Outcomes of Single Port Laparoscopy in Colorectal Surgery

Thesis
Submitted for partial fulfillment of the MD degree in
General Surgery

By
Mohammed Abd El-Aty Mansour
M.B., B.Ch; M.Sc.
Faculty of Medicine, Ain Shams University

Under Supervision of

Prof. Dr./ Ahmed Abdel Aziz Abou-Zaid
Professor of General Surgery
Faculty of medicine, Ain Shams University

Dr./ Essam Fakhry Ebied
Lecturer of General Surgery
Faculty of medicine, Ain Shams University

Dr./ Tarek Youssef Ahmed
Lecturer of General Surgery
Faculty of medicine, Ain Shams University

Faculty of medicine
Ain Shams University
2014

Acknowledgement

*First and foremost I thank "**ALLAH**" to whom I relate any success in achieving any work in my life.*

*I would like to express my deep appreciation to **Prof. Dr./ Ahmed Abdel Aziz Abou-Zaid,** Professor of General Surgery, Faculty of medicine, Ain Shams University for his precious help, moral support, fruitful advice and kind attitude. I really have the honor to complete this work under his supervision.*

*I'm immensely indebted and deeply grateful to **Dr./ Essam Fakhry Ebied,** Lecturer of General Surgery, Faculty of medicine, Ain Shams University for his great encouragement, excellent guidance, powerful support, valuable constructer advices and generous help throughout this work.*

*I would like to express my great and deep appreciation to **Dr./ Tarek Youssef Ahmed,** Lecturer of General Surgery, Faculty of medicine, Ain Shams University who gave me the honor of working under his supervision. He was kind to offer me much of his valuable time and advice.*

List of Abbreviations

BMI	: Body mass index
CA	: California
CC	: Cubic centimeter
CLASICC	: Conventional vs laparoscopic-assisted surgery in colorectal cancer
CLS	: Conventional laparoscopic surgery
CM	: Centimeter
CO2	: Carbon di-oxide
COST	: Clinical outcomes of surgical therapy
CT	: Computed tomography
DVT	: Deep venous thrombosis
E-NOTES	: Embryonic natural orifice transluminal endoscopic surgery
HRS	: Hours
IV	: Intravenous
LESS	: Laparoscopic endoscopic single site
mm	: Millimeter
MRI	: Magnetic resonance imaging
NOTES	: Natural orifice transluminal endoscopic surgery
NOTUS	: Natural orifice transumbilical surgery
OPUS	: One port umbilical surgery
PDS	: Polydioxanone suture
QOL	: Quality of life
SILS	: Single incision laparoscopic surgery
SPA	: Single-port access
SPICES	: Single-port incisionless conventional equipment utilizing surgery
SPL	: Single port laparoscopy
SPLS	: Single port laparoscopic surgery
SPT	: Single-port technique
TED	: Thromboembolism deterrent
TM	: Trade mark
TME	: Total mesorectal excision
TUE	: Trans umbilical endoscopic surgery
USA	: United states of America

Contents

List of Figures

List of Tables

Tab. No.	*Title*	*Page*

Introduction

Laparoscopic surgery has spread quickly during the past twenty years ***(Bittner, 2006)***. The widespread adoption of laparoscopic procedures has occurred since 1987. Initially used in patients with benign disease, laparoscopy has taken on an increasingly larger role in surgery for both benign and malignant indications. In 1997, the mini-laparoscopic cholecystectomy was introduced to further reduce the extent of surgical wounds ***(Yuan et al., 1997)***.

More recently, natural orifice transluminal endoscopic surgery (NOTES) has gained much interest as a step towards an even less invasive procedure. In both animal and human models, this procedure has shown some success, but it certainly has limitations due to current technology ***(Perretta et al., 2008 and Fan et al., 2009)***. NOTES surgery currently has a number of instrumental limitations (still under development): the difficulty of triangulation for certain technical manoeuvres, surgical specimen size and access routes. Although some published results have been acceptable ***(Lacy et al., 2008)***, it is technically difficult and not very reproducible, which limits the progress of the technology and its standardization ***(Remzi et al., 2008; Brunner et al., 2009; Leroy et al., 2009 and Rieger et al., 2010)***.

