Original research

The incidence of postprandial nausea and nutritional regression in gynecologic cancer patients following intestinal surgery: A retrospective cohort study

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HIGHLIGHTS

- Postoperative oral feeding is often initiated once bowel functioning resumes.
- Patients who prematurely commence oral feeding may be at risk for postprandial nausea.
- Delayed feeding may address this concern but patient hospital stay may be prolonged.

ABSTRACT

Introduction: We sought to evaluate the impact of defined intestinal surgeries on postprandial nausea, nutritional regression (i.e., a soft diet that was altered to clear liquids) and hospital stay duration in a population of gynecologic cancer patients.

Method: The following study variables were evaluated: age, intestinal surgery type: 1) small bowel resection (SBR) 2) proximal colectomy alone (Col) 3) rectosigmoid resection (RSR) and 4) rectosigmoid resection with proximal colectomy (RSR + Col), initiation of postoperative feeding (period 1 = days 1 or 2, period 2 = days 3 or 4, or period 3 ≥ day 5), development of postprandial nausea, incidence of nutritional regression and hospital stay duration.

Results: There were 218 patients who were the subject of this study. Patients who initiated early feeding (i.e., period 1) were at significantly greater risk for developing postprandial nausea (P = 0.005); the subjects in the RSR and RSR + Col groups had the highest incidence of postprandial nausea (P = 0.008). Also, in the combined group of patients, those who were fed the latest (i.e., period 3 or ≥ 5 days) had the longest hospital stay (P < 0.001).

Conclusion: Early postoperative feeding is presumably safe but postprandial nausea and nutritional regression may be a concern in these patients who have undergone an extensive intestinal surgery. Delayed feeding may mitigate the incidence of postprandial nausea and nutritional regression although potentially at the expense of increased hospital stay duration.

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1. Introduction

Traditionally, oral feeding following major abdominal surgery is postponed until the resumption of bowel functioning, which typically occurs within a week [1,2]. When the initiation of oral feeding is further prolonged (e.g., >5 days) [3], the decision is often attributed to a physician's concern for nausea, emesis, a paralytic ileus, aspiration, or anastomotic extravasation [4-6].

Initially, the results from early (i.e., commencing within 72 h postoperatively) oral intake surgery studies have suggested that these patients experience favorable postoperative wound healing and thereby, have a reduced hospitalization period [7-10]. Nevertheless, there is some concern for postprandial nausea, which can effectuate aspiration, nutritional regression (i.e., a soft diet that was altered to clear liquids) and increased readmission rates [5,11-15].
Studies involving postoperative intra-abdominal procedures have similarly endorsed early feeding although when describing their bowel surgeries, they have often included either homogenous (e.g., upper GI only) or nonspecific (e.g., intestinal) colorectal classifications [1,6,8,16,17] and thus, the potential impact of diet advancement in patients who underwent an extensive intestinal surgery (e.g., rectosigmoid resection and colectomy) is indeterminate [18,19].

In the field of gynecologic oncology, wherein both extensive pelvic and abdominal surgery may be required, an established standard of care for postoperative feeding has not been established [19]. Hence, the purpose of the current retrospective study was to evaluate the association between various mid and distal intestinal surgeries and the timing of feeding initiation on the incidence of postprandial nausea, nutritional regression and hospital stay duration in a population of gynecologic cancer patients. We hypothesize that the patients who were fed the earliest and underwent the most extensive intestinal surgeries will have the highest incidence of postprandial nausea and require “nutritional regression”.

2. Methods

2.1. Patient population

We retrospectively evaluated 265 gynecologic cancer patients who underwent an intestinal resection coinciding with their primary surgical treatment by a single group of gynecologic oncologists (M.R., L.A., J.M., J.B., and A.M.) at an individual tertiary hospital from June 2009 until June 2013. An institutional review board approved this retrospective study before any patient data were abstracted.

