

Comparison of Post-operative Outcomes in Laparoscopic and Open Right Colectomy for Colon Cancer: A 4-year single centre Experience

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ABSTRACT

Background: Laparoscopic right colectomy (LRHC) is a procedure which has been getting more popular compared to traditional open right colectomy (ORHC) over the last three decades. This study compares the post-operative outcomes in laparoscopic and open right colectomy for colon cancer.

Patients and Methods: This is a retrospective study of right colectomy at a single institution from January 2018 to December 2021. The factors that were studied included post-operative HDU admission, the incidence of post-operative ileus (POI) and the length of hospital stay.

Results: During the study period, 161 patients underwent right hemicolectomy. Sixty-seven (42%) underwent LRHC, 73 (45%) ORHC, and 21 (13%) laparoscopic converted to open procedure. The overall incidence of POI was 56 (35%), 14 (21%) among the LRHC and 28 (38%) among the ORHC group ($p=0.024$). The length of hospital stay was 7.1 (± 4.8) days after the laparoscopic procedure compared to 8.7 (± 4.4) in the open group ($p=0.048$). Forty-two patients out of 161 (26%) needed post-operative HDU admissions; out of these 11 (16%) were in the laparoscopic group and 29 (40%) among the open group ($p=0.023$).

Conclusion: Post-operative recovery was significantly quicker among the laparoscopic right hemicolectomy group in comparison to the open right hemicolectomy group.

INTRODUCTION

Since the first laparoscopic colorectal surgery was described by Jacobs et al.¹ in 1991, the laparoscopic approach has become widely accepted for both benign and malignant right-side colonic lesions.² This popularity of laparoscopic right colectomy is mainly because of the superiority of minimally invasive surgery compared to open surgery regarding post-operative pain, the incidence of wound infection, resumption of a regular diet, and return to normal daily activities.³⁻⁵ However, unlike left colectomy, the laparoscopic right colectomy has not been standardised; there are many variations in colonic mobilisation, lymph nodes dissection and anastomotic technique;⁶⁻⁸ this lack of standardisation may adversely affect the post-operative surgical outcomes.⁹ This study compared the post-operative outcomes of laparoscopic and open right colectomy.

PATIENT AND METHODS

This retrospective review investigated all patients who underwent elective right hemicolectomy in the Royal Lancaster Infirmary, UHMBT NHS Trust UK between January 2018 and December 2021. Data were collected from patients' electronic medical records. Patients were classified into laparoscopic

right hemicolectomy (LRHC) and open right hemicolectomy (ORHC) groups. All patients with urgent right hemicolectomy were excluded from the study.

Surgical Technique

All surgical operations were performed by five colorectal surgeons with standardised techniques for the anastomosis for both the open and laparoscopic approaches.

Open right hemicolectomy: The approach through midline laparotomy or transverse incision, depending on the body habitus and previous abdominal scars. Lateral to medial mobilisation with the protection of duodenum, right ureter and kidney is followed by ligation and division of lymph vascular pedicles of ileocolic, right colic and right branch of the middle colic, then side to side ileo-transverse anastomosis is performed with TLC 75 staplers followed by division of the specimens using TLC 75 staplers.

Laparoscopic right hemicolectomy: Initially, one 12 mm and three 5mm ports are inserted in the left and right iliac fossa, periumbilical and left hypochondrium. The ileocolic pedicle is then identified and divided either with an endoscopic vascular stapler (ENDOPATH ETS 45mm Articulating Linear Cutter, Ethicon, US) or between hem-o-lok clips (Weck® Hem-o-lok® Polymer Ligation System – Clips, Teleflex, US). Medial to lateral mobilisation is then started to protect the duodenum. This step is followed by lateral mobilisation starting from the ileocecal junction up to hepatic flexure with the protection of the right ureter. Then the greater omentum is mobilised from the proximal half of the transverse colon and divided. The supraumbilical incision is extended to exteriorise and divide the specimen, and the extracorporeal anastomosis is then performed as in the open approach.

Perioperative care

All patients were managed in accordance with the enhanced recovery protocol. No oral bowel preoperative was prescribed routinely. All patients had preload carbohydrate drinks and were encouraged to eat and drink as tolerated after surgery. The indication for HDU admission was made based on the patient's comorbidities, cardio-respiratory capacity and perioperative monitoring. Thoracic epidural catheter was introduced before surgery and removed on the third post-operative day in all open procedures unless contraindicated. Patients operated on laparoscopically had spinal analgesia followed by Fentanyl PCA (patient controlled analgesia) or Fentanyl patch if required. Patients were discharged once the following discharge criteria had been met: no signs of sepsis; pain well controlled with oral pain relief medication (+/- fentanyl patch for discharge); complaint with a soft diet; able to mobilise independently or back at the baseline; wounds manageable at home or by primary care.

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Outcomes

The primary outcome of interest was the incidence of post-operative ileus (POI), defined as post-operative obstipation and/or vomiting requiring nasogastric tube insertion. Secondary outcomes were length of hospital stay and planned post-operative HDU admission. The rate of post-operative complications using Clavien-Dindo classification was also assessed.

Statistics

Numeric values were reported according to data distribution as means with standard deviation and compared using parametric (t-test) testing. The categorical variables, including POI incidence, HDU stay were compared using Chi square test.

