OBJECTIVES

Several studies have shown that gum chewing may stimulate bowel motility after gastrointestinal surgery. Because urinary diversion typically uses a segment of bowel, it is conceivable that patients undergoing cystectomy and diversion may benefit from gum chewing. This study aimed to determine whether gum chewing in the immediate postoperative period facilitates a return to bowel function in patients undergoing cystectomy and urinary diversion.

METHODS

A total of 102 patients underwent radical cystectomy and urinary diversion for clinically localized bladder cancer. Each patient followed our institution’s perioperative cystectomy care plan. The first cohort of patients underwent surgery between July 2004 and August 2005 and served as a comparison (control) group in which no gum was dispensed. The second cohort underwent surgery during September 2005 to July 2006. These patients were given chewing gum to begin on postoperative day 1. Outcome measures included time to flatus, time to bowel movement, length of hospital stay, and complications.

RESULTS

The time to flatus was shorter in patients who received gum compared with controls (2.4 versus 2.9 days; \( P < 0.001 \)). Also, time to bowel movement was reduced in patients who received gum (3.2 versus 3.9 days; \( P < 0.001 \)). There was no significant difference in length of hospital stay between gum-chewing patients and controls (4.7 versus 5.1 days, respectively; \( P = 0.067 \)). Gum chewing was well tolerated in all patients.

CONCLUSIONS

Gum chewing may speed the recovery of bowel function after cystectomy and diversion. These findings are consistent with outcomes in the colorectal surgery published data that support the use of chewing gum as an easy and inexpensive way to enhance recovery after surgery.


Paralytic ileus is the most common minor postoperative complication after radical cystectomy with urinary diversion for the treatment of bladder cancer. Delayed return of gastrointestinal motility may result in abdominal distension, pain, nausea, vomiting, and intestinal cramping. Prolonged return of bowel function may affect 12% to 40% of patients undergoing radical cystectomy and often results in an increased length of hospital stay (LOS) with considerable discomfort to the patient. Despite efforts to decrease the incidence of ileus after radical cystectomy, return of bowel function still represents a primary obstacle for a patient’s discharge home.

Studies have also shown that gastrointestinal (GI) tract function is influenced by afferent modulation by neural and humoral factors. Chewing has been shown to increase the hormonal and direct vagal afferent stimulation of smooth muscle fibers and to stimulate secretion from salivary glands and the liver. Moreover, it is apparent that control of digestion is influenced by a cephalic-vagal pathway with direct axonal projections of orofacial motor neurons to vagal afferent pathways. These modulatory inputs can lead to an increase in gastric motility and also dampen the inhibitory effects of sympathetic afferent pathways.

With this in mind, it may not be that surprising that gum chewing may provide early stimulation of the GI tract. Accordingly, several studies have shown gum chewing may stimulate bowel motility and decrease the incidence of paralytic ileus after GI surgery, thus leading to a faster time to flatus and to bowel movements (BMs) after GI surgery.

Because urinary diversion typically uses harvesting a segment of bowel (typically ileum) with associated bowel reanastomosis, it is conceivable that patients undergoing cystectomy and urinary diversion may benefit from gum chewing as well. This study aimed to determine whether gum chewing in the immediate postoperative period fa-
cilitates a return to bowel function in patients undergoing radical cystectomy and urinary diversion for bladder cancer.

MATERIALS AND METHODS

One hundred two patients underwent radical cystectomy and urinary diversion with curative intent by a single surgeon (R.S.P.) between July 2004 and May 2006 for clinically localized bladder cancer (clinical stage T2 or less). In this case series, no patient had received preoperative radiotherapy or neoadjuvant chemotherapy. Each patient followed our institution’s perioperative radical cystectomy care plan that has been previously described.11

Preoperative

All patients underwent a mechanical-only bowel preparation with the use of Fleets Phospho-soda (C.B. Fleet Company, Lynchburg, VA) and a clear liquid diet on the day before surgery. No oral antibiotic preparation was used. In 99 cases this was performed on an outpatient basis, and in 3 cases the patients were admitted on the day before surgery for the preparation.

Operative

The cystectomy and urinary diversion were typically performed via a 10-cm to 12-cm midline infraumbilical incision. The urinary diversion was accomplished by creation of an ileal conduit or orthotopic ileal neobladder. (In no case was an alternative bowel segment used.) An approximately 15-cm length of ileum was used to create ileal conduits, and a 40-cm length was used to create an ileal neobladder.