Subjects who did not undergo an intestinal surgery or were not originally treated for their gynecologic malignancy by the aforesaid group of gynecologic oncologists were excluded from the study analysis. Also patients who had either an enterostomy or colostomy were precluded from study inclusion.

2.2. Study variables

Demographic and clinical data included age, primary diagnosis, intestinal surgery classification (1: small bowel resection (SBR) or enterectomy, 2: proximal colectomy alone (Col) involving a proximal colectomy and reanastomosis, 3: rectosigmoid resection (RSR) encompassing a sigmoidectomy with reanastomosis and 4: rectosigmoid resection with proximal colectomy (RSR + Col) that comprised a sigmoidectomy with reanastomosis and proximal colectomy with reanastomosis), initiation of postoperative feeding (period 1 = days 1 or 2, period 2 = days 3 or 4 and period 3 ≥ day 5), the development of postprandial nausea (e.g., oral intake decreased with intravenous fluids indicated within 24 h), the incidence of nutritional regression (i.e., a soft diet that was altered to clear liquids that were modified to nil per os) and hospital stay duration. The severity of postprandial nausea was evaluated in accordance with the Common Terminology Criteria for Adverse Events [20]. In patients who were afflicted with this condition, palonosetron (0.25 mg) was administered.

2.3. Statistical analyses

All statistical analyses were conducted using MedCalc statistical software for biomedical research (version 9.5.1 for Windows). The initial data analysis was conducted via multiple regression; additional univariate analyses were performed using ANOVAs and Chi-square. In determining significance, 2-sided p values were utilized to assess any relationships amongst the relevant clinicopathologic parameters.

3. Results

We identified 218 gynecologic cancer patients who fulfilled the study criteria. The majority of diagnoses included ovarian cancer (n = 122; 55.9%) and uterine cancer (n = 35; 16%). Median overall patient age was 62 (range, 29–91) (See Table 1). In the study population, 55 underwent an SBR (25.2%), 52 had an RSR (23.8%), 43 underwent an RSR + Col (19.7%) and 68 had a Col (31.2%). From these 4 surgery groups, 71 (SBR = 13, RSR = 20, RSR + Col = 16, Col = 22) were fed during period 1, 73 (SBR = 23, RSR = 18, RSR + Col = 14, Col = 18) initiated feeding during period 2 and 74 (SBR = 19, RSR = 14, RSR + Col = 13, Col = 28) commenced feeding during period 3. Table 2 illustrates the individual surgery groups’ varying initial postoperative feeding periods.

A multiple logistic regression was employed to ascertain the significance of the inherent prognostic variables (age, intestinal surgery type and initiation of postoperative feeding) on the patients’ development of postprandial nausea, incidence of nutritional regression and hospital length of stay; the model was significant at predicting the development of postprandial nausea (R^2 = 0.14; P < 0.001), nutritional regression (R^2 = 0.03; P < 0.001) and hospital stay (R^2 = 0.11; P < 0.001).

In the entire study population, 86 patients developed postprandial nausea; there were a combined 38 subjects who were fed early (i.e., period 1 or on postoperative days 1 and 2) and 2 developed this condition; in contrast, 27 patients who were fed during period 2 (postoperative days 3 or 4) and 21 patients who initiated feeding during period 3 (on days ≥ 5) manifested postprandial nausea. A subsequent univariate evaluation revealed that for the entire study population, the patients who underwent early feeding (period 1) were at significantly greater risk for developing postprandial nausea compared to the patients who were fed during periods 2 and 3 (F(2, 214) = 5.45; P = 0.005); the incidence of postprandial nausea was similar for the period 2 and 3 groups (P > 0.05). When considering the individual surgery groups, 19 SBR patients developed postprandial nausea, 25 patients in the RSR group had postprandial nausea, 24 in the RSR + Col group exhibited postprandial nausea and 18 in the Col group experienced postprandial nausea (F(3, 214) = 4.08; P = 0.008) (Fig. 1); the subjects in the RSR and RSR + Col groups had a significantly higher incidence of postprandial nausea compared to the Col group.

