



Case report

Post-operative gastroparesis following carbohydrate loading in a diabetic patient

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ABSTRACT

Gastroparesis is a syndrome of delayed gastric emptying associated with nausea, vomiting, and postprandial fullness. Despite multiple etiologies, diabetes is one of the principal causes of gastroparesis. This case report examines a 57 year-old woman with poorly controlled diabetes type II (HbA1c 8.3%) complicated by diabetic nephropathy who was readmitted for gastroparesis after two days following uncomplicated robotic surgical staging for endometrial cancer. Prior to the procedure, the patient had received carbohydrate loading in accordance with our center's enhanced recovery pathway; this resulted in severe acute hyperglycemia, a recognized cause of gastroparesis in women with diabetes. During her readmission, she improved with bowel rest and optimization of glycemic control. This case suggests that routine pre-operative carbohydrate loading should be used with caution in poorly controlled diabetic patients.

1. Introduction

Gastroparesis is a motility disorder characterized by delayed gastric emptying in the absence of a mechanical obstruction, accompanied by nausea, vomiting, and postprandial fullness. This syndrome is associated with multiple conditions including diabetes mellitus (Camilleri, 2007). Prevalence of symptoms associated to gastroparesis have been reported to be 5 – 12% among diabetic patients (Horowitz, 1989). Furthermore, the 10-year cumulative incidence rate of diabetic gastroparesis is 4.8% among type 1 diabetics and 1% among type 2 diabetics (Choung, 2012). We present a case of a woman with diabetes type II who was readmitted with severe gastroparesis following a robotic hysterectomy bilateral salpingo-oophorectomy and peritoneal nodule resection.

2. Case report

The patient is a 57 year-old non-obese woman (body mass index 28.48 kg/m²) with a past medical history of hypertension and diabetes mellitus type II complicated by mild chronic kidney disease (baseline creatinine 1.2 mg/dL) secondary to diabetic nephropathy. She was diagnosed with moderately differentiated endometrioid endometrial cancer on pre-operative biopsy following 4 months of postmenopausal

bleeding and was scheduled for robotic surgical staging. She was known to have poor long-term glycemic control (HbA1c 8.3%) and was using insulin glargine (50 units per day) and an insulin aspart sliding scale with meals. She had received pre-operative carbohydrate loading (a 100 g carbohydrate drink 12 h prior and a 50 g carbohydrate drink two hours prior to surgery) in accordance with the Enhanced Recovery after Surgery (ERAS) pathway departmental guidelines. On arrival to pre-operative holding prior to surgery, her glucose was 359 mg/dL and she required 13 units of insulin aspart in order to bring her blood sugar to < 200 mg/dL. During the procedure, she was found to have stage IV endometrial cancer following intra-operative frozen section analysis of a 3 cm tumor nodule on the left posterior peritoneum near the uterosacral ligament. Given her stage IV disease, no lymph node dissection was attempted and total hysterectomy with bilateral salpingo-oophorectomy with peritoneal nodule resections was completed without any complications nor lysis of adhesions. As well, there was minimal intraoperative handling of the bowel. The surgical procedure lasted 200 min with an estimated blood loss of 50 cc and no residual tumor at the end of the procedure. At our institution, uncomplicated minimally invasive surgical cases are typically discharged on the same day as the operation. However, this patient was hospitalized overnight given a late commencement of the operation. She was discharged home the

