Laparoscopic versus Open Complete Mesocolic Excision for Right Colon Cancer
A prospective Randomized Study

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- Hohenberger et al proposed complete mesocolic excision (CME) as a standard technique in 2009 in which the same principle as TME in rectal cancer
- CME allows the removal of specimen that contains the draining lymph nodes, lymphatics and blood vessels through which the tumor may disseminate, and also reduces the risk of an involved circumferential resection margin (CRM)

Original article

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Standardized surgery for colonic cancer: complete mesocolic excision and central ligation – technical notes and outcome

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Abstract

Objective Total mesorectal excision (TME) as proposed by R.J. Heald more than 20 years ago, is nowadays accepted worldwide for optimal rectal cancer surgery. This technique is focused on an intact package of the tumour and its main lymphatic drainage.

This concept can be translated into colon cancer surgery, as the mesorectum is only part of the mesenteric planes which cover the colon and its lymphatic drainage like envelopes. According to the concept of TME for rectal cancer, we perform a concept of complete mesocolic excision (CME) for colonic cancer. This technique aims at the separation of the mesocolic from the parietal plane and true central ligation of the supplying arteries and draining veins right at their roots.

Method Prospectively obtained data from 1329 consecutive patients of our department with RO-resection of colon cancer between 1978 and 2002 were analysed. Patient data of three subdivided time periods were compared.

Results By consequent application of the procedure of CME, we were able to reduce local 5-year recurrence rates in colon cancer from 6.5% in the period from 1978 to 1984 to 3.6% in 1995 to 2002. In the same period, the cancer related 5-year survival rates in patients resected for cure increased from 82.1% to 89.1%.

Conclusion The technique of CME in colon cancer surgery aims at a specimen with intact layers and a maximum of lymphnode harvest. This is translated into lower local recurrence rates and better overall survival.

Keywords Colon cancer, Standardization surgical treatment, complete mesocolic excision

- **There are three essential components of CME with CVL:**
  - (1) Development of a mesofascial or retrofascial plane to mobilize an intact and inviolate mesocolon as an intact package;
  - (2) CVL with high tie to maximize the vertical lymph node dissection (central spread);
  - (3) adequate length of bowel to remove pericolic lymph nodes, maximizing the longitudinal lymph node harvesting (longitudinal spread).