We also ascertained that in separate univariate analyses, postprandial nausea (P = 0.001) and intestinal surgery type (P = 0.044) were surrogate markers for nutritional regression. In the 86 patients who developed postprandial nausea, 55 required nutritional regression; this relationship was significant (X^2(1) = 22.31; P < 0.0001). In particular, there were 15 patients in the SBR group who necessitated nutritional regression, 17 RSR subjects required nutritional regression, 14 RSR + Col patients who necessitated nutritional regression and 9 Col patients who required nutritional regression; the Col group was significantly less likely to undergo nutritional regression compared to the other intestinal surgery groups. Fig. 2 depicts the incidence of nutritional regression for the

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Patient demographics and clinical diagnoses (N = 218).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer type</td>
<td>n (%)</td>
</tr>
<tr>
<td>Ovarian</td>
<td>122 (55.9)</td>
</tr>
<tr>
<td>Uterine</td>
<td>35 (16.1)</td>
</tr>
<tr>
<td>Cervix</td>
<td>27 (12.4)</td>
</tr>
<tr>
<td>Vaginal</td>
<td>17 (7.8)</td>
</tr>
<tr>
<td>Vulvar</td>
<td>5 (0.5)</td>
</tr>
<tr>
<td>Other*</td>
<td>12 (5.5)</td>
</tr>
</tbody>
</table>

* Leiomyosarcoma, Endometrial stromal sarcoma.
specific surgery groups in accordance with the varying postoperative periods.

When collectively examining all patient groups and their hospital stay, the subjects who were fed the latest (period 3) had the longest hospital stay (12.3 days) compared to the patients who were fed during periods 1 (7.5 days) and 2 (7.9 days) \((F(2, 215) = 14.25; P < 0.001)\); there were no feeding initiation differences between periods 1 and 2 \((P > 0.05)\). In regard to intestinal surgery classification, the subjects in the RSR group had the shortest hospital stay duration (7.65 days), followed by the SBR group (9.49 days) and the Col group (9.88 days); the RSR + Col group had the longest mean hospital stay (9.91 days) but there were no significant differences amongst the four intestinal surgery groups \((P = 0.223)\). Table 3 exhibits the patients’ development of postprandial nausea, incidence of nutritional regression and hospital length of stay according to their specific intestinal surgery subtype. Overall median patient follow-up was 23 months (range, 1-47).

### Table 2

Patients’ initiation of postoperative feeding in accordance with bowel surgery type \((N = 218)\).

<table>
<thead>
<tr>
<th>Surgery type (^b)</th>
<th>Period 1 (^a)</th>
<th>Period 2</th>
<th>Period 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBR ((n = 55))</td>
<td>13 (23.6)</td>
<td>23 (41.8)</td>
<td>19 (34.5)</td>
</tr>
<tr>
<td>RSR ((n = 52))</td>
<td>20 (38.5)</td>
<td>18 (34.6)</td>
<td>14 (26.9)</td>
</tr>
<tr>
<td>RSR + Col ((n = 43))</td>
<td>16 (37.2)</td>
<td>14 (32.6)</td>
<td>13 (30.2)</td>
</tr>
<tr>
<td>Col ((n = 68))</td>
<td>22 (32.4)</td>
<td>18 (26.5)</td>
<td>28 (41.2)</td>
</tr>
</tbody>
</table>

\(^a\) Period 1 (postoperative feeding commenced on days 1 or 2), Period 2 (postoperative feeding commenced on days 3 or 4), Period 3 (postoperative feeding commenced on days \(<5\)).

\(^b\) SBR-small bowel resection, RSR-rectosigmoid resection, RSR + Col-rectosigmoid resection and colectomy, Col-proximal colectomy.