RESULTS

During the study period, 161 patients underwent right hemicolectomy; median age = 72.7 years, male to female ratio was 1.01: 1. There was no difference in age, sex, presence of pre-morbid medical conditions, and estimated perioperative blood loss between the two groups. The main indication for surgery was right colonic cancer in 120 (75%). Sixty-seven (42%) patients underwent LRHC, seventy-three (45%) ORHC and twenty-one (13%) laparoscopic converted to an open procedure. There was no difference in major (Clavien-Dindo \geq III) post-operative surgically related complications. Nonsurgical-related complications were also similar.

The overall incidence of POI was 56 (34.8 %) – 14 (21%) in LRHC vs. 28 (38%) in ORHC group ($p=0.024$) and 13 (66%) in the converted group. The length of hospital stay was significantly shorter after laparoscopic (7.1 ± 4.8 days) compared to open (8.7 ± 4.4 days) and converted (8.6 ± 3.3 days) procedures ($p=0.048$). Forty-two (26%) patients were admitted to HDU after surgery; out of these, 11(16%) were in the laparoscopic and 29 (40%) among the open group ($p=0.023$).

DISCUSSION

The first successful laparoscopic colectomy in history was performed by Jacob et al. in 1991.¹ Since that time, there has been an extensive evolution of laparoscopic colonic surgery.¹⁰ The main advantage of laparoscopic right colectomy in comparison to open is the ability to explore the whole abdominal cavity, especially during right colonic cancer resection where exclusion of liver and peritoneal metastasis is a must before planning colonic resection, however laparoscopic right colectomy is a technically challenging and lengthy procedure with a steep learning curve for trainee surgeons.¹¹

Major colonic surgery is associated with a substantial metabolic response that may prolong the post-operative recovery. Accordingly, this delayed recovery has an excessive physical and mental impact on the patients and leads to a considerable financial burden on the health system. According to the literature, two strategies have been implemented to improve patient recovery after colonic surgery: Enhanced Recovery after Surgery (ERAS) programs. Multiple meta-analyses have confirmed that ERAS significantly improves post-operative recovery.¹²⁻¹⁴ In our centre, we routinely used ERAS after all colonic surgical resections. Secondly, laparoscopic-

assisted colectomy has decreased short-term post-operative complications and hospital stay postoperatively.^{15, 16}

Although many randomised controlled trials showed the superiority of the laparoscopic right colectomy compared to the open approach regarding the post-operative pain and post-operative recovery,^{17, 18} few studies have compared the post-operative outcomes, mainly the incidence of post-operative ileus and HDU admission rate. Our study aims to assess if the laparoscopic approach impacts early post-operative recovery compared to the open approach after right colonic resection.

The incidence of POI was 28 (38.4%) among the LRHC group, which was significantly lower compared to (ORHC) group. The less POI among the laparoscopic group is the less metabolic response after the minimally invasive laparoscopic approach; this view is also supported by Bauer et al.¹⁹ In contradistinction, Tan et al did not observe significant difference between laparoscopic and open approach in time to bowel function recovery; however, this study compared 37 laparoscopic with 40 open right hemicolectomies only.²⁰

Our study confirms that the laparoscopic approach is superior to the open approach regarding the length of hospital stay. These findings are supported by the national Japanese clinical database series published by Matsuda et al.²¹ Although there might be confounding factors, which are the narcotic requirements that can potentially delay the discharge and increase the risk of post-operative ileus.²² This finding is also supported by Khan et al., who compared 89 vs. 75 patients operated laparoscopically or by open approach respectively.²³ They clearly demonstrated the beneficial effect on early recovery. In Khan et al's study, the median length of stay was shorter in the laparoscopic group – 4 (3-16) days compared to our cohort. We believe that a relatively high incidence of postoperative ileus in our hospital contributed to this.²³

Regarding post-operative HDU admission, our finding is supported by the publication from Lee et al.²⁴, which showed a statistically significant incidence of post-operative HDU admission among the open right hemicolectomy group. We believe that our relatively high rates of postoperative HDU admissions could have been associated with the COVID-19 pandemic, when there were more COVID positive patients on surgical wards during certain periods of time. Nevertheless, the need for ICU was similar in Lee et al's study – 31.4% vs. 13.4% after open and laparoscopic right hemicolectomy.²⁴

Although this review is a single-centre retrospective study, the result is comparable to the recent large meta-analysis conducted by Chaouch et al.²⁵ which included 506 patients and seven studies, two of which are randomized control trials. They conclude that laparoscopic right hemicolectomy is associated with statistically significantly lower POI and shorter hospital stay than open right hemicolectomy.

LIMITATION

In this retrospective review, selection bias was the main limitation. Patients were selected for the laparoscopic approach if no absolute contraindication existed instead of being randomised into either group. A randomised controlled trial would be required to eliminate this bias. The laparoscopic approach became a core technique in colorectal surgery and is recommended currently by recent guidelines; therefore, arranging such a trial would be difficult for ethical reasons.

CONCLUSION

Early post-operative recovery was significantly quicker, with a lower incidence of POI amongst the laparoscopic right hemicolectomy group. However, the laparoscopic approach is commonly performed in surgically less challenging patients. It is also well known to be associated with earlier ambulation and less post-operative pain, which could be confounding factors that improve the post-operative outcome in this group.

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