Carol Rees Parrish, R.D., M.S., Series Editor

Pre-op NPO and Traditional Post-op Diet Advancement: Time to Move On

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The standard method for initiating and advancing oral diet after surgery is evolving. The old approach includes nasogastric decompression and withholding oral diet until bowel function has clearly returned. While the use of nasogastric tubes (NGT) for decompression after surgery is not as common, the initiation of oral diet is still often held until the perceived return of bowel function. The resumption of an oral diet in this setting may begin with ice chips or sips of clear liquids, and then advance to clear liquids, then gradually to a regular diet. There is substantial evidence that this traditional approach is unnecessary in most instances. This paper will review that evidence as well as address the role of nutrition in the Enhanced Recovery After Surgery (ERAS) pathways.

POSTOPERATIVE ILEUS

Postoperative ileus (POI) is defined as "transient cessation of coordinated bowel motility after surgical intervention, which prevents effective transit of intestinal contents or tolerance of oral intake" (1). A "primary" POI occurs without being caused by postoperative complications. A "secondary" POI occurs due to a postoperative complication such as infection, anastomotic leak, obstruction, etc. (2). Prolonged POI reduces patient satisfaction, delays hospital discharge, and increases the cost of hospital care (3,4).

A POI is considered prolonged if it lasts >5 days (5). Earlier data demonstrated that after surgery small bowel motility typically returns in <1 day, gastric motility in 1–2 days and colonic motility in 3–5 days (6). The types of surgery that are most likely to cause POI include major surgeries in the abdomen and pelvis (5) particularly bowel resections (5) and colon surgery (7). However, other types of procedures have also been

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documented to cause POI. Those include: cardiac surgery, orthopedic surgery and trauma (2).

The pathogenesis of POI is believed to be multifactorial. There appear to be four different pathways initiated by surgical stress that lead to POI: neurogenic (activation of inhibitory reflexes), hormonal, and inflammatory responses, and pharmacological causes (endogenous and analgesic opioids) (2). The incidence of POI has been reduced over the years with improvements in surgical techniques and anesthesia (8). In fact, there are some who question whether primary POI exists (8).

NASOGASTRIC DECOMPRESSION

Historically, surgeons have waited until gut function returns before removing the decompressing NGT and allowing oral or enteral feeding; this is particularly true after abdominal or pelvic surgeries due to fear of complications caused by increased bowel contents. These complications include aspiration and subsequent pneumonia, wound dehiscence, anastomotic breakdown and subsequent fistula formation (9). They also believed that NGT decompression reduced POI, nausea and vomiting.

The tradition of leaving in a NGT after surgery until the POI resolved was initially questioned in the published literature in the early 1980's. Multiple studies since then have shown that postoperative use of NGT for decompression does not reduce postoperative nausea and vomiting (PONV) (10,11), or reduce anastomotic or other complications (11,12). In fact, discontinuing the use of NGTs in the post-op period has been shown to shorten POI and reduce fever, atelectasis and pneumonia (13). Avoidance of NGTs is one component of the Enhanced Recovery After Surgery (ERAS) protocols that will be discussed later in this article. A recently published survey showed 76% of responding U.S. surgeons (n = 407) removed the NGT on POD 0 or did not use one at all (5). Selective use of the NGT is the current recommendation.

MARKERS OF BOWEL FUNCTION

Part of the confusion associated with studying the topic of postoperative nutrition is the lack of a clear marker designating the return of bowel function. Studies have shown that lack of bowel sounds (BS), passage of flatus or stool are not diagnostic for an ileus (14–18).

BS are an unreliable marker of normal bowel function for several reasons. Prior to resumption of coordinated motility after surgery there are random electrical impulses followed by random muscle contractions (19). In this situation, BS can indicate antegrade movement of bowel contents (20). Furthermore, BS may or may not be present with normal bowel activity (21).

Waiting for first flatus or stool is not a timely measure of the initial return of bowel function. Early postoperative feeding studies have demonstrated that feeding can safely begin prior to the return of flatus or stool (22–26).

Feeding may actually be helpful in reducing POI by stimulating bowel motility. Of note, the time frames for the return of bowel function after surgery are based on return of bowel function *without* feeding. Studies have shown quicker return of bowel function with feeding (27–29). Kasparek studied colonic motility after early food status post colorectal surgery (29). They found that feeding a high fat (53% of kcals) meal of 500 kcals total on postoperative day (POD) 1 resulted in increased colonic motility when compared to standard treatment of *nil per os* (NPO). Unfortunately, a high percentage (66%) of the patients experienced nausea after this meal. The authors questioned whether a lower fat meal would produce a similar return of colonic function without causing nausea.

LAPAROSCOPIC SURGERY

There is little evidence to support the practice of leaving an NGT in after surgery and waiting for the traditional markers of bowel function return prior to starting an oral diet. In fact, when technology advanced to the point that laparoscopic surgeries could be performed, surgeons no longer applied the same rules regarding postoperative feeding. Patients' diets were advanced quickly due to the surgeons' theory that this less invasive procedure that involved less bowel manipulation and anesthesia would naturally not cause a POI or if so, it would naturally be shorter (18). Since then it has been demonstrated that laparoscopic

surgery results in a 30% reduction in length of POI and hospital stay (30). Two separate studies (18,31) evaluated laparoscopic vs. open procedures in colorectal surgery patients. In both studies, the laparoscopic group tolerated earlier oral diet and had a shorter hospital length of stay (LOS).