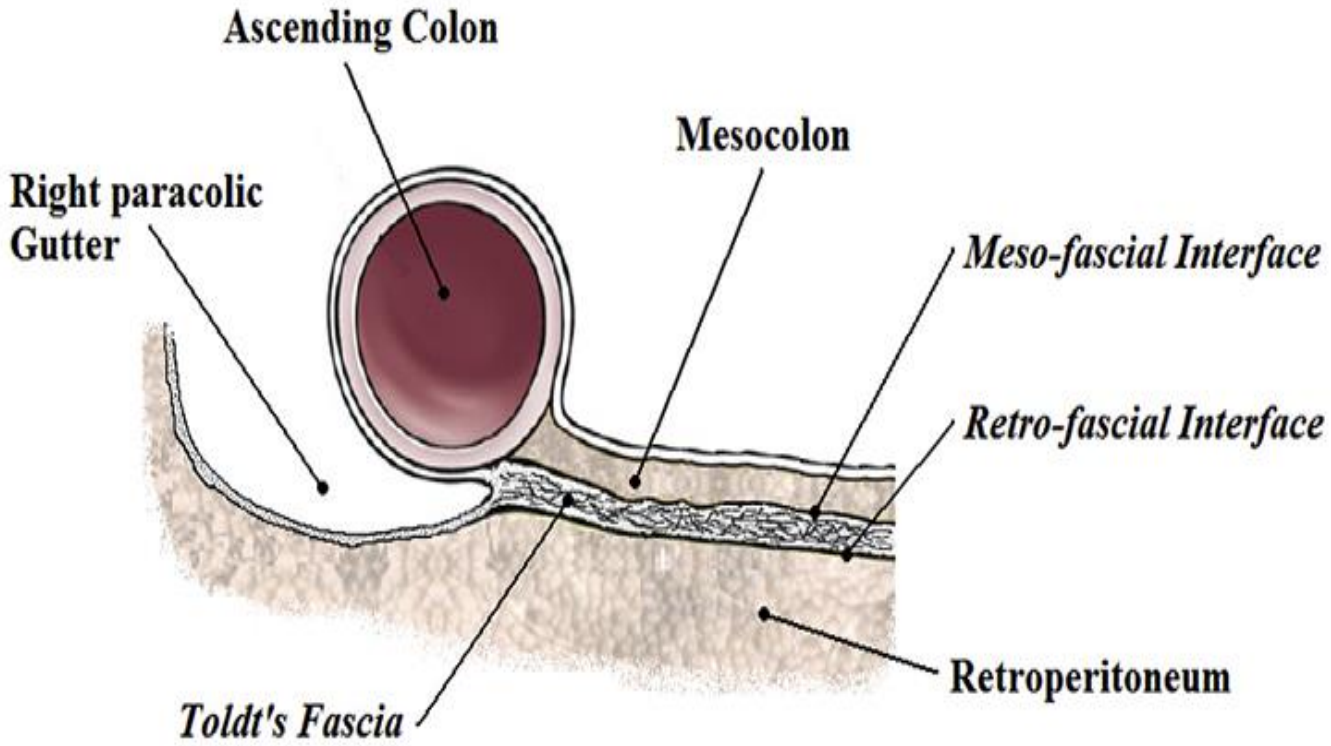

Fig. 1 – Schematic drawing of the actual view of the right (ascending) mesocolon with its components: the *meso-fascial interface* consists in the apposition between the Toldt's fascia and the overlying mesocolon; the *retro-fascial interface* consists in the apposition between the Toldt's fascia and the underlying retroperitoneum. The picture is shown in axial and bottom to top fashion (relationships and dimensions purposely exaggerated for schematic reasons).

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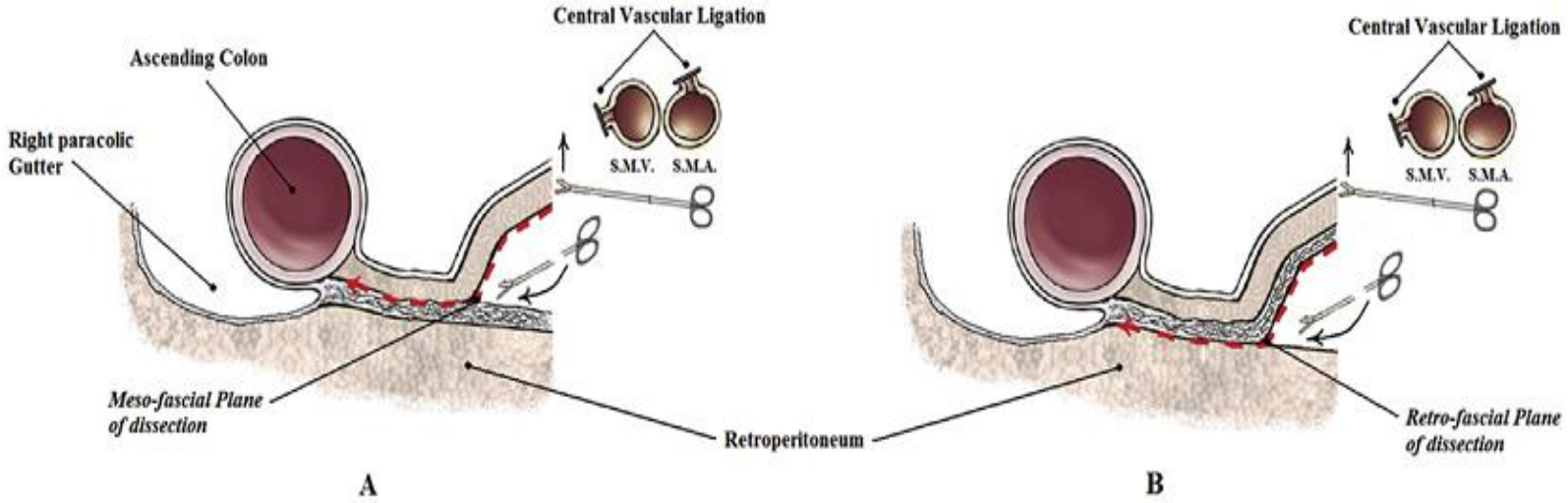

