

Original Article

Early Enteral Feeding after Colorectal Surgery: Preliminary Hospital Experience

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Key Words

Colorectal cancer;
Early enteral feeding;
Gastrointestinal function;
Prognosis

Purpose. The aim of this study was to determine whether early postoperative enteral feeding is suitable for patients undergoing colorectal surgery in our hospital.

Methods. A retrospective review was performed of a prospectively collected database of patients undergoing colorectal surgery in our hospital between March 2014 and March 2015. Patients were divided into two groups, early enteral feeding and traditional “nil by mouth.” The early feeding group was treated by a modified fast track protocol and the traditional group was treated as per usual practice. Primary end point was time to first defecation; secondary end point was anastomosis leakage.

Results. Of the 200 enrolled patients, 190 patients were analyzed (95/group). Mean time to flatus was 2.76 (1 to 10) days in the modified fast track group and 4.07 (3 to 7) days in the traditional group; mean time to first defecation was 4.04 (2 to 13) days and 6.05 (3 to 19) days, respectively. These results were statistically significant ($p < 0.05$). Time to solid diet in the modified fast track group was 4.44 (3 to 17) days compared with 6.72 (4 to 21) days in the traditional group ($p < 0.05$). There was one case of anastomotic leakage in the traditional group ($p = 0.316$).

Conclusion. Early enteral feeding plays an important role in the recovery of patients after colorectal surgery and can improve gastrointestinal function without increasing postoperative complications. More aggressive patient treatment protocols with strict application should be considered in the future.

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Early postoperative enteral nutrition following colorectal surgery has been widely adopted in Western countries over the last decade, unfortunately, no statistically different effect on postoperative complications such as anastomotic leakage have been observed. Several randomized trials and meta-analysis studies also shown that reduced hospital stay supports an improved trend of postoperative recovery.¹⁻⁶

Indeed, additional strategies for enhancing postoperative recovery have been developed and applied throughout clinical practice in Western countries over recent years.⁷

While it is routine practice at Kaohsiung Veterans General Hospital (VGHKS) to treat most patients with “nil by mouth” after surgery for at least five to seven days until flatus, we have established a fast track re-

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covery protocol at our hospital for early enteral feeding in 2014. Therefore, this study aimed to determinate whether early postoperative enteral feeding is suitable for patients that have undergone colorectal surgery.

Materials and Methods

Patients

A retrospective review of a prospectively collated patient database for those undergoing colorectal surgery in our hospital was performed between March 2014 and March 2015. Patients were divided into two groups, “early enteral feeding” and the traditional “nil by mouth.” The early feeding group was treated with a modified fast track protocol while the traditional “nil by mouth” group was treated as per usual practice. Data were collected from medical records, anesthesia charts, and the pathology database, and included age, gender, common comorbidities, diagnosis, operative procedure, time to flatus, time to bowel movement, time to discharge, and complications during admission. Exclusion criteria for this study included presence of enterostomy and severe comorbidity necessitating admission to the ICU (the patient selection process is detailed in Fig. 1).

Early feeding protocol

A nasogastric (NG) tube is routinely inserted during surgery and removed when the patient commences oral intake. In the early feeding group, we began oral intake (a sip of water) from postoperative day one (POD#1) and shifted the patient to a liquid diet on POD#2, followed by a gradual shift to solid food POD#3 or #4, dependent on the presence of significant postoperative nausea and vomiting (PONV). The NG tube was reinserted in case of severe PONV. The detailed recovery protocol is presented in Table 1.

Operative technique

During this study period, laparoscopic surgery was not routinely performed and so the majority of the

operative procedures in this study were performed in the traditional (open) manner.

End points

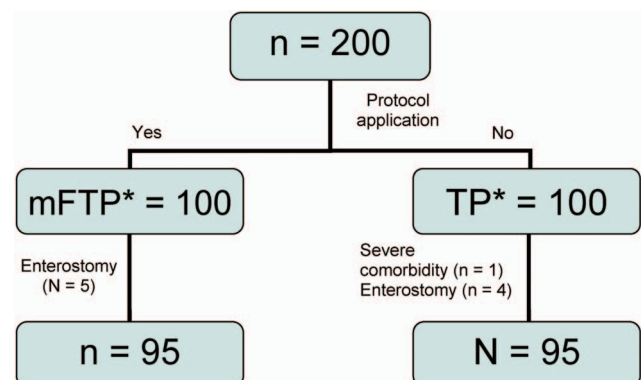
The primary end point of this study was time to first defecation and the secondary end point was anastomotic leakage.