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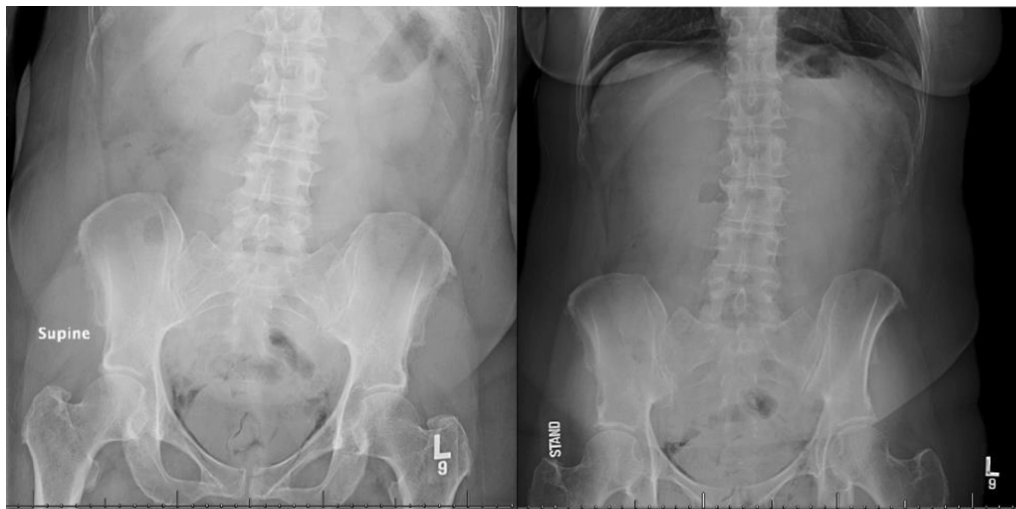


Fig. 1. Hospital re-admission abdominal radiograph on post-operative day 2.

following day in stable condition and was tolerating oral intake with minimal opioid use. Her glucose oscillated from 131 to 246 mg/dL using her home insulin regimen and was 246 mg/dL on discharge.

The patient re-presented to the emergency department with intractable nausea and vomiting on POD #2. She reported new-onset poor oral intake due to vomiting following meals with both solids and fluids but did report two bowel movements on the same day of presenting to the emergency department with passing some flatulence. She also reported bloating with mild diffuse abdominal pain with more concentration at the epigastric and left upper quadrant region. On exam, she had normal vital signs. Her abdomen was soft and there was some epigastric and left upper quadrant tenderness but no rebound. Pertinent labs on presentation were white blood cell count $11.7 \times 10^3/\mu\text{L}$, hemoglobin 10.0 g/dL, serum creatinine of 1.24 mg/dL, blood glucose of 344 mg/dL, and normal electrolytes overall (mildly elevated potassium 5.1 mEq/L). Except for the serum glucose, these serum values were similar to the discharge values on POD#1. Abdominal radiographs did not suggest ileus nor bowel obstruction given no air fluid levels were observed (see Fig. 1) and there was a small amount of expected air under the diaphragm given her recent surgical pneumoperitoneum. A CT abdomen & pelvis was subsequently performed to rule out bowel injury and assess for other pathologies but was also negative. She required nasogastric tube decompression due to vomiting. Although the nasogastric tube output was not impressive (maximum output of 210 ml over 12 h), the patient felt symptomatically better. Given her symptoms and in the absence of other bowel pathology, she was clinically suspected to have gastroparesis (her first episode). Following removal of her nasogastric tube on hospital day #3 (POD #4), her diet was slowly advanced and her glycemic control improved with the aid of the Endocrinology service. She was discharged after a total of 4 days of hospitalization.

3. Discussion

Importantly, as bowel injury must always be suspected in patients who present after pelvic surgery with severe nausea and vomiting, the above patient was closely monitored with bowel obstruction and injury being ruled out with imaging and serial exams. Although ileus can rarely occur in uncomplicated minimally invasive gynecologic surgeries, we did not feel that ileus was the cause of her nausea and vomiting due to absence of signs, such as small bowel distention and air-fluid levels, on abdominal radiographs and CT scans, unimpressive nasogastric tube output, and passing bowel movements and flatulence. Although the gold standard for diagnosis of gastroparesis is a gastric emptying assessment via scintigraphy, we did not feel an evaluation via scintigraphy was

clinically warranted given the patient had an expedient clinical improvement with conservative treatment and glycemic control. However, it should be noted that scintigraphy should be performed with persistent signs or symptoms of gastroparesis to reach a definitive diagnosis once other pathologies have been ruled out.

