



## FEASIBILITY AND OUTCOMES OF TOTAL MESOCOLIC EXCISION VERSUS TRADITIONAL RESECTION IN RT-SIDED COLON CANCER

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### Abstract

**Background:** The concept of Complete Mesocolic Excision (CME) provided a correct anatomical plane and surgical approach for most cases of colon cancer. It is consistent with the concepts of Total Mesorectal Excision (TME) and has good surgical and oncological outcomes. Two traditional surgical methods are used in right sided hemicolectomy: Medial access and Lateral access.

**Aim and objectives:** To evaluate the feasibility, safety and outcome of total mesocolic excision (TME) compared to the traditional resection for right sided colon cancer.

**Subjects and methods:** This prospective randomized controlled cohort study was conducted in Surgery Department of the Suez Canal University Hospital, during the period from 2018-2022. All patients included, resectable right sided colonic cancer and their age over 18 years of both sex.

**Results:** There were no statistically significant differences between groups regarding age, location of the tumor, occurrence of complications and mortality. There were statistically significant differences between both groups regarding number of lymph nodes, intra-operative blood loss, days of the first flatus and day for first stool and tumor recurrence.

**Conclusion:** We found that total mesocolic excision (TME) with central vessel ligations as a technique is feasible and easy to be learnt in comparison with right hemicolectomy in right side cancer colon.

**Keywords:** Total Mesocolic Excision, Traditional Resection, Colon Cancer

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### INTRODUCTION

The choice of treatment for colorectal cancer can depend on several factors, including the patient's health, the size of the tumor, and its location. Surgery is the most common treatment option, and the type of surgery used, again, depends on variables such as the location of the cancer and the existence and extent of metastasis (1).

Radical surgical resection remains the main pillar in the treatment of most colon cancers with, if indicated, adjuvant chemotherapy. The goal of the resection of colon cancer must be to achieve the best long-term outcome (overall and disease-free survival), at the lowest acceptable costs in terms of short-term and long-term morbidity (2,3).

Traditional colon surgery included en-block resection of the affected colonic segment with its lymph node bearing mesentery and ligation of the draining vessels (4).

The concept of complete mesocolic excision (CME) was initially proposed by Hohenberger in 2009 and it provided a correct anatomical plane and surgical approach for most cases of colon cancer (3). It is

consistent with the concepts of total mesorectal excision (TME) and has good surgical and oncological outcomes (5).

Complete mesocolic excision involves dissection of the colon and corresponding mesocolon along the embryological planes, central ligation and division of the supplying colonic vessels, and removal of adequate colon. The acquired specimen is covered by mesocolic fascia which, in addition to the tumor-bearing colonic segment, contains the mesocolon with all draining lymphatic vessels, lymph nodes, and possible tumor micro-deposits (6). During en-block resection of the colon, the fascial space of the posterior wall of mesocolon is completely dissected to separate the fusion fascia between the visceral fascia and the parietal fascia up to the radix of mesocolon. As a result, the higher level of blood vessels that needed to be ligated are revealed, also, colonic vessels needed to be cut-off to obtain maximum amount of lymphoid tissue (7,8).

Embryological planes used TME fuse with those in CME at the fusion fascia of Toldt, dissection along

the vessel-free planes can prevent injury to retroperitoneal structures such as the kidneys, ureters, reproductive organs, associated nerves and vessels, so sharp dissection along Toldt fascia minimized the spread of cancerous cells and ensured maximal lymph nodes harvest with R0 resection (9). Now CME conducted by fusion fascia exposure with radical lymph node dissection along the gastro-colic trunk of Henle has the potential to become the standard procedure for colon cancer, as a result of its effectiveness in reducing local recurrence and improving prognosis (10).

This study aimed to evaluate the feasibility, safety and outcome of total mesocolic excision (TME) compared to the traditional resection for right sided colon cancer.

## **PATIENTS AND METHODS**

**Type of the study:** A prospective randomized controlled cohort study

**Location of the study:** Patients of Department of Surgery of the Suez Canal University Hospital, during the period from 2018-2022.

**Inclusion Criteria:** All patients that carry the following criteria were included in the study, resectable right sided colonic cancer. And patients age over 18 years of both sex.

**Exclusion criteria:** Patients that carry the following criteria were excluded from the study, Patients with emergency situations (obstruction and/or perforation), Patients for multi-visceral resection, Patients who had previous colonic surgery, Patients who received previous radiotherapy of other surgeries and Patients with metastatic disease.