Postoperative

All patients underwent a postoperative care plan that has previously been described.11 In brief, patients received the prokinetic agent metoclopramide and stress gastritis prophylaxis in the form of H2 blockers for 48 hours after surgery. Most patients received intravenous ketorolac for pain that was dose-adjusted according to renal function and age. Intravenous morphine via a patient-controlled analgesia system was also available for breakthrough pain. Nasogastric tubes were removed on postoperative day (POD) 1. A limited clear liquid diet (8 ounces of clear liquid each 8 hours) was started on POD 2 irrespective of bowel function, and the diet was advanced to unrestricted clear fluids on POD 3 and a regular diet on POD 4. This diet was initiated and advanced irrespective of the presence of flatus or BM and was delayed only if a patient experienced nausea or emesis. Patients were discharged from the hospital once tolerating a regular diet.

The first cohort of patients underwent radical cystectomy with urinary diversion during July 2004 to August 2005 (n = 51). This group served as a comparison (control) group in which no gum was dispensed. The second cohort of patients underwent radical cystectomy with urinary diversion during September 2005 to July 2006 (n = 51). These patients were given chewing gum to begin to chew on POD 1 (Wrigley’s Freuden peppermint flavored). Patients were given five sticks of gum per 24 hours and instructed to chew a piece every 2 to 4 hours.

Outcome measures included time to flatus, time to BM, and LOS, which were measured daily. Patient demographics, preoperative blood counts (as reflected in hematocrit), preoperative renal function (as reflected in creatinine), mode of urinary diversion, and postoperative complications (including GI complications) were also recorded. Statistical analysis was performed by using two-tailed Student’s t tests and chi-square analysis.

RESULTS

The demographics of the control and gum-chewing cohorts are shown in Table 1. Overall there were no significant differences of age or sex between the control group and the gum-chewing group (P <0.001). Preoperative factors including hematocrit and creatinine (perhaps serving as a surrogate for preoperative health status) were not significantly different between groups. Operative outcomes, including types of diversion and 90-day complication rates (including GI complications), are also shown in Table 1. There were no significant differences of these variables between the control group and the gum-chewing group (P <0.001).

Table 2 shows time to flatus, time to BM, and LOS of the case series. The time to flatus was significantly shorter in patients who received gum compared with controls (2.4 versus 2.9 days, respectively; P <0.001). Also, the time to BM was significantly reduced in patients who received gum compared with controls (3.2 versus 3.9 days, respectively; P <0.001). However, there was no significant difference in LOS between gum chewing and controls (4.7 versus 5.1 days, respectively; P = 0.067). Gum chewing was well tolerated, and all patients completed their course of gum chewing until the return of bowel function.

Complication rates in the control and gum-chewing groups were 18% and 20%, respectively. In the control group, 5 patients had a total of five (10%) GI complications, including ileus (n = 4) and readmission for ab-

<table>
<thead>
<tr>
<th>Table 1. Patient demographics and operative characteristics</th>
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<tbody>
<tr>
<td>Group</td>
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<tr>
<td>-------</td>
</tr>
<tr>
<td>Control</td>
</tr>
<tr>
<td>Gum chewing</td>
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</tbody>
</table>

GI = gastrointestinal. There were no statistically significant differences with regard to age, preoperative laboratory values, type of diversion, or complication rates between groups.
dominal pain/diarrhea (n = 1; resolved with hydration). In the gum-chewing group, 4 patients had a total of five (10%) GI complications, including ileus (n = 3), Clostridium difficile colitis (n = 1), and GI bleed (n = 1; resolved with admission and conservative management). Only 2 patients in the control group and 1 patient in the gum-chewing group required nasogastric tube reinsertion for reasons of ileus.

**COMMENT**

Ileus is a common postoperative complication after radical cystectomy and urinary diversion that may lead to prolonged hospital stays and patient discomfort. Consequently, several studies have examined interventions designed to facilitate a faster return of bowel function. Some examples include early removal of nasogastric tubes, use of promotility agents (metoclopramide, cisapride, or erythromycin), bowel-preparation methods (sodium phosphate or polyethylene glycol), early enteral feeding, and use of nonopiate pain control, among others. However, despite these studies and incorporation of findings into radical cystectomy perioperative care pathways, ileus remains a common postoperative complication.

Postoperative ileus is thought to be a response to peritoneal irritation that leads to alteration of the normal motile organization of the GI tract. Although segments retain electrical and muscular activity, the overall circuitry of the GI tract displays random contractions and abnormal propagating migrating motor complexes. The end result is gut dysmotility. The underlying cause of ileus is believed to be related to postoperative sympathetic hyperactivity and increased plasma concentrations of catecholamines. In the GI tract, sympathetic activation leads to a general inhibitory response and overrides the parasympathetic input that is normally stimulatory.

Studies have also shown that GI tract function is influenced by afferent modulation by neural and humoral factors. Chewing has been shown to increase the plasma concentrations of several hormones involved in direct vagal afferent stimulation of smooth muscle fibers (gastrin, neurotensin, pancreatic polypeptide, and cholecystokinin). Also, chewing increases secretion from the salivary glands and liver. Moreover, it is apparent that control of digestion is influenced by a cephalic–vagal pathway with direct axonal projections of orofacial motorneurons to vagal afferent pathways. These modulatory inputs can lead to an increase in gastric motility and also dampen the inhibitory effects of sympathetic afferent pathways.

