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Laparoscopy at all costs? Not now during COVID-19 outbreak and not for acute care surgery and emergency colorectal surgery: A practical algorithm from a hub tertiary teaching hospital in Northern Lombardy, Italy

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We are working at a University Hospital and a tertiary-referral trauma center of the sadly notorious Lombardy Region in Italy. We are geographically located in the northern eastern area of Lombardy, between Milan and Lugano (Switzerland).

The current President of our local of college of physicians and surgeons of the province of Varese died recently from Coronavirus, and this news raised considerable concerns worldwide.[1–3]

As of today, our university hospital has 350 beds (roughly 55% of the total beds capacity of the whole hospital) dedicated for Coronavirus Disease (COVID) patients, with an occupancy rate higher than 80%. Sixty patients are being treated with Continuous Positive Airway Pressure (C-PAP). In our intensive care unit facilities we have 41 COVID patients, with 33 of them intubated.

As general surgeons also managing the acute care and trauma surgery service, we have been following with great interest the most recent experiences and practical advice on whether the use of laparoscopy should be continued or not during these difficult times; with the fear and potential risks of virus spread being higher with laparoscopy or with open surgery. Initial documents seemed to conditionally advise against use of laparoscopy, not only because of pneumoperitoneum but also for the use of electrical and/or ultrasonic devices during minimally invasive surgery (MIS) rather than with open surgery.[4]

We have read the latest documents from Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) stating that although previous research has shown that laparoscopy can lead to aerosolization of blood-borne viruses, there is currently no evidence to indicate that this effect is seen with COVID-19, nor that it would be isolated to MIS procedures.[5] SAGES also highlighted that proven benefits of MIS of reduced length of stay and complications should be strongly considered in these patients, in addition to the potential for ultrafiltration of the majority or all aerosolized particles. Filtration of aerosolized particles may be more difficult during open surgery.[6] We feel still concerned because if the main message is that there is no evidence of aeresolization of COVID-19 and laparoscopy in COVID should be considered, but with *several* maneuvers during laparoscopy/desufflation, which we should use to avoid spreading the virus.

However, if we get this wrong and we pursue laparoscopy at all costs—we fear the outcome may subject the theater staff and the anesthetic team (and probably the next patient) to the virus. So if a few patients will have an open procedure rather than laparoscopic during this time, we should balance the advantages of MIS against the potential risks of viral spread.

On the European side, there is a much more prudent attitude toward laparoscopy, as highlighted by the Intercollegiate General Surgery Guidance in the United Kingdom.[7] However, we all must acknowledge that the pendulum is likely to swing back and forth again several times before it reaches equilibrium.

At present, on this current week, we have halted all our elective surgery, including surgical oncology and cancer surgery of any speciality. Only cancers with active bleeding and requiring transfusions, or with impending obstruction are being treated. The only surgical services currently provided in our hospital and in most European and North American countries are acute care, trauma, and emergency general surgery (EGS). These services now account for an estimated 95% of all operative room (OR) utilization, compared with elective cancer services. In this setting, of mainly urgent surgeries being taken to the OR, we have elected to stay on the safe side when approaching acute care surgery and trauma. Very briefly, our philosophy for now will be to enhance the use nonoperative management strategies whenever possible and safe, even with established outpatient management and follow-up for subacute, uncomplicated, and/or mild abdominal conditions (e.g., acute, nonsevere cholecystitis, uncomplicated or maximum Hinchey 1a diverticulitis, uncomplicated appendicitis) by telephone or remote follow-up if the patient is suitable for oral intake (food and antibiotics) and remotely assessing their response to the treatment is reliable.

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Despite being advocates of the use of MIS in emergency surgery and even in selected cases of trauma surgery,[8,9] and having often highlighted not only the safe feasibility but also the advantages of laparoscopy in an emergency setting for appendicitis.[10] We frankly feel safer performing open surgery as much as possible, both as health care operators and for the patients, especially as uncertainty exists about knowledge of the COVID-19 viral spread in theaters. Not least, the recommended use of filtration devices, smoke evacuation device connected to trocars, use of self-sealing trocars connected to negative pressure suction, can be cumbersome and may add significant financial burden to a health care system which is already under maximal pressure (as it is now in Italy and Spain for the latest couple of weeks). Furthermore, any deviation from best practice or mistakes while using these precautions, or when removing the specimen/trocar, may paradoxically represent a higher risk of pollution and dangerous exposure for the entire OR staff and subsequent personnel in the OR.

