



Case report

Candy cane syndrome at jejunojejunostomy causing small bowel obstruction following revisional laparoscopic gastric bypass: A case report and review of literature

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ABSTRACT

Introduction and importance: The literature described Candy cane syndrome (CCS) as causing various symptoms and affecting patients' quality of life. Most of the literature described this syndrome occurrence at gastro-jejunojejunostomy (GJ) anastomosis. The literature lacks data on this syndrome occurring at the jejunojejunostomy (JJ).

Case presentation: We describe a patient who underwent revision of laparoscopic gastric bypass (LGB) due to weight regain and presented three days after the procedure with small bowel obstruction (SBO). The patient was admitted as she demonstrated a picture of SBO. A complete workup and contrast study was done and showed dilated bowel loops. The patient was taken for exploratory laparoscopy, which revealed dilated 10–15 cm candy cane near the JJ, causing and obstruction. Resection of the elongated blind pouch was done, and the patient tolerated the surgery with improvement in her symptoms. Preoperative imaging, perioperative management, procedure videos, and follow-up were used to describe the case.

Clinical discussion: After reviewing the literature, eight papers reported CCS, 7 of those articles mentioned the syndrome located at the GJ. CCS located near the JJ can lead to symptoms including SBO. Management is mainly surgical, and prevention of occurrence can be achieved by limiting unnecessary elongated blind pouches.

Conclusion: CCS is a well-established condition occurring at the GJ following LGB, but it can manifest similarly if an elongated blind limb is left unresected at the JJ.

1. Introduction

With the increasing rate of obesity worldwide and the proven benefit of metabolic surgeries in preventing health problems, more operations are being performed worldwide. LGB comes second after laparoscopic sleeve gastrectomy (LSG), comprising around 20% of the total metabolic procedures performed in Saudi Arabia [1]. Weight regain is considered a definition of procedure failure in the literature, and around 25% of patients subjected to LGB regain weight during a 5-year follow-up [2–4]. Hence revisional surgeries are inevitable with different strategies to achieve weight reduction including lengthening the biliopancreatic limb and pouch resizing [5,6]. Small bowel obstruction is one of the complications following LGB, with various possible causes like internal hernias, adhesions, narrowing, or twisting of the anastomosis. Part of

the LGB procedure is constructing two anastomoses, which might leave blind pouches near the anastomoses. These blind pouches are referred to as candy cane and might be involved in postoperative symptoms and morbidity [7]. To our knowledge, no report mentioned SBO presentation post-LGB caused by candy cane (CC) at JJ. The purpose of this review is to report a patient who presented to the emergency department at our private hospital with SBO following revision of LGB, and review the literature for any similar presentation to elaborate on how patients with a similar case can present and the optimal way to manage and resolve the issue. This paper was reported inline with the SCARE 2020 criteria [8].

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2. Patient information

A 36 year old lady, who undergone LGB 10 years back due to obesity, came to our private clinic because of weight recidivism (body mass index of 49). Upon further enquiry, no medications or family history were relevant to her condition. Keeping in mind that she was subjected to weight reducing surgery in the past, interest in losing the excess weight was paramount as it affected her socially and psychologically. She was investigated preoperatively with upper oesophagogastroscopy, upper contrast study, essential blood works, electrocardiogram, and chest X-ray. The patient was taken to the operating room for revision, and the strategy was to resize the gastric pouch, jejunojejunostomy distalization, shortening of the common channel, and closure of mesenteric defects. The patient tolerated the procedure and was discharged on the second day after tolerating fluid intake and patent GI tract confirmed by contrast study. After 3 uneventful days following discharge, the patient presented to the emergency department. The main complaint was sudden severe crescendo abdominal pain, nausea, and vomiting. Her vital signs and basic laboratory tests were within normal limits. Physical examination showed tenderness at the epigastric area, mild distension, and no peritoneal sign. X-ray of the abdomen showed dilated bowel loops, especially at the left upper quadrant, but there was no air-fluid level and the contrast of the previous test taken in her last

admission seen in the colon (Figs. 1, 2). The patient was given another oral contrast which showed normal filling of the gastric pouch, normal alimentary limb but no filling of the common channel through the newly constructed jejunojejunostomy.

