Single Port Laparoscopic Surgery versus Conventional Laparoscopic Surgery

Thesis Submitted for Partial Fulfillment of Master Degree

In General Surgery

By

Ahmed Mohammed Abd EL Salam Mohammed (M.B.B.CH)

Supervised by

Prof. Dr. Medhat Mahmoud Assem

Professor of general surgery

Faculty of medicine

Cairo University

Prof. Dr. Ahmed Farag Ahmed Farag

Professor of general surgery

Faculty of medicine

Cairo University

Abstract

The main advantages of laparoscopy were decreased pain, faster recovery, shorter hospital stay and possibly reduced immunosuppresion.

The excitement to develop new techniques, to improve cosmesis and hasten recovery has given rise to the natural orifice transluminal endoscopic surgery (NOTES), and more recently to single incision laparoscopic surgery (SILS). The initial applications of SILS in gastrointestinal surgery were appendicectomy and cholecystectomy, but then it became involved in almost all abdominal surgeries.

Conventional laparoscopic colorectal surgery is itself a challenge to surgeons as it involves laparoscopic mobilization of colon over a wide area, intracorporeal division of major vessels, extraction of specimen and a bowel anastomosis. There is a steep learning curve to achieve advanced laparoscopic skills, and specialized equipment is required.

SILS is further more technically difficult. Externally, the handling of both straight instruments in parallel with the laparoscope through a small single incision decreases the freedom of motion for the surgeon and complicates the holding of the laparoscope for the assistant.

Key Words:

Laparoscopy in different colonic diseases - Single Port Laparoscopic Surgery .

Contents

List of Figures:

List of tables

Introduction

Introduction:

For many years, large incisions were required to perform abdominal surgical procedures. Although effective, multiple morbidities were associated with this method, including postoperative pain, wound infection, incisional hernia, and prolonged hospitalization. The current rate of wound infection is 2 to 25 percent, and occurrence of incisional hernia is 4 to 18 percent in US patients ***(Boni et al., 2006; McGee et al., 2006).***

Some surgeons' perceptions are that complications and morbidities were associated with the size and extent of the incision led them to minimize their incision length. Laparoscopy, prevalent in gynecologic surgery for many years, was widely introduced to the general surgical domain with laparoscopic cholecystectomy more than 20 years ago. By making much smaller incisions that were protected by a port, there was a great reduction in incision-related complications ***(Hockberger & Lamade 2005; Vitale et al., 2005).***

There was faster postoperative recovery, pain reduction, less need for narcotics, respiratory function improvement, decrease in infection and hernias, and better overall cosmesis ***(Calland et al., 2001; Sauerland et al., 2004; Kapischke et al., 2006).***

Single-incision laparoscopic surgery (SILS) aims to eliminate multiple port incisions. Published complications, morbidity, and hospital length of stay are comparable to conventional laparoscopy and provide excellent cosmetic results and morbidity seems similar to conventional laparoscopy ***(Forghi et al., 2010).***

Aim of work:

The aim of the study is to compare between Single port laparoscopic surgery and conventional laparoscopic surgery as regards feasibility, post operative pain, costs, recovery and cosmesis.

Review of Literature

Anatomy

The colon differs from the small bowel in that it is characterized by a saccular or haustral appearance, it contains three taenia bands, and it has appendices epiploicae, a series of fatty appendages located on the antimesenteric surface of the colon. The taenia bands are longitudinal muscle running along the colon from the base of the appendix. They merge in the distal sigmoid colon, where the longitudinal fibers continue through the entire length of the rectum. A study by ***(Fraser et al., 1981)*** has shown that the longitudinal muscle forms a complete coat around the colon but is much thicker at the taeniae. The three taenia bands are named according to their relation to the transverse colon: taenia mesocolica, which is attached to the mesocolon; taenia omentalis, which is attached to the greater omentum; and taenia libera, which has no attachment. These bands are about one sixth shorter than the intestine and are believed to be responsible for the sacculations ***(Morson & Dawson, 1972)***.

Histology

In many situations, an accurate diagnosis of "normal colonic mucosa" is essential in understanding the various disease processes. This is especially true in the case of neoplasia, where the depth of penetration will dictate the treatment recommendation. Therefore it is essential to examine histologic features ***(Levine and Haggitt, 1992).***

The innermost layer is the mucosa, which is composed of three divisions. The first is a layer of columnar epithelial cells with a series of crevices or crypts characterized by straight tubules that lie parallel and close to one another and do not branch (glands of Lieberkuhn). The surface epithelium around the openings of the crypts consists of simple columnar cells with occasional goblet cells. The tubules are lined predominantly by goblet cells, except at the base of the crypts where undifferentiated cells as well as enterochromaffin and amine precursor uptake