

Research Article

Laparoscopic complete mesocolic excision with central vascular ligation for right colonic cancer (feasibility & safety).

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Abstract

Background: Laparoscopic complete mesocolic excision with central vascular ligation, when performed in the right mesocolic plane, produces high quality surgical specimens. **Aim of the work:** Assessment of feasibility, safety, and quality of surgical specimen after laparoscopic complete mesocolic excision with central vascular ligation in right colon. **Patients and Methods:** Fifty patients with right colonic cancer were assigned to receive laparoscopic complete mesocolic excision with central vascular ligation during the period from April, 2017 till June, 2019 and their data were prospectively collected. **Results:** The average length of the ileocolic segment was 26.67 ± 2.10 cm, the average distance from near bowel wall to high vascular tie was 85.26 ± 5.32 mm, the average distance from tumor to high vascular tie was 107.82 ± 3.39 mm, and Average number of LN harvest was number 22.72 ± 10.17 . **Conclusion:** Laparoscopic complete mesocolic excision with central vascular ligation procedure is associated with minimal operative blood loss, rapid recovery after operation, and short hospital stay and adequate number of harvested lymph nodes.

Key words: outcome, laparoscopic, complete mesocolic

Introduction

Colorectal cancer (CRC) is the third most commonly diagnosed cancer and the fourth leading cause of cancer death worldwide¹. In 2009, Hohenberger et al.,² translated the concept of TME to colonic cancer, noting that traditionally more favorable oncologic results of colon neoplasia was eventually overtaken by rectal cancer and a more radical surgical approach performed along embryonic planes of development with higher quality specimens, produce better oncologic outcome; thus, complete mesocolic excision (CME) with central vascular ligation (CVL) was theorized, standardized and eventually validated by several studies^{3&4}.

Patients & methods

Patients

Fifty patients with right colonic cancer underwent laparoscopic complete mesocolic excision with central vascular ligation in Minia university hospital and El Salam oncology center during the period from April, 2017 till

June, 2019 and their data were prospectively collected.

Written consents were taken from patients explaining the details of surgery, the advantages of minimally invasive surgery, and clarifying the possible complications of surgery and the possibility of conversion to open surgery.

All patients had preoperative examinations including chest radiographs, abdominal computed tomography, colonoscopy and biopsy, routine laboratory testing, and tumor markers. Patients were excluded from the analysis if they had metastasis, received emergency surgery due to acute intestinal obstruction or perforation, pregnant, or had severe cardiopulmonary disease.

Surgical technique:

Surgical approach was conducted under general anesthesia. The patient is placed in supine position, the patient's left arm is tucked along his side and the right arm extended on an

arm abroad. Creation of pneumoperitoneum using veress needle and insufflation of CO₂ is done until intrabdominal pressure reaches between 12- 14 mmHg. The first port is inserted using the optiview technique (12 mm umbilical port for the telescope) and then 3 other ports were inserted under direct vision (one 10 mm and two 5 mm) in the suprapubic region, left lower abdomen, and right upper abdomen respectively. Patients were placed in steep Trendelenburg with the right side elevated. Once the working space is created (by placing the greater omentum and transverse colon over the the liver), a medial to lateral approach was used in all cases. The first step is always a thorough exploration of the abdominal cavity. The right colon was pulled upwards and toward the right lower quadrant, stretching and exposing the ileo-colic pedicle (figure 1). The peritoneum was incised and the ileo-colic vessels were identified clipped and divided close to their origin. Mesenteric lymphadenectomy was conducted from the

origin of ileo-colic vessels in a caudal direction along the superior mesenteric vein (SMV) to the origin of the Henle's gastro-colic trunk, and then toward the terminal ileum.

Completion of devascularization, the right colic vessels were isolated and sectioned if present. Then pulling up the transverse colon, its mesentery was dissected from the root and the right branches of the middle colic vessels were identified and dissected by Endoclips. The right colon was then reflected medially from the hepatic flexure downward, dividing the peritoneal reflection in the right gutter. The specimens were exteriorized through a small pfennistel incision after wound retraction using Alexis port. By using harmonic device enterotomies were done in both the small intestine and the colon. Intracorporeal side to side ileo-transverse anastomosis was done using EndoGIA stapler (figure 2) and closure of enterotomy using 3/0 PDS sutures.