4. **Discussion**

Numerous gynecologic surgery studies have examined early feeding within the context of patients who have undergone intestinal surgery \([1,8,15,19]\). In the Gerardi et al. \([19]\) study, they reported that ovarian and peritoneal cancer patients who underwent cytoreductive surgery with a concomitant rectosigmoid colectomy...
patients who commenced feeding during the earliest period (on
	
tional regression and hospital length of stay. We ascertained that
	
impact of varying intestinal surgeries and feeding initiation periods
	
colon) and upper abdominal (dislocation of the splenic
	
ternal surgery type (i.e., the speci
	
prandial nausea and the incidence of nutritional regression. These
	
consider further comparing our surgery group results with the
	
reporting on additional, major postoperative complications and their
	
oncologists, we do not preclude the impact of selection bias. Additionally,
	
the practice of nutritional regression was not initially standardized, arbitrary management may have produced
	
condition independently when attempting to confer optimal nutritional management [19].
	
There are several limitations to our study, one of which is the
	
condition may not necessarily be recorded in the clinical chart
	
without a standard post-operative care protocol, one could speculate that excessive variability
	
by the patient. Hence, without a standard post-operative care protocol, we might have conferred additional insight.
	
Moreover, since we only included patients who were surgically managed and surveilled by the same group of gynecologic oncologists, we do not preclude the impact of selection bias. Additionally, considering that the practice of nutritional regression was not initially standardized, arbitrary management may have produced confounding results.
	
The documenting of nausea is also not standardized and thus, the condition may not necessarily be recorded in the clinical chart or reported by the patient. Hence, without a standard post-operative care protocol, one could speculate that excessive variability may have adversely affected our results. Also, since nausea, without vomiting, rarely results in major postoperative complications (such as a wound infection, aspiration pneumonia and an anastomotic leak), this condition is relatively inconsequential.
	
We also did not discuss the potential impact of perioperative narcotic use or the criteria for utilizing anti-emetics and therefore, one cannot adequately surmise how these two variables may have affected the patients’ incidence of postoperative nausea. We also recognize that the patients’ concomitant gynecologic surgery may have further impacted their postoperative course and overall outcome. Consequently, the study might have benefited from reporting on additional, major postoperative complications and their respective impact on the patients’ prognosis (e.g., readmission rates).
	
Finally, the duration of nausea and nutritional regression was not included in the study analyses; we conjecture that this data would have been edifying in further assessing the results. Despite the study’s limitations, our data are quite provocative and warrant further evaluation of the prognostic correlates that predispose gynecologic cancer patients undergoing a significant intestinal surgery to develop postprandial nausea to that potentially necessitates nutritional regression.

**Funding**

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**Conflicts of interest related to this study**

None.

**Acknowledgments**

The authors appreciate the contributions of Michael Petka, who assisted with devising the graphs for this study.

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**Table 3**

The patients' development of postprandial nausea, incidence of nutritional regression and length of hospital stay in accordance with bowel surgery type (N = 218).

<table>
<thead>
<tr>
<th>Surgery type†</th>
<th>Postprandial nausea</th>
<th>Nutritional regression</th>
<th>Hospital stay duration (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBR (n = 55)</td>
<td>19 (34.5)</td>
<td>15 (27.3)</td>
<td>9.49</td>
</tr>
<tr>
<td>RSR (n = 52)</td>
<td>25 (48.1)</td>
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<tr>
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† SBR=sophagectomy resection, RSR-rectosigmoid resection, RSR + Col-rectosigmoid resection and colectomy, Col-proximal colectomy.

experienced favorable outcomes and a significantly reduced length of hospital stay. However, many of the aforementioned studies generally classify their patients into upper, lower or simply intestinal surgery groups [1,6,16,17] thereby potentially attenuating the influence of a specific intestinal surgery on a patient's post-operative course [19].

