

Implementation of a clinical pathway for the surgical treatment of colorectal cancer during the COVID-19 pandemic

S. Evans, C. Taylor, A. Antoniou, T. Agarwal, E. Burns, J.T. Jenkins and D. Miskovic

St Mark's Hospital, London, UK

Received 27 May 2020; accepted 30 May 2020; Accepted Article online 12 July 2020

Abstract

Aim This report summarizes the early experience of implementing elective colorectal cancer surgery during the COVID-19 pandemic.

Methods A pathway to minimize the risk of including COVID-19-positive patients for elective surgery was established. Prioritization and additional safety measures were introduced into clinical practice. Minimal invasive surgery was used where appropriate.

Results Thirty-eight patients were prioritized, and 23 patients underwent surgery (eight colon, 14 rectal and one anal cancer). The minimal invasive surgery rate was 78%. There were no major postoperative complications

or patients diagnosed with COVID-19. Histopathological outcomes were similar to normal practice.

Conclusion A safe pathway to offer standard high-quality surgery to colorectal cancer patients during the COVID-19 pandemic is feasible.

Keywords colorectal cancer, minimal access surgery, laparoscopy, coronavirus, COVID-19 pandemic

What does this paper add to the literature?

In this paper we demonstrate the feasibility of high quality and minimally-invasive surgery for colorectal cancer in the initial phase of the first wave of the Covid-19 pandemic.

Introduction

The safe implementation of colorectal cancer surgery during the COVID-19 pandemic is challenging due to restrictions [i.e. hospital and intensive care unit (ICU) beds], staff shortages (i.e. anaesthetists, ICU personnel), health and safety of the operating room team members, and the concerns of postoperative COVID-19-associated complications and mortality [1]. There has been controversy about both the choice of surgical access and prioritization of patients [2–4].

St Mark's Hospital in London, UK, addressed these challenges at an early stage, as their campus was identified as one of the capital's main referral centres for COVID-19 patients. This collapsed normal operational structures as the early stages of the pandemic reached the UK. Elective cancer surgery became impossible within days and so a new pathway for cancer patients was established and a new site identified to conduct operations. This report

summarizes the early results of this process with a view to acting as a guide for others during the predicted second wave of COVID-19 surges.

Method

Setup

The operating rooms and wards of St Mark's Hospital at the London North West University Hospitals NHS Trust were not operational due to a surge of COVID-19 patients from 25 March to 9 April 2020. The London Clinic, a charity-based private hospital in central London, was contracted to provide operating rooms and staff for a limited time to treat patients with colorectal cancer during this period. The hospital was appropriately equipped for complex colorectal surgery and its staff has longstanding experience in supporting patients undergoing such procedures. An independent radiology institute (London Radiology) at a different central London location within a short walking distance, provided CT scanner resources for preoperative scans.

*Correspondence to: D. Miskovic PhD FRCS, Consultant Colorectal Surgeon, St Mark's Hospital, London North West University Hospital NHS, Watford Rd, Harrow, London HA1 3UJ, UK.
E-mail: danilo.miskovic@nhs.net

Patient pathway

A patient pathway was developed with the aim of reducing the risk of COVID-19-positive patients entering the hospital in the first place and hence reducing risks for staff and postoperative recovery. To maximize the accuracy of testing, multiple test methods were employed: (i) during a telephone clinic patients were asked about any COVID-19 related symptoms; (ii) asymptomatic patients were swabbed for polymerase chain reaction testing in a dedicated clinic room through a separate entrance from the main hospital; (iii) the day before the planned operation a CT thorax was performed at the independent radiology institute. As soon as patients entered the process, they were asked to self-isolate in their homes until admitted to the hospital. Only patients who were clear on all three occasions (telephone clinic, swab and CT thorax) were admitted to the London Clinic and further preoperative interventions (e.g. mechanical bowel preparation, oral antibiotics etc.) were instigated. After surgery, patients recovered in the ICU (which was used as a high dependency unit) and on the regular ward in single rooms. There were daily consultant-led ward rounds by a small team of clinicians wearing personal protection equipment (surgical masks, gowns and single-use gloves), maintaining maximum physical distance and meticulous hand hygiene. No non-clinical visitors were allowed during the hospital stay. Following discharge, patients were asked to self-isolate at home for 14 days. They were followed up by telephone 2 days after discharge by a dedicated nurse specialist who was involved during the whole perioperative process, and followed up again if necessary. Another telephone clinic appointment was arranged by the clinician in charge to discuss further management once histopathology reports were available.

Patient selection

All patients with primary colorectal cancer were eligible. They were prioritized according to three categories: (i) needing urgent surgery within 72 h (e.g. obstruction, acute bleeding from tumour), (ii) needing surgery in < 3 months (e.g. tumours at risk of progressing, node positive, vascular invasion) and (iii) can potentially wait > 3 months (e.g. polyp cancers after endoscopic resection, tumours with dysplasia only) [5]. All patients were contacted by telephone and informed about the possibility of being entered into the pathway. All patients gave written consent including the significant risk of additional morbidity and mortality in the case of developing COVID-19. There was no age limitation, but patients with significant comorbidities or low exercise tolerance were further evaluated by stress

echocardiography and clinical assessment by a consultant anaesthetist.