Fig. 2 – Schematic picture of a *medial-to-lateral approach* generally used in laparoscopic resection (related to the ascending colon, i.e. laparoscopic right total mesocolectomy). In A, it is illustrated the *meso-fascial separation*, performed along the meso-fascial interface, thus separating an intact mesocolon from the underlying Toldt's fascia (red dotted line). In B, it is shown the *retro-fascial separation*, performed along the retro-fascial interface, thus separating the mesocolon-Toldt's fascia complex from the underlying retroperitoneum (red dotted line). According to Hohenberger et al.,[8] both are components of CME. The picture is shown in axial and bottom to top fashion (relationships and dimensions purposely exaggerated for schematic reasons). The thin, black vertical arrows show the counter-traction needed to "open" the proper dissection plane; the thin, black curved arrows show the instrument direction in creating the correct plane of dissection.

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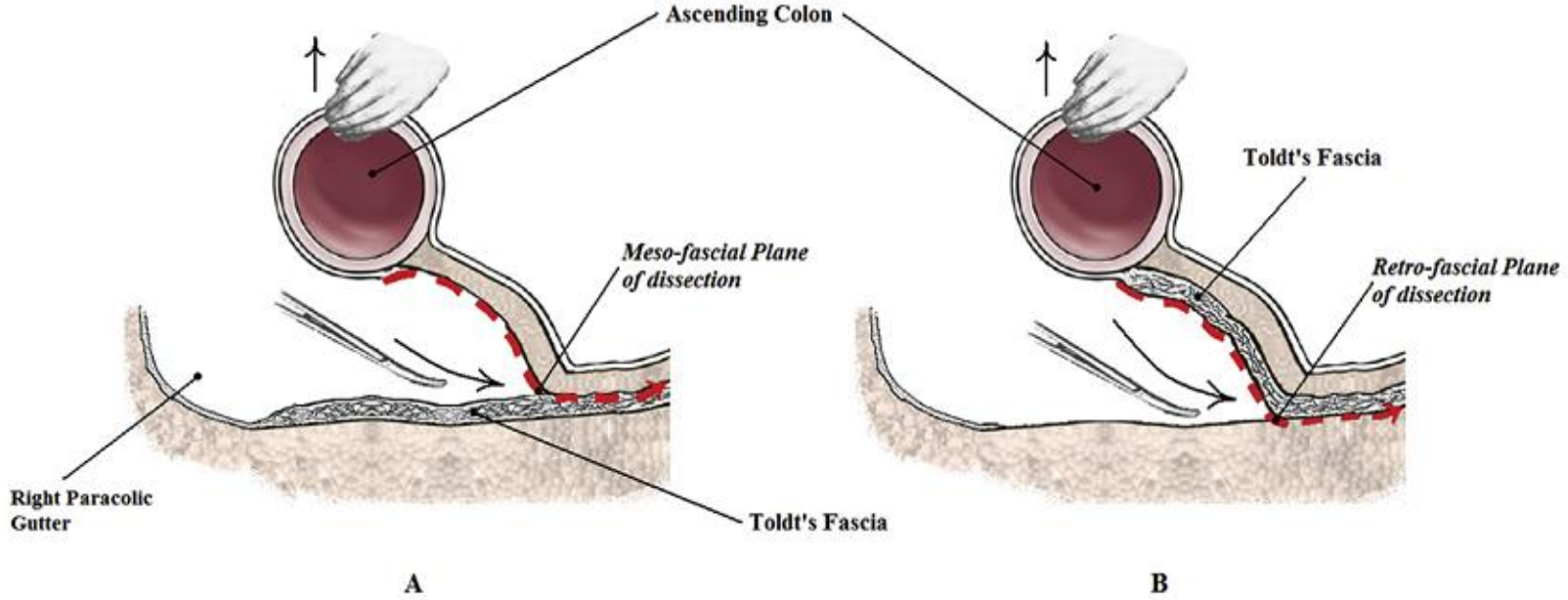

