Thirty-Day (Early) Complications of Bariatric Surgical Procedures

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Giselle G. Hamad and Veronica T. Guerrero

A total of 179,000 bariatric surgeries were performed in the USA in 2013, with Roux-en-Y gastric bypass (RYGB) comprising 34 % and laparoscopic sleeve gastrectomy (SG) 42 % of the procedures [1]. This chapter focuses on the complications from RYGB, SG, laparoscopic adjustable gastric band (LAGB), and biliopancreatic diversion with duodenal switch (DS) that occur within the first 30 days. Given that surgical intervention may be required, patients presenting with complications in the early postoperative period may benefit from transfer to their bariatric surgeon or a bariatric surgery center. In the event of peritonitis or hemodynamic instability, prompt transfer and treatment may not be feasible. Therefore, it is important for general surgeons to be able to recognize and manage acute bariatric surgical complications. Initial evaluation should proceed with special attention to the type of bariatric procedure, giving intravenous fluid resuscitation and correction of electrolytes, obtaining a complete blood count with coagulation markers, and possibly obtaining appropriate imaging.

G.G. Hamad, M.D., F.A.C.S., F.A.S.M.B.S. (✉)
Department of Surgery, University of Pittsburgh Medical Center, Magee Womens Hospital, 3380 Boulevard of the Allies, Suite 390, Pittsburgh, PA 15213, USA
e-mail: hamadg@upmc.edu

V.T. Guerrero, M.D.
Brownsville Surgical Specialists, Brownsville, TX, USA
e-mail: tiradovero@gmail.com

2.1 Gastric Bypass Complications

Results from a patient database including over 26,000 patients who had undergone RYGB demonstrated a 30-day complication rate of 8.7 % [2]. The early complications most commonly encountered included bleeding (2.1 %), leak (1.8 %), port-site-related complications (0.6 %), and small bowel obstruction (1.0 %).

2.1.1 Bleeding

Bleeding may not always require surgical intervention, but it should be high on the differential for patients who present with tachycardia or hypotension unresponsive to fluid resuscitation early in the postoperative period. Patients may also present with abdominal wall distention or ecchymosis. Other symptoms suggesting hemorrhage include hematemesis, melena, and hematochezia [3]. Patients routinely ambulate early and may experience positional lightheadedness or dizziness when they get up to ambulate. Laboratory evaluation may reveal a reduction in hemoglobin and hematocrit levels. Prompt volume resuscitation, cardiac monitoring, and serial hemoglobins should experience instituted. If the patient remains hemodynamically stable and the hemoglobin plateaus, volume resuscitation and discontinuation of chemical thromboprophylaxis

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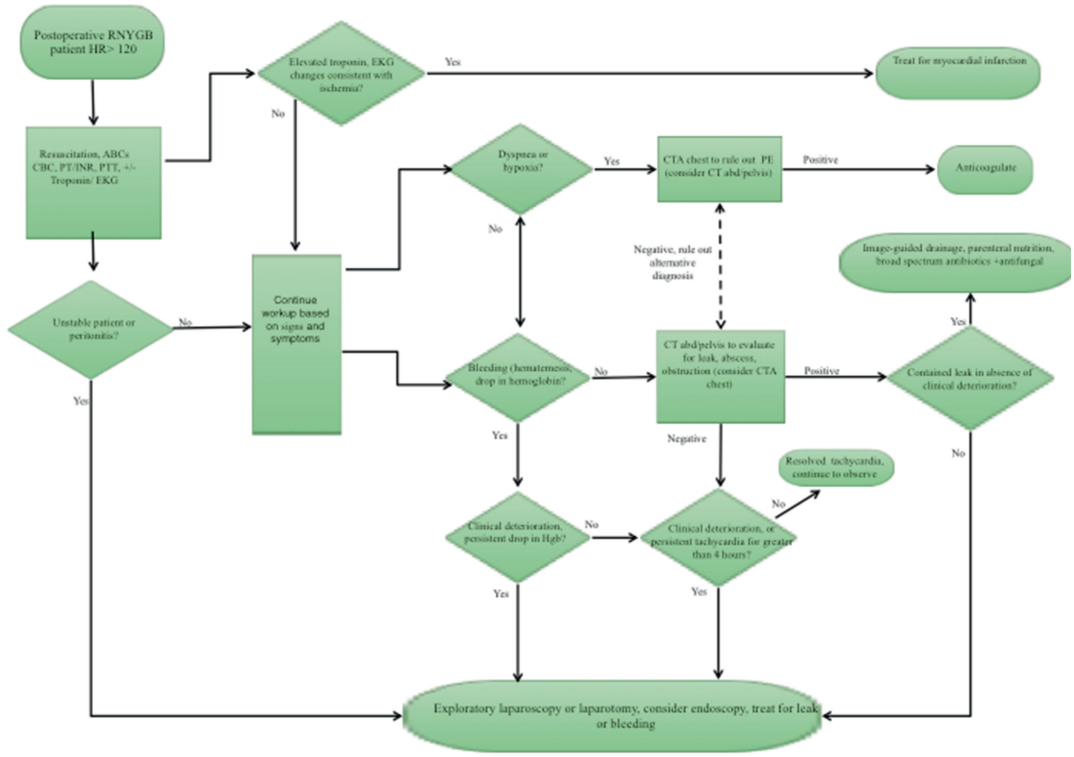