We are, therefore, utilizing the skills, knowledge, and experience of most senior surgeons who are fully trained in open surgery and propose the following practical treatment strategies.

Exploratory laparotomy (Ex-Lap) is the access of choice. We all know that an Ex-Lap can be performed without any use of cautery and, therefore, avoiding production of smoke. Some of us are faculty of the Definitive Surgical Trauma Skills course and are used to teaching how to perform laparotomy with a scalpel and scissors and, subsequently, dealing with major abdominal trauma (controlling hemorrhage, contamination with basic equipment sets) with minimal or no use of diathermy/advanced energy devices.[11]

Perforated peptic ulcers (PPU) can be treated with a simple xipho-umbilical midline laparotomy performed with a scalpel and scissors, and the ulcer repaired with usual primary suture and omental patch. This does not require any energy and does not carry significant risk of aerosolization or exposure. Moreover, a laparoscopic repair of a PPU was easily taking 60 minutes to 80 minutes even in experienced hands and with standard use of laparoscopic stack before COVID-19 times, and now, with the necessary adoption of the precautions suggested for a safe laparoscopy during COVID-19 pandemic, the overall operative times for a laparoscopic PPU repair can easily increase to 90 minutes to 120 minutes. Does this balance the advantages of laparoscopic versus open repair of PPU where no significant differences exist in clinical outcomes between the two groups was demonstrated by a recent mata-analysis?[12]

Hot gallbladders are now initially managed conservatively with antibiotics and/or percutaneous cholecystostomy drainage when needed, avoiding any role for early lap chole. Patients with suspected gangrene or gall bladder perforation are selectively and carefully considered for laparoscopic approach. Given the already high chances of conversion to open procedures and increased risks of longer operative times and possibility of iatrogenic injuries, a limited right subcostal incision is being preferred, provided necessary skills and experience in hepatobiliary and pancreatic (HPB) surgery is available by the attending/consultant surgeon.

Acute small bowel obstruction is managed with nonoperative management (NOM) and gastrografin which has been proven to reduce the operative rate in partial acute small bowel obstruction without signs of peritonitis of strangulation.[13] Small bowel operations, such as adhesiolysis of strangulating and completely obstructing bands or small bowel (SB) resections, can be easily performed via a limited midline infra-umbilical laparotomy with sharp incision of the median raphe, with adhesiolysis carried out with sharp scissors/scalpel and resection/anastomosis completed with staplers and sutures as appropriate and the mesentery controlled with Kelly clamps and heavy ties.

Colorectal surgery represents a significant proportion of emergency surgery and perioperative practice recommendations on how to safely scrub, and the use of protective measures/equipment have been described elsewhere.[14] The management of appendicitis should be simplified. Preoperative imaging will be implemented in all patients with right iliac fossa (RIF) and lower abdominal pain to be absolutely sure about the diagnosis and avoiding diagnostic laparoscopies and negative appendicectomies as much as possible.

Patients with imaging-proven inflamed appendix should be distinguished in nonperforated appendicitis who would be better managed with initial NOM +/− antibiotics and discharged home with oral medications if tolerating oral diet when appropriate. Outpatient management of uncomplicated appendicitis with serial, once a day, telephone (or any remote web-based—smartphone-driven) follow-up is advisable and has already been proven to be safe and effective even before this COVID-19 epidemic.[15] Dedicated telephone contact lines may be established for the patients managed as outpatients to reach the out-of-hours acute care surgery service and on-call surgical team, on a 24/7 basis. This will avoid overcrowding the hospital wards and clinics.