With this in mind, it may not be that surprising that gum chewing may provide some stimulation of the GI tract. Accordingly, several studies have shown that gum chewing can lead to a faster time to flatus and a faster time to BMs after GI surgery. Asao et al. were the first to demonstrate an improved recovery of postoperative ileus after bowel surgery with gum chewing. These investigators reported passage of flatus with gum 2.1 days after colectomy versus 3.2 in the control group (P < 0.01): BM occurred after 3.1 days in the gum group versus 5.8 days in the control group (P < 0.05). In another study after colorectal surgery, Hirayama et al. showed that gum chewing hastened the recovery of flatus and BM by 1.4 and 2.1 days, respectively, versus controls. Schuster et al. also demonstrated hastened feelings of hunger, passage of flatus, and occurrence of BM in a gum-chewing group versus a control group. Finally, Qah et al. found in patients undergoing colectomy in a gum-chewing group (versus controls), the passage of flatus occurred at 2.4 days (versus 2.7 days) and that BM occurred at 3.2 days (versus 3.9 days) after surgery. These results did not achieve statistical significance, but this may have been due to underpowering of the study, according to the investigators, because each arm contained only 19 patients. It is important to note that in all trials, gum chewing was well tolerated, and no adverse effects were reported.

Our results showed that flatus occurred 0.5 days earlier in gum-chewing patients than in controls and that the return of BM occurred 0.7 days earlier in gum-chewing patients than controls. This return of normal bowel function in our study is similar in magnitude to previous studies performed in GI procedures. Also, the patients in our study tolerated the gum, and most patients enjoyed having something to moisten their mouths. In addition, we observed a trend toward a shorter LOS in the gum-chewing group (4.7 versus 5.1 days), but this difference did not achieve statistical significance (P = 0.067). Certainly other factors apart from bowel function may also affect a patient’s LOS. Nevertheless, earlier hospital discharge, whether by expediting bowel recovery or by other means, may have important implications for a patient’s well-being, as well as for health care expenditures. On the basis of the cost, tolerability, and results on bowel function, gum chewing provides a simple method to

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**Table 2. Bowel motility outcomes**

<table>
<thead>
<tr>
<th>Group</th>
<th>Time to Flatus, d (Median: SD: Range)</th>
<th>Time to BM, d (Median: SD: Range)</th>
<th>LOS, d (Median: SD: Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>2.9 (3.0: 0.6: 2–5)</td>
<td>3.9 (4.0: 0.8: 3–6)</td>
<td>5.1 (5.0: 1.1: 4–9)</td>
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<tr>
<td>Gum chewing</td>
<td>2.4 (2.0: 0.6: 1–3)</td>
<td>3.2 (3.0: 0.6: 2–5)</td>
<td>4.7 (4.0: 1.0: 4–9)</td>
</tr>
<tr>
<td>P value</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>0.067</td>
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BM = bowel movement; LOS = length of hospital stay.
Time to flatus and time to bowel movement were significantly shorter in the gum-chewing group.
improve the postoperative state of patients undergoing radical cystectomy with urinary diversion.

Our study has several limitations. First, it is unclear as to whether the differences in time to flatus or time to BM have marked clinical implications. That is, do such differences truly improve patient quality of life or other procedural outcomes? We did begin to see a trend toward faster hospital discharge, but this difference fell short of achieving statistical significance. In addition, given the innocuous nature and low associated cost of such an intervention, it would seem that gum chewing may be a sensible addition to postoperative care.

Second, we did not have a placebo comparison group, and it is not known whether a placebo effect may occur during evaluation of interventions for stimulation of bowel function. In Matros and colleagues’ study\textsuperscript{10} of gum chewing and postoperative ileus, two control groups were used—a no-gum group and an acupressure wrist bracelet (ie, placebo) group. Of interest, the no-gum group and acupressure bracelet group had no difference in time to flatus and BM, thus suggesting that a placebo effect may not exist in studies of bowel motility.

Third, our study did not represent a randomized cohort but was a sequential case series. The influence of this sequential study should be limited by the short times of each of the series and between the sequential series and by the fact that all patients underwent the same surgical techniques and perioperative care pathway (except for the introduction of gum chewing in the second series). This would likely minimize the potential for any other influences on bowel return and function. Future studies are necessary to address these limitations.

CONCLUSIONS
Gum chewing may speed recovery of bowel function after cystectomy and urinary diversion by stimulating GI motility after surgery. These findings support the outcomes seen in the colorectal surgery published data that support the use of chewing gum as an easy and inexpensive way to enhance recovery of bowel function after surgery involving bowel resection and anastomosis.

References