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Early postoperative diet after bariatric surgery: impact on length of stay and 30-day events

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Abstract

Background Pathways for enhanced recovery after surgery (ERAS) have been shown to improve length-of-stay (LOS) and post-operative complications across various surgical fields, however there is a lack of evidence-based studies in bariatric surgery. Specifically, the value of early feeding within an ERAS program in bariatric surgery is unclear. The objective of the current study was to determine the effect of early feeding on LOS for patients who underwent primary or revisional laparoscopic sleeve gastrectomy (LSG) and Roux-en-y gastric bypass (RYGB).

Methods Retrospective single institution study of implementation of a new diet protocol in which initiation of oral intake changed from post-operative day 1 to day 0. LOS and 30-day events were compared. Patients were excluded if they were planned for 23-h stay, had significant intra-operative complications, or required reoperation within the same admission. Mann–Whitney U tests were done to compare LOS and chi-squared tests to compare 30-day events pre- and post-intervention.

Results A total of 244 patients were included; 84.4% were primary cases. 50.8% of cases occurred prior to early feeding implementation. Median age was 43.5 years (IQR 33–53) and majority of patients were female (78.7%). Median LOS was 32.6 (IQR 30.0–50.6). Median LOS across the whole sample was shorter in the early feeding group (36.2 vs. 31.0 h; $p < 0.001$). This difference remained statistically significant for primary, but not revisional cases. Post-operative events at 30 days were similar between pre- and post-intervention groups.

Conclusions Early feeding the day of surgery is associated with significantly shorter LOS for patients who undergo bariatric surgery with no difference in 30-day readmissions.

Keywords ERAS · Bariatric surgery · Length-of-stay · LSG · RYGB

Enhanced recovery after surgery (ERAS) has become a well-established and widely-implemented process of standardized, evidence-based protocols within various surgical fields. Broadly, ERAS protocols are multimodal and aimed at helping patients recover more quickly after surgery, with the goal of improved patient outcomes, reduced in-hospital stay, and lower health care costs [1]. Mechanisms to achieve this involve pre-operative, intra-operative, and post-operative interventions including patient education, early post-operative feeding and ambulation, and reduced use of narcotic analgesia.

Although ERAS protocols have been implemented successfully in multiple surgical fields, there is a relative lack of studies on the utility of ERAS in bariatric surgery. Some observational studies have provided preliminary support of the use of ERAS protocols in bariatric surgery. In one prospective observational study at a low-volume center, patients who underwent laparoscopic Roux-en-y gastric bypass (RYGB) on an ERAS protocol were followed post-operatively. The authors found a mean length-of-stay (LOS) of 1.3 days with 83% of patients discharged on post-operative day (POD) 1 [2]. Overall morbidity was < 10% and readmission rate was under 5%. However, there was no control group with which to compare the patients on ERAS protocol.

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Other prospective studies have found similar results, with shorter LOS and lower rates of readmission after implementation of an ERAS protocol [3–5]. Dogan et al. [6] achieved a reduction of mean hospital stay from 65 to 43 h after implementation of a "fast track" program for primary laparoscopic RYGB patients, with no difference in rates of complications. Another study, however, found a higher rate of complications after hospital discharge among the fast-track group of patients undergoing primary laparoscopic RYGB [7]. Importantly, however, these prospective studies have only included patients undergoing primary procedures, not revisions.

In our institution we had previously implemented many aspects of enhanced recovery protocols including standardized protocols, minimizing narcotics, early ambulation, and avoidance of drains or catheters. The goal of the present study was to examine how one specific component of ERAS protocols, early post-operative feeding, impacted hospital resource utilization. Specifically, we investigated the impact of early diet on LOS and 30-day readmission among patients undergoing primary and revisional LSG and RYGB.