Instead, this patient had an acute manifestation of severe gastroparesis post-robotic surgical staging for endometrial cancer. Although surgical procedures may contribute to the development of gastroparesis, these operations typically involve gastric and pancreatic manipulation or resection, especially with injury to the vagal nerve (Dong, 2006). In contrast, it is unusual for gynecologic procedures to cause postsurgical gastroparesis, especially with minimal manipulation of the gastrointestinal tract. Poor glycemic control, instead, was likely the greatest contributor to this patient's gastric motility disorder. Support for this hypothesis include evidence that diabetic patients with sequelae, such as retinopathy, neuropathy, or nephropathy are at greater risk for gastroparesis (Camilleri, 2007). Furthermore, multiple studies have demonstrated that both acute and chronic hyperglycemia can result in delayed gastric emptying in those afflicted with diabetes mellitus (Schvarcz, 1997) and this may be one of the physiologic mechanisms of reducing the severity of postprandial hyperglycemia (Camilleri, 2007). Not only did this patient have poorly controlled diabetes with diabetic nephropathy, she also had an acute exacerbation of glycemic control following ingesting of a pre-operative carbohydrate load (an integral part of our enhanced recovery pathway) which led to her first episode of diabetic gastroparesis. This case also highlights the importance of optimizing preoperative glycemic control. Although preoperative glucose control should be optimized as much as possible, clinicians will need to balance the intensity of glycemic control with delay in surgical intervention in patients with long-term poor glycemic control. Additionally, delayed gastric emptying may also be worsened by foods with high fat or fiber content (Nelson, 2019). However, this patient's gastroparesis is less likely to be impacted by these factors given our departmental ERAS protocol institutes a postoperative diet that is low fat, low fiber, and bland while in hospital and instructs patients to follow such a diet for 1 – 2 weeks postoperatively. Clinicians should be vigilant regarding the possibility of gastroparesis in the differential diagnosis for patients at risk; these patients may still have delayed gastric emptying of solids despite normal emptying of liquids (Camilleri, 2007; Couturier, 2004).

Enhanced recovery pathways, developed by the ERAS society, have been instrumental in reducing *peri*-operative hospital stay and complication rates (Nelson, 2019). One of the ERAS Society recommendations include pre-operative carbohydrate loading, which multiple randomized

control trials have demonstrated the reduction of postoperative nausea, vomiting, *peri*-operative complications, and insulin resistance (Nelson, 2019). Despite this strong recommendation for the general patient population, diabetics have overwhelmingly been excluded from these trials (Nelson, 2019; Albalawi, 2017). One study by Gustafsson et al. has specifically assessed carbohydrate loading in diabetic patients and reported no difference in delayed gastric emptying between diabetic type 2 patients and their controls (Gustafsson, 2008). Although the authors suggested that pre-operative carbohydrate loading may be used in diabetic patients, the gastric emptying evaluations were not performed in a perioperative setting where general anesthesia and the surgery could influence the impact of pre-carbohydrate loading on poorly controlled diabetics (Gustafsson, 2008). Furthermore, the sample size was small ($n = 25$) with a diabetic population with better long-term glycemic control pre-operatively (mean HbA1c 6.8%) and lower mean peak serum glucose (241 mg/dL) compared to the discussed case (Gustafsson, 2008). Thus, given the paucity of evidence, standard pre-operative carbohydrate loading may not be generalizable to all diabetic patients, especially for those with poor glycemic control who may be more vulnerable. This uncertainty is echoed in the 2019 ERAS recommendations for gynecology & oncology that state there is insufficient evidence to allow a general recommendation for diabetic patients (Nelson, 2019). As this case illustrates, routine pre-operative carbohydrate loading should be used with caution in patients with poorly controlled diabetes mellitus until further studies clarify its role.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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IRB approval and patient informed consent

IRB approval was not required for this case report as per institutional policy. Written informed consent was obtained from the patient for publication of this case report and accompanying image. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Availability of data and material

Information and data in this case report are available from the corresponding author upon reasonable request.

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