Against this background, single-incision laparoscopic surgery (SILS) is a rapidly evolving field to overcome these

limitations and has emerged as a more feasible, minimally invasive approach ***(Perretta et al., 2008)***. In the past decade, single-port laparoscopic surgery has been reported for a number of surgical interventions, including appendectomies, cholecystectomies, and gynecologic procedures ***(Boruta et al., 2011 and Marks et al., 2011)***.

Proposed advantages of single-incision laparoscopic surgery include improved cosmesis, less incisional pain, less incisions with their potential problems as hernia and port site tumour implantation, and easy conversion to a traditional multi-port laparoscopic technique when needed ***(Perreta et al., 2008)***.

The real challenge of SILS is to avoid conflict between the operative instruments and the camera, to maintain the pneumo-peritoneum and reduce operative stress ***(Gumbs et al., 2009)***.

We believe that the single-port approach for the management of colorectal disease is another option in the laparoscopic approach, as are robotic surgery and the natural orifice approach. It reduces the complications inherent in additional ports with the conventional technique ***(Bucher et al., 2008)***.

It is reproducible for surgeons familiar with laparoscopic surgical anatomy and the learning curve depends on getting used to the device and handling the

forceps in different planes. We think its future lies at a point where there is less invasion, increased oncological and technical safety using single-port approach devices and robotic surgery, which are currently being developed on an experimental basis ***(Bucher et al., 2008)***.

As in any new surgery, placing and locating the single port will be technically more difficult in the first cases. Triangulation is feasible, however, one has to get used to working in a different horizontal plane with each hand so as not to strike the instruments outside the abdomen. The same situation occurred when an assistant had to introduce a third clamp through the fourth trocar. Another useful recommendation is to remove the camera from the operating field with the use of integrated or long optics to minimise contact with the instruments ***(Remzi et al., 2008)***.

In our study we will report our experience with thirty (30) patients who will undergo single-incision laparoscopic colorectal surgery.

Aim of the Study

A prospective study to find out single port access technique tips and tricks in colorectal disease, as regards its suitability, reliability, safety and reproducibility of the technique.

Review of Literature

Anatomical background

Colon

The colon is approximately five feet (1.5 meters) in length, begins at the ileocecal valve, and ends at the rectosigmoid junction. Arterial blood supply to the colon from cecum to splenic flexure is through the superior mesenteric artery which gives rise to the ileocolic, right colic, and middle colic arteries. The left and sigmoid colon is supplied by the inferior mesenteric artery which gives rise to the left colic and sigmoidal arteries. There can be several anatomic variations in the colic arteries including absent iddle colic artery, absent right colic artery, common trunk for right and ileocolic artery, and the presence of an Arc of Riolan between the middle and left colic artery ***(Netter, 2001).***

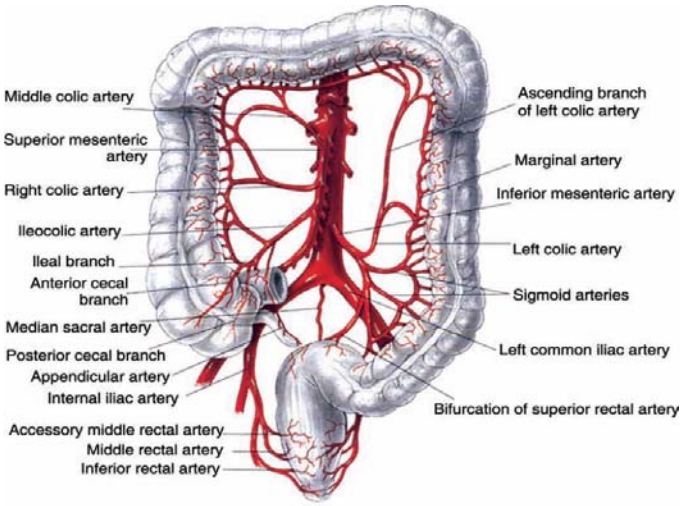

Figure (1): Arterial blood supply to the colon ***(Nivatvongs and Philip, 2007).***

