



Perforated Marginal Ulcer in a COVID-19 Patient. Laparoscopy in these Trying Times?

A. Galvez¹  · K. King¹ · M. El Chaar¹ · L. Claros¹

Published online: 24 May 2020

© Springer Science+Business Media, LLC, part of Springer Nature 2020

We present a 59-year-old male with a past medical history significant a previous laparoscopic Roux-en-Y gastric bypass (RYGB) in 2012. He has lost approximately 80 lbs, with a current body mass index (BMI) of 30.34 kg/m². Frequent naproxen use for chronic right shoulder pain was reported, but tobacco use was denied. On 4/7/2020, COVID-19 testing was ordered by his family physician due to dry cough, daily fevers, myalgia, and headaches for 1 week. There was known contact to COVID-19 positive patients at work. A nasopharyngeal swab returned positive in 24 h. Three days later, the patient is brought to the ED via ambulance due to a fever, severe headaches, and shortness of breath.

On evaluation, the patient's vital signs were temperature of 101.7 °F, pulse of 101 bpm, blood pressure of 139/93 mmHg, respirations of 30/min, and O₂ saturation of 91% via 6 L nasal cannula. Initial laboratory work was notable for a white blood cell count (WBC) of 10.91, with a low relative lymphocyte count of 7%. C-reactive protein and D-dimer were elevated at 264.8 mg/L and 0.84 µg/ml, respectively. The full admission laboratory panel is presented in (Table 1). A portable chest x-ray found bilateral diffuse lung infiltrates concerning for a multifocal pneumonia (Fig. 1). The patient was admitted to the specialty COVID-19 floor and treated for severe COVID-19 as per our institutional protocol, which includes

methylprednisolone at 1 mg/kg/day. For the next 4 days, supplemental oxygen need and WBC count would steadily increase.

On hospital day 5, the patient reported a sudden onset left upper quadrant abdominal pain with chest and neck radiation. There was worsening shortness of breath with even higher oxygen requirements. A contrasted CT of the chest, abdomen, and pelvis was ordered. Laboratory values for that day are shown on Table 1. The CT scan found worse pulmonary ground-glass opacities and a large amount of pneumoperitoneum (Fig. 2). Perforated viscus was suspected and surgical consultation was placed.

An extensive multidisciplinary discussion between the surgical and pulmonary service was had. Despite current surgical recommendations [1] advising against routine laparoscopy in COVID-19 patients for aerosolization concerns; a laparoscopic approach was decided given availability of laparoscopic high-efficiency particulate air (HEPA) filters (PlumePort® ActiV®. Buffalo filter LLC, CONMED. Lancaster, NY. USA) at our institution. Recent reports of poor outcomes in COVID-19 patients undergoing extensive open abdominal surgery [2] were also taken into account. Additionally, the worsening respiratory status was also a concern. Once intubated, the patient would remain this way and likely worsen to the point of requiring proning, which would be complicated by a midline laparotomy incision.

The patient was taken to the operative room and intubated following current COVID-19 intubation guidelines [3]. Our standard 5-port approach was employed, and upon laparoscopic inspection, a significant amount of diffuse purulent peritonitis was found. The Roux limb was traced up to the gastric pouch, where a segment of thickened omentum was found to be densely adherent. This was unroofed, and a 3 mm round perforation at the gastrojejunal anastomosis was encountered. A Graham patch repair was performed, and a 19 Fr Blake drain was placed. The pneumoperitoneum was then evacuated via the laparoscopic HEPA filter, in accordance with the latest recommendations [4]. The patient was left

✉ A. Galvez
Alvaro.galvezlima@sluhn.org

K. King
Keith.king@sluhn.org

M. El Chaar
Maher.elchaar@sluhn.org

L. Claros
Leonardo.claros@sluhn.org

¹ St Luke's University Health Network, St Luke's Weight Management Center, North, 240 Cetronia Rd, Allentown, PA, USA