**Randomization:** Patients were randomly assigned following simple randomization procedures (computerized random numbers) to one of two treatment groups referred as group (A) and group (B). Randomization sequence was created using excel 2010 (Microsoft, Redmon, WA, USA).

Patients were classified into 2 groups:

**Group A:** Included 30 patients assigned to total mesocolic and **Group B:** Included 30 patients assigned to traditional colectomy.

**Ethics of Research :** Informed consent was taken from patients and in cases of incompetent patients the informed consent was taken from the guardians.

### **Methods**

**All patients in the present study were subjected to the following:** Full history taking, Complete Clinical Examination, Investigations,

**Surgical technique :**Two traditional surgical methods were used in right sided hemicolecotomy: Medial access and Lateral access. In the medial access, the surgeon applied a lateral pull to the cecum to facilitate presentation of the ileocolic vessel and without mobilizing the central structures; the surgeon made the incision centrally above the mentioned vessel. These vessels were then sectioned

in accordance without manipulation of the tumor prior to the vessel ligation. If the surgeon decided to approach the vessels as centrally as possible; the superior mesenteric vessel should be exposed using anterior approach. Such exposure was likely to compromise preservation of an intact mesocolon in the central parts of the specimen and following vessel ligation, the right half of the colon was mobilized and bowel resection was performed (7). In the lateral access; the surgeon mobilized the right half of the colon in the embryonic planes facing the retroperitoneal structures (renal fascia, duodenum, and pancreas) and then precedes to sever the two resection sites of the colon and the terminal ileum. Next, the mesocolon was severed, in a V-shapedlike fashion towards the central vessel structures and finally the ileo-colic vessels and right colic vessel were severed as centrally as possible (8).

In the comprehensive surgical method, the surgeon took lateral approach dissection started with mobilization of the right colon as in standard lateral access. In the non-advanced tumor, it was possible from the onset to perform the procedure in the embryonic planes only, while in the advanced tumor, the aim was to obtain "en-bloc" resection that includes any neighboring structures with tumor ingrowth. After bowel mobilization, dissection continues centrally in the embryonic plane between the mesocolon and the retroperitoneal structures to include the posterior part of the ileocolic vessel, this mobilization was described by Hohenberger, who also included "Kocher's manoeuvre" with full duodenal mobilization (11).

After such dissection, the surgeon could precisely severe the ileo-colic vessel, the right colic vessel and the middle colic vessel "in the right sided hemicolecotomy" at the site of their inflows into the superior mesenteric vessel. Next, bowel resection was performed by staying in the embryonic plan as far as the superior mesenteric vessel inflows, extra-attention was given to the task of ensuring an intact mesocolon even in the central parts of the specimen (12).

A pathologist examined the specimen in accordance with the guidelines from the Danish Colorectal Cancer Group. After an initial description of the specimen including any relevant measurements, the extra-mesentery segment was sectioned and independently examined, described and embedded for microscopy. Lymph nodes found in the border-area between the conventional and the extra-section of the specimen was added to the conventional lymph node count (13).

**Follow-up including:** Assessment, Short outcome measures and Long-term follow-up.

### **Statistical analysis of the data (14)**

Data were fed to the computer and analyzed using IBM ,SPSS software package version 20.0

(Armonk, NY: IBM Corp) (15) Qualitative data were described using number and percent. The Kolmogorov-Smirnov test was used to verify the normality of distribution Quantitative data were described using range (minimum and maximum),

mean and standard deviation. Significance of the obtained results was judged at the 5% level .

**The used tests were:** Chi-square test, Student t-test and Mann Whitney test.

## RESULTS

**Table 1: Comparison between two groups as regard to patient's age (years).**

Age	Group (A) (n = 30)	Group (B) (n = 30)	U	P Value
Min.-Max.	35-72	38-67	447.50	0.970
Mean±S.D.	52.10±10.015	51.80±10.714		

U: Mann-Whitney test; P: p value for comparing between the two studied groups; \*: Statistically significant at P <0.05  
There were no statistically significant differences between groups regarding age as P = 0.970 (Table 1).

**Table 2: Comparison between both groups regarding tumor location.**

Location of tumor	Group (A) (n = 30)		Group (B) (n = 30)		P Value
	No.	%	No.	%	
Cecum	10	33.3	13	43.3	0.579
(Proximal) right transverse	11	36.7	5	16.7	
Ascending colon	7	23.3	9	30.0	
Hepatic flexure	2	6.7	3	10.0	
Total	30	100	30	100	

P: P value for comparing between the two studied groups; \*: Statistically significant at P <0.05  
There were no statistically significant differences between groups regarding location of the tumor as P = 0.579 (Table 2).