Figure 1. Algorithm for evaluation of postoperative tachycardia, defined as heart rate greater than 120 bpm in gastric bypass patients.

Fig. 2.1 Algorithm for management of sustained tachycardia in the post-bariatric surgical patient

may suffice. Nevertheless, reoperation should not be delayed if tachycardia or hypotension persists and active bleeding is suspected (Fig. 2.1). In a retrospective review of 450 patients undergoing RYGB, 20 (4.4 %) developed a postoperative hemorrhage; 12 (60 %) of these had evidence of intraluminal bleeding and melena, 15 (75 %) required blood transfusions, and 3 (15 %) required surgery [4].

Potential intra-luminal sites of bleeding include the staple lines of the pouch, excluded stomach, gastrojejunostomy, or jejunojejunostomy [3]. Bleeding from the staple lines into the excluded stomach is particularly hard to detect. Extraluminal sources of bleeding include the staple lines along the pouch or excluded stomach, mesentery, and port sites. Laparoscopic exploration may reveal an extraluminal source of bleeding, but frequently, the site of bleeding has already clotted off. When active extraluminal staple-line bleeding is found, the application of clips or sutures to achieve hemostasis usually suffices.

If the patient presents with hematemesis, bloody bowel movements, or melena, an intraluminal source should be suspected [3]. There are a few case reports of bleeding causing obstruction [5, 6]. Intraluminal clot from gastrointestinal bleeding may cause an intestinal obstruction, which is associated with nausea, vomiting, tachycardia, and abdominal pain [5]. Bleeding into the distal remnant, with clotting of the duodenum, may result in acute gastric distension and will present as sustained retching from irritation of the diaphragm. A bleed from the gastrojejunal anastomosis usually presents with hematemesis and results in a dilated, clot-filled Roux limb, but this may also result from a jejunojejunostomy bleed with retrograde extension of intraluminal clot.

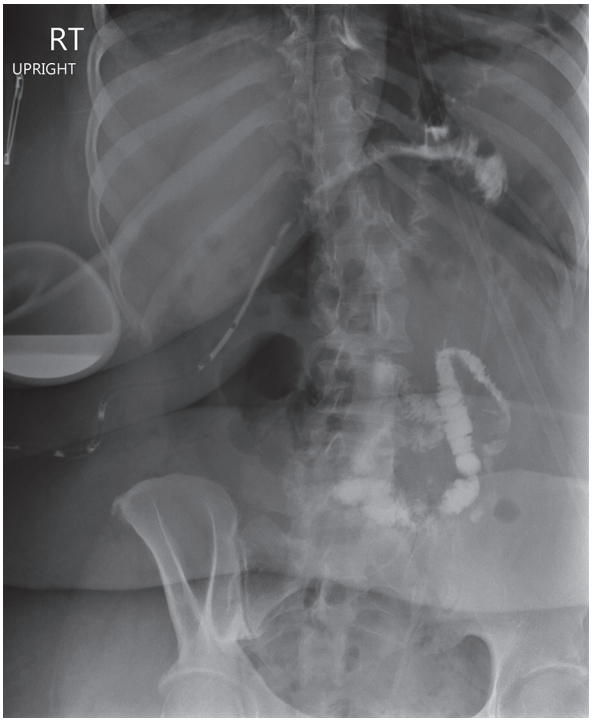

Fig. 2.2 Upper gastrointestinal study demonstrating contrast extravasation consistent with a gastrojejunostomy leak after RYGB

