

Intra- Versus Extra-Corporeal Anastomosis After Laparoscopic Right Hemicolectomy For Colon Cancer: A Comparative Study

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ABSTRACT

Background: An anastomosis between the small and large intestines must be created after bowel resection. The best method for re-establishing continuity is extracorporeal anastomosis, although intracorporeal (IC) anastomosis is also an option that has been proven to be as secure and effective in a number of observational studies.

Objective: This study aimed to standardize the most ideal technique of anastomosis after laparoscopic right hemicolectomy with the least chance for leakage and better quality of life for patient of cancer colon.

Patients and Method: A prospective clinical trial study was conducted in the Onco-Surgery Unit, General Surgery Department, Faculty of Medicine, Zagazig University through the period from October 2021 to July 2022. The study included 18 patients with right side colon cancer for Laparoscopic right hemicolectomy. The patients were divided into two equal groups 9 cases for intracorporeal ileocolic anastomosis (Group A) and 9 cases for extracorporeal ileocolic anastomosis (Group B).

Results: Our findings were mainly that EC anastomosis group had a significantly shorter operative time compared to group A (p value 0.004), and significantly longer postoperative hospital stay (p value 0.0001). In the current study, IC anastomosis had markedly lower complication rate 11.1% versus 88.9% in EC group (p value 0.0001).

Conclusion: Intracorporeal (IC) anastomosis after laparoscopic hemicolectomy is time saving and less morbid technique compared to extracorporeal anastomosis.

Keywords: Intracorporeal, Extracorporeal, Anastomosis, Right hemicolectomy, Anastomotic leakage.

INTRODUCTION

One of the most prevalent health threats in the world is colorectal cancer (CRC). With 1.85 million new cases each year, or 10.2% of all malignancies. It is currently the third most common cancer in the world. Predictions indicate that it will become even more common by 2030 [1]. On the other hand, the second- or third-most prevalent tumour condition, with more than a million new diagnoses and half a million fatalities per year, the right hemi colon is where about 40% of colorectal malignancies are found [2].

Laparoscopic colorectal surgery for colorectal cancer has rapidly grown in popularity since it was first introduced in 1991. Research from Great Britain and Ireland showed that between 2004 and 2007, the number of surgeons performing laparoscopic colorectal surgery for the treatment of colorectal cancer more than doubled. Laparoscopic right hemicolectomy (LRH) was the most frequently utilised surgical method among these physicians, accounting for 30% of all resections performed [3].

The aim of this study was to standardize the most ideal technique of anastomosis after laparoscopic right hemicolectomy with the least chance for leakage and better quality of life for patient of cancer colon.

PATIENTS AND METHODS

This current prospective clinical trial study was conducted in the Onco-Surgery Unit, General Surgery Department, Faculty of Medicine, Zagazig University. 18 patients were eligible for recruitment criteria in the time period from October 2021 to July 2022.

Ethical consent: An approval of the study was obtained from Zagazig University Academic and

Ethical Committee. Every patient signed an informed written consent for acceptance of participation in the study. The study was done according to The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Inclusion criteria: Patients for this study in between 14 years of age to 75 years. Both genders are accepted. Patients who were candidate for radical right hemicolectomy. Patients diagnosed by tissue diagnosis as carcinoma of right side of the colon.

Exclusion Criteria: Patients with bleeding disorders. Patients unfit for laparoscopic surgery. Patient with previous abdominal surgery or radiotherapy. Patients unfit for general anesthesia.

Pre-operative:

All included patients were subjected to history taking, clinical examination for assessment of conscious level and vital signs (pulse, MBP, temperature and respiratory rate). Laboratory investigations were done for all patients including complete blood count (CBC), kidney function (creatinine) and liver function tests (AST, ALT), sodium (Na), potassium (K), serum albumin and INR. Radiological investigations.

Operative procedures:

All patients underwent operation under general anesthesia, after being assessed by a senior anesthesiologist and given an ASA score. Patients were divided into 2 groups after laparoscopic right hemicolectomy **Group A:** intracorporeal ileocolic anastomosis after laparoscopic right hemicolectomy.

Group B: extracorporeal ileocolic anastomosis after laparoscopic right hemicolectomy.