**Table 3: Comparison between both groups regarding the number of lymph nodes retrieved.**

No. of LNs retrieved	roup (A) (n = 30)	roup (B) (n = 30)	t	P Value
Min.-Max.	9-32	7-25	5.063	□0.001*
Mean±S.D	21.40±5.341	14.83±4.684		

t: T-student test; P: P value for comparing between the two studied groups; \*: Statistically significant at P <0.05  
There were statistically significant differences between both groups regarding number of lymph nodes as P <0.001 (Table 3).

**Table 4: Comparison between both groups regard operative outcome.**

Variable	Group (A) (n = 30)	Group (B) (n = 30)	Test of Sig.	P Value
Operative Time: Min.-Max. Mean± S.D	130-255 194.83±31.91	140-260 189.00±33.85	t = 0.687	0.495
Time of resection only: Min.-Max. Mean±S.D	65-90 72±22.5	74-103 81±21.7	t = 0.731	0.314
Intraoperative blood loss: Min.-Max. Mean± S.D	54-148 108.43±24.35	80-175 128.73±25.58	t = 3.148	0.003*
Days of the first flatus: Min.-Max. Mean± S.D	1-4 2.63±1.13	2-5 3.80±0.89	U = 199.50	<0.001*
Day for first stool: Min.-Max. Mean± S.D	2-6 3.70±1.09	2-7 4.43±1.31	U = 312.50	0.036*

U: Mann-Whitney test t: T-Student test; P: P value for comparing between the two studied groups; \*: Statistically significant at P <0.05

Operative outcome showed statistically significant differences between groups according to intra-

operative blood loss ( $P = 0.003$ ), days of the first flatus ( $P < 0.001$ ) and day for first stool ( $P = 0.036$ ) (Table 4).

**Table 5: Comparison between both groups of the study as regard occurrence of complications**

Complications	Group (A)		Group (B)		P Value
	No.	%	No.	%	
No	21	70.0	20	66.7	0.898
Wound infection	2	6.7	3	10.0	
Intestinal obstruction	3	10.0	1	3.3	
Anastomotic leakage	1	3.3	3	10.0	
Seroma of the wound	1	3.3	1	3.3	
Chest infection	1	3.3	1	3.3	
Urinary tract infection	1	3.3	1	3.3	
Total	30	100	30	100	

P: P value for comparing between the two studied groups; \*: Statistically significant at  $P < 0.05$

Comparison between both groups of the study as regard occurrence of complications showed that complications occurred in 9 (30%) of cases in group

A and occurred in 11 (36.7%) in group B with no statistically significant differences between both groups as  $P = 0.898$  (Table 5).

**Table 6: Outcome in both groups regarding mortality rate and tumor recurrence.**

Variable	Group (A) (n = 30)		Group (B) (n = 30)		P Value
	No.	%	No.	%	
Recurrence:					0.021
No	29	96.7	25	83.3	
Yes	1	3.3	5	16.7	
Mortality	2	6.7	1	3.3	0.231

P: P value for comparing between the two studied groups

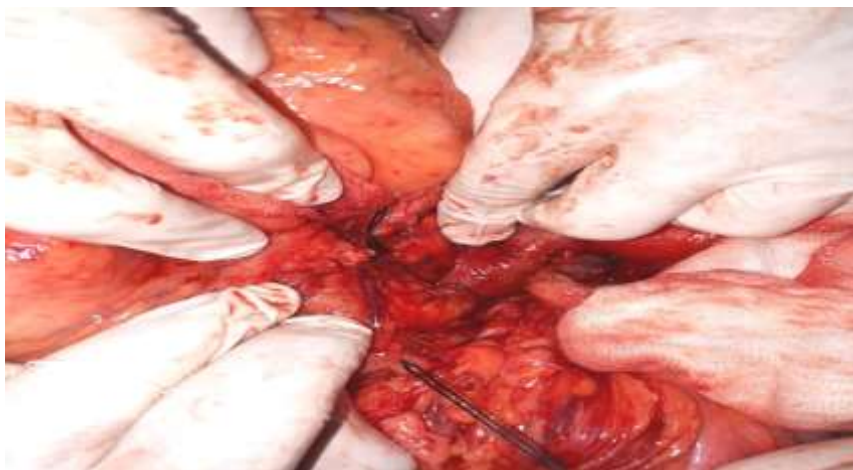
There was statistically significant increase in the recurrence in group B than in group A ( $P = 0.021$ ). Death occurred in 2 (6.7%) of patients in group (A)

and only one (3.3%) occurred in group (B) with no statistical difference between both groups regarding mortality as  $P = 0.231$  (Table 6).