EARLY RECOVERY AFTER SURGERY PATHWAYS

Early feeding after surgery is a component of the pathways that have been used to enhance overall recovery after surgery. The Early Recovery After Surgery (ERAS) pathway or modifications of it include up to 20 perioperative interventions (32). Most of the pathways that have been published involve lower gastrointestinal (GI) surgery patients. The interventions typically include: extensive preoperative counseling, no bowel preparation, antibiotic prophylaxis, limited preoperative fasting, etc. (see Table 1). Use of such pathways has led to earlier return of GI function and shorter hospital LOS by 1–4 days (33).

The enhanced recovery pathways originated in Europe. A survey done in the U.S. by Delaney and colleagues (5) showed 30% of the surgeons who responded worked in hospitals that had a perioperative protocol for patients undergoing bowel resections. Hospitals with electronic medical records (EMR) more often used care pathways than those without EMRs. The interventions that were most common to the pathways used in the U.S. were: early ambulation, early diet progression, opioid-sparing techniques and early removal of NGT or no NGT at all (5). Overall use of a standard pathway like the ERAS is still rare in the U.S.

PREOPERATIVE FASTING AND PREOPERATIVE CARBOHYDRATE LOADING

One component of the ERAS-type pathways addresses preoperative fasting and carbohydrate loading. Despite the lack of evidence to support the practice of preoperative fasting, many U.S. hospitals begin a preoperative fast at midnight before the surgery (31). The current evidence supports changing the practice by shortening the length of fasting time. The ERAS-type pathways address this change in preoperative fasting as well as carbohydrate loading.

Table 1.
Suggested Summary Guidelines:
From Evidence to Bedside

- Extensive preoperative counseling
- No bowel preparation
- Antibiotic prophylaxis
- Limited preoperative fasting: solids allowed until six hrs prior to surgery and clear liquids up until two hrs before surgery
- Thoracic epidural
- Selective use of NGT or early removal of NGT
- Avoidance of perioperative fluid overload
- Early (POD 0 or 1) feeding and oral supplements 200 mL 2–3 times/day from the day of surgery until "normal food intake achieved"
- Continue supplementation (nutrition support) if the patient was malnourished baseline and early mobilization
- Consider gum chewing for 30 minutes TID on POD 1
- Early ambulation
- Opioid-sparing techniques

A Cochrane review published in 2003 that included 22 randomized controlled trials (RCT) concluded that changing the preoperative fasting to clear liquids until 2 hrs prior to surgery does not increase risk of complications (34). In fact, guidelines from Scandinavian and American Anesthesiology groups now recommend clear liquids until 2 hrs and solid foods until 6 hrs prior to starting anesthesia (35,36). The benefits of this practice include reduced preoperative hunger, thirst, and anxiety (34) and improved insulin sensitivity postoperatively (37). Furthermore, 2 randomized controlled trials show shorter LOS and faster recovery in colorectal surgery patients who receive preoperative carbohydrates such as: a hypo-osmolar maltodextrin drink 800 mL the night before surgery and 400 mL three hours prior to surgery (38,39).

LARGE BOWEL SURGERY

The majority of early oral feeding studies have been done in patients undergoing elective colorectal surgery

(16,23,26,40,41). Each study has different methods in terms of how they introduce oral feedings in their study and control groups. However, they have all shown that compared to the control group, the early oral feeding groups have no more complications, and in some, the early fed group had shorter hospital LOS (14–16,40,42,43).

SMALL AND LARGE BOWEL SURGERY

While most studies have investigated lower bowel surgery or gynecologic surgery, several studies have combined patients undergoing both upper and lower bowel surgery. Binderow and colleagues randomized 64 patients who had undergone open colon or ileal resection to regular diet on POD 1 vs. waiting for stool prior to starting an oral diet (18). They found no differences in the need for replacement of NGT due to nausea and vomiting or in the length of the POI. Behrns and colleagues randomized 44 patients undergoing surgery on their small bowel (35%), colon (53%) or both (12%), to standard treatment of clear liquids after stool or flatus vs. starting clear liquids on POD 2 (14). The control group was maintained on clear liquids until they tolerated 750 mL/day at which point they were advanced to a solid diet and then discharged after tolerating 3 meals. The protocol for the study group was to receive clear liquids on POD 2, regardless of whether they had experienced flatus or had a bowel movement, and they were to be discharged on clear liquids on POD 4 if there were no complications. Their diet was advanced at home based on information gathered during post discharge phone calls by a clinician on the research team. There was a trend towards reduced LOS in the study group (average of 4 vs 6 days). Due to the small sample size this was not statistically significant (14).