The combination of laparoscopy and intraoperative endoscopy plays an important role in the evaluation of persistent GI bleeding. Intraoperative upper endoscopy may be performed at the time of diagnostic laparoscopy to rule out an intraluminal bleed from the gastrojejunostomy. The bleeding anastomosis may need to be opened to achieve hemostasis or to evacuate intraluminal clot. Peeters et al. reported one intraluminal bleed out of 796 RYGB in which a laparotomy was performed. An enterotomy was made distal to the jejunojejunostomy for clot removal [5]. Gastrostomy tube placement for decompression of the excluded stomach may also be necessary [4].

2.1.2 Anastomotic Leak

An anastomotic leak is a serious complication of RYGB and can result in life-threatening sequelae (Fig. 2.2). The incidence of leak after laparoscopic RYGB ranges from 0.3 to 4.3 % [7, 8]. A recent multicenter study of 4444 patients who underwent RYGB reported an anastomotic leak rate of 1.0 % [9]. No specific technique for the gastrojejunostomy was associated with an increased rate of leak. However, this study revealed a statistically significant increase in the rate of anastomotic leak among patients who had open surgery, revisional surgery, and placement of an abdominal drain.

A high suspicion for an anastomotic leak must be maintained in a patient with persistent unexplained sustained tachycardia exceeding 120 beats per minute, even in the absence of radiologic findings of a leak [10]. In addition to tachycardia, a sensitive sign of leak is an increase in oxygen requirement of the patient. Other symptoms include abdominal pain, nausea, vomiting, and a feeling of impending doom. It cannot be overemphasized that persistent tachycardia should not be dismissed because a patient is afebrile with a benign abdominal exam, normal white blood cell count, or negative upper gastrointestinal imaging. Negative contrast studies may be falsely negative and should not delay treatment. The sensitivity of swallow studies conducted on postoperative day 1 after RYGB has been reported as 25 %, with a positive predictive

value of 31 % [11]. In contrast, sustained tachycardia has been shown to be a reliable indicator of anastomotic leak [10, 12].

Initial management consists of volume resuscitation and coverage with broad-spectrum antibiotics and antifungal therapy. While nonoperative management of anastomotic leak has been described [13, 14], early surgical treatment of leaks is associated with a shorter hospital stay [15]. Standard of care for patients with anastomotic leaks consists of prompt reoperation for abdominal washout, repair of the leak, and drainage. Enteral access should be strongly considered; a gastrostomy tube may be placed in the gastric remnant. Nonoperative management may be appropriate in select cases depending upon the patient's clinical status and availability of local expertise with the use of nonoperative techniques. If the patient had surgery or is being treated for the complication in a community hospital setting, transfer to a tertiary bariatric center which has the ability to rescue the patient is optimal soon after the patient is initially stabilized.

2.1.3 Obstruction

Early small bowel obstructions after RYGB are most commonly caused by technical problems such as narrowing or angulation at the jejunojejunostomy [16] or bleeding [5, 17]. Other possible etiologies include Roux-en-O configuration [18], a twist of the Roux limb, or obstruction at the transverse mesocolon [16, 19]. Bilious vomiting suggests a Roux-en-O configuration [18, 20], gastrogastric fistula, or obstruction distal to the jejunojejunostomy [20]. Therefore, prompt exploration should be undertaken for early bowel obstructions to rule out technical complications. Nausea, vomiting, and dysphagia may be presenting symptoms of a gastrojejunostomy stricture, which is diagnosed by upper endoscopy. The presentation occurs 1–3 months postoperatively, with 90 % presenting between 30 and 60 days and 10 % between 60 and 90 days [21]. Endoscopic dilation is generally successful after 1–3 dilations [21].