Fig. 4 – Schematic picture of a *lateral-to-medial approach* generally used in open surgery (related to the ascending colon, i.e. open total right mesocolectomy). In A, it is depicted the *meso-fascial separation* along the meso-fascial interface, with separation of an intact mesocolon from the underlying Toldt's fascia (red dotted line). In B, it is drawn the *retro-fascial separation*, carried out along the retro-fascial interface, with separation of the mesocolon-Toldt's fascia complex from the underlying retroperitoneum (red dotted line). According to Hohenberger et al.,[8] both separations are components of CME. The picture is shown in axial and bottom to top fashion (relationships and dimensions purposely exaggerated for schematic reasons). The thin, black vertical arrows show the counter-traction needed to "open" the proper dissection plane; the thin, black curved arrows show the instrument direction in creating the correct plane of dissection.

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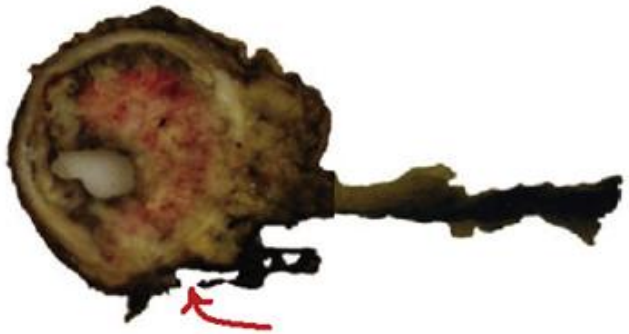
QUALITY OF THE SURGICAL SPECIMEN

- (1) **Mesocolic plane of resection** (“good "plane of surgery; intact, inviolate mesocolon with a smooth peritoneal-lined surface);
- (2) **Intramesocolic plane of resection** (“moderate” plane of surgery; irregular breaches in the mesocolon, none reaching down to the muscularis propria of the viscus); and
- (3) **Muscularis propria plane** (“poor” surgical plane; disruption of the mesocolon down to the muscularis propria)