UPPER GASTROINTESTINAL SURGERIES

While there is strong evidence suggesting that it is safe to feed soon after lower GI surgery, there is limited evidence that this practice is safe in upper GI surgery patients. Surgeons are hesitant to allow early feeding in this patient population due to the concern of the effect of eating on gastric distention and potential anastomotic leaks (27). One study in 447 patients who had undergone one of the following: hepatic, pancreatic, gastric (total and subtotal resections), esophageal, pancreatoduodenectomy and other miscellaneous upper GI surgeries were randomized to oral diet at will on POD 1 vs. jejunostomy feeding POD 1 and allowing oral diet on POD 6 (27). The orally fed group had a significantly shorter time to flatus after surgery, had fewer post-discharge complications, and had no more major complications.

In a smaller study, 35 patients who underwent gastric resection were randomized to 2 different diet progressions: Early – sips of clears on POD 1, clear liquids on POD 2 and soft diet on POD 3 vs. Late = sips of clears on POD 3, clear liquids on POD 4–5 and soft diet on POD 6 (28). The earlier fed group had significantly faster return to bowel function and shorter LOS.

OTHER TYPES OF SURGERIES

Although most of the studies cited thus far have involved patients undergoing GI surgery, there are multiple studies with similar results in gynecologic surgery patients. A summary of the gynecologic studies published by Cochrane reviews states that early feeding is safe and associated with shorter hospital LOS (44). However, there is increased nausea in the early fed patients (44). There are also a few studies in cardiac (45), urology (46), and otolaryngology surgery patients (17) that show early feeding is safe.

EXCLUSION CRITERIA

Not all patients may be candidates for early oral diet after surgery. Each of the studies reviewed above excluded certain categories of patients. The most common exclusion criteria were: patients who underwent emergent surgeries or combined surgeries. Others included: history of prior intestinal resection, projected prolonged hospital stay, perforation or abscess with associated sepsis, life expectancy <3 months, short gut or other reason for requiring parenteral nutrition. Until these types of patients are included in early postoperative feeding studies, the safety of early postoperative

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oral feeding for these patients cannot be presumed. Furthermore, private communications with colorectal surgeons indicates the heightened concern for aspiration pneumonia in the elderly and those with questionable mental status as their rationale for a more cautious approach in initiating and advancing oral diet after surgery in those patient groups.

GUM CHEWING

Six randomized trials and three meta-analyses have been published evaluating the practice of gum chewing after surgery to reduce POI (47–49,50–55). The theory is that gum chewing acts as sham feeding and as such stimulates the cephalic phase of digestion thereby increasing secretions from the salivary glands, stomach and biliopancreatic systems as well as increasing GI motility. In trials of elective colorectal surgery patients, comparing standard treatment to gum chewing 3 times per day for 5–60 minutes POD1, the length of the POI was significantly shorter as demonstrated by less time to the first flatus, first stool and shorter LOS (47).

MEDICATIONS

Various medications have been studied to evaluate their effectiveness in reducing POI. Unfortunately none of the prokinetic medications have been effective (32). Use of laxatives for this purpose requires more study (56). Avoiding opioids such as morphine is recommended due to their known inhibitory effect on bowel motility. A relatively new medication, alvimopan, a mu-opioid receptor antagonist that blocks the inhibitory effects of opioids on bowel activity, was approved in 2008 by the Food & Drug Administration for use in postoperative ileus. It has been shown to reduce the POI up to 28 hrs (2).

POSTOPERATIVE DIET

There is a lack of evidence for the use of clear liquid diets after surgery. Jeffery and colleagues randomized patients to a clear liquid or regular diet after open abdominal surgery and found no difference in nausea and vomiting (57). Of note, they did wait for "return of bowel function" (as determined by the primary surgeon) prior to starting the diet.

Different approaches have been used to study the ideal postoperative diet. Kawamura and colleagues used appetite as a guide (58). They allowed water, tea, and isotonic drink immediately after NGT removal in patients after open and laparoscopic colon surgeries. Patients were then fed based on their appetite and preferences. By POD 1, 27% were eating and tolerating solid foods. By POD 2, the number had risen to 81.3% and by POD 3, 97.1% were tolerating solid foods (58).

Postoperative food preferences were studied in 145 patients who were allowed to eat within 24 hours after colorectal surgery (59). POD 1, the most commonly preferred foods and beverages included: toast (80%), fruit juice (75%); broth (73%); fresh fruit (73%); potatoes (73%); egg (70%); coffee/tea (64%); ice cream (64%); crackers (64%); pudding, yogurt and sandwiches (61%). Most of these foods are not part of a clear or full liquid diet. On POD 2 similar foods and beverages as well as cooked vegetables; hot cereal; and casseroles were chosen. Tolerance to these foods and beverages was not evaluated in this study.

CONCLUSION

Based on the most current evidence a postoperative diet can be safely started prior to traditional markers of the return of bowel function in most patients and that the ideal postoperative diet is a patient self select diet. It is important to note that most studies evaluating earlier oral diet postoperatively excluded patients undergoing emergent surgery. With regard to withholding feeding prior to surgery, better outcomes may be achieved by allowing oral diet with solid foods until six hours prior to anesthesia and carbohydrate containing clear liquids until two hours prior to anesthesia. ■

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