Totally laparoscopic right hemicolectomy with up-down approach.

A single institution experience

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Totally laparoscopic right hemicolectomy with up-down approach. A single institution experience.

AIM: *Many laparoscopic techniques have been described for the treatment of right colon cancer. The purpose of this study is to communicate our experience in the totally laparoscopic treatment of right colon cancer and to report our short-term results in order to confirm the feasibility and safeness of this demanding procedure.*
MATERIAL OF STUDY: *From November 2017 to April 2020, we performed 384 surgical operations for colorectal cancers, of these 81 have involved tumors of the right colon in urgent and elective conditions. Right hemicolectomies with a totally laparoscopic approach were performed, by the same surgical team, in 55 patients in elective surgery.*
RESULTS: *During the study period we evaluated intra and postoperative complications in terms of: demographic data and preoperative clinical characteristics, intraoperative and postoperative outcomes (operative time, blood loss, conversion rate, surgical complications, hospitalization, readmission, and mortality), pathological outcomes.*
DISCUSSION: *Our experience confirms that totally laparoscopic approach, with up to down dissection, for the treatment of right colon cancer, performed by expert surgeons is a safe and feasible technique.*
CONCLUSION: *This procedure allows the mesocolon excision with outstanding number of harvested lymph nodes ensuring low complications and better oncological cleaning.*

KEY WORDS: Central Vascular Ligation, Colorectal Cancer, Fluorescence GLaparoscopy, Right Hemicolectomy, Complete Mesocolic Excision, Surgery

Introduction

Laparoscopic approach is continuously increasing in surgery, every year in the world many patients undergo laparoscopic surgery and in many cases it is the patient who requires this type of treatment [1,2]. In colorectal surgery, laparoscopy has been shown to have greater benefits than open surgery: faster recovery, earlier return of bowel function, shorter length of stay, reduced blood loss and pain, and lower postoperative morbidity. In addition, laparoscopic colorectal surgery compared to open surgery does not compromise the quality of resection and lymphectomy, the oncological outcomes are comparable [3,4]. Various techniques have been described for the laparoscopic right hemicolectomy (LRH): totally LRH, single incision LRH, laparoscopic assisted right hemicolectomy, hand-assisted right hemicolectomy, and robotic right hemicolectomy. In our Department we prefer the totally laparoscopic technique with a complete mesocolic excision (CME) with central vascular ligation (CVL) [5], and the direction of the dissection performed by us is from up to down [6]. Our belief is that with this approach it is possible to obtain a resection of the primary tumor with clear margins, comprising a greater number of tributary lymph nodes and that with up to down dissection the identification of the vessels is much simpler even in the presence of anatomic anomalies. The purpose of this study is to communicate our single Institution experience about totally laparoscopic treatment of right colon cancer and to report our short-term results in order to confirm the feasibility and safeness of this demanding procedure.

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Material and Methods

Patients

From November 2017 to April 2020, at the Surgical and Traumatological Department of the "L. Bonomo Hospital" in Andria (Italy), we performed 384 surgical operations for colorectal cancers, of these 81 have involved tumors of the right colon in urgent and elective conditions. During this period, 55 laparoscopic right hemicolectomies were performed, under election conditions, with a totally laparoscopic approach. Patients were 24 males (43.64 %) and 31 females (56.36 %) with a mean age of 70.76 years (range 46–92), demographic data and clinical characteristics are reported in Table I. A detailed informed consent was given to them and accepted by everyone. All procedures were performed by the same surgical team. Prior to surgery, all the patients undergone endoscopic evaluation of the lesion, as well as staging with computed tomography of the chest and abdomen, blood tests and tumor markers. From this study we excluded patients with presence of distant unresectable metastasis, synchronous or double primary cancer, cancer related to hereditary syndromes, presence of inflammatory bowel disease and any operation performed in an emergency setting. Our evaluations concerned short-term clinical and oncological outcomes.