Figure 1: identification of ileocolic pedicle.



Figure 2 : ileotransverse anastomosis using Endo GIA stapler.

Data collection:

Patient data included gender, age, and tumor site and pathological type. Other data collected included operative time, intra-

operative blood loss, conversion to laparotomy, length of postoperative hospital stay, and intraoperative and postoperative complications. Quality of surgical specimens

assessed as follow: Plane of dissection (mesocolic, intramesocolic and muscularis propria), proximal & distal margins, length of ileocolic segment, distance from near bowel wall to high vascular tie (mm), area of mesentery (mm^2), and number of LN harvest.

Statistical analysis

The data collected were coded, tabulated, and statistically analyzed using SPSS program (Statistical Package for Social Sciences) software version 25. Descriptive statistics were done for parametric quantitative data by mean \pm standard deviation and for non-parametric quantitative data by median, while they were done for categorical data by number and percentage.

Results

The study was conducted on 50 patients with right colonic cancer to whom laparoscopic resections were done. The age of this group of patients ranged from 37-65 years (the mean age was 54.86 ± 9.27 years). 56 percent of our patients complained of medical disorders and were distributed as follow 22% diabetic, 22% hypertensive, 6% cardiac and 6% hepatic. The tumor site was 38% in the ascending colon, 34% in the caecum and 28% in the hepatic flexure.

The intraoperative data discussed in table 1 revealed that the conversion rate to open technique was 6%, operative time ranged from

123 minutes to 210 minutes (the mean operative time was 156.44 ± 21.30), intraoperative blood loss ranged from 50 ml to 200 ml (the mean blood loss was 95.80 ± 45.68 ml). Finally no intraoperative complications such as vascular or visceral injury occurred in any of our patients.

Postoperative data discussed in table 2 shows that the mean postoperative oral intake was 3.52 ± 0.64 days. As regard to postoperative complications (which occurred in 11 patients), they are, 6 cases suffered from paralytic ileus and 5 cases suffered from urinary tract infection.

The parameters that determine the quality of surgical specimen were discussed in table 3. The plane of dissection that being the mesocolic plane in 94% and the intramesocolic in 6%. The proximal and distal margins of the resected ileocolic segment which were free in all excised specimens. The length of the ileocolic segment ranged from 23.5 cm to 31 cm (the average length was 26.67 ± 2.10 cm). The distance from near bowel wall to high vascular tie ranged from 77mm to 96 mm (the average distance was 85.26 ± 5.32 mm). The distance from tumor to high vascular tie ranged from 101 mm to 114 mm (the average distance was 107.82 ± 3.39 mm). Area of mesentery ranged from 15500 mm^2 to 19800 mm^2 (the average was 18810 ± 1146.64). Number of LN harvest ranged from 12 to 60 (with an average number 22.72 ± 10.17).

Table (1): The intraoperative parameters and hospital stay duration of studied sample:

Intraoperative parameters:		
Conversion to open:	n (%)	3(6%)
Operative time(minutes)	Mean \pm SD	156.44 \pm 21.30
	Median (range)	155(123-210)
Intraoperative blood Loss (ml)	Mean \pm SD	95.80 \pm 45.68
	Median (range)	85(50-200)
Hospital stay(days)	Mean \pm SD	5.92 \pm 0.87
	Median (range)	6(5-8)
Intraoperative complications: n (%)	Vascular injury	0(0%)
	Visceral injury	0(0%)
Histologic type Adenocarcinoma: n (%)	Well differentiated	24(48%)
	Moderately differentiated	10(20%)
	poorly differentiated	16(32%)

