transanastomotic tube, did require TPN. However, duration of TPN (either a total range or post-operative duration) of the group receiving a transanastomotic tube was the same as that of no-transanastomotic tube. Although the group with a transanastomotic tube received earlier first feeding (4.5 days *vs* 7.8 days) ($p = 0.09$), the post-operative onset of full feeding and the hospital stay were not different from that of the other group who had no transanastomotic tube. Although it seemed that the group with a transanastomotic tube had higher morbidity, it was so difficult to conclude this event because of the limited size of the group (n = 4).

There were two mortalities in our series. Both were duodenal atresia who had diamond-shaped duodeno-duodenostomy (without a trans-

Table 3. Comparison between diamond-shaped duodeno-duodenostomy and side-to-side duodeno-duodenostomy.

	Diamond-shape (n = 18)	Side-to-side (n = 11)
Age at operation +,- SD (days)	5.72 ± 6.63	3.82 ± 4.31
TPN*	n = 17	n = 10
Pre-operative TPN (cases)	4	1
Post-operative TPN (cases)	13	9
Post-operative interval of TPN +,- SD (days)	1.38 ± 0.65	1.33 ± 0.71
Duration of TPN +,- SD (days)	12.24 ± 5.62	11.10 ± 7.03
Duration of post-op TPN +,- SD (days)	11.29 ± 5.45	10.60 ± 7.06
First feeding	n = 18	n = 11
Post-operative interval +,- SD (days)	7.06 ± 3.86	7.36 ± 3.14
Age +,- SD (days)	12.78 ± 7.64	11.18 ± 4.81
BW +,- SD (gm)	2284 ± 519	2295 ± 498
Full feeding**	n = 16	n = 11
Post-operative interval +,- SD (days)	15.75 ± 6.54	14.09 ± 7.22
BW +,- SD (gm)	2511 ± 516	2452 ± 474
Discharge**	n = 16	n = 11
Post-operative interval +,- SD (days)	20.13 ± 9.63	19.55 ± 16.89
BW +,- SD (gm)	2548 ± 473	2532 ± 436
Mortality	n = 2	n = 0
Morbidity		
Sepsis	4	1
Heart failure and bronchospasm	1	0
Apnea	1	0

* excluded 2 cases who received no TPN.
** excluded 2 non-survival cases.

anastomotic feeding tube) done. One had multiple anomalies (Down's syndrome, posterior urethral valve, congenital heart disease, hydrocephalus) and died from intractable heart failure at the age of 18 days. The other was a 1,360 g preterm neonate who also had an associated anorectal malformation, suffered from respiratory distress syndrome and eventually died from recurrent fungal sepsis at 25 days of age. Both survived until the first feeding was started and they tolerated the feeding quite well but unfortunately, they expired from underlying medical diseases before receiving full feeding.

DISCUSSION

In our study, eleven per cent of duodenal atresia had non-bile vomiting. Partial duodenal obstructions such as duodenal web, annular pancreas and duodenal stenosis, tend to vomit later on and this renders them to be operated on at an older age than those with duodenal atresia. Hematemesis which is a rare presentation of duodenal atresia and recognized in only one case of our series, is the result of duodenitis(5).

Although the typical radiographic pattern of duodenal atresia is the "double bubble" sign with absence of distal bowel gas, air may present in the distal bowel when anomalous bile ducts, which permit communication between the proximal and distal duodenal segments, provide a conduit around the atretic segment(6). Contrast studies are generally not performed in clinical and radiographic evaluation of typical duodenal atresia, if a double bubble sign is found. However, an upper gastrointestinal series is still generally recommended in a partial duodenal obstruction in defining the more complex anomaly. In our series, upper GI study gave no definite diagnosis and the benefit of upper GI study to define the anatomical details of partial duodenal obstruction has been questioned.

Duodeno-duodenostomy is presently recognized as an operative procedure of choice for duodenal atresia, annular pancreas and duodenal stenosis. The other by-pass procedures such as duodeno-jejunostomy and gastro-jejunostomy have declined in popularity because of many complications related to a poorly drained "blind-loop" duodenal distension

Table 4. Comparison between transanastomotic tube and no transanastomotic tube.