The patient was admitted and managed as a case of small bowel obstruction, and taken to the operating room for exploratory laparoscopy. There was free fluid in the abdomen, a dilated biliopancreatic limb loops, and at the end of the limb near the jejunojejunostomy, a distended blind loop, i.e., candy cane of around 10–15 cm in length. The limb was pulling on JJ anastomosis, causing acute angulation leading to an obstruction at the jejunojejunostomy. Additionally, the gravity of the bile accumulating in the biliopancreatic limb aided in the obstruction (Fig. 3). Application of stay stitch was applied between the biliopancreatic limb and the alimentary limb for better alignment. The candy cane was resected using Ethicon EndoGIA Tristapler, and the stapler line was invaginated with a nonabsorbable suture (Figs. 4, 5). Both procedures were conducted by the same surgeon, with more than 10 years of experience and more than 10 cases per month. After concluding the surgery, the patient returned to the ward and was monitored. Oral intake was resumed with no issues, the patient started to pass flatus, and an oral contrast study confirmed the patency gastrointestinal tract with no evidence of leak or obstruction. Clear instructions were given to the patient, and close contact by phone assured



Fig. 1. Abdominal x-ray showing dilated small bowel at the left upper quadrant.



Fig. 2. Abdominal x-ray showing dilated small bowel loops.

symptom-free recovery after discharge. Two weeks post-discharge in the clinic, the patient advanced her diet with no concerns and was having minimal pain controlled with pain medications. Patient expressed her understanding of the possible postoperative complications, and that she was pleased with the management.

3. Discussion

Readmission due to SBO is a relatively uncommon complication after LGB with a rate of less than 1%. Considering reoperation is a risk for SBO presentation because of a higher chance of adhesion formation or changing the anatomy, readmission and reoperation are more common in patients who underwent revisional procedures [9]. Several reports demonstrated different causes of SBO after revisional surgery, including internal hernias, adhesions, kinking, or narrowing of anastomosis [10–13]. Although consequences and presentations of symptomatic CC are documented in the literature, to our knowledge, no report mentioned CC causing SBO post-LGB.

There is an abundance of data in the literature explaining the candy cane syndrome occurring at the gastrojejunostomy (Table 1). Usually, patients present with abdominal pain, which is the chief complaint [14,15]. Other symptoms include nausea, vomiting, gastroesophageal

reflux, or weight regain, presenting chronically and affecting patients' quality of life [16,17]. These symptoms could be attributed to losing the coordinated migratory myoelectric complexes after bowel division, rearranging the anatomy, and constructing the anastomosis [18,19].

Surgical interventions usually occur after a significant period from the index surgery due to the variety of differential diagnoses and the need for a high index of suspicion during the presentation [14,16]. Investigations utilized according to the literature that can aid in reaching a diagnosis were mainly upper endoscopy, contrast studies, and computed tomography with the contrast study being more sensitive to other imaging modalities [17]. Surgical management of the candy cane led to improvement in most reports, but others mentioned some patients not having their symptoms ameliorated by resection of the candy cane resection and discovered other diagnoses to be the reason for symptoms [16,17].

Our case is unusual based on what the literature mentioned from two aspects. First, symptomatic CC at the JJ is not commonly reported in the literature, with a scarcity of data on how they present subjectively from the patient's reported symptoms and objectively how they manifest in the investigations. Secondly, no report mentioned a symptomatic CC causing SBO, not to mention if it is located at the JJ. The presentation can be vague with a wide range of symptoms, including abdominal pain,