Table (2): postoperative data of studied samples

Postoperative follow up		Descriptive statistics
Postoperative oral intake	Mean \pm SD	3.52 \pm 0.64
	Median (range)	3(3-5)
Postoperative complications: n (%)	Paralytic ileus	6(12%)
	Intramural bleeding	0(0%)
	Anastomotic leakage	0(0%)
	Port site infection	0(0%)
	Abdominal abscess	0(0%)
	Port site hernia	0(0%)
	Pneumonia	0(0%)
	UTI	5(10%)
	DVT	0(0%)
Recurrence:	N (%)	0(0%)
Perioperative mortality:	N (%)	0(0%)

Table (3): Quality of surgical specimen:

Variable		Descriptive statistics
Grade of plane of mesocolic dissection: n (%)	*mesocolic	47 (94%)
	*intramesocolic	3 (6%)
	*muscularis propria	0 (0%)
Proximal & distal margins: n (%)	Free	50 (100%)
Length of ileocolic segment (cm)	Mean \pm SD	26.67 \pm 2.10
	Median (range)	26(23.5-31)
Distance from near bowel wall to high vascular tie(mm)	Mean \pm SD	85.26 \pm 5.32
	Median (range)	84(77-96)
Distance from tumor to high vascular tie(mm)	Mean \pm SD	107.82 \pm 3.39
	Median (range)	108(101-114)
Area of mesentery (mm ²)	Mean \pm SD	18810 \pm 1146.64
	Median (range)	19200 (15500-19800)
Number of LN Harvest	Mean \pm SD	22.72 \pm 10.17
	Median (range)	21(12-60)
Number of positive LN	Mean \pm SD	0.72 \pm 1.62
	Median (range)	0(0-5)

Discussion

Complete excision of the primitive dorsal mesentery along the anatomico-embryological and surgical planes by means of CME is now the standard of care for colonic cancers. Technical strategies for CME include two aspects: sharp separation of visceral and parietal fascia, and ligation at the root of central supply vessels and more radical lymph node dissection for improving oncological outcomes⁵. However, the right hemicolectomy is performed routinely worldwide, the feasibility and safety of complete mesocolic excision has recently been showed in open and laparoscopic surgeries⁶.

In our study, the mean age of patients (16 males and 34 females) was 54.86 \pm 9.27 years.

According to a study done by L. M. Siani et al., 2015, the mean age of patients (75 males and 40 females with a male to female ratio of 1.8) was 65 \pm 1.3 years⁽⁷⁾. While in a study done by Hossam et al., 2019, the mean age of patients (14 male (46.7%) and 16(53.3%) females) was 58.33 \pm 5.88 years⁽⁸⁾. Jung et al., 2018, in his study reported the mean age of patients (445 (44.1%) males and 565 (55.9%) females) was 60 \pm 11 years⁽⁹⁾.

In our study, the mean operating time was 156.44 ± 21.30 minutes and intraoperative blood loss was 95.80 ± 45.68 ml. According to a study by Hossam et al., 2019, the mean operating time was 180.0 ± 20.0 minutes and intra-operative blood loss was 200.6 ± 50.5 ml⁽⁸⁾, while in a study by Jung et al., 2018, the mean operating time was 165 ± 50 minutes⁽⁹⁾. IL Yong et al., 2016 also reported operating time of 178 minutes, intraoperative blood loss was 149 ml⁽¹⁰⁾. Finally L. M. Siani et al., 2015 in his study reported, mean operative length of 179 ± 39 min⁽⁷⁾. Contrasting our results with other studies, our mean operating time was slightly lower compared to others.

The mean duration of hospital stay in our thesis was 5.92 ± 0.87 days. IL Yong et al., 2016 reported hospital stay of 11 days⁽¹⁰⁾. Hossam et al., 2019 in his study reported hospital stay 4.40 ± 0.910 days. According to study done by Jung et al., 2018, the mean duration of hospital stay was 9.3 ± 3.2 days⁽⁹⁾, while L. M. Siani et al., 2015 reported hospital stay duration of 10.5 ± 1.9 days⁽⁷⁾. The mean hospital stay in our thesis was even shorter than that of other studies except a study done by Hossam et al., 2019. This can be attributed to the enhanced recovery program that was followed during the study. King et al., 2006 demonstrated with the standardized postoperative program in a randomized controlled trial that the patients who underwent laparoscopic resection was associated with 32% reduction of hospital stay⁽¹¹⁾. Senagore et al., 2003 showed that with a standardized technique and a standardized post-operative care plan, a reduction of mean hospital stay of 2.9 days and a low morbidity of 6.6% could be achieved⁽¹²⁾. Thus the use of laparoscopic surgery and a standardized fast track postoperative protocol is likely the optimal treatment for patients with colorectal cancer.