Table I - *Demographic data and clinical characteristics.*

SEX	
Male	24/55 (43.64%)
Female	31/55 (56.36%)
AGE (years)	
Mean (SD)	70.76 (9.99)
Median	70
Range	46-92
BMI (Kg/m^2)	
Mean (SD)	22.78 (1.36)
Median	23
Range	20-25
ASA Score	
I	0/55 (0%)
II	27/55 (49.09%)
III	26/55 (47.27%)
IV	2/55 (3.64%)
V	0/55 (0%)
Clinical stage	
Endoscopically unresectable polyps (severe dysplasia)	4/55 (7.27%)
0	3/55 (5.45%)
I	13/55 (23.64%)
II	19/55 (34.55%)
III	15/55 (27.27%)
IV	1/55 (1.82%)
Tumor site	
Cecum	15/55 (27.27%)
Ascending colon	32/55 (58.18%)
Hepatic flexure	6/55 (10.91%)
Transverse colon	2/55 (3.64%)

Surgical Technique

The patient is placed in a supine position, the operator surgeon and assistant with the camera driver stand to the left of the patient. The pneumoperitoneum is performed by a 12 mm trocar positioned on the left flank in open laparoscopy. 2 other trocars, 12 mm and 5 mm, are placed respectively in the left upper and lower abdominal quadrants. All trocars are inserted along the left hemiclavicular line (Fig. 1). Our technique involves some standardized steps with an up / down approach:
– exposure and division of gastro-colic ligament along the greater curve of the stomach, search for the right gastroepiploic vessels and their subsequent section between clips. Then, the stomach and omentum are free from the ventral surface of transverse mesocolon and duodenum and pancreatic head are exposed (Fig. 2);
– the posterior peritoneum is dissected and the right colic flexure is separated from Gerota fascia and mobilized to the midline;
– the dissection is followed in Told fascia plane and the right colon and its mesocolon are completely freed and medialized;
– the mesocolon is divided along the mesenteric root and right colic vessels are sealed; but the first to be dissected are the ileocolic vessels and consequently the ileum is resected with a blue cartridge of 60 mm linear stapler (Fig. 3);
– the section of the proximal transverse colon is performed along the previous section line of the gastrocolic ligament and completed with a blue cartridge of 60 mm linear stapler (Fig. 4);
– usually we performed a side-to-side stapled anastomosis. After the anastomosis, the specimen is removed by endobag through a service incision on the central trocar. Finally the mesentery is closed by resorbable sutures (Fig. 5).

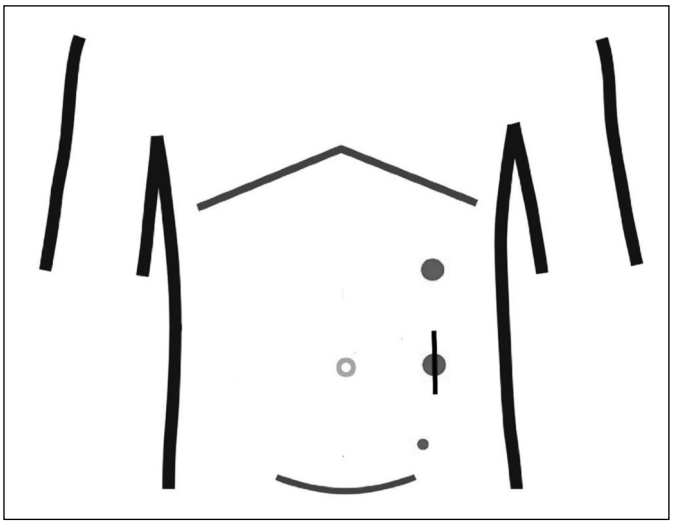

Fig. 1: Trocars position.

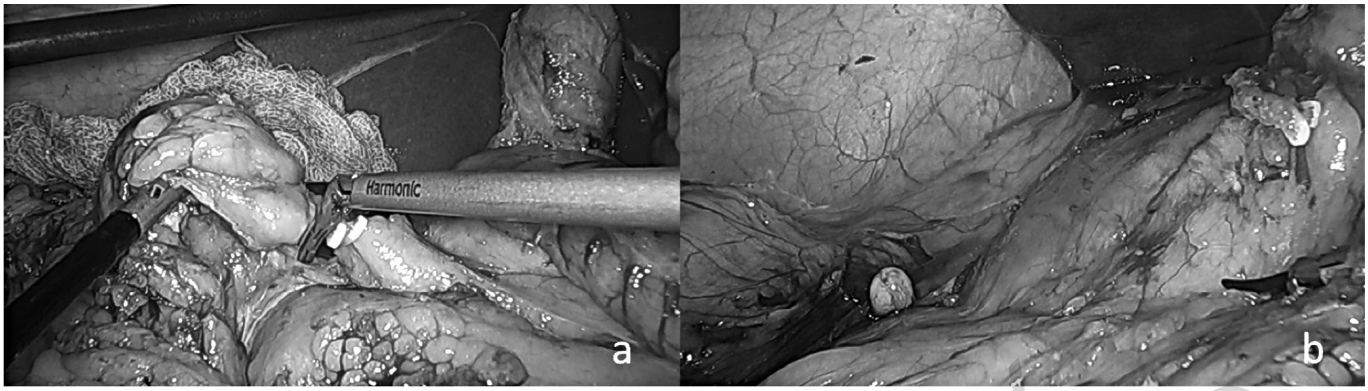

Fig. 2: Intraoperative images: a) section of the right gastroepiploic vessels, b) separation of the transverse mesocolon from the duodenum and head of the pancreas.