Procedures

The surgery was carried out exclusively by St Mark's sub-specialist cancer surgeons, and all operations were performed by at least two experienced senior surgeons. None of the operations were used as training procedures in accordance with Association of Coloproctology of Great Britain and Ireland guidance at the time. The aim was to offer the patients the same high-quality surgery as during normal times. Ultimately, it was the surgeon's choice which procedure was most appropriate for each individual patient. Most surgeons chose to perform minimally invasive (MI) techniques such as laparoscopy and robotic surgery. For MI techniques additional safety measures such as the use of closed and filtered insufflation systems (AirSeal®, Conmed, Utica, New York, USA) and controlled decompression of the pneumoperitoneum at the end of the operation using a filtered suction device were implemented [6] (Intuitive Surgical, personal communication, 27 March 2020). Port site incisions were made smaller than usual to improve the seal around ports and balloon ports were used where possible. All staff in the operating room were wearing full personal protection equipment, including FFP3 masks, visual shields, waterproof gowns and double gloves. During intubation and extubation, only relevant anaesthetic staff were present. After each procedure the operating room was deep cleaned in preparation for the next case. A maximum of two cases per day could be performed.

Results

A total of 38 patients were prioritized (15 patients were excluded from the pathway, 10 patients because they did not wish to have surgery during the COVID-19 pandemic, two patients due to significant comorbidities and frailty, three patients were reassessed as priority (ii-ii)). One patient on preoperative CT thorax was felt to have CT changes consistent with COVID-19 despite a negative swab result and lack of symptoms. His surgery was deferred by 14 days after being retested and remaining symptom-free.

Twenty-three procedures were performed; patient demographics and procedures can be found in Tables 1 and 2. 78% were performed with MI surgery (17% robotic, 61% laparoscopic). Two procedures were converted to laparotomy, one due to difficult access in a morbidly obese patient and one due to T4 tumour progression. Fourteen patients had a stoma formed (six loop- and one end-ileostomy, six colostomy and one

urostomy). All but one were planned. In one patient, a planned anterior resection was converted to a Hartmann's resection due to poor perfusion of the colonic conduit based on clinical assessment (lack of marginal arterial bleeding). Indocyanine green fluorescence was not available in this setup.

There were 10 postoperative complications. All of them were Clavien–Dindo I–II (one neuropraxia, two high output ileostomy, two non-COVID-19 chest infection, one port site infection, one ileus, three stoma care delays). There were no new cases of COVID-19 in any patients during hospitalization or after discharge. Two patients were tested due to respiratory symptoms, but both polymerase chain reaction swab and CT thorax came back as negative in each case. There were no major complications (Clavien–Dindo III–IV) and no postoperative mortality to date. There were no reoperations and no unplanned readmissions. All patients were discharged and the median length of stay was 6 days (range 1–17), which is similar to the length of stay for a similar case mix prior to the pandemic (Table 3). All resections were R0. A detailed summary of histopathological results can be found in Table 4.

One of the anaesthetists self-isolated after developing respiratory symptoms at the end of a 2-week period at work but was not tested for COVID-19. One surgeon developed anosmia 1 week after performing the last case and was tested positive for COVID-19. Both recovered rapidly. No other staff members were reported to be affected by COVID-19.

Discussion

In this brief report we demonstrate that high-quality surgery for colorectal cancer could be delivered during the COVID-19 pandemic using considered measures to mitigate risk. The three pillars of safety interventions can be summarized as (i) careful patient selection, (ii) meticulous patient screening and (iii) the use of 'cold' sites where potential contact with COVID-19 patients can be

Table 1 Demographics

N	23
Male gender	16 (67%)
Age (range)	65 (38–87)
BMI	30 (20–46)
ASA 1	0
ASA 2	12 (52%)
ASA 3	10 (44%)
ASA 4	1 (4%)

BMI, body mass index, ASA, American Society of Anesthesiologists physical status.

Table 2 Procedures

N (colon cancer)	8 (35%)
Right colectomy	4
Sigmoid colectomy	3
Hartmann's procedure	1
N (rectum cancer)	14 (61%)
Low anterior resection	6
Hartmann	1
Abdominoperineal resection	3
Soft tissue exenteration*	3
Panproctocolectomy	1
N (anal cancer)	1 (4%)
Defunctioning ileostomy	1

*Including one cystectomy for bladder cancer.

Table 3 Complications

Clavien–Dindo category	
I	6 (26%)
II	4 (17%)
III	0
IV	0
V	0
LOS, days, median (range)	6 (3–17)
Readmission	0

LOS, length of stay.