Shimizu et al. reported that 0.5 % of laparoscopic RYGB patients underwent surgical management for small bowel obstruction within 30 days after surgery [17]. In this study, all of the patients had undergone antecolic-antegastric RYGB. The 11 patients with early small bowel obstruction were diagnosed by CT with oral contrast and underwent laparoscopic exploration. Causes included a kink at the jejunojejunostomy, intraluminal blood clot, intra-abdominal hematoma, and pelvic adhesions. Bowel resection was only required in one patient and four patients were converted to laparotomy. Endoscopy was a valuable adjunct for assessing hemostasis, decompressing the Roux limb, and confirming patency at the jejunojejunostomy.

An additional cause of early small bowel obstruction is incarceration of small bowel in an unrepaired ventral hernia. Ventral hernias may be left open to be more optimally repaired after the patient has lost a substantial amount of weight, as the hernia may reoccur if a repair is attempted when the patient still carries a substantial amount of weight. When a ventral hernia is identified prior to surgery, patients should be consented for simultaneous hernia repair with possible mesh placement. The use of synthetic mesh raises a concern for mesh infection because of the GI anastomoses. If a ventral hernia is detected at the time of surgery, a postoperative conversation should ensue with the patient to explain the intraoperative decision making, signs and symptoms of small bowel obstruction, and specific instructions regarding postoperative activity restrictions. In all cases, if a ventral hernia is left unrepaired, a specific note should be made in the operative record, in case the small bowel obstruction presents to another surgeon/team.

2.2 Sleeve Gastrectomy Complications

The sleeve gastrectomy (SG) was initially described as a component of the duodenal switch [22, 23]. It was subsequently proposed as the initial procedure in a two-stage approach for high-risk patients [24]. Over the past decade, it has

gained tremendous popularity as a primary bariatric surgical procedure [25] and has now surpassed the RYGB in volume at academic medical centers [26].

In a recent literature review, there were no significant differences in overall complication rates between RYGB and SG; the reported leak rate for SG was 2.3 % versus 1.9 % in RYGB [27]. The rates of bleeding and stenosis were slightly but significantly higher for SG but there was no significant difference in leak rates between RYGB and SF. In a single-institution study comparing outcomes among SG, RYGB, and DS, the rate of leakage for RYGB and SG was similar but hemorrhage was more frequent after SG [28].

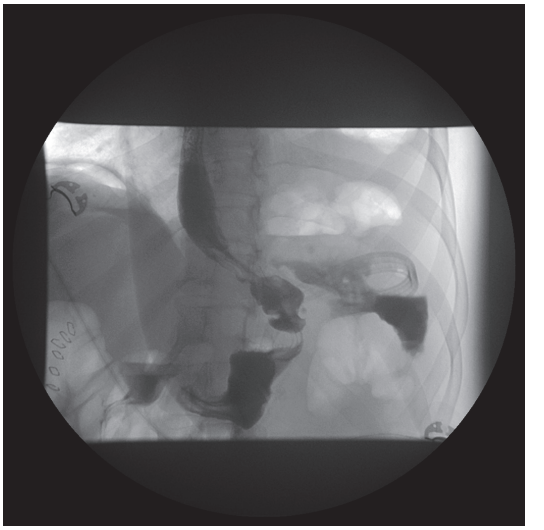

Fig. 2.3 Upper gastrointestinal study demonstrating a leak 20 days after SG

2.2.1 Sleeve Leak

Management of leaks after SG remains a challenging clinical problem that can lead to devastating sequelae if not recognized and treated promptly [29]. Leaks most commonly occur in the proximal stomach at the gastroesophageal junction [29, 30] (Fig. 2.3). Unrecognized leaks may lead to abscess formation and sepsis [31] and persistent leaks may lead to fistula formation [32]. A literature review of 4888 primary SG patients in 29 studies documented a leak rate of 2.4 % [30]. Leaks were more frequent in patients with a body mass index (BMI) of greater than 50 kg/m^2 (2.9 %) [30].

There is no consensus regarding the optimal bougie size for SG. According to the International Sleeve Gastrectomy Expert Panel Consensus Statement, the use of a bougie size less than 32 French has been associated with an increased risk of leaks and strictures [33]. In the meta-analysis by Aurora et al., the leak rate for using a bougie size of 40 French or greater was 0.6 % versus 2.8 % when using a bougie smaller than 40 French [30]. This is concordant with the data from Parikh et al. whose meta-analysis demonstrated a lower leak rate for a bougie size of greater than or equal to 40 French [34]. There is no consensus regarding whether buttressing reduces the leak rate [33, 34].