Perforated appendicitis needs urgent surgery, and in our institution, this is now being performed routinely via open surgery in all COVID+ or suspected COVID+ patients. In all other patients, laparoscopy may be selectively considered only if the abovementioned precautions and devices are available and properly used in the theater. However, we must keep in mind that a laparoscopic appendicectomy nowadays often requires 30 minutes to 45 minutes of surgical time, including the preparation of laparoscopic equipment and insufflation of the pneumoperitoneum. These times are now certainly prolonged (50–80 minutes estimated times as we have seen during these latest weeks in our institution) with the precautions and preventive measure currently advocated for safe use of laparoscopy during the COVID pandemic.

Use of staplers for the appendicectomy +/− advanced energy devices for mesentery may add further economical burden to the health care system. Perhaps, also, the extraction of the specimen, which is removed once all the CO_2 gas and smoke is evacuated, can become cumbersome. In fact, several theaters provide simple and robust retrieval bags that do not have a purse string for tight closure of the bag. This may lead to risk of spillage of purulent/enteric content or of the specimen itself, when the retrieval is not accomplished under direct vision with the pneumoperitonuem still present. On the other hand, the retrieval devices with detachable bag and purse string system are usually made with more thin and less resistant plastic material, and their blind extraction when the pneumoperitoneum is desufflated may lead to inadvertent pulling/drawing back of the underlying bowel loops and possible risk of serosal tears, mesenteric bleeding, or even bowel incarceration within trocar site incisions used

for the specimen retrieval, because with CO_2 desufflation, the usual safety check before terminating the pneumoperitoneum is no longer possible. Nevertheless, if appropriate expertise in doing an open appendicectomy is available, the open approach is a sensible decision in all patients regardless of their COVID status given the risk of asymptomatic COVID+ patients.

Traditionally, open appendicectomy is done via Mc Burney or Lanz incision in the right iliac fossa; it can be carried out with minimal or no use of diathermy, using cold blade and scissors for the aponeurosis of the external oblique, muscle splitting technique, and pick up the peritoneal layer opened with cold scissors as many of us have been doing during times of our residency program. The appendix can be bluntly divided from inflammatory adhesions and isolated with gentle finger dissection, grasped with a Babcock and using a right angle +/− Kelly clamps, the base can be divided between heavy ties (eventually buried or inverted if needed) and the mesentery controlled with Kelly clamp and heavy ties as well. The incision will be closed layer by layer with running sutures. Skin will be subcuticular. This procedure of an open appendectomy will take, on average, 20 minutes to 40 minutes in experienced hands.

All EGS patients should be tested for COVID-19, without delays. Awaiting results of the testing should not delay surgical treatment whenever this is urgently needed.

We will be simplifying the management of large bowel perforations during COVID-19 pandemic, with open surgery becoming the standard, usually associated with much shorter operative times. Endoscopic stent (SEMS) placement should be strongly avoided in case of large bowel obstructions, and immediate surgery will be usually preferred in our settings not only to minimize exposure during long and difficult endoscopic procedures requiring prolonged insufflation and intraoperative radiology but also to minimize the well-known risk of colonic perforations and complications following SEMS placement, which would represent an additional burden for the hospital and resource utilization. On the other hand, immediate surgery and resection will also allow the definitive treatment of the obstructing cancer, without requiring further hospital admission in the short to medium term for the definitive colectomy, ultimately, most likely improving the overall survival of these patients with advanced colorectal cancer. Following the same principles of avoiding postoperative complications and speeding up the recovery of these patients with obstructing colon cancer, high-risk anastomoses should be avoided, and we will consider all patients with partially or completely obstructing or bleeding colon cancer for open resection and end stoma (or only diverting stoma if patients with advanced metastatic disease and in palliative setting).

The management algorithm of complicated diverticulitis should also be simplified. Patients should be preoperatively routinely scanned with computed tomography abdomen and chest. Patients should be then stratified into patients with or without peritonitis and severe or uncontrolled sepsis. Initial nonoperative approach with fluid resuscitation and broad spectrum antibiotics should be implemented in stable and nonperitonitic patients. Procedures, such as percutaneous drainage, should be risk-assessed and used whenever possible to avoid a major surgery.