Materials and methods

A new post-operative diet protocol was implemented for all admitted bariatric patients at a single, tertiary referral center. In this modification to an existing ERAS-based protocol, post-operative diet was changed from a bariatric specific full liquid diet (FLD) on post-operative day (POD) 1 to FLD on POD 0. The FLD involved 30 mL per hour of a liquid high-protein supplement, and 90 mL per hour of clear non-carbonated low-carbohydrate liquids staggered 30 mL every 15 min, expanding on POD1 to 60 mL per hour of a liquid high-protein supplement, and 180 mL per hour of clear non-carbonated low-carbohydrate liquids. The ERAS pathway for both groups included the same processes for multimodal analgesia, focusing preferentially on local and NSAID analgesia with narcotics reserved for breakthrough pain only, routine use of antiemetic medications, same day ambulation, and lack of routine post-operative imaging or use of surgical drains or catheters. All patients undergoing bariatric surgery were tracked in a prospectively collected dataset. This study received approval from the hospital's Institutional Review Board with waiver of informed consent, as this was a retrospective review of a divisional quality assurance database.

Any patient in the dataset who underwent primary or revision RYGB or LSG between January 2016 and September 2017 was considered for inclusion. Patients undergoing isolated adjustable gastric band removal were not included. Patients were excluded if they were planned for a 23-h stay ($n=22$) or required reoperation within the same admission ($n=2$).

A retrospective analysis was conducted to compare those who underwent surgery prior to versus after implementation of this ERAS-based diet protocol, which occurred midway through the follow-up period. The remainder of the ERAS protocol was not changed. Hospital LOS and 30-day events (readmissions, ED visits, and/or need for IV rehydration) were compared across pre- and post-intervention groups. Due to non-normal distribution of data, Mann–Whitney *U* tests were used to compare continuous variables (LOS) and chi-squared tests were used for categorical variables (30-day readmissions) before and after diet change was implemented. Data are reported as median (interquartile range [IQR]) or count (%). Analysis was performed using SPSS for Windows version 25 (IBM, Somers, NY).

Results

A total of 244 patients were eligible for inclusion; sample characteristics are summarized in Table 1. The majority (84.4%) of cases were for primary procedures. There were 38 total revisions during the follow-up period. Of these, 35 were revisions of or to RYGB and 3 were revisions to LSG. Half (50.8%) of cases occurred prior to the ERAS diet implementation. The median age was 43.5 (33–53) years. The majority of patients were female (79.1%) and underwent primary LSG (57.0%).

Among primary cases, there were a total of 6 events within 30 days of surgery with no difference pre- and post-ERAS diet implementation (3 vs. 3 events; $p=0.85$).

Three patients experienced a hospital readmission after revisional surgery, one of which occurred in the early feeding group (Table 1).

Table 1 Sample characteristics

	LSG		RYGB	
	Primary $n=139$	Revision $n=3$	Primary $n=67$	Revision $n=35$
Female gender (*n*, %)	106 (76.3%)	2 (66.7%)	54 (80.6%)	31 (88.6%)
Age (median, IQR)	42 (31–52)	50 (n/a)	44 (35–56)	49 (39–52)
LOS hours (median, IQR)	32.9 (30.3–51.6)	29.8 (n/a)	32.6 (29.8–51.1)	33.1 (29.8–36.7)
30-day events (*n*, %)	3 (2.1%)	1 (33.3%)	3 (4.5%)	2 (5.7%)

The median LOS for the entire sample was 32.6 (30.0–50.6) h; LOS was significantly shorter after early feeding was implemented [36.2 (32.5–55.9) vs. 31.0 (29.0–32.8) h; $p < 0.001$]. Results of the diet intervention on LOS by procedure type are summarized in Table 2.

Discussion

Implementation of early post-operative feeding protocol was associated with a significantly shorter overall LOS among patients undergoing bariatric surgery. In the subgroup comparisons, this improvement in LOS remained statistically significant for primary procedures only. However, all groups, including revisional procedures, experienced a numerical decrease, albeit not statistically significant. Furthermore, there were no differences in 30-day events pre- and post-diet intervention, suggesting that early post-operative feeding is safe for both primary and revision LSG and RYGB patients.

Our finding that LOS was shortened by 16.4% for primary LSG and 11.5% for primary RYGB after implementation of early feeding is encouraging and consistent with previous studies that have investigated the impact of complete ERAS protocols on LOS. For instance, Dogan et al. [6] found a decrease in LOS of 33.8% in patients undergoing primary laparoscopic RYGB after implementing a comprehensive fast-track program. Importantly, like Dogan et al. [6] many of these previous studies evaluated the impact of a multi-component ERAS protocol, and thus were unable to determine which of the multiple interventions contributed to the observed results. Our findings demonstrate that early post-operative diet is independently associated with shorter LOS in bariatric surgery, and suggests that early feeding might explain a significant percentage of the decrease in LOS seen in previous studies of full ERAS protocols within the bariatric literature.