Signs and symptoms of an SG leak include fever, chills, left shoulder pain, nausea, vomiting, abdominal pain, tachycardia, and tachypnea [31]. Chest radiographs may demonstrate a left pleural effusion. A UGI study may be useful in establishing the diagnosis, but CT scan with oral water-soluble contrast will not only diagnose the leak but also guide percutaneous treatment of an associated abscess. Initial management consists of bowel rest, fluid resuscitation, antibiotics, and parenteral nutrition.

Leaks may be classified as acute (within 7 days), early (1–6 weeks), late (greater than 6 weeks from procedure), and chronic (greater than 12 weeks) [33]. Leaks after SG are more frequently seen as a late complication; 79 % of leaks present more than 10 days postoperatively [30]. The endoscopic and surgical options for sleeve leaks depend upon the timing and presentation. Endoscopic options include endoscopic stenting [35] or clip placement [36]. The 2011 Expert Panel Consensus guidelines recommend that stents are a valid treatment for acute proximal leaks, and advise that stenting after 30 days is less likely to be effective [33]. Moon et al. recommended that late leaks should be treated with endoscopic clips or fibrin glue if small (less than 1 cm) or with stent placement if larger or unresolved [31]. Keren et al.

reported a success rate of 81 % for treating SG leaks with an endoscopic clip [36].

Similar to bypass patients, SG patients with fever and sustained tachycardia should undergo immediate reoperation for lavage, omental patch repair, and drainage [33]. Given that healing of a SG leak may be prolonged because the sleeve is a high-pressure system, providing enteral nutritional access should be considered in patients who warrant surgical exploration. Persistent leaks may need to be converted to RYGB as a last resort [31]. A period of at least 12 weeks of nonoperative therapy should elapse prior to undertaking revision to RYGB if these measures fail [33].

Moon et al. published a retrospective study of 539 sleeve gastrectomy patients with a 2.8 % leak rate after a mean follow-up of 12 months [31]. The diagnosis was established at a mean of 27.2 ± 29.9 postoperative days. Two out of the fifteen patients with a leak were diagnosed prior to discharge and underwent successful laparoscopic repair with omental patching. Five patients underwent endoscopic intervention such as fibrin glue and hemoclip placement to close the leak, which was successful in four out of the five patients (80 %). Eight of the fifteen were managed nonoperatively with antibiotics, total parenteral nutrition, and CT-guided drainage and among these eight, only one leak (12.5 %) resolved and six (75 %) required stent placement, which was successful in 50 %. One patient with persistent fevers required laparoscopic repair and drainage. The authors concluded that acute sleeve leaks presenting prior to discharge may be optimally repaired laparoscopically; however, conservative therapy alone without stenting had a high failure rate. If the hospital where the patient presents is unable to offer stenting, it may be best to transfer the patient for revisional surgery.

2.2.2 Stenosis and Bleeding

Stenosis after sleeve gastrectomy occurs in less than 1 %. The rate of stricture is not significantly different between surgeons who oversew the staple line versus those who do not [30]. Stenosis may be caused by angulation of the stapler, kinking or twisting of the stomach, hematoma, or edema. Patients typically present with regurgitation, vomiting, or dysphagia. The incisura angularis is the most common site of strictures [33]. Symptomatic strictures should be treated with observation, followed by endoscopic dilation, and then possibly seromyotomy or revision to RYGB if endoscopic dilations fail [33].

In their systematic analysis, Aurora et al. reported that the incidence of bleeding after SG requiring surgical intervention was 0.7 % [30]. The use of staple-line oversewing or reinforcement was not associated with lower bleeding rates in their study. Bleeding complications following SG should be managed similar to RYGB patients; however, the division of the short gastric vessels makes the possibility of major hemorrhage immediately postop substantial. A patient who drops their blood pressure in the immediate postoperative period should be evaluated for bleeding without delay.

2.3 Complications of Laparoscopic Adjustable Gastric Banding

LAGB patients presenting with abdominal pain, nausea, intractable reflux, or intolerance of oral intake should have the fluid from the band withdrawn. This is accomplished by accessing the subcutaneous port with a non-coring needle. A plain abdominal X-ray should also be done to evaluate for band slippage. In addition, one should assess the tubing from band to port on plain films to rule out port disconnection. If emptying the fluid does not resolve symptoms or plain films suggest band slippage, a UGI study may be done for further evaluation (Fig. 2.4).