## CASES



**Fig.1: Dissection and ligation of ileocolic artery and LNs.**



**Fig.2: Completion of dissection of the mass after isolation of vascular bed.**

## DISCUSSION

Regarding demographic data, Age in Group (A) was ranged between 35-72 years with a mean of  $52.10 \pm 10.015$  years while in Group (B) was ranged between 38-67 years with a mean of  $51.80 \pm 10.714$  years. There was no statistically significant differences between groups where  $P = 0.970$ .

In the study of **Goda and his colleagues**, CRC accounted for 14% of all colonoscopies performed at our hospital. The mean age of patients was 51 years with 25% of cancers occurring in patients aged less than 40 years. These data and our data are similar to those reported in other Middle-Eastern countries and are much higher than in Western countries (16). Regarding tumor location, Location of tumor in Group (A) show that 10 (33.3%) had tumor in Caecum, 11 (36.7%) had tumor in (Proximal) right transverse, 7 (23.3%) had tumor in Ascending colon and 2 cases (6.7%) had tumor in Hepatic flexure while in Group (B) 13 (43.3%) had tumor in Caecum, 5 (16.7%) had tumor in (Proximal) right transverse, 9 (30%) had tumor in Ascending colon and 3 (10.0%) had tumor in hepatic flexure. There was no statistically significant differences between groups where  $P = 0.579$ .

In our study as regarding Number of lymph nodes retrieved, Number of lymph nodes retrieved in Group (A) was ranged between 9-32 with a mean of  $21.40 \pm 5.341$  while in Group (B) was ranged between 7-25 with a mean of  $14.83 \pm 4.684$ .

There were statistically significant increase in the number of LNs removed with CME which help id better diagnosis of the removed surgical specimen ( $P < 0.001$ ).

**Ouyang and his colleagues**, in their study they concluded that CME facilitates exposure and isolation of the root of the mesentery for ligation of the colonic blood vessels, and dissection of the central group of lymph nodes. These key principles of laparoscopic CME were probably responsible, in the present study, for the better harvest of lymph

nodes and superior survival outcomes in the CME group relative to the CRR group (17).

Similar to our results, **Galizia and his colleagues**, in their study found that CME could help achieve better lymph node clearance compared with conventional surgery, by making hidden areas accessible (18).

As regarding Operative outcomes, they show showed a statistically significant differences between groups according to intra-operative blood loss ( $P = 0.003$ ), the days of the first flatus ( $P < 0.001$ ) and the day for first stool ( $P = 0.036$ ). Group A patients had better operative outcomes in comparison to Group B. Also intensive care unit admission in Group (A) found in 6(20.0%) while in Group (B) 9(30.0%) admission to ICU without statistically significant differences between groups where ( $P = 0.552$ ) in addition to a non-statistically significant differences between groups regarding post-operative complications.

Complete meso-colic excision is associated with lesser complications and better post-operative outcomes than classic radical resection. This also comes in agreement with Ouyang and his colleagues, Galizia and his coworkers, and Bertelsen and colleagues (18,17, 2).

In our study, regarding comparison between two groups with tumor recurrence; Group (A) show that 4(13.3%) had tumor re-growth while in Group (B) 10(33.3%) had tumor re-growth without statistically significant differences between groups where  $P = 0.125$ .

Some studies reported high success rates of CME but reported higher complications as in the study of **Di Buono and his coworkers**, where they reported that although CME with central vascular ligation in laparoscopic right hemicolectomy is associated with a significant decrease in local recurrence rates and improvements in cancer-related 5year survival, there may be additional risks associated with this technique because of increased surgical complications. As a result, there is controversy surrounding its use. This may attributed to the study

was done using laparoscopic technique which adds more difficulty and needs more skillfull hands (19).

## CONCLUSION

From our study we found that total mesocolic excision (TME) with central vessel ligations as a technique is feasible and easy to be learnt in comparison with right hemicolectomy in right side cancer colon. New approach has the advantage of better oncological outcomes due to dissection in embryological mesocolic planes, central ligation and more area of resected mesentry as well as due to high number of harvested lymph nodes.

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