	Transanastomotic tube* (n = 4)	No transanastomotic tube (n = 30)
Duration of jejunostomy +,- SD (days)	8.75 ± 2.87	Nil
Causes of jejunostomy removal	2 No further use 1 Accidental removal 1 Kinking	Nil
No TPN (case)	(1) 25%	(1) 3.3%
TPN (cases)**	(3) 75%	(29) 96.7%
Pre-operative TPN (cases)	0	8
Post-operative TPN (cases)	3	21
Post-operative interval of TPN +,- SD (days)	1.00 ± 0.00	1.48 ± 0.75
Duration of TPN +,- SD (days)	11.67 ± 7.51	12.83 ± 8.03
Duration of post-op TPN +,- SD (days)	11.67 ± 7.51	11.59 ± 6.97
First feeding	n = 4	n = 30
Post-operative interval +,- SD (days)	4.50 ± 4.36	7.80 ± 3.46
Age +,- SD (days)	6.75 ± 4.19	13.47 ± 6.94
BW +,- SD (g)	2198 ± 242	2242 ± 564
Full feeding* **	n = 4	n = 28
Post-operative interval +,- SD (days)	15.50 ± 4.36	15.46 ± 8.14
BW +,- SD (g)	2325 ± 371	2458 ± 584
Discharge* **	n = 4	n = 28
Post-operative interval +,- SD (days)	23.50 ± 10.08	19.79 ± 13.11
BW +,- SD (g)	2430 ± 347	2470 ± 507
Complication	(2) 50.0%	(6) 20.0%
Death	0	(2) 6.7%
Sepsis	(2) 50.0%	(3) 10.0%
Others	0	(2) 6.7%

* composed of 2 transanastomotic naso-jejunostomy and 2 transanastomotic gastro-jejunostomy tubes.
** excluded 2 cases who received no TPN.
*** excluded 2 non-survival cases.

above the obstructive point. Food particles tend to pass through the normal anatomical pathway and do not enter into the anastomosed jejunum although its anastomosis is patent. The following complications, related to the duodenal pouch have been reported in the literature: peptic ulcer, duodenitis or gastritis, abdominal pain, dumping syndrome and malnutrition[1].

Duodenal web differs from other types of duodenal atresia. It can often be misinterpreted resulting in a late diagnosis and should be reported as a separate entity. In our series, the presenting symptom leading to diagnosis was bile-stained vomiting, in contrast to a series by Mikaelsson C, et al, who reported that 94 per cent of cases presented with non-bile stained vomiting[7]. In treatment modalities for duodenal web, more than a standard duodeno-duodenostomy is offered, an alternative treatment is partial excision of the duodenal membrane with a duodenoplasty, which was performed in 43 per cent of cases in our study. In our series, duodeno-duodenostomy was compared with excision of the web and duodenoplasty. There was no difference between these two groups in all parameters: post-operative duration of TPN, ability to be early fed, capability to be fully fed and duration of hospital stay.

Duodenal atresia is associated with midgut malrotation in 28 to 56 per cent[8,9]. Our study found 17.6 per cent of cases. This concomitant midgut malrotation should be corrected by Ladd's procedure and a miserable midgut volvulus with massive intestinal infraction is prevented. This is an important message that one should look for in associated unsuspected intrinsic duodenal obstruction while performing Ladd's procedure for a "simple" malrotation.

A retrocolic side-to-side duodeno-duodenostomy has been the generally accepted standard operative procedure for correction of congenital duodenal atresia and stenosis until diamond-shaped anastomosis challenged its popularity[3]. In a diamond-shaped anastomosis, a transverse incision is made in the dilated proximal duodenum and a

longitudinal incision in the duodenum distal to the obstruction. The stoma is fashioned by approximating the end of each incision to the appropriate midportion of the other incision. The diamond-shaped anastomosis is claimed to provide an earlier recovery of anastomotic function[4,10,11], earlier discharge[10,11] and avoidance of later complications, such as formation of a blind loop or anastomotic stenosis[4]. However, there are no scientifically supportive data for this phenomenon and this claim is still debated. In our study, there was no statistically significant difference between the two types of anastomosis in all aspects, such as duration of TPN (either in total duration or post-operative duration), onset of the first feeding, post-operative interval for full feeding and total hospitalization time. We can explain this by pointing to the fact that whatever type of anastomosis is used, the main factor determining the ability of feeding depends on how big the bowel proximal to the obstructive point is. Dilated bowel is related to disturbed transit time and low contraction- amplitude of the dilated bowel is the main pathophysiological obstacle[12]. Stagnation and functional obstruction in the proximal duodenum is the main factor influencing morbidity among these patients. Tapering duodenoplasty has been proposed in order to reduce problems asso- ciated with megaduodenum, such as blind loop syn-drome, bile reflux gastritis, cholestatic jaundice and gastro-oesophageal reflux[12-14].