Complications requiring reoperation from LAGB within the first 30 days are rare. In a study of over 6,000 LAGB patients, 14 (0.2 %) patients required emergency surgery for a complication related to the band [37]. The median time of presentation was 19 months and ranged from 1 to 61 months. The most common complication was band slippage with or without gastric necrosis. Other complications included small bowel obstruction, perforated gastric ulcer, bowel penetration, and port disconnection.

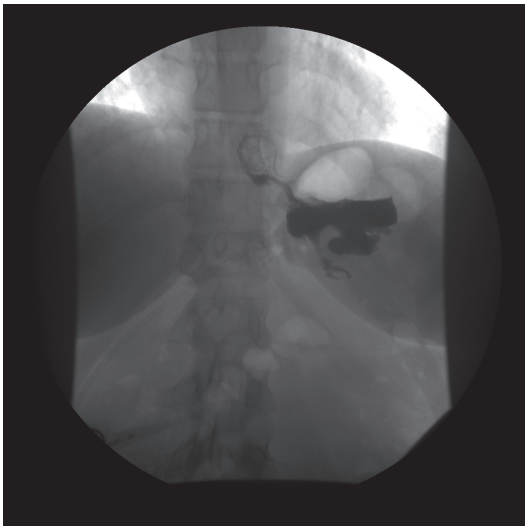

Fig. 2.4 Band slippage and gastric prolapse

Symptoms of acute band slippage include epigastric pain, dysphagia, gastroesophageal reflux, and vomiting [38]. A contrast study may reveal anterior or posterior prolapse in which the anterior or posterior wall of the stomach herniates above the band. The prolapsed stomach may become ischemic or necrotic [39]. Therefore, emergent surgical intervention is indicated. If gastric ischemia or necrosis is present, urgent explantation would be required. The band may be removed laparoscopically by cutting the tubing first distally which traverses the abdominal wall and then mobilizing the soft tissue where it connects to the band, incising the capsule anterior to the band, and then mobilizing and releasing the band from the stomach. The band is then removed from a 15 mm trocar site and the subcutaneous port is then dissected free and removed. If the stomach is viable, repositioning of the band at the gastroesophageal junction may be feasible [40] only if the patient has had satisfactory weight loss with the band. If the patient is a partial or nonresponder, consideration for removal only should be given, with plans to convert to a metabolic procedure after the acute situation is resolved.

Port-site infections in the early postoperative period may be treated with antibiotics if infection is limited. Band erosion should be suspected if the access port is erythematous or tender [41]; this is best evaluated with upper endoscopy and would require band removal. However, band erosion is rarely seen in the early postoperative period. In the absence of band erosion, if there is an abscess at the port site or if there is no response to antibiotics, the port should be disconnected and removed and the band tubing should be left inside the peritoneal cavity for future reconnection to a new access port [42]. Damage to the port may be diagnosed by loss of volume of the injected fluid and failure of satiety despite band fills. Port leakage or leakage along the band tubing may be diagnosed by injecting contrast into the port under fluoroscopy. Port removal or band replacement may be necessary and this may be done electively.

2.3.1 Complications of Duodenal Switch

The biliopancreatic diversion/duodenal switch (DS) constitutes 2.2 % of all bariatric procedures [43]. While it has the highest weight loss compared to the other bariatric surgical procedures [44], it has been shown to have the highest short-term complication rate of all of the bariatric procedures [45]. Thirty-day morbidity ranges from 7 to 8.6 % for one-stage procedures [46, 47]. Buchwald et al. reported on their early postoperative outcomes in 190 patients ≤30 days after open or laparoscopic/robotic DS [48]. The total complication rate was 19.5 % and no mortalities. There were 14 patients who had 18 serious complications (9.5 %), including 2 leaks (1 %).