In the current study, we were interested in examining the impact of varying intestinal surgeries and feeding initiation periods on the development of postprandial nausea, incidence of nutritional regression and hospital length of stay. We ascertained that patients who commenced feeding during the earliest period (on postoperative days 1 or 2) were significantly more likely to manifest postprandial nausea; these results coincide with the Charoenkwan et al. [15] study which reported that early feeding subsequent to abdominal, gynecologic surgery is safe but associated with an increased risk for nausea. Similarly, Kalogera et al. [21] evaluated the impact of enhanced recovery (i.e., early feeding) in a group of 241 gynecologic cancer patients who underwent surgery; they encountered more nausea and vomiting (55.6% and 17.3%, respectively) in the enhanced recovery group compared to historic controls (38.5% and 2.6%). Minig et al., however, documented a 55% and 56% incidence of postprandial nausea in their traditional and early oral feeding groups, respectively [1]. Interestingly, when reviewing the Gerardi et al. [19] data, they documented postoperative complications but did not comment on the incidence of nausea with their patient population.

A tension free anastomosis following sigmoid resection requires extensive pelvic, mid-abdominal (mobilization of the descending colon) and upper abdominal (dislocation of the splenic flexure) dissection. In accordance with our initial hypothesis, the patients who underwent more extensive intestinal surgeries (rectosigmoid surgery alone and rectosigmoid surgery and colectomy) experienced the highest incidence of postoperative nausea. Initially, we considered further comparing our surgery group results with the Kalogera et al. [21] study but they classified their patients under a complex cytoreductive surgery category (i.e., the specific intestinal surgeries were not documented). We contend that these nausea implications are quite noteworthy in the context of postoperative management, primarily due to the concern for aspiration pneumonia and overall quality of care [22,23].

We encountered a prognostic relationship between postprandial nausea and the incidence of nutritional regression. These findings are in contrast to several studies which indicate that patients can safely tolerate early feeding following abdominal gynecologic surgery [18,24,25]. While we had predicted that the subjects who underwent the most extensive intestinal surgery (a rectosigmoidectomy and proximal colectomy) would be associated with a higher incidence of nutritional regression, these results were not borne out.

Similar to several studies, we also ascertained that patients who were fed later had a protracted hospital stay [26,27]. This is seemingly intuitive given that delaying nutritional support may significantly prolong a patient's recovery time and subsequent discharge. However, we did not find significant differences amongst the various intestinal surgery groups with regard to hospital stay duration. One could conjecture that our results reflect the manner in which we specifically managed the patients’ symptoms and not necessarily because of the specific event.

Currently, the conventional belief is that gynecologic cancer patients who undergo intestinal surgery can tolerate early oral food intake without incident. We do not necessarily dispute this claim; our results, nevertheless, suggest that postprandial nausea may be a concern for these patients, particularly those of whom underwent an extensive intestinal surgery. Delayed feeding decreases the incidence of postprandial nausea and nutritional regression although potentially at the expense of increased hospital stay duration. Nonetheless, oncology physicians should always consider a patient’s condition independently when attempting to confer optimal nutritional management [19].

Table 3

The patients' development of postprandial nausea, incidence of nutritional regression and length of hospital stay in accordance with bowel surgery type (N = 218).

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There are several limitations to our study, one of which is the retrospective nature of the investigation; there was also not a comparative group which might have conferred additional insight. Moreover, since we only included patients who were surgically managed and surveilled by the same group of gynecologic oncologists, we do not preclude the impact of selection bias. Additionally, considering that the practice of nutritional regression was not initially standardized, arbitrary management may have produced confounding results.

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Finally, the duration of nausea and nutritional regression was not included in the study analyses; we conjecture that this data would have been edifying in further assessing the results. Despite the study's limitations, our data are quite provocative and warrant further evaluation of the prognostic correlates that predispose gynecologic cancer patients undergoing a significant intestinal surgery to develop postprandial nausea to that potentially necessitates nutritional regression.

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References