Veins of the colon follow the arteries. On the right (the cecum, ascending colon, and right transverse colon), the veins join to form the superior mesenteric vein. Drainage from the left portion of the transverse colon enters the superior mesenteric vein. The superior rectal vein drains the descending and sigmoid colons; it passes upward to form the inferior mesenteric vein. ***(Santhat and Philip, 2007).***

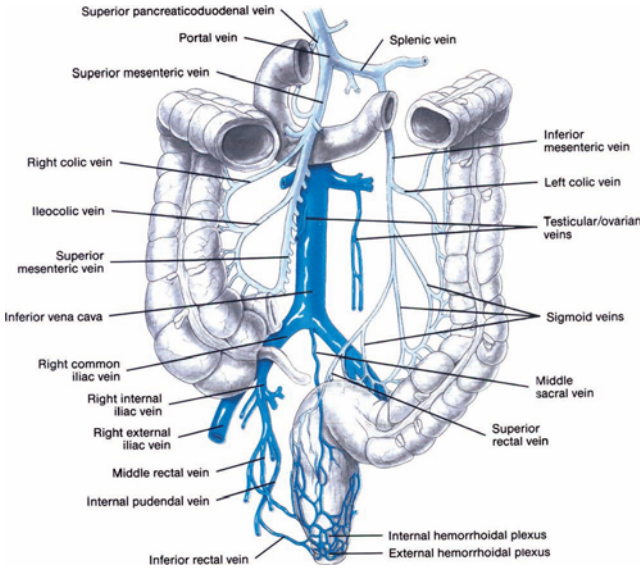

Figure (2): Venous drainage of the colon and rectum Santhat ***(Nivatvongs and Philip, 2007).***

The colonic wall histologically from lumen outward consists of:

(1) A simple columnar epithelium which forms crypts,

(2) Lamina propria,

(3) Muscularis mucosa,
(4) Submucosa,
(5) Muscularis propria formed by an inner circular and outer longitudinal layer of smooth muscle, and
(6) Serosa

(Keighley and Williams, 2001).

The typical colonic malignancy is an adenocarcinoma. Once the neoplastic epithelial cells penetrate the muscularis mucosa and into the submucosa, a malignant (the ability to metastasize) adenocarcinoma is formed. The mainstay for treatment is operative resection of the involved colonic segment along with the draining lymph nodes located in the mesentery. Neoplastic cells confined by the muscularis mucosa are termed carcinoma-in-situ or severe dysplasia and are not as yet malignant thereby typically eliminating the need for segmental colonic resection ***(Gordon and Nivatvongs, 1992).***

The outer longitudinal smooth muscle of the colon thickens in three locations called tenia coli. The rectosigmoid junction is the point at which the three tenia fan out and form a complete outer longitudinal layer. This anatomic point has clinical significance. Carcinomas proximal to this point are colonic; whereas distal tumors are rectal and as such may

benefit from adjuvant radiation therapy. Likewise, operative resection for classic sigmoid diverticular disease should include the rectosigmoid junction with the anastomosis located at the upper rectum ***(Keighley and Williams, 2001).***

The function of the colon is (1) absorption of water and electrolytes, and (2) propulsion and storage of unabsorbed fecal waste for evacuation. Approximately one liter of fluid chyme enters the cecum each day with an average of only 100cc excreted in the feces. Parasympathetc innervation by preganglionic vagal fibers and pelvic fibers result in colonic motility. Sympathetic innervation by the superior mesenteric plexus, inferior mesenteric plexus, and the hypogastric plexus inhibits colonic motility. It appears that the major control of motility depends on the colonic wall intrinsic plexus (myenteric or Auerbach's/submucous or Meissner's). An absence of intrinsic plexuses occurs in Hirschsprung's Disease resulting in tonic wall contraction and functional obstruction ***(Rassmussen, 1994).***

Disorders of colonic motility including irritable bowel syndrome, slow-transit constipation, colonic pseudo-obstruction, and post-operative ileus are poorly understood but may represent an imbalance in this autonomic imput to the smooth muscle wall of the colon. Normal colon transit