Until recently, the DS was most often performed through open access. Wound complications are the most common complication after DS, occurring in 7.7–10 % of patients [47, 48]. Leaks after DS occur in 1–2.3 % of patients, and most often arise from the gastric sleeve staple line [43, 46, 47]. Leaks are managed as per the SG recommendations above, with endoscopic stenting or clips versus surgical exploration and drainage if endoscopic measures fail [43, 47]. A meta-analysis of 16 single-center studies comparing a total of 874 DS and 1149 RYGB proce-

dures demonstrated a higher leak rate for DS (5 % vs. 2.2 % RYGP, $p=0.002$) and no significant difference in mortality (0.6 % DS vs. 0.2 % RYGP, $p=0.33$) [49]. In a study of 27 patients who underwent two-stage DS, 3 patients had bleeding complications that presented within 3 days postoperatively [50]. Four patients presented with stenosis of the duodeno-ileal anastomosis between 1 and 3 months after surgery and were generally treated with endoscopic dilation [50].

A single-institution study of 1000 patients undergoing DS demonstrated no difference in the 30-day complication rates between laparoscopic and open DS (7 % vs. 7.4 %, $p=0.1$) [46]. The open group was more likely to have gastric leaks (2 % vs. 0 % laparoscopic, $p=0.02$) and wound complications. There was one mortality in the laparoscopic group (0.1 %) from massive pulmonary embolism.

An analysis of data from the American College of Surgeons NSQIP database demonstrates that the overall morbidity for laparoscopic DS is higher than for laparoscopic RYGB (8.8 % vs. 4.6 %, $p=0.33$) and a laparoscopic DS patient is nine times more likely to have a complication than a laparoscopic RYGB patient [47]. In a single-center study of 178 DS patients who were matched to 139 RYGB patients, there were more frequent visits to the emergency department in the DS patients (40 % vs. 25 % in RYGB, $p<0.01$) but no significant difference in overall morbidity rates between DS and RYGB. There were no 30-day mortalities for either procedure [51].

The DS requires surgical expertise and a highly trained interdisciplinary team. This is not an optimal procedure for many surgeons/centers that have little experience with the RYGB or who do not practice in a setting with resources for the rescue of a medically complex patient. The patients who often require a DS are heavier and may have a higher burden of obesity-related disease.

2.3.2 Venous Thromboembolism

Venous thromboembolism (VTE), which includes deep venous thrombosis (DVT) and pulmonary embolism (PE), is a preventable cause of mortality after bariatric surgery [52]. Given the widespread use of thromboprophylaxis, the rate of VTE after bariatric surgery is low, ranging between 0.21 and 0.42 % within 90 days of surgery [45, 53, 54]. After laparoscopic DS, the rate of VTE is 2.2–3.3 % [47, 55].

Most bariatric surgery patients are at high risk for VTE [52]. Obesity itself is an independent risk factor for VTE [56]. Obesity, especially class 3, may be accompanied by poor mobility. In addition, obesity hypoventilation/sleep apnea syndrome, truncal obesity, venous stasis disease, and a body mass index (BMI) ≥ 60 kg/m^2 increase the risk of VTE [57]. Due to the high risk, many patients are given chemical VTE prophylaxis an hour or two prior to surgery and that is continued after the procedure during their hospital stay. The other two components of prevention are mechanical prophylaxis with sequential compression stockings and early ambulation.

Classic signs and symptoms of DVT are lower extremity edema, pain, warmth, and erythema. If DVT is suspected, a lower extremity venous duplex should be obtained. Patients who present with tachycardia and respiratory distress should be suspected having a PE. After initial resuscitation and initiation of cardiac and pulmonary monitoring, diagnosis should be established by spiral computerized tomography (CT) with PE protocol. Some patients cannot be accommodated in the scanner because of their weight or abdominal girth and other imaging modalities such as ventilation/perfusion scanning or pulmonary angiography may need to be considered. Knowledge of the weight limits and girth limits of hospital diagnostic imaging is required for surgeons/programs doing these procedures.

Options for initial treatment of VTE include LMWH, intravenous unfractionated heparin (UFH), or fondaparinux as a bridge to vitamin K antagonists. The risk of bleeding in the postoperative patient must be balanced against the risk of PE. Use of a weight-based protocol for UFH or LMWH dosing in this population may lead to coagulopathy and hemorrhage [58]; therefore, close monitoring is necessary and dose capping should be considered [59]. When bariatric surgical patients are transitioned to Coumadin, they

may be prone to having a supratherapeutic INR [60], which is not surprising given that their dietary intake of vitamin K tends to be low in the early postoperative period. Close follow-up by the surgeon and team is essential. In addition, thorough education of the patient and personal contact with the primary care physician to discuss the follow-up plan and risk for supratherapeutic INR is optimal.