There were no deaths in our study, also Jung et al., 2018 reported no deaths in his study⁽⁹⁾. While L. M. Siani et al., 2015 reported post-operative mortality of 1.7% (2 patients)⁽⁷⁾. Eleven morbidities (22%) occurred in our thesis. Sixt Patients (12%) complained of paralytic ileus and conservative management in the form of iv fluids, NGT insertion and NBM was done and they passed successfully. Five

patients (10%) developed UTI who were managed by urinary antiseptics.

Overall complication rates after laparoscopic colon resection were evaluated in many trials. Hossam et al., 2019 reported an incidence of complications following laparoscopic colon resections of 26.7% (8 cases)⁽⁸⁾. Jung et al., 2018 demonstrated a morbidity of 18.3% (125 cases) after laparoscopic resection for colon cancer⁽⁹⁾. L.m. siani et al., 2015 reported a 22.6% (26 cases) incidence of postoperative complications following laparoscopic resection for patients with right colon cancer⁽⁷⁾.

Three conversions occurred in our thesis (6%), all of them because of extensive adhesions.

In our study, plane of dissection was mesocolic in 47 cases (94%) and intramesocolic in three cases (6%). The average number of harvested lymph nodes was 22.72 ± 10 . Histological examination revealed that proximal and distal margins were free of microscopic disease. The length of the ileocolic segment was 26.67 ± 2.10 cm. the distance from near bowel wall to high vascular tie was 85.26 ± 5.32 mm. the distance from tumour to high vascular tie was 107.82 ± 3.39 mm. Area of mesentery was 18810 ± 1146.64 mm².

Jung et al., 2018 in his study reported that, the average number of harvested lymph nodes was 25.7 ± 10.9 . Histological examination revealed that proximal and distal margins were free. The length of the proximal and distal margins were 15.1 ± 9.7 , 15.2 ± 7.4 cm respectively⁽⁹⁾.

According to a study done by L. m. siani et al., 2015, Colonic resection was classified as mesocolic plane in 65.2% (75 cases), intramesocolic plane in 21.7% (25 cases) and muscularis propria plane in 13% (15 cases). For mesocolic plane of surgery, mean ileocolic segment length was 23.5 ± 3.7 cm and resection margins were all free of microscopic disease; distance from the nearest bowel wall to high tie was 83 ± 7 mm, distance from tumor and high tie was 103 ± 5 mm, and area of mesentery was 15.350 ± 1.570 mm²; mean lymph nodes harvested were 29 ± 5 . For non-mesocolic (i.e. intramesocolic and muscularis propria) planes of resection, mean ileocolic segment length was 21.3 ± 2.5 cm and resection margins were all free

of microscopic disease; distance from the nearest bowel wall to high tie was 67 ± 5 mm, distance from tumor and high tie was 87 ± 9 mm, and area of mesentery was 14.135 ± 1.150 mm²; mean lymph nodes harvested were 19 ± 7.7

Conclusion

Laparoscopic complete mesocolic excision with central vascular ligation procedure is associated with minimal operative blood loss, rapid recovery after operation, and short hospital stay, high quality of surgical specimen and adequate number of harvested lymph nodes

This study was approved by the Institutional Ethics Committee of School of Medicine, Minia University, Egypt, and all patients gave informed consent before participation in this study. The study conducted in accordance with the ethical guidelines of the 1975 Declaration of Helsinki and International Conference on Harmonization Guidelines for Good Clinical Practice.

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