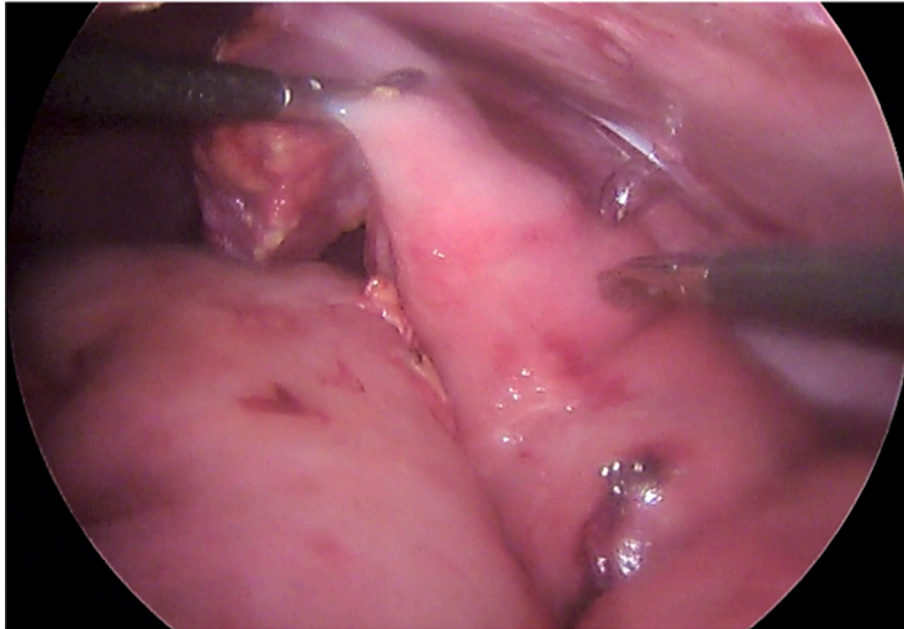


Fig. 3. The candy cane limb located near the jejunojejunostomy.

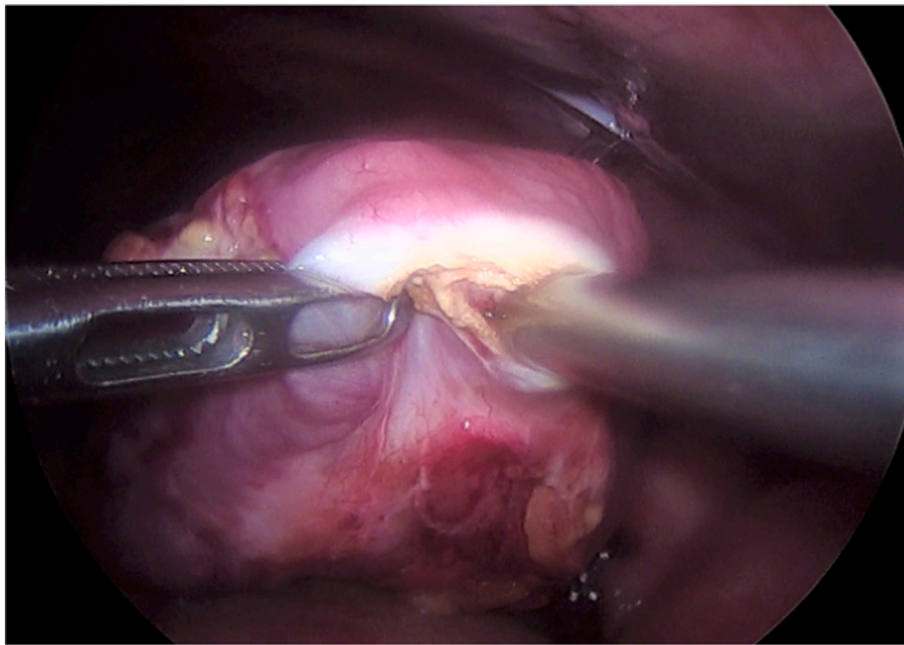


Fig. 4. The opening, suctioning and deflation of candy cane.

nausea, and vomiting. Assessment for hemodynamic stability and any signs of peritonism is prudent. An x-ray of the abdomen with erect and supine position to check for any signs indicative of bowel obstruction is a quick tool that expedites reaching a diagnosis. In patients with altered bowel anatomy like the LGB, the addition of contrast in the image is a valuable tool to assess the patency of the GI limbs and the anastomoses. If surgical treatment is decided and the CC is the most likely causative reason, resection is advisable and usually curative. The best treatment is preventing unnecessary elongated CC from the beginning at the index LGB surgery at both anastomoses i.e., the GJ and JJ.

4. Conclusion

Although CCS is a well-described entity following LGB commonly occurring near the GJ and causing vague symptoms, it can manifest near the JJ and lead to a more severe and acute presentation like SBO. Limiting unnecessary elongated blind pouches at index surgery is recommended to reduce potential morbidity, and the decision to resect CC if symptoms occurred is usually curative and advisable.