Table 1 Admission labwork on left, preoperative labwork on the right

		Admission	Preoperative
CBC	Reference range		
White blood cell count	(4.31–10.16 thousand/uL)	10.91	18.87
Red blood cell count	(3.88–5.62 million/uL)	4.82	4.8
Hemoglobin	(12–17 g/dL)	14.3	14.1
Platelet count	(149–390 thousands/uL)	242	387
Differential			
Neutrophils%	(43–75%)	86	
Immat grans%	(0–2%)	0	
Lymphocytes relative	(14–44%)	7	
Monocytes relative	(4–12%)	7	
Eosinophils	(0–6%)	0	
Basophils Relative	(0–1%)	0	
CHEM PROFILE			
Sodium	(136–145 mmol/L)	134	140
Potassium	(3.5–5.3 mmol/L)	4.3	4.4
Chloride	(100–108 mmol/L)	98	104
CO2	(21–32 mmol/L)	29	27
BUN	(5–25 mg/dL)	14	24
Creatinine	(0.60–1.30 mg/dL)	0.99	0.82
Glucose, random	(65–140 mg/dL)	122	144
Calcium	(8.3–10.1 mg/dL)	9.1	
AST	(5–45 U/L)	39	
ALT	(12–78 U/L)	28	
Alkaline phosphatase	(46–116 U/L)	95	
Total protein	(6.4–8.2 g/dL)	8.1	
Albumin	(3.5–5.0 g/dL)	3	
Total bilirubin	(0.20–1 mg/dL)	0.47	
COVID-19 Admit panel			
Lactic acid	(0.5–2 mmol/L)	1.2	
Ferritin	(8–388 ng/mL)	527	
Vitamin D	(30–100 ng/mL)	32.7	
LDH	(81–234 U/L)	393	
C-reactive prot	(<3 mg/L)	264.8	
ESR	(0–10 mm/h)	38	
D-Dimer	(<0.50 µg/ml FEU)	0.84	
Procalcitonin	(<=0.25 ng/ml)	0.06	
Interleukin-6	(0–15.5 pg/mL)	140.9	
G6PD Dehydrog. Quant.	(146–376 U/10e12 RBC)	274	

intubated and transferred to the intensive care unit for further management.

Postoperatively, the patient had a favorable recovery, being extubated on postoperative day (POD) 2. On POD 4, a full liquid diet was introduced. Methylprednisolone was eventually tapered off, and an empiric 7-day course of piperacillin/tazobactam and fluconazole was completed. The patient's WBC would normalize, and on postoperative day 7, the drain was removed. He was advanced to a soft diet and eventually discharged home on POD 14.

Discussion

In the midst of the ongoing pandemic due to the novel SARS-CoV2 disease [5], bariatric patients are at increased risk of late complications due to factors inherent to their modified anatomy. We present a bariatric surgery patient who suffered a well-known complication of the RYGB procedure, potentially due to the use of non-steroidal anti-inflammatory drugs (NSAIDs) in combination with high-dose corticosteroids (6). These medications are well-described sources of marginal

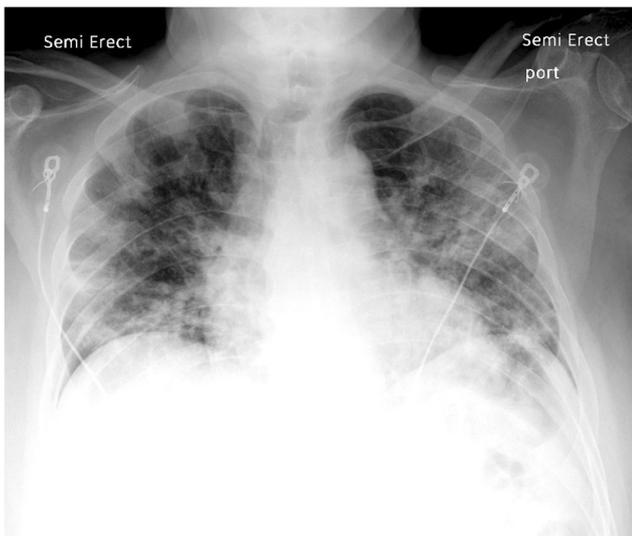
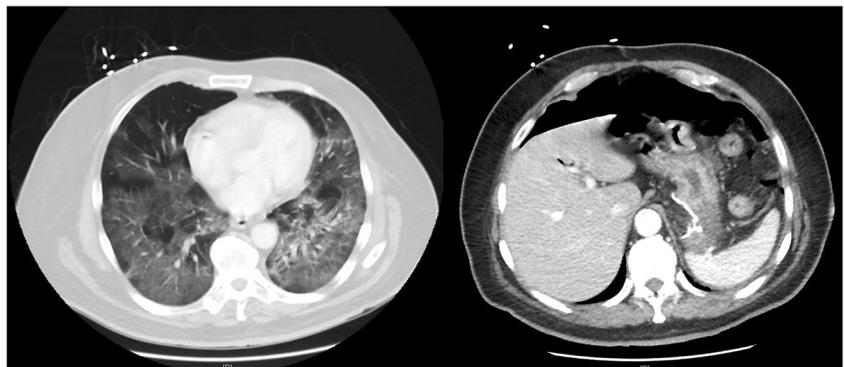


Fig 1 Admission CXR: Bilateral diffuse lung infiltrates, concerning for a multifocal pneumonia in known COVID-19 positive patient.

ulcers, and the high doses likely lead to the patient's ultimate perforation and peritonitis.