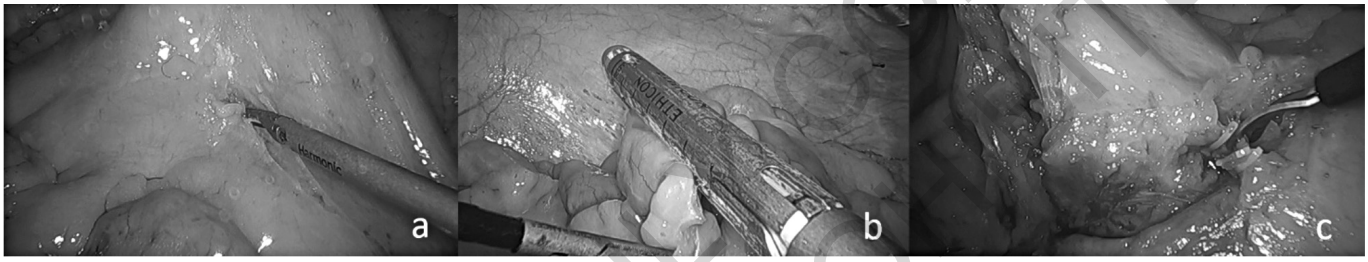

Fig. 3: Intraoperative images: a) preparation of the ileal transection near the ileocolic vessels, b) transection of the ileum with linear stapler, c) section of the ileocolic vessels.

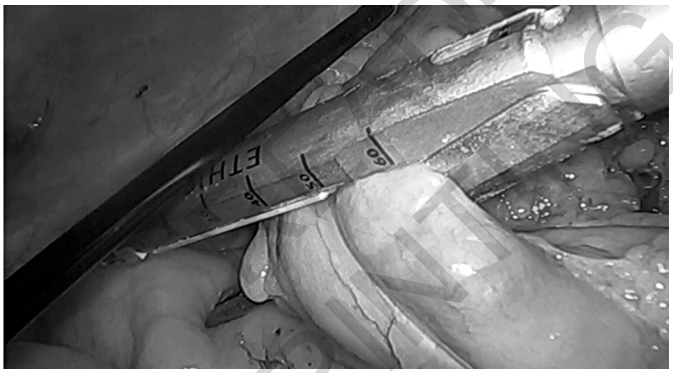

Fig. 4: Intraoperative images: linear stapler transection of the proximal transverse colon.

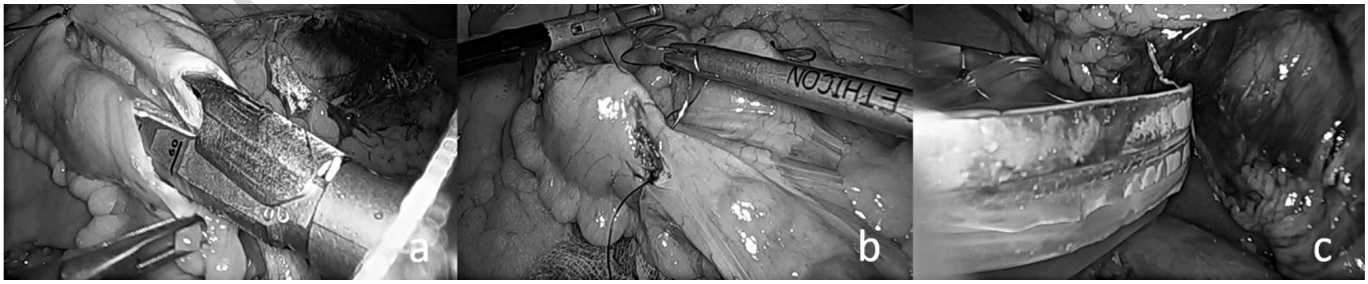

Fig. 5: Intraoperative images: a) and b) ileocolic side to side anastomosis with linear stapler, c) specimen removal by endobag.

