Original Article

Role of Transanastomotic Feeding Tube versus Early Gastric Feeding in Postoperative Duodenal Surgery

Dolrudee Aroonsaeng, MD[1,2], Sumate Teeraratkul, MD[2], Sani Molagool, MD[2], Chollasak Thirapattaraphan, MD[2], Pornsri Thanachatchairattana, MD[2]

[1] Pediatric Surgery Unit, Department of Surgery, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand.
[2] Division of Pediatric Surgery, Department of Surgery, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Bangkok, Thailand.

Background: Postoperative enteral feeding in congenital duodenal obstruction is usually delayed due to dilated atonic duodenum. The trans-anastomotic tube feeding (TAT) has been proposed to be more effective than early gastric feeding in the role of supporting "Enhanced recovery after surgery concept".

Objective: Comparing time to feeding among patients using TAT, early gastric feeding, and traditional delayed gastric feeding.

Materials and Methods: Comparing postoperative enteric feeding via TAT (group A: n=7) and gastric feeding (group B: n=6) — prospective data collected from 2015 to 2020 — to traditional gastric feeding (group C: n=17) that is retrospective data from 2008 to 2015, in neonates with congenital duodenal obstruction.

Results: TAT and early gastric (OG) feedings had provided earlier enteral feeding compared to traditional practice ($p<0.001$). The early gastric feeding was faster full fed than TAT on the earlier postoperative date with median (IQR) = 11 (10, 11) and 16 (13, 23) respectively. However, all 3 groups had the same timing of gastric full feeding (median (IQR): A=8 (5, 11); B=7 (4, 7); C=9 (5, 10)), $p=0.772$. Even not significant, the early gastric feeding group provided the shorter time of hospital stay and TPN administration.

Conclusion: The early OG feeding is feasible for early postoperative feeding comparable to TAT feeding and applicable in cases beware of TAT-related complications. Postoperative gastric function recovery is not related to the pre- or post-anastomotic feeding.

Keywords: Duodenal atresia; Duodenal stenosis; Neonatal duodenal obstruction; Trans-anastomotic feeding tube; Enteral feeding; ERAS

J Med Assoc Thai 2021;104(Suppl.5): S38-41
Website: http://www.jmatonline.com

One of the standard postoperative nutritional support is total parenteral nutrition (TPN) via central venous catheters (C-line) while waiting for gastrointestinal function in postoperative period[1]. The early enteral feeding in the concept of "Enhanced recovery after surgery" (ERAS) is promising in present practice in place of TPN[2-4]. Prolonged TPN or C-line and long length of hospital stay can cause many complications related to venous catheter and TPN-usage, and attributes to higher cost of treatment. The possibility for early gastric feeding was demonstrated with UGIS in cases of postoperative repair in congenital duodenal obstruction[5] and gastric feeding was feasiable to even patients may have persistent bilious gastric contents caused by dysfunction at anastomosis[6] or dilated atonic duodenum proved by manometry[7].

Trans-anastomotic feeding tube (TAT) is believed to shorten time-to-full enteral feeding after surgery and length of hospital stay in patients with congenital duodenal obstruction[6,8]. The aim of this study is to compare the time to full enteral feeding among three groups of patients after duodenal surgery with TAT-feeding, early and delayed gastric feeding.

Correspondence to:

Thanachatchairattana P.

Division of Pediatric Surgery, Department of Surgery, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Bangkok 10400, Thailand.

Phone: +66-2-2011315 ext. 336, **Fax:** +66-2-2011316

Email: jiabsi@yahoo.com, pornsri.tha@mahidol.ac.th

How to cite this article:

Aroonsaeng D, Teeraratkul S, Molagool S, Thirapattaraphan C, Thanachatchairattana P. Role of Transanastomotic Feeding Tube versus Early Gastric Feeding in Postoperative Duodenal Surgery. J Med Assoc Thai 2021;104 (Suppl5): S38-41

doi.org/10.35755/jmedassocthai.2021.S05.00068

Materials and Methods

Patients selection

The study included patients who were diagnosed with duodenal atresia or stenosis from 2008 to 2020 (n=33), excluding who died before full enteric feeding and who were delayed enteral feeding from non-related study, i.e., chylothorax, postoperatively complicated intestinal anastomosis. Prospective cases were allocated by preoperative parental decision into early enteric feeding group via TAT (group A: n=7) and early gastric feeding group (group B: n=6) conducted in 2015 to 2020 Retrospective cases for delayed gastric feeding group (group C: n=17) collected from hospital's medical records in 2008 to 2015 as a control group.