A. Mesocolic Plane

B. IntraMesocolic Plane



C. Muscolaris Propria Plane

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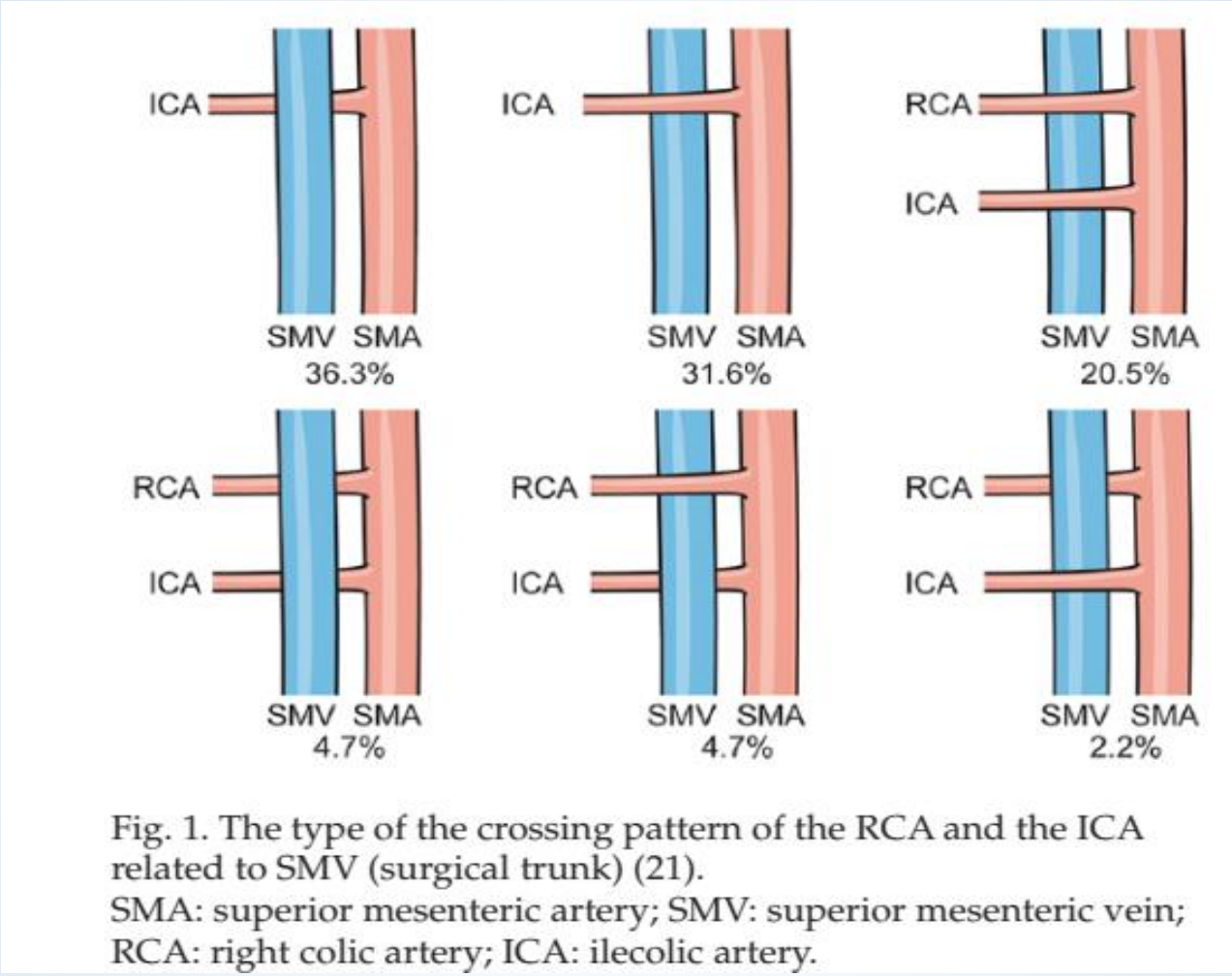
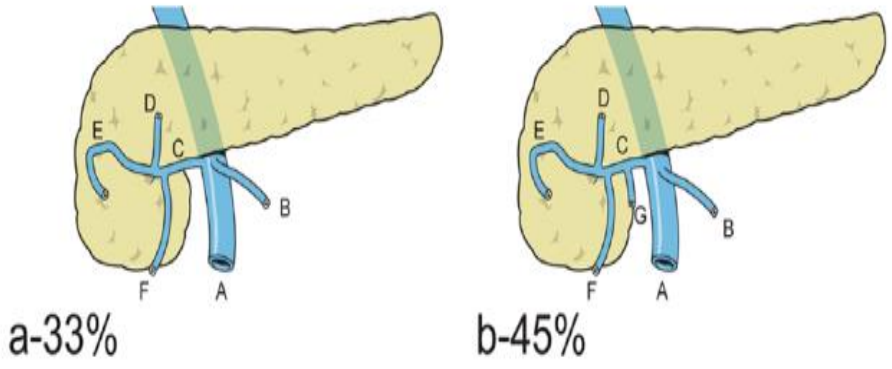


Fig. 1. The type of the crossing pattern of the RCA and the ICA related to SMV (surgical trunk) (21).
SMA: superior mesenteric artery; SMV: superior mesenteric vein; RCA: right colic artery; ICA: ilecolic artery.