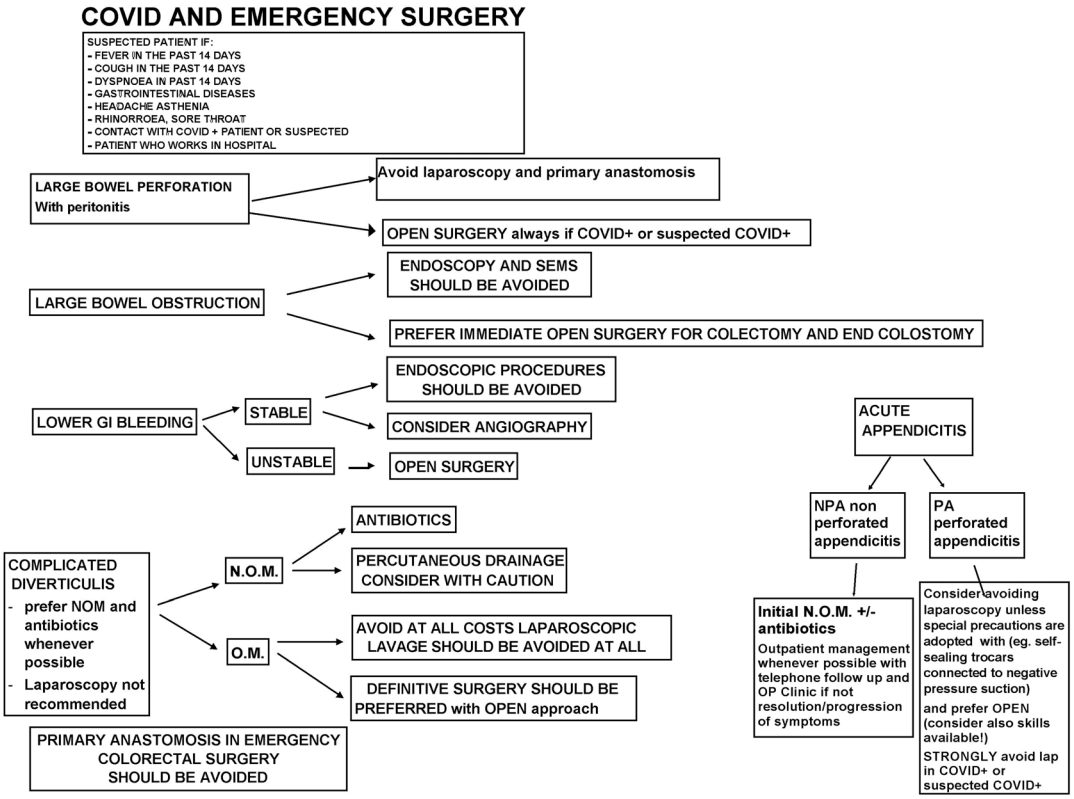

Figure 1. Local new protocol for management of specific colorectal condition presenting as emergency during COVID-19 outbreak. OM, operative management.

Whereas in patients with diffuse peritonitis or with uncontrolled and/or worsening severe sepsis requiring source control, laparoscopic lavage should never be used, and definitive open surgery with source control will be our preferred choice. Laparoscopic sigmoidectomy and primary anastomoses will be avoided due to the abovementioned reasons and within a strategy of avoiding postoperative complications and leaks and rational utilization of resources. Open abdomen should be avoided, preferring one-stage definitive procedures and end colostomy.

The operative algorithm and management pathway adopted in our Northern Italian Surgical Department for lower gastrointestinal (GI) surgical emergencies and emergency colorectal surgery are summarized in Figure 1.

AUTHORSHIP

S.D.S. participated in the conception and design, drafting of the article, revision of the article for important scientific content, approval of the final version of the article. M.K. participated in the English language revision, revision of the article for important scientific content, and approval of the final version of the article. F.P. participated in the revision of the article for important scientific content and approval of the final version of the article. G.I. participated in the revision of the article for important scientific content and approval of the final version of the article. B.D.S. participated in the revision of the article for important scientific content and approval of the final version of the article. E.Z. participated in the revision of the article for important scientific content and approval of the final version of the article. G.C. participated in the drafting of the article, revision of the article for important scientific content, and approval of the final version of the article.

DISCLOSURE

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