Tube placement

All patients had orogastric (OG) tube placement while trans-anastomotic tube (TAT) was indwelled in only patients whose parents preoperatively consented to participate in TAT study group (group A).

Trans-anastomotic feeding tubes, soft feeding tube No. 6 or 8, were selected depend on the size of neonatal nostril and placed under direct vision at the time of duodenal anastomosis, tip at 5 to 10 cm beyond the anastomotic site. After the operation, abdominal x-ray confirmed the position of TAT before starting feeding. It was removed when displaced or concurrent gastric feeding was uneventful.

Feeding regimen

Breast milk or formula milk 3 to 5 ml/kg/feed, 8 feeds per day followed by 2 to 10 ml/feed/day increment. Feeding for group A started via TAT at the first postoperative date when patients had been stable and switched to gastric feeding when patients had significant TAT-content reflux back into stomach. Feeding via OG tube in group B when patient's gastric content markedly reduced in volume and lighter bilious color is acceptable.

Group C was the traditional fed neonates who had been fed via OG tube when gastric content was clear in color and markedly reduced in volume.

Data collection

Data collection included demographic data, type of pathology, type of operation, start-feeding date, full-feeding date, full gastrointestinal feeding time, duration of TPN and C-line, complications of TPN and C-line, length of hospital stay.

Statistics used Kruskal-Wallis test and Fisher's exact test analyzed by using Stata version 14. Statistics were significant with p-value less than 0.05.

The present study was approved by ethics committee, Faculty of Medicine Ramathibodi Hospital, Mahidol University (No. MURA2017/82).

Results

The patients' characteristics showed in Table 1, male predominant (56.67%) with mostly preterm (63.33%). The associated anomalies were Down syndrome (36.67%), heart disease (40%), annular pancreas (30%) and other (6.67%; 2 patients: abdominal situs inversus with malrotation, and the other congenital subglottic stenosis). Median age at operation and median body weight were not statistical difference in all groups. The anatomic pathologies were atresia type I (43.33%), II (13.33%), III (26.67%) and stenosis (16.67%). The operations were duodenoduodenostomy (73.33%), duodenojejunostomy (23.34%) and duodenoduodenostomy combined with duodenojejunostomy (3.33%). The C-line was inserted in 93.33% of patients for TPN administration. Neither of them was meaningly different among groups, only postoperative full-fed date, and date of starting postoperative feeding were statistically different, $p=0.027$, $p<0.001$ respectively.

Plausibility in enhanced enteral feeding in postoperative neonatal congenital duodenal obstruction was evident by comparing postoperative date of start feeding in group A and B to traditional practice as 2 and 4 to 8 days ($p<0.001$). Early gastric-fed group compared to TAT group revealed even starting feeding later, day 4 vs. 2, the earlier full-fed in postoperative date 11 vs. 16 ($p=0.027$). Although insignificant, the early gastric feeding group could decrease length of hospital stay and TPN administration as shown in Table 2.

For the gastric function reaching postoperative full gastric feeding in both pre-anastomotic (B) and post-anastomotic (A) groups was the same period as of control group (median (IQR); group A=8 (5,11), group B=7 (4, 7), group C=9 (5, 10) days, respectively; $p=0.772$).

In the present study period, only single case of TAT-migration was encountered in 3rd postoperative date without major complicated event.

Discussion

Concept of early enteral feeding has been standardized for management in abdominal surgery, therefore, TAT or early OG feeding was encouraged instead of traditional gastric feeding. There has been no definite length of TAT beyond the anastomotic site documented in any literature, thus we indwelled the tube 5 to 10 cm distally to anastomosis that it might not dislodge. Some studies have reported TAT may cause complications such as anastomosis leakage and perforation[9], which are considered for TAT-rejection. Contrary, in our study, there was no such events and only single case of TAT-migration whose tube was displaced 3 days after feeding.

In our study, even the small sample number, TAT and OG feedings result in positive effect for time to start enteral feeding and neutral effect for full gastric feeding. The results tended to support Hall, et al that TAT carried several significant advantages: shorter time to first enteral feed, reduce the use of C-line and TPN[6]; and of Arnbjornsson, et al that TAT withdrawn the use of TPN and C-line and reduced time to full enteral feeding after duodenal surgery[8]. Impressively, our study revealed that early OG feeding had several benefits as aforementioned for TAT feeding i.e., earlier started enteric and full gastric feedings, and decreased time for TPN-administration. Correlation with the evolution of ERAS concept[2-4] and UGIS finding[5], enhanced early OG feeding be implemented without hesitation.