Postoperative care:

In the recovery room all patients were observed for 2 hours postoperatively, then were transferred to surgical ward. After 24 hours, drainage volume, considered in this study, results from the sum of the volume of the contents drained by two drain tubes were calculated. Physical therapy and early mobilization of limb, wound care and assessment of color and amount of the drain fluid were all followed up during hospital stay. Removal of drain was conducted at 4th postoperative day, and patients were discharged at day 6th postoperative day. In-hospital medications were mainly antibiotic, analgesics and anti-inflammatory drugs.

Follow up:

All patients were instructed to follow up in the outpatient clinics after 1 months postoperatively and 4 months.

Statistical analysis:

The collected data were coded, processed and analyzed using the SPSS (Statistical Package for Social

Sciences) version 22 for Windows® (IBM SPSS Inc., Chicago, IL, USA). Data were tested for normal distribution using the Shapiro Walk test. Qualitative data were represented as frequencies and relative percentages. Chi square test (χ^2) was used to calculate difference between two or more groups of qualitative variables. Quantitative data were expressed as mean \pm SD (Standard deviation). Independent samples t-test was used to compare between two independent groups of normally distributed variables (parametric data). P value \leq 0.05 was considered significant.

RESULTS

18 patients were eligible for inclusion in the current study. They had a mean age of 53.1 ± 13.9 years. The majority were males accounting for 61.1% versus 38.9% females. They were divided into two groups. Group A for intracorporeal ileocolic anastomosis and group B for extra-corporeal ileocolic anastomosis after laparoscopic right hemicolectomy. Regarding comorbidities, 10 (55.6%) patients were free, 4 patients had diabetes, 2 patients had ischemic heart disease and one patient had hypertension (Table 1).

Table (1): Demographics of the included patients

			N=18	
Age	In years	Mean, SD	53.1	13.9
Gender	Female	N, %	7	38.90%
	Male	N, %	11	61.10%
Co-Morbidity	DM	N, %	2	11.10%
	DM, HTN	N, %	2	11.10%
	DM, IHD	N, %	1	5.60%
	Free	N, %	10	55.60%
	HCV	N, %	2	11.10%
	IHD	N, %	1	5.60%
Type Of Operation	Right hemicolectomy	N, %	9	50.00%
	Extended right hemicolectomy	N, %	9	50.00%

Group B showed a significantly shorter operative time compared to group A (p value 0.004), however it had a significantly longer postoperative hospital stay (p value 0.0001). There was no statistical difference in duration till returning to normal bowel function between study groups (p value 0.931) (Table 2).

Table (2): Intraoperative details among study groups.

	Groups						P value
	Intra corporeal anastomosis (n=9)			Extra corporeal anastomosis (n=9)			
	Median	Min	Max	Median	Min	Max	
Operative time in hours	4	4	5	3	3	4	0.004

Regarding complications rate, group A had markedly lower complication rate 11.1% (n=1) versus 88.9% (n=8) in group B (p value 0.0001). However, there was no statistically significant difference in a specific type of postoperative complications including SSI, paralytic ileus, bowel obstruction, and reoperation (p values > 0.05 all) (table 3).

Table (3): Comparison of postoperative complications among study groups.

	Groups				P value	
	Intra corporeal anastomosis (n=9)		Extra corporeal anastomosis (n=9)			
	Count	Column N %	Count	Column N %		
Complications rate	1	11.10%	8	88.90%	0.0001	
Wound infection (SSI)	No	8	88.90%	6	66.70%	0.257
	Yes	1	11.10%	3	33.30%	
Paralytic Ileus	No	9	100.00%	7	77.80%	0.134
	Yes	0	0.00%	2	22.20%	
Anastomotic leakage	No	9	100.00%	8	88.90%	0.303
	Yes	0	0.00%	1	11.10%	
Bowel obstruction	No	9	100.00%	8	88.90%	0.303
	Yes	0	0.00%	1	11.10%	
Reoperation	No	9	100.00%	8	88.90%	0.303
	Yes	0	0.00%	1	11.10%	

DISCUSSION

We recruited a total of 18 patients who were eligible for inclusion in the current study. They had a mean age of 53.1 ± 13.9 years and the majority were males accounting for 61.1% versus 38.9% of females. Regarding comorbidities, 4 patients had diabetes, 2 patients had ischemic heart disease and one patient had hypertension. The mean age of the current cohort was younger than reported in *Allaix et al.* [4], *Aiolfi et al.* [5] and *Milone et al.* [6] studies. This can be explained by the lower mean age at diagnosis with cancer colon among Egyptians as reported by previous population-based studies [7].