Results

During the study period we performed 55 totally laparoscopic right hemicolectomies. Intraoperative and postoperative outcomes are summarized in Table II. The average operation length was 124.94 min (range: 100-150), the average intraoperative blood loss was 177.38 ml (range: 105-375). All operations were completed in laparoscopy without any conversion to open surgery. Postoperative complications occurred in 5 patients (9.1%): 1 anastomotic leakage treated with anastomosis resection and temporary ileostomy, 2 low digestive hemorrhages likely due to mechanical resection with stapler, 1 case of ileus with first flatus on the 6th postoperative day, and 1 case of wound infection of the service port for the extraction of the surgical specimen. Mean hospitalization after surgery was 6.76 days (range: 5-9), intraoperative mortality and postoperative 30-day mortality were 0%. Readmission within 30 days of surgery occurred in 1 patient who had another rectal bleeding then resolved with medical therapy. Finally, all surgical specimens were analyzed by the same team of pathologists, and the results in order to pathological stage, tumor differentiation, harvested lymph nodes, lymphovascular invasion and residual tumor are shown in Table III.

Table II - *Intraoperative and postoperative outcomes.*

OPERATIVE TIME (min)	
Mean (SD)	124.94 (11.08)
Median	125
Range	100-150
BLOOD LOSS (ml)	
Mean (SD)	177.38 (56.14)
Median	167.5
Range	105-375
CONVERSION to open surgery	0/55 (0%)
POSTOPERATIVE complication (%)	5/55 (9.1%)
Anastomotic leakage	1/55 (1.82%)
Ileus	1/55 (1.82%)
Wound infection	1/55 (1.82%)
Haemorrage	2/55 (3.64%)
Incisional Hernia	0/55 (0%)
POSTOPERATIVE hospitalization (days)	
Mean (SD)	6.76 (1.12)
Median	7
Range	5-9
Hospital 30-day readmission	1/55 (1.82%)
Intraoperative mortality	0/55 (0%)
Postoperative 30-day mortality	0/55 (0%)

Table III - *Pathological outcomes.*

PATHOLOGICAL stage	
Polyps (confirmed severe dysplasia)	2/55
0	5/55
I	10/55
II	16/55
III	19/55
IV	3/55
TUMOR differentiation	
GX: grade cannot be determined	4/55
G1: well differentiated	8/55
G2: moderately differentiated	19/55
G3: poorly differentiated	20/55
G4: undifferentiated	4/55
Harvested lymph nodes (median, range)	
Mean (SD)	25.20 (7.44)
Median	24
Range	15-45
Upstaging	
Severe dysplasia to p0 Stage	2
cII Stage to pIII Stage	6
cIII Stage to pIV Stage	2

Discussion and Comments

The use of laparoscopic surgery is increasing everywhere, and many patients undergo this type of approach for the treatment of colorectal cancer. Laparoscopic colorectal surgery compared to open surgery has numerous advantages: reduced blood loss, less pain, earlier return of bowel function, better aesthetic effects, reduced length of stay and its costs. However, these advantages do not compromise the quality of oncological resection and nodal yield in any way [7-10]. Generally, for right colon cancer surgery, the approach chosen by colorectal surgeons is a standard laparoscopic right hemicolectomy (LRH), but there is no real gold standard technique for LRH and several techniques are described in the literature [11,12,6]. Heald et al [13,14] introducing the concept of total mesorectal excision (TME) in rectal cancer surgery, this has revolutionized the oncological results for this disease. Heald's concept states that the rectal tumour is dissected in the plane between the embryologic mesorectal and parietal fascia (Holy Plane). In this manner the tumor is removed in a fascial and peritoneal lined envelope that also contains the draining lymphatic vessels, lymph nodes and blood vessels that could be responsible for its spread, hence minimizing local recurrence rates and improving survival. Borrowing this thesis Hohenberger [5] proposed to perform a complete mesocolic excision (CME) with central vascular ligation (CVL) in colon cancer resection. He showed that his technique, especially perfected in the last study period, yields excellent disease-specific survival (from 82.1% to 89.1%) and low local recurrence rates (from 6.5% to 3.6%). The study also showed that a higher lymph node count was significantly associated with better survival in patients with node-negative disease, results confirmed by Bokey et al [15] in 2003. The idea behind CME is that by resecting the tumor with clear margins and in an intact mesocolic envelope, it will minimize the chance of left behind a residual metastatic tumour. CME also