Study from Boston Children's Hospital with large sample size of 87 newborns with duodenal obstruction reported in 2014, supported that proximal bowel dilation, duodenal anatomy, or technique of primary surgical repair not affecting in timing of enteral feeding, except prematurity, congenital heart disease and malrotation[10]. The same as of Waever, et al that the different types of duodenal anastomosis, duodenoduodenostomy and duodenojejunostomy, showed no impact on enteric

Table 1. Patients' characteristics

Data	Total (n=30)	TAT (n=7)	Early gastric feeding (n=6)	Delayed gastric feeding (n=17)	p-value
Gender, n (%)					
Male	17 (56.67)	4 (57.14)	6 (100)	7 (41.18)	0.049
Female	13 (43.33)	3 (42.86)	0	10 (58.82)	
Term, n (%)					
Preterm	19 (63.33)	6 (85.71)	3 (50.00)	10 (58.82)	0.404
Term	11 (36.67)	1 (14.29)	3 (50.00)	7 (41.18)	
Associated anomalie, n (%)					
Down syndrome	11 (36.67)	4 (57.14)	2 (33.33)	5 (29.41)	0.520
Heart disease	12 (40.00)	4 (57.14)	2 (33.33)	6 (35.29)	0.599
Anular pancrease	9 (30.00)	2 (28.57)	1 (16.67)	6 (35.29)	0.864
Other	2 (6.67)	0	2 (33.33)	0	0.034
Age at operation (day), median (IQR)	3 (2, 6)	3 (2, 10)	4 (2, 5)	3 (2, 6)	0.673
Birth weight (gm), median (IQR)	2,308 (1,850, 2,500)	1,950 (1,680, 2,705)	2,228 (2,040, 2,450)	2,420 (1,835, 2,500)	0.677
Type of pathology, n (%)					
Atresia type I	13 (43.33)	4 (57.14)	2 (33.33)	7 (41.18)	0.660
Atresia type II	4 (13.33)	1 (14.29)	0	3 (17.65)	
Atresia type III	8 (26.67)	2 (28.57)	3 (50.00)	3 (17.65)	
Stenosis	5 (16.67)	0	1 (16.67)	4 (23.52)	
Operation, n (%)					
Duodenoduodenostomy	22 (73.33)	5 (71.43)	4 (66.66)	13 (76.47)	0.607
Duodenojejunostomy	7 (23.34)	2 (28.57)	1 (16.67)	4 (23.53)	
Duo-duo with Duo-jej	1 (3.33)	0	1 (16.67)	0	
C-line, n (%)	28 (93.33)	6 (85.71)	6 (100)	16 (94.12)	0.687

Fisher's exact test >Gender, Term, Associated anomalie, Type of pathology, Operation, C-line
Kruskal-Wallis test >Age at Operation, Birth weight

Table 2. Outcomes

Data	Total (n=30)	TAT (n=7)	Early gastric feeding (n=6)	Delayed gastric feeding (n=17)	p-value
Start feeding (post-op date), median (IQR)	6 (4, 8)	2 (1, 3)	4 (4, 5)	8 (6, 10)	0.000
Full feed (post-op date), median (IQR)	14 (11, 20)	16 (13, 23)	11 (10, 11)	14 (14, 23)	0.027
Full gastric feed (day), median (IQR)	7 (5, 10)	8 (5, 11)	7 (4, 7)	9 (5, 10)	0.772
Length of hospital stay (day), median (IQR)	22 (17, 29)	23 (19, 31)	18 (14, 20)	25 (18, 30)	0.115
Length of TPN (day), median (IQR)	13 (10, 17)	13 (6, 24)	11 (9, 12)	15 (11, 18)	0.152
Length of C-line (day), median (IQR)	14 (11, 18)	16 (7, 19)	13 (11, 15)	14 (12, 18)	0.597
TPN complication, n (%)	2 (6.67)	1 (14.29)	1 (16.67)	0	0.179
C-line complication, n (%)	2 (6.67)	1 (14.29)	0	1 (5.88)	0.687

Kruskal-Wallis test >Start feeding, Full Feed, Full gastric feed, Length of hospital stay, Length of TPN (day), Length of C-line
Fisher's exact test >TPN complication, C-line complication

function[11]. Down syndrome was also not elucidated in worse outcomes[10,12]. Even our limitation of study, e.g. small sample size, some timely variations in patient care, we found neither other factors in our data such as associated anomalies

(e.g. Down's syndrome, annular pancreas, heart disease), birth weight, gestational age, type of pathology, type of operation had an effect on postoperative enteric function, coincidence as aforementioned studies[10-12]. Therefore, the knowledge learned from our preliminary study inspired further study on the effect of early OG feeding, more technically feasible than TAT feeding.