Our findings were mainly that EC anastomosis group had a significantly shorter operative time compared to group A (p value 0.004), and significantly longer postoperative hospital stay (p value 0.0001). However, there was no statistical difference in duration till returning to normal bowel function between study groups (p value 0.931). These findings are contradictor to that reported by *Malczak et al.* [8] who stated that EC had significantly longer median operative time (p value <0.001). Nonetheless, a recent large observational study by *Anania et al.* [9] stated that EC was associated with a shorter operative time, which is consistent with our study. On contrary, a large meta-analysis showed no differences in the duration of the surgeries [10].

Anania et al. [9], conducted a large multicenter prospective observational study including 85 Surgical Units experienced in colorectal and advanced laparoscopic surgery. They found that 70.4% of patients underwent ICA, whereas ECA was performed in 29.6%. In 86% of cases, a hand-sewn enterotomy closure was used. Postoperative complications were recorded in 35.4% of ICA patients and 50.7% of ECA

patients with no significant differences were found based on patient characteristics or technologies used. For ICA, the median hospital stay was significantly shorter (7.3 vs. 9 POD). Postoperative pain was significantly reduced in the ICA group in patients who had not been provided opioids. They concluded that ICA offers better short-term outcomes, with reduction of hospital stay and postoperative pain. These findings are similar to ones reported in the current study in terms of postoperative stay, however inconsistent with complications rate among study groups.

Selvy et al. [10] conducted a large systematic review and meta-analysis studies. They included 24 studies comparing IC to EC in laparoscopic right hemicolectomy, they found that there was a statistically significant difference of postoperative length of stay in favor of IC [10].

Ricci et al. [11] conducted a systematic review with matched selection criteria, which included 1717 patients where 50.3 % of them underwent LRH with intracorporeal anastomosis versus 49.7 % with extracorporeal anastomosis. They found that incidence of anastomotic leakage was similar between ICA and ECA groups accounting for 3.4 vs. 4.6 %, respectively. The intra- corporeal anastomosis group had lower overall complication rate 27.6% vs. 38.4% for ECA (P = 0.009) , which is similar to that reported in our study. However, they showed that there were no differences in operative time, blood loss, conversion, internal hernia, reoperation, mortality, time to first flatus and defecation, analgesic requirement, number of lymph nodes harvested and length of distal margin [11]. These findings are inconsistent with the findings in the current study as we documented statistically significant shorter operative time among patients in the ECA group.

Milone et al. [6] conducted a case control study where they compared 286 patients who underwent

LRH with ICA versus 226 matched patients who underwent LRH with ECA. Their findings showed that laparoscopic colectomy with intracorporeal anastomosis was associated with a lower rate of post-operative complications (OR 0.65, 95 % CI 0.44, 0.95, $p = 0.027$). While, there was no statistically significant difference in operative time between study groups [6].

Arredondo Chaves et al. [12], conducted a case-control study including a total of 60 patients who were surgically operated between June 2004 to June 2010 (35 IC & 25 EC). They found no significant differences between study groups concerning operation time and postoperative complication rate.

Zhang et al. [13] conducted a meta-analysis of 5 RCT including 559 patients. They reported that there were significantly favorable outcome in the ICA group compared to ECA group in terms of rate of wound infection (relative risk 0.46 (95% CI. 0.23 to 0.91, P value < 0.02). However, there were no statistically significant differences between the two groups in duration of hospital stay (P 0.47) and operative time (P 0.07).

In the current study, IC anastomosis had markedly lower complication rate 11.1% versus 88.9% in EC group (p value 0.0001). These findings are consistent with **Bollo et al.** [14] **Allaix et al.** [4] who reported higher complication rates among patients who underwent EC anastomosis compared to IC. These results disagree with the findings of **Malczak et al.** [8] who reported no significant difference in postoperative complications between study groups (p values > 0.05). As well as meta-analysis conducted by **Selvy and colleagues** [10].

CONCLUSION

We concluded that intracorporeal (IC) anastomosis after laparoscopic hemicolectomy is time saving and less morbid technique compared to extracorporeal anastomosis.

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Author contribution: Authors contributed equally in the study.

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