RCA and the ICA related to SMV Alsabilah J et al 2016



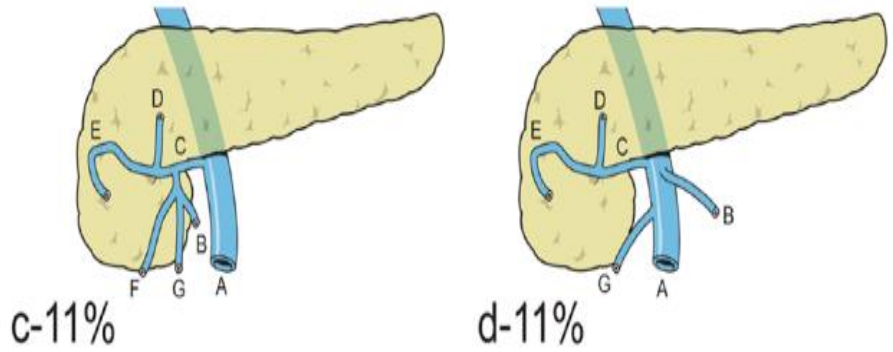
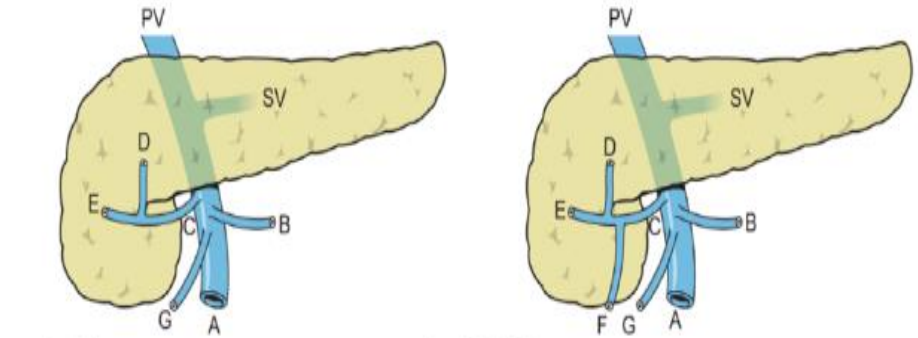
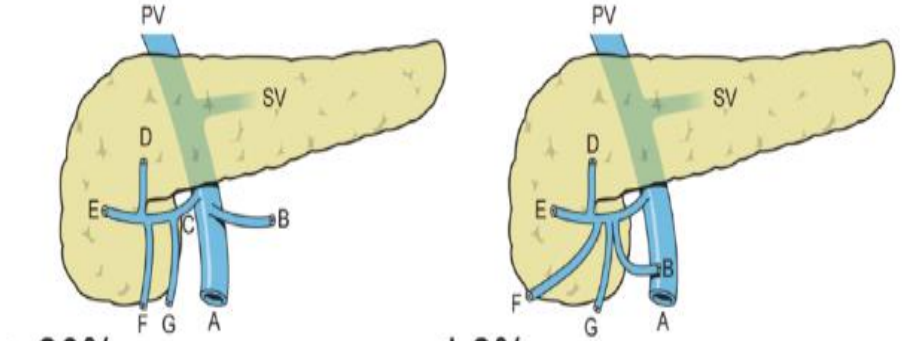


Fig. 4. a) to d) Variations of Henle's gastrocolic trunk according to the number of tributaries and their percentages (A: superior mesenteric vein; B: middle colic vein; C: Henle's gastrocolic trunk; D: right gastroepiploic vein; E: anterior superior pancreaticoduodenal vein; F: superior colic vein; G: right colic vein) (26).





. 5. a) to d) The variations of Henle's gastrocolic trunk according to the right colonic veins and their percentage of appearance superior mesenteric vein; B: middle colic vein; C: Henle's gastrocolic trunk; D: right gastroepiploic vein; E: anterior superior ncreaticoduodenal vein; F: superior right colic vein; G: right colic vein) (27).

Gastrocolic trunk of Henel Alsabilah J et al 2016

ORIGINAL ARTICLE

ANZJSurg.com

Oncological outcomes of complete versus conventional mesocolic excision in laparoscopic right hemicolectomy

Min Sung An, HyungJoo Baik, Se Hui Oh, Yo-Han Park, Sang Hyuk Seo, Kwang Hee Kim, Kwan Hee Hong and Ki Beom Bae
Department of Surgery, Busan Paik Hospital, College of Medicine, Inje University, Busan, South Korea

Minerva Chirurgica 2017 ????;72(??):000-000
DOI: 10.23736/S0026-4733.17.07451-X

ORIGINAL ARTICLE

Propensity score-matched comparison between complete mesocolic excision and classic right hemicolectomy for colon cancer