The strength of our study was complete electronic medical records for analysis, and qualified surgeons and neonatologists made our study being conserved in standard health care. Limitation in number of patients and the time in management regimen.

Conclusion

Trans-anastomotic tube and early gastric feedings can support concept of early postoperative enteral feeding especially in newborns with duodenal obstruction without causing major complications. The early gastric feeding was feasible and applicable in cases beware of TAT-related complications, the early OG feeding enhanced the time to full feed in earlier postoperative date. Gastric function may not be the problem in feeding in all 3 groups, therefore, the flowing gastric content through the patent duodenal anastomosis was essential step.

The OG tube has the advantages of gastric decompression and feeding, encouraging us for further study in how to feed via OG tube for accelerating time to full feed and shortening the length of hospital stay.

Acknowledgements

This research project is supported by Faculty of Medicine Ramathibodi Hospital, Mahidol University.

What is already known on this topic?

ERAS protocol or early postoperative enteral feeding concept could implement successfully with both TAT and OG tubes. TAT has been accepted more confident in feeding bypassing the anastomotic site and atonic proximal obstructed bowel with cautious about anastomotic complication.

What this study adds?

The conventional OG tube could be used for early gastric feed as effective as TAT feeding and more convenient in the TAT-concerning cases.

Potential conflicts of interest

The authors declare no conflict of interest.

References

1. Bishay M, Lakshminarayanan B, Arnaud A, Garriboli M, Cross KM, Curry JI, et al. The role of parenteral nutrition following surgery for duodenal atresia or stenosis. Pediatr Surg Int 2013;29:191-5.
2. Xu L, Gong S, Yuan LK, Chen JY, Yang WY, Zhu XC, et al. Enhanced recovery after surgery for the treatment of congenital duodenal obstruction. J Pediatr Surg 2020;55:2403-7.
3. Brindle ME, McDiarmid C, Short K, Miller K, MacRobie A, Lam JYK, et al. Consensus guidelines for perioperative care in neonatal intestinal surgery: Enhanced Recovery After Surgery (ERAS) Society recommendations. World J Surg 2020;44:2482-92.
4. Gibb ACN, Crosby MA, McDiarmid C, Urban D, Lam JYK, Wales PW, et al. Creation of an Enhanced Recovery After Surgery (ERAS) Guideline for neonatal intestinal surgery patients: a knowledge synthesis and consensus generation approach and protocol study. BMJ Open 2018;8:e023651.
5. Spilde TL, St Peter SD, Keckler SJ, Holcomb GW, 3rd, Snyder CL, Ostlie DJ. Open vs laparoscopic repair of congenital duodenal obstructions: a concurrent series. J Pediatr Surg 2008;43:1002-5.
6. Hall NJ, Drewett M, Wheeler RA, Griffiths DM, Kitteringham LJ, Burge DM. Trans-anastomotic tubes reduce the need for central venous access and parenteral nutrition in infants with congenital duodenal obstruction. Pediatr Surg Int 2011;27:851-5.
7. Takahashi A, Tomomasa T, Suzuki N, Kuroiwa M, Ikeda H, Morikawa A, et al. The relationship between disturbed transit and dilated bowel, and manometric findings of dilated bowel in patients with duodenal atresia and stenosis. J Pediatr Surg 1997;32:1157-60.
8. Arnbjornsson E, Larsson M, Finkel Y, Karpe B. Transanastomotic feeding tube after an operation for duodenal atresia. Eur J Pediatr Surg 2002;12:159-62.
9. Upadhyay V, Sakalkale R, Parashar K, Mitra SK, Buick RG, Gornall P, et al. Duodenal atresia: a comparison of three modes of treatment. Eur J Pediatr Surg 1996; 6:75-7.
10. Bairdain S, Yu DC, Lien C, Khan FA, Pathak B, Grabowski MJ, et al. A modern cohort of duodenal obstruction patients: predictors of delayed transition to full enteral nutrition. J Nutr Metab 2014;2014: 850820.
11. Waever E, Nielsen O, Arnbjornsson E, Kullendorff C. Operative management of duodenal atresia. Pediatr Surg Int 1995;10:322-4.
12. Singh MV, Richards C, Bowen JC. Does Down syndrome affect the outcome of congenital duodenal obstruction? Pediatr Surg Int 2004;20:586-9.