2.3.3 Mesenteric Thrombosis

Mesenteric thrombosis is a rare but potentially lethal complication that has been described in patients who have had laparoscopic bariatric surgery. The incidence has been reported as 0.3 % for all bariatric patients [61] and 1 % after SG [62, 63]. Most patients initially present with new-onset epigastric pain after an average of 10 postoperative days [61]. They may also endorse pain radiating to the back or left scapula, nausea, and vomiting [61]. CT scan with intravenous contrast is the diagnostic modality of choice [61, 62, 64] (Fig. 2.5). Treatment consists of intravenous hydration, bowel rest, and anticoagulation with low-molecular-weight heparin or intravenous unfractionated heparin followed by the initiation of oral anticoagulation [61]. Workup for thrombophilia is warranted and anticoagulation is usually recommended for 6–12 months. If patients may present with peritonitis or CT findings concerning for bowel ischemia, emergent exploration with bowel resection and planned second-look surgery should be undertaken. Thrombolysis via direct catheterization of the portal vein has been reported in cases of complete thrombosis [61].

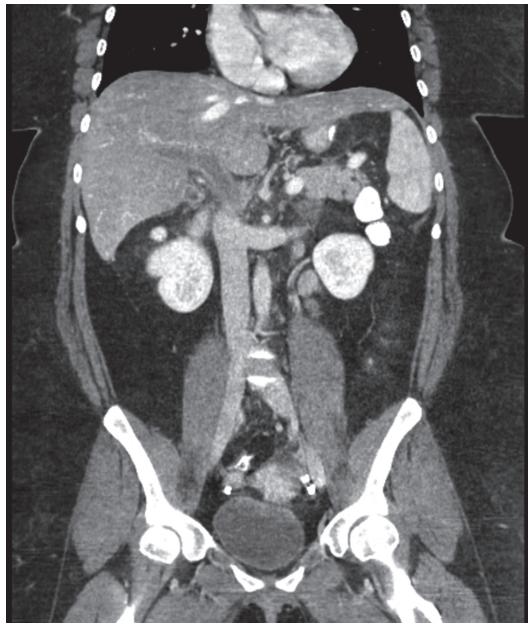

Fig. 2.5 CT scan of the abdomen with IV contrast demonstrating massive portal vein thrombosis. The patient presented with severe epigastric and back pain

2.4 Conclusion

Outcomes after complications in the early postoperative period after bariatric surgery depend upon early recognition and treatment. Bleeding after RYGB may present as an intestinal obstruction. The combination of laparoscopy and intraoperative endoscopy is useful in managing anastomotic bleeds. Early obstruction after RYGB should be considered a technical complication warranting surgical intervention. RYGB and SG patients with sustained tachycardia should be considered to have a leak until proven otherwise by surgical exploration. Leaks after SG are usually a late complication and their management options vary widely. Bariatric surgical patients are at higher risk for VTE than the routine general surgical patient. Dosing of anticoagulation in obese patients requires close monitoring.

2.5 Self-Assessment Questions

1. A 56-year-old female with a BMI of 52 kg/m^2 is postoperative day 2 from a laparoscopic Roux-en-Y gastric bypass. The upper GI study from postoperative day 1 was negative for leak. She has a sustained tachycardia of 130 bpm which does not respond to fluid bolus. EKG and troponins are negative. After resuscitation and initiation of cardiac monitoring, what is the most appropriate next step in management?
   (a) Repeat upper GI study

(b) CT scan of the chest, abdomen, and pelvis
(c) Surgical exploration
(d) IV lorazepam

2. Which is *not* likely to be a source of hemorrhage on postoperative day 1 after a gastric bypass?
   (a) Stomach staple lines
   (b) Gastrojejunostomy
   (c) Jejunojejunostomy
   (d) Port sites
   (e) Marginal ulcer
3. Leaks after sleeve gastrectomy are most commonly:
   (a) At the proximal gastric staple line
   (b) At the distal staple line
   (c) From esophageal injuries from bougie placement
   (d) From small bowel injury

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