Statistical analysis

The analysis was performed using the SPSS software package (version 20.0). The Mann-Whitney U test was used to compare continuous variables while the χ^2 test was used to compare discrete variables. A p -value < 0.05 was considered statistically significant.

Results

Of the 200 patients enrolled in this study (100/group), 190 patients were analyzed (95/group). Patient characteristics are presented in Table 2 and no significant difference between variables was observed. Results are presented in Table 3 and the mean time to flatus was 2.76 (1 to 10 days) with the modified fast track pathway and 4.07 (3 to 7) days with the traditional pathway. The mean times to first defecation were 4.04 (2 to 13) days and 6.05 (3 to 19) days respectively. Both results were shown to be significantly different (both p -values < 0.001). In addition, the time to tolerance of a solid diet under the modified fast track



* mFTP = modified fast track pathway; TP = traditional pathway.

Fig. 1. Patient selection process.

Table 1. Recovery protocol

	Modified fast track pathway	Traditional pathway
Pre-op fasting	Yes (clear liquid diet for two days before surgery)	Yes (clear liquid diet for two days before surgery)
Colon preparation	Yes (Oral sachets of fleet)	Yes (Oral sachets of fleet)
Anesthesia	G.A.	G.A.
NG	Routine insertion, remove on POD#1	Routine insertion, remove by clinical judgment (Usually after flatus passage)
Surgical management	Median laparotomy	Median laparotomy
Surgical drain	Routine insertion, remove on day of discharge	Routine insertion, remove on day of discharge
Post-op analgesia	IV Opioids/ NSAIDs or PCIA	IV Opioids/ NSAIDs or PCIA
Fluid balance	Post-op IV 1500-3000 ml/day until oral intake > 600 ml	Post-op IV 1500-3000 ml/day until oral intake > 600 ml
Diet	U/O > 1500 ml in first 3 days	U/O > 1500 ml in first 3 days
(Enteric feeding)	POD#1: Sip of water	Sip of water after flatus
	POD#2: liquid diet	Liquid diet --> low residual diet (adjust by clinical condition)
	POD#3-4: low residual diet (Adjust if significant of PONV)	
Ambulation	POD#1: out of bed least 4 times	Clinical judgment
	POD#2: mobilize > 6 times	(Usually out of bed as soon as possible on POD#1)
	POD#3: normal activity	
Discharge	POD#7 (Adjust by clinical condition)	Clinical judgment

* GA = general anesthetic; IV = intravenous; POD = postoperative day; PCIA = patient controlled intravenous analgesia; U/O = urine output; PONV = postoperative nausea and vomiting.

Table 2. Clinicopathologic characteristics of 190 patients

	mFast track (n = 95)	Control (n = 95)	<i>p</i> -value
Age (years)	63.83 (37-92)	61.59 (40-85)	0.620
Gender (M:F)	44:51	48:47	0.561
Comorbidities			
Hypertension	29	19	0.095
Cardiovascular disease	5	1	0.097
Diabetic mellitus	14	12	0.673
Others	7	5	0.551
Diagnosis			0.422
Rectum	16	19	
Rectosigmoid junction	19	16	
Sigmoid colon	36	31	
Left colon	1	9	
Transverse colon	1	3	
Right colon	18	16	
Others	0	1	
Procedure			0.697
Low anterior resection	33	39	
Anterior resection	38	28	
Left hemicolectomy	5	10	
Right hemicolectomy	19	18	

Table 3. Results

	mFast track (n = 26)	Control (n = 28)	<i>p</i> -value
Time to tolerate solid food (days)	4.44 (3-17)	6.72 (4-21)	< 0.001
Time to flatus (days)	2.76 (1-10)	4.07 (3-7)	< 0.001
Time to defecation (days)	4.04 (2-13)	6.05 (3-19)	< 0.001
Complications			
Wound infection/poor healing	2	1	0.561
Severe ileus	6	3	0.306
Anastomosis leakage	0	1	0.316
No. of reinsertions of NG tube	4	3	0.7
Rate (% among ileus)	67	100	
Time to discharge (days)	9.15 (6-23)	9.51 (6-38)	0.218

pathway was 4.44 (3 to 17) days compared to 6.72 (4 to 21) days with the traditional pathway ($p < 0.05$).