Table 4 Pathological outcomes

T stage	
yT0	2
T1	1
T2	5
T3	11
T4	4
N stage	
N0	15
N1	5
N2	2
M stage	
M0	21
M1	1
V stage	
V0	12
V1	10
R stage	
R0	22
R1	0
Lymph node count	30 (11–71)
Mesocolic plane	8/8
Mesorectal plane	14/14

minimized. The use of CT thorax as a screening tool is still controversial, but improved sensitivity has been suggested recently [7]. We felt that multiple testing by using different modalities in a short time frame may further reduce the risk of false-negative tests. The ‘cold’ site was crucial, not only to minimize potential patient exposure to the virus but also to reduce the impact of resource shortages on the elective operating programme. Through exclusive use of single rooms, all patients were effectively barrier-nursed which may further have helped to reduce cross-infections within the unit.

The intercollegiate guidance by the Royal Colleges of Surgery indicates that laparoscopy should only be considered for individuals when the clinical benefit exceeds the risk of potential virus transmission during surgery [8]. We believe that with minimizing the risk of infected patients we were still able to deliver the advantages of minimal access surgery to our patients, not least the lower risk for respiratory complications after MIS when compared with laparotomy [9].

In addition to the three main pillars outlined above, we also introduced technical and operational changes to minimize potential exposure of staff. The use of a closed loop insufflation system might not be available in every hospital, but alternative approaches such as the use of filters for passive gas evacuation have been suggested [10]. The impact of human factors is not to be underestimated. It was crucial to perform surgery with a team that was performing such procedures routinely prior to the pandemic.

This report outlines our early experience in the first 2 weeks of the COVID-19 pandemic. At that time, the exact impact and projection of this unprecedented event were still unclear and no clear guidance was available. Two months later, recommendations by scientific societies, regulatory bodies and governments are emerging and broadly supporting the steps we have taken to deliver safe cancer surgery. In London, UK, all cancer surgery is now delivered and regulated within two major hub and spoke networks [11]. For colorectal cancer, a similar approach to the one outlined in this paper and further safety measures such as a no-theatre-entry policy for 20 min after intubation have been introduced. The main aspects of delivering safe surgery during COVID-19 – meticulous testing, careful patient selection, the use of a ‘cold’ site, safety equipment and an experienced team – are here to stay for the foreseeable future.

References

- 1 Bhangu A. Mortality and pulmonary complications in patients undergoing surgery with perioperative SARS-CoV-2 infection: an international cohort study. *Lancet*, 2020; **396**: 27–38. [Epub ahead of print].
- 2 Di Saverio S, Khan M, Pata F *et al.* Laparoscopy at all costs? Not now during COVID-19 and not for acute care surgery and emergency colorectal surgery: a practical algorithm from a hub tertiary teaching hospital in Northern Lombardy. *J Trauma Acute Care Surg* 2020; **88**: 715–718. [Epub ahead of print].
- 3 Vigneswaran Y, Prachand VN, Posner MC, Matthews JB, Hussain M. What is the appropriate use of laparoscopy over open procedures in the current COVID-19 climate? *J Gastrointest Surg* 2020; **24**: 1686–1691. [Epub ahead of print].
- 4 Francis N, Dort J, Cho E *et al.* SAGES and EAES recommendations for minimally invasive surgery during COVID-19 pandemic. *Surg Endosc* 2020; **34**: 2327–31. [Epub ahead of print].
- 5 NHS England. Clinical guide to surgical prioritisation during the coronavirus pandemic. <https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/03/C0221-specialty-guide-surgical-prioritisation-v1.pdf> (accessed April 2020).
- 6 Society of American Gastrointestinal and Endoscopic Surgeons (SAGES). Resources for smoke and gas evacuation during open, laparoscopic and endoscopic procedures. [Online] <https://www.sages.org/resources-smoke-gas-evacuation-during-open-laparoscopic-endoscopic-procedures/> (accessed May 2020).
- 7 Fang Y, Zhang H, Xie J *et al.* Sensitivity of chest CT for COVID-19: comparison to RT-PCR. *Radiology* 2020; **296**. [Epub ahead of print].
- 8 Royal College of Surgeons. Intercollegiate guidance for surgeons. [Online] <https://www.rcseng.ac.uk/coronavirus/joint-guidance-for-surgeons-v2/> (accessed April 2020).
- 9 Morris SN, Fader AN, Milad MP, Dionisi HJ. Understanding the ‘Scope’ of the problem: why laparoscopy is considered safe during the COVID-19 pandemic. *J Minim Invasive Gynecol.* 2020; **S1553–4650**: 30171.
- 10 Mintz Y, Arezzo A, Boni L *et al.* A low cost, safe and effective method for smoke evacuation in laparoscopic surgery for suspected coronavirus patients. *Ann Surg* 2020; **272(1)**: e7–e8. [Epub ahead of print].
- 11 NHS England. Cancer services in London during the COVID-19 pandemic. [Online] 2020. <https://www.england.nhs.uk/london/2020/03/27/cancer-services-in-london-during-the-covid-19-pandemic/>.