ensures that lymph node harvest is maximized. Overall, the CME technique seeks to minimize local recurrence and increase survivability. We have imported these purposes into our surgical technique for the resection of right colon cancers, adopting the concepts of CME and CVL with an up to down dissection approach. The up to down technique is relative recently described, Levard et al [6] claim that the standard procedure for laparoscopic right hemicolectomy can be complicated, mostly, when the right mesocolon is strongly affixed posteriorly or broad and short, making the identification of the vessels somewhat difficult. Anatomical variations are frequent, and therefore following the dissection from up to down renders the identification of vessels much simpler. This approach allows a complete dissection of the colon with better exposure of anatomic planes [16] and the mesocolic excision with an outstanding number of harvested lymph nodes [17,18]. In our case series we found no differences compared to other laparoscopic techniques neither in terms of operating time nor in blood loss, as well as for postoperative complications (a single anastomotic dehiscence) and mortality. No conversions have occurred in open surgery. These outcomes compare favorably with other studies on standard right hemicolectomy and are equivalent to studies on the CME right hemicolectomy from Western and Eastern countries [19-28]. We found a very high number of removed lymph nodes (mean: 25.20, range: 15-45) and this allowed a pathological upstaging of the disease. 6 patients who prior to surgery were classified as stage II at pathological verification were found to be in stage III, and 2 other patients in clinical stage III were found to be in pathological stage IV. In addition, 2 patients with endoscopically unresectable polyps and clinical diagnosis of severe dysplasia after histological analysis were included in stage 0, but this depended on the pT. As everyone knows, one of the most important predictive factors in colorectal cancer is the involvement of lymph nodes. The presence of lymph node metastasis determines patients to receive adjuvant chemotherapy and predict outcomes related to disease-free and overall survival. Small amount of removed lymph nodes may influence on the underestimation of cancer stage. Recent studies outcomes suggest that survival rate improves when more lymph nodes are gathered, regardless of current node status [29,30]. A lymphadenectomy, including pericolic, intermediate, and main node dissection, is underline by surgeons as an important issue for accurate staging and therapy with the best oncological outcomes. In our opinion, the upstaging we obtained is also due to the surgical technique performed and consequently to the high number of lymph nodes removed. Regarding the low percentage of anastomotic dehiscence observed, our team is equipped with high surgical and laparoscopic skills acquired through a long experience. Most surgeons performing laparoscopic right colectomy use the extracorporeal anastomosis technique because the intracorporeal one is considered more technically demanding. In fact, intracorporeal anastomosis requires advanced laparoscopic skills and a long learning curve. It is indeed demonstrated that the ability in performing intracorporeal suture improves with training [31]. Some authors like us emphasize the superiority of intracorporeal anastomosis in laparoscopic right hemicolectomy in terms of reduced short-term morbidity, decreased length of hospital stay and faster recovery [32,33]. Furthermore, we recommend the use of indocyanine green to check the vitality of the anastomotic stumps. Unfortunately, the technology needed for fluorescence-guided surgery is not available in all surgical departments, for about 2 years this technology has been present in our department and we believe that in the near future it will represent a cornerstone not only for colorectal surgery [34,35].

Conclusions

Our study shows that the application of laparoscopic CME and CVL with an up to down dissection for the treatment of right colon cancer, performed by expert surgeons, is a safe and feasible technique. This procedure allows the mesocolon excision with outstanding number of harvested lymph nodes, ensuring low complications and better oncological cleaning. However, due to the short follow-up, no definite conclusions can be drawn with regard to long-term survival and disease-free outcomes, but these data can be a good starting point for further evaluations.

Riassunto

Molte tecniche laparoscopiche sono state descritte per il trattamento del cancro del colon destro. Lo scopo di questo studio è quello di comunicare la nostra esperienza nel trattamento totalmente laparoscopico del cancro del colon destro e di riportare i nostri risultati a breve termine al fine di confermare la fattibilità e la sicurezza di questa procedura impegnativa.

Da novembre 2017 ad aprile 2020 abbiamo eseguito 384 interventi chirurgici per tumori del colon-retto, 81 di questi hanno coinvolto tumori del colon destro in condizioni di urgenza ed in elezione. In quest'ultimo scenario 55 sono state le emicolectomie destre con approccio totalmente laparoscopico eseguite, e tutte dallo stesso team chirurgico.

Durante il periodo di studio abbiamo valutato le complicanze intra e postoperatorie in termini di: dati demografici e caratteristiche cliniche preoperatorie, esiti intraoperatori e postoperatori (tempo operatorio, perdita di sangue, tasso di conversione, complicanze chirurgiche, ospedalizzazione, riammissione e mortalità), esiti patologici.

La nostra esperienza conferma che l'approccio totalmente laparoscopico, con dissezione dall'alto verso il basso, per

il trattamento del cancro del colon destro, eseguito da chirurghi esperti è una tecnica sicura e fattibile.
Questa procedura consente l'escissione del mesocolon con un numero elevato di linfonodi asportati, garantendo basse complicanze e un migliore risultato oncologico.

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