Eva LIETO [1], Mohamed ABDELKHALEK [2], Michele ORDITURA [3], Adel DENEWER [2], Paolo CASTELLANO [1], Tamer F. YOUSSEF [2], Annamaria AURICCHIO [1], Ahmed SETIT [2], Gennaro GALIZIA [1]*

Disease-free survival after complete mesocolic excision compared with conventional colon cancer surgery: a retrospective, population-based study

Claus Anders Bertelsen, Anders Ulrich Neuenschwander, Jens Erik Jansen, Michael Wilhelmsen, Anders Kirkegaard-Klitbo, Jutaka Reilin Tenma, Birgitte Bols, Peter Ingeholm, Leif Ahrenst Rasmussen, Lars Vedel Jepsen, Else Refsgaard Iversen, Bent Kristensen, Ismail Gögenur, on the behalf of the Danish Colorectal Cancer Group

Original article

Short-term outcomes after complete mesocolic excision compared with 'conventional' colonic cancer surgery

C. A. Bertelsen[1], A. U. Neuenschwander[1], J. E. Jansen[1], A. Kirkegaard-Klitbo[2,4], J. R. Tenma[5], M. Wilhelmsen[6], L. A. Rasmussen[1], L. V. Jepsen[1], B. Kristensen[3] and I. Gögenur[4], on behalf of the Copenhagen Complete Mesocolic Excision Study (COMES) Group* and the Danish Colorectal Cancer Group (DCCG)

Systematic review

doi:10.1111/codi.13900

Safety, quality and effect of complete mesocolic excision *vs* non-complete mesocolic excision in patients with colon cancer: a systemic review and meta-analysis

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Int J Colorectal Dis (2016) 31:1577–1594
DOI 10.1007/s00384-016-2626-2

REVIEW

Surgery along the embryological planes for colon cancer: a systematic review of complete mesocolic excision

Nikolaos Gouvas[1] · Christos Agalianos[2] · Kleio Papaparaskeva[3] · Aristotelis Perrakis[4] · Werner Hohenberger[4] · Evaghelos Xynos[5]

WJGS World Journal of Gastrointestinal Surgery

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DOI: 10.4240/wjgs.v8.i2.106

World J Gastrointest Surg 2016 February 27; 8(2): 106-114
ISSN 1948-9366 (online)

TOPIC HIGHLIGHT

2016 Laparoscopic Surgery: Global view

Laparoscopic complete mesocolic excision with central vascular ligation in right colon cancer: A comprehensive review

Luca Maria Siani, Gianluca Garulli

ORIGINAL ARTICLE

LAPAROSCOPIC COMPLETE MESOCOLIC EXCISION WITH CENTRAL VASCULAR LIGATION IN RIGHT COLON CANCER: LONG-TERM ONCOLOGIC OUTCOME BETWEEN MESOCOLIC AND NON-MESOCOLIC PLANES OF SURGERY

L. M. Siani, C. Pulica

Scandinavian Journal of Surgery
2015, Vol. 104(4) 219–226

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- The risks and benefits of laparoscopic CME have not yet been examined fully.
- The aim of the present study was to compare the outcomes of laparoscopic vs. open CME for right colon cancer.

Patients and methods

Study design

- This is a prospective randomized study on patients who were presented with right colonic cancer to be managed in Gastrointestinal Surgical Center, Mansoura University, Egypt.
- Consecutive patients with right colon cancer were enrolled in the study from June 2014 to November 2017
- This study was approved by the IRB of our hospital

- Inclusion criteria: Patients with a right colonic cancer, Tumour length 6 cm or less
- Exclusion criteria included previous abdominal surgery, liver cirrhosis patients were excluded from the analysis if they had metastasis, received emergency surgery due to acute intestinal obstruction or perforation, were pregnant, severely obese, or had serious diseases of the heart, lung, liver, or kidney

Randomization

- Patients enrolled in the study randomized into two groups using the closed envelope method.
- The study population was divided into two groups;
  - Group (A) managed by open right hemicolectomy with CME
  - group (B) managed by laparoscopic hemicolectomy with CME.