Thus far, only one randomized clinical trial has studied the impact of ERAS in bariatric surgery. In this trial of 116 patients undergoing laparoscopic sleeve gastrectomy (LSG) only, the authors found that median hospital stay was significantly shorter by 1 day in the ERAS group than in the control group receiving standard care. The ERAS protocol in this intervention included pre-, peri-, and post-operative standardization of patient education, anesthesia, fluid intake, analgesia, and thromboprophylaxis. Furthermore, rates of readmission, post-operative complications, and post-operative fatigue were the same between groups, and hospital cost was significantly lower for the ERAS group, suggesting that shorter LOS was both safe and cost-effective in patients undergoing LSG [8].

The present study builds on this growing body of literature as the first study to our knowledge to investigate the incremental effect of early post-operative feeding in patients undergoing revisional bariatric surgery, where we observed a trend towards shorter LOS after early diet implementation. Only one abstract was identified which investigated early feeding among 351 revisional bariatric cases, with a reduction in LOS of 34.4% [9]. As revisional bariatric surgery becomes increasingly common and is also associated with longer LOS and increased complications [10], our findings suggest that early post-operative diet is safe in this more complex population.

This study should be considered in light of several limitations. First, we used retrospective data, and were not able to randomize patients to different post-operative diet conditions. Secondly, our sample was relatively small, particularly as it related to the subgroup comparisons. In that regard, although the LOS was numerically decreased, the present study was underpowered to detect such differences in the subgroups.

In addition, during the second portion of the study period, a select group of low risk patients were managed in an outpatient extended stay pathway. These patients who were selected by the surgeons were excluded from this analysis. Those patients also received the POD diet protocol, but were excluded from this study as they experienced a greater reduction in LOS, unrelated to the diet protocol alone. If those patients were included, the LOS reduction would have been magnified. Finally, our study only included LOS and 30-day events as outcome measures. Recent consensus statements have advised the inclusion of more comprehensive measures of patient-reported outcomes in assessing surgical recovery

Table 2 Length-of-stay (hours) before and after diet intervention

	Pre-intervention (median, IQR)	Post-intervention (median, IQR)	Total (median, IQR)	*p* value
Total cases ($n=244$)	36.2 (32.5–55.9)	31.0 (29.0–32.8)	32.6 (30.0–50.6)	< 0.001
All primary cases ($n=206$)	36.5 (32.4–56.6)	30.5 (28.8–32.6)	30.2 (32.8–51.2)	< 0.001
Primary LSG ($n=139$)	37.0 (32.7–56.4)	30.2 (28.3–32.2)	32.9 (30.3–51.6)	< 0.001
Primary RYGB ($n=67$)	35.5 (31.2–56.9)	31.4 (29.0-34.6)	32.6 (29.8–51.1)	0.002
All revision cases ($n=38$)	33.4 (31.2–55.1)	31.7 (29.6–34.4)	32.5 (29.8–35.8)	0.133
Revision LSG ($n=3$)	28.1 (28.1–28.1)	30.7 (N/A)	29.8 (N/A)	N/A
Revision RYGB ($n=35$)	33.7 (32.8–55.1)	31.7 (29.5–34.6)	33.1 (29.8–36.7)	0.790

[11]. Follow-up studies should include patient-reported measures of disability and quality of recovery in order to determine if these patient-reported outcomes improve along with shortened LOS.

Furthermore, while the difference between groups was significant, it is unknown if a reduction in LOS by 5 h translates into meaningful cost savings for the health system. However, the ability to safely feed primary and revision LSG and RYGB patients on POD 0 is encouraging, and suggests that additional ERAS interventions combined with early diet may be a safe and effective way to achieve clinically and financially meaningful decreases in LOS for bariatric patients.

Overall, our results support the implementation of postoperative feeding on POD 0 for patients undergoing primary bariatric surgery. Most importantly, we found this intervention to be safe and easily implemented across both primary and revisional procedures. Additional prospective studies are needed to confirm these findings and evaluate the impact of early feeding on patient-reported outcomes in addition to LOS and 30-day events.

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Compliance with ethical standards

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