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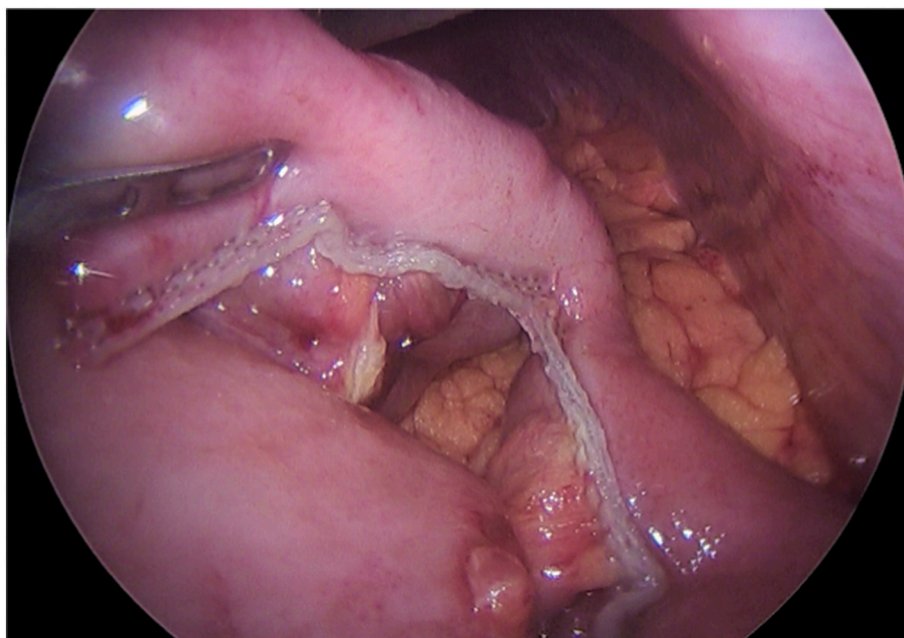


Fig. 5. Resection of the candy cane.

Table 1
Studies reporting symptomatic candy cane.

Author	Type of study	Number of patients	Symptoms	Location of Candy cane	Timing of symptoms	Specific test	management	Improvement rate	complications
Dallal et al., 2007 [18]	Case series	3	AP, N/V, WR, GERD	GJ	3 weeks 1 month 3 years	UGI, scope	Resection	100%	none
Romero-Mejia et al., 2010 [19]	Case report	1	AP, affecting QOL	GJ	2 years	UGI,	Resection	100%	none
Aryaie et al., 2017 [12]	Restrospective	19	AP, N/V	GJ	3–11 years	UGI, scope	Resection	94%	1 biloma
Robert et al., 2018 [20]	Case report	1	AP	JJ	5 years	Scope, CT	Resection	100%	none
Khan et al., 2018 [13]	Case series	3	AP, N/V	GJ	1 year	UGI, scope, CT	Resection	100%	none
Frieder et al., 2019 [14]	Restrospective	26	AP, N/V, GERD, WR	GJ	10 year	Not mentioned	Resection	92%	1 leak
Cartillone et al., 2020 [21]	Case report	1	AP, D, Vasomotor	GJ	5 years	CT	Resection	100%	none
Kamocka et al., 2020 [15]	Restrospective	28	AP, V, GERD	GJ	Not mentioned	CT, scope, UGI	Resection	73%	3 Infections, 1 anastomosis ulcer, 1 enterotomy, 1 hematoma

AP: abdominal pain, N/V: nausea and vomiting, WR: weight regain, GERD: gastroesophageal reflux disease, UGI: upper gastrointestinal series, QOL: quality of life, CT: computed tomography.

Ethical approval

The study is exempted from the need of ethical approval.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Research registration

NA.

Guarantor

Dr. Awadh Alqahtani.

Provenance and peer review

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CRediT authorship contribution statement

Dr. Mohammad Almayouf: writing of paper, review of literature, collecting images.
 Dr. Srikar Billa: collecting images.
 Dr. Awadh Alqahtani: concept and overall review.

Declaration of competing interest

No conflict of interest to be declared.

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