Transanastomotic tube decreases the requirement of TPN in a few cases and provides earlier enteral feeding. The reason is that normal oral feeding can not be provided until the dilated duodenum has adequate contraction passing food particles through an anastomosis. This tube plays a role as a by-pass conduit. However, it is quite unusual to obtain full nutritional support by only this tube feeding and TPN is still required. Because the transanastomotic tube can not be withdrawn until the duodenum has an adequate peristalsis (which is nearly the same period, whether a transanastomotic tube is used or not), some authors do not recommend this practice[15].

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การผ่าตัดรักษาโรคลำไส้ส่วนดูโอดีนัมตีบตันแต่กำเนิด

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ผู้ป่วยโรคลำไส้ส่วนดูโอดีนัมตีบตันแต่กำเนิด 34 รายได้รับการผ่าตัดรักษา ณ โรงพยาบาลศิริราชระหว่างปี พ.ศ. 2533 ถึงปี พ.ศ. 2542 โดยในจำนวนนี้เป็นโรคลำไส้ส่วนดูโอดีนัมอุดตันสมบูรณ์ 19 ราย, โรคเยื่อกั้นลำไส้ส่วนดูโอดีนัม 7 ราย, การหมุนตัวผิดปกติของตับอ่อน 7 ราย และเป็นโรคลำไส้ส่วนดูโอดีนัมตีบอีก 1 ราย ผู้ป่วย 11 เปอร์เซ็นต์ของโรคลำไส้ส่วนดูโอดีนัมอุดตันสมบูรณ์อาเจียนแบบไม่มีน้ำดีปน โรคเยื่อกั้นลำไส้ส่วนดูโอดีนัมอาเจียนมีน้ำดีปนและ 43 เปอร์เซ็นต์ของผู้ป่วยโรคนี้ได้รับการผ่าตัดตัดเยื่อกั้นลำไส้ออก ผู้ป่วย 29 รายได้รับการผ่าตัดดูโอดีโนดูโอดีนอสโตมี, 2 รายได้รับการผ่าตัดดูโอดีโนเจจูนอสโตมีและผู้ป่วยอีก 3 รายได้รับการผ่าตัดตัดเยื่อกั้นลำไส้ออก ผู้ป่วยหลังการผ่าตัดดูโอดีโนดูโอดีนอสโตมีสามารถรับอาหารได้ใกล้เคียงกันกับการผ่าตัดตัดเยื่อกั้นลำไส้ออก การผ่าตัดดูโอดีโนดูโอดีนอสโตมีรูปสี่เหลี่ยมขนมเปียกปูนสำหรับผู้ป่วย 18 รายให้ผลการรักษาไม่แตกต่างกันกับการผ่าตัดดูโอดีโนดูโอดีนอสโตมีแบบข้างต่อข้างซึ่งมีทั้งสิ้น 11 รายในแง่ของความสามารถในรับอาหารมื้อแรกและการรับอาหารอย่างสมบูรณ์ ระยะเวลาที่จำเป็นต้องได้รับอาหารทางเส้นเลือดดำและระยะเวลาที่จำเป็นต้องได้รับการรักษาในโรงพยาบาล แม้ว่าการใส่สายให้อาหารผ่านรอยต่อลำไส้ซึ่งมีทั้งสิ้น 4 รายจะลดความจำเป็นในการให้อาหารทางเส้นเลือดดำและทำให้สามารถให้อาหารทางลำไส้ได้เร็วขึ้นก็ตาม ผู้ป่วยก็ยังไม่สามารถได้รับอาหารทางลำไส้อย่างเพียงพอ ทำให้ระยะเวลาของการให้อาหารทางเส้นเลือดดำตลอดจนระยะเวลาในการรับการรักษาในโรงพยาบาลนั้น ไม่ได้แตกต่างกันกับการไม่ได้ใส่สายให้อาหารผ่านรอยต่อลำไส้ซึ่งมีทั้งสิ้น 30 รายเลย

คำสำคัญ : การอุดตันของดูโอดีนัม, ดูโอดีนัมตีบตัน, ตับอ่อน, เทคนิคการเย็บ, การตัดต่อลำไส้, ผลแทรกซ้อนหลังการผ่าตัด, ผลการรักษา, เด็ก, ทารก

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