Regarding the operative approach for this patient; current guidelines [3] recommend avoiding the use of routine laparoscopy in COVID-19 patients if possible, due to the risk of biological fluid aerosolization. We believe that laparoscopy should be carefully considered in facilities with laparoscopic air and fluid filtration capacities if the benefit to the patient can be clearly demonstrated. This was key in our decision-making, given that the patient's respiratory status had deteriorated, and we fully expected the patient to require mechanical ventilation postoperatively. Recent reports [1] of worse postoperative outcomes in COVID-19 patients made us suspect that our patient could eventually require salvage respiratory measures. Proning is currently recommended [7] as an adjunct to mechanical ventilation in severe COVID-19, and we did not want to impede this with a large midline laparotomy incision. Aside from this, infection and healing of a large incision in the setting of a critically ill, obese patient on high-dose steroid therapy was also a concern.

Fig. 2 Preoperative CT scan: (on the left) severe bilateral ground-glass opacities consistent with the known history of COVID-19 pneumonia; (on the right) large amount of diffuse pneumoperitoneum in previous RYGB patient, with pouch and gastric remnant staple lines visible.



Ultimately, our patient's fast extubation, good recovery, and eventual discharge proved our reasoning to be appropriate. We believe the minimally invasive approach still hastened recovery and lead a good outcome due to:

- Minimal need for sedation given minimal incisional pain
- Minimal postoperative fluid shifts due a closed abdomen
- Minimal incisional pain allowing incentive spirometry and early mobilization
- Rapid enteral route initiation allowing adequate postoperative nutrition and hydration, with no need for supplemental intravenous fluids

All of these are well-known and well-described benefits of the minimally invasive surgical approach [8], which harmonize well with current clinical recommendations [7] in the management of COVID-19.

It is worth mentioning that all current airway management [2], operating room, and personal protective guidelines [3] in the management of COVID-19 patients were followed, and no sick healthcare providers were reported in the weeks following the patient's operation.

Conclusion

Clinicians caring for bariatric patients need to be mindful of the increased risk of ulcerogenic treatment in in these patients, and maximal antacid therapy should be ensured as part of the treatment regimen when the patient's therapy calls for these medications (e.g., corticosteroids). The current COVID-19 pandemic mandates strict aerosol and body fluid precautions during surgery, but the benefits of the laparoscopic approach—a high aerosol-creating procedure—should not be overlooked in carefully selected patients if the appropriate equipment is available. The minimally invasive approach to a perforated marginal ulcer in this complicated COVID-19 positive patient led to an excellent postoperative outcome. The multiple well-described benefits of

minimally invasive surgery should not be overlooked, especially during these trying times.

The authors of this report have no conflicts of interest to disclose. This article does not contain any studies with human participants or animals performed by any of the authors. For this type of study formal consent is not required.

References

1. COVID-19: Considerations for Optimum Surgeon Protection Before, During, and After Operation. (4/2020). www.facs.org. Available at: <https://www.facs.org/covid-19/clinical-guidance/surgeon-protection> Consulted: 4/21/2020
2. Lei, Shaoqing, et al. "Clinical characteristics and outcomes of patients undergoing surgeries during the incubation period of COVID-19 infection." *EclinicalMedicine* (2020): 100331.
3. Wax, Randy S., and Michael D. Christian. Practical recommendations for critical care and anesthesiology teams caring for novel coronavirus (2019-nCoV) patients. *Canadian Journal of Anesthesia/Journal canadien d'anesthésie* (2020): 1–9.
4. Pryor, A. SAGES and EAES recommendations regarding surgical response to COVID-10 crisis. (3/2020). www.sages.org. Available at: <https://www.sages.org/recommendations-surgical-response-covid-19/> Consulted: 4/21/2020
5. WHO Coronavirus disease 2019 (COVID-19). Situation Report—41. (3/2020). Available at: https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200301-sitrep-41-covid-19.pdf?sfvrsn=6768306d_2. Consulted: 4/23/2020
6. Peterson, Richard M., and Jason W. Kempenich. Management of Marginal Ulcers. *The ASMBS Textbook of Bariatric Surgery*. Springer, Cham, 2020. 225–234.
7. Alhazzani, Waleed, et al. Surviving Sepsis campaign: guidelines on the management of critically ill adults with coronavirus disease 2019 (COVID-19). *Intensive Care Med* (2020): 1–34.
8. Schwenk, Wolfgang, et al. Short term benefits for laparoscopic colorectal resection. *Cochrane database of systematic reviews* 2 (2005).

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.