Procedures

- Each patient was placed in the supine position with legs apart.
- A pneumoperitoneum was created through an infra-umbilical puncture and maintained at 13 mm Hg.
- A 4-port technique was used
- Surgery was carried out from medial to lateral.
- The intestines were pulled by gravity to fully expose the ascending mesocolon.
- Identifying the main superior mesenteric vein (SMV) and ileocolic vessels. The vessels were ligated at their roots
- Dissection proceeded along the SMV to expose the main veins and arteries to the colonic segment.
- We transected the right colic vessels (if present), the colic branch of the gastrocolic trunk and the right branch of the middle colic artery
- The right mesocolon was incised along the right edge of the SMV up to Toldt's space
- Particular caution was used when mobilizing over the right ureter and the duodenum.

Open surgery with CME

- Open surgery with CME was performed via a lateral to medial approach in a caudal to cranial direction. Mobilization of the right hemicolon and mesocolon was similar to that of laparoscopic CME.

- The primary outcome is the rate of postoperative complications.
- Secondary outcomes will include number of lymph node dissection, blood loss, hospital stay, wound length, conversion rate, proximal margin, distal margin, time to first flatus, and dietary intake, analgesic use up to postoperative day 3, reoperation, mortality, recurrence rate, and survival rate.

Results

Demographic Data

	Open	Laparoscopic	P VALUE
Age	58.5 (33-65)	55 (22-66)	0.22
Male Female	18 (60%) 12 (40%)	20 (66.7%) 10 (33.3%	0.54
BMI	26.2 (18-40)	27 (17-33)	0.34
DM	5 (16.7%)	8 (26.7%)	0.35
Preoperative Hemoglobin	9.4 (8-13.6)	9.7 (7.9-13.5)	0.6
Preoperative albumin Preoperative CEA	3.7 (3.2-4.9) 4 (2-192)	3.8 (3.3-4.4) 3 (3-120)	0.98 0.38

Operative data

	Open	Laparoscopic	P VALUE
Operative time (minutes)	110 (70-170)	130 (90-170)	0.001
Time needed for dissection	70 (35-110)	80 (55-120)	0.0001
Time needed for anastomosis	30 (25-60)	30 (20-60)	0.07
Blood loss (ml)	230 (100-540)	180 (50-400)	0.28
Incision length (CM)	20 (16-22)	5 (4-6)	0.0001
Mass size (CM)	5 (2-6)	5 (3-6)	0.31
Tumour to HVT (mm)	102.5 (80-140)	115 (80-140)	0.24
Normal bowel to HVT (mm)	87.5 (70-110)	92.5 (70-114)	0.19
Length of large bowel (mm)	220 (160-290)	220 (150-320)	0.69
Length of small bowel (mm)	90 (60-120)	88.5 (60-120)	0.98

Postoperative data

	Open	Laparoscopic	P VALUE
Hospital stay	6 (4-25)	4 (3-7)	0.01
Time to resume oral intake	4 (3-8)	3 (2-5)	0.0001
Leakage	1 (3.3%)	0	0.31
Wound infection	3 (10%)	0	0.03
VAS D1 VAS D3	7.5 (6-9) 4 (3-5)	5 (4-6) 2 (1-3)	0.0001 0.0001
Hospital mortality	0	0	

Oncologic outcomes

	Open	Laparoscopic	P VALUE
Lymph node retrieved	24 (16-32)	27 (17-51)	0.13
Safety margins			
R0	30	30	1
Tumour differentiation			
Well differentiated	13 (43.3%)	13 (43.3%)	0.86
Moderately differentiated	13(43.3%)	14 (46.7%)	
Poorly differentiated	4 (13.3%)	3 (10%)	
Recurrence rate	2 (6.7%)	1 (3.3%)	0.55
Median survival rate (months)	36	35	0.97
1 year survival	97%	97%	
3 year survival	74%	71%	

Conclusion

- Laparoscopic CME for right colon cancer is feasible, safe, and effective with oncological outcomes similar to those of open surgery.
- Short-term outcomes (such as faster recovery time) are clear
- Long term outcomes (recurrence rate and survival) similar to those of open surgery.


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