There was one case of anastomotic leakage in the traditional patient group. Poor wound healing or in-

fections were observed in 2 patients in the fast track group and 1 patient in the traditional group. Severe ileus was observed in 6 patients in the fast track group and 3 patients in the traditional group. Despite these complications, no significant differences were observed between the two groups. The NG tube reinsertion rate in patients with severe ileus was 67% (4 of 6) and 100% (3 of 3) in the fast track and traditional groups, respectively.

Discussion

The results of this study indicate that early enteral feeding after colorectal surgery is effective and safe for postoperative recovery. In previous studies, patients that have undergone an enhanced recovery treatment pathway in western countries return to a soft solids diet on postoperative day 1 after colorectal surgery.^{1,5,6} In the present study however, patients returned to a solid diet approximately 3 to 4 days after surgery with the modified fast recovery pathway; as a result, time to flatus and first defecation was somewhat extended (2.76 and 4.04 days respectively). Indeed, additional factors such as postoperative analgesics and the surgical method used will affect the recovery process,^{1,8,9} however, the effectiveness of these factors could not be determined in this study due to a lack of strict experimental settings, such as no restriction on administration of postoperative and epidural analgesics, intravenous opioids or NSAIDs to all patients in both groups. Compliance with protocols could play a role in postoperative recovery as patient cooperation may result in improved outcomes under the fast track recovery program.

In certain studies, patients will continue with oral intake of anti-emetic medication until severe vomiting occurs.^{2,7,9} In the present study, management of PONV involved delayed oral intake and this could affect the results, leading to increased time to adoption of a solid diet, time to flatus, and first defecation.

Time to discharge was only slightly lower in the traditional group when compared with the fast track group (9.15 vs. 9.51 days, $p = 0.218$) and differs from other studies,²⁻⁷ many of which have shown remar-

kably reduced length of hospital stay. We believe this is attributable to an imperfect outpatient care system that results in the responsible physician choosing to keep patients admitted until an absolute stable condition is reached (such as no obvious discomfort for 2 or 3 days after resuming a regular diet), as opposed to relying on clinical follow ups. A further concern related to extended hospital stays is that the medical cost of inpatient treatment is much lower than that of treatment received at outpatient follow ups in Taiwan. Both of these factors contribute towards a longer hospital stay and may not be resolved under the current health insurance system.

Notably, a right hemicolectomy causes increased incidence of ileus when compared with left-side colon surgery due to additional manipulation of the duodenum. In our clinical experience, right-side colon surgery did not result in a higher incidence of ileus when compared with left-side surgery; however, no statistical difference was observed in the subanalysis of this study ($p = 0.507$). However, only 37 patients (19.5%, about 18 patients in each arm) received a right hemicolectomy in this study and may therefore not be truly representative.

Conclusions

In conclusion, a fast track rehabilitation program plays an important role in the recovery of patients after colorectal surgery, which can accelerate the restoration of gastrointestinal function without increasing postoperative complications. A more aggressive protocol (which is at present a standard recovery pathway in western countries) with strict application should be considered moving forward.

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原 著

大腸直腸手術術後早期腸道進食： 高雄榮總的經驗

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目的 此篇研究的目的為探討是否早期腸道進食對我們醫院的患者是否有同樣的好處。

方法 從 2014 年三月至 2015 年三月間，對於接受大腸直腸手術且有完整病歷記錄的病患進行前瞻性的回溯分析。病人分為兩組，一組為早期進食組，另一組為傳統禁食組。早期進食組依照早期恢復的治療流程進行而傳統組則照一般治療的方式。主要終點為第一次排便的時間而次要終點為吻合處滲漏。

結果 共 200 位病患被收錄，其中 190 位進入最後分析（兩組各 95 位患者）。平均排氣時間為早期進食組的 2.76 天（1 到 10 天）比上傳統組的 4.07 天（3 到 7 天）；平均第一次排便的時間則為 4.04 天（2 到 13 天）比上 6.05 天（3 到 19 天）。兩者統計學上皆有意義（ $p < 0.05$ ）。另外，平均恢復至攝取固體食物的時間為早期進食組的 4.44 天（3 到 17 天）比上傳統組的 6.72 天（4 到 21 天），同樣 p 值 < 0.05 。另外，傳統組的患者有一位發生吻合處滲漏的情形（ $p = 0.316$ ）。

結論 早期進食對於大腸直腸術後患者的恢復扮演了一個重要的角色，可以讓患者提早恢復腸道的功能並且不會增加術後併發症的機率。未來我們將會考慮對患者施行的更積極且嚴謹的治療流程（目前可能為多數西方國家標準的術後恢復流程）。

關鍵詞 大腸直腸癌、術後早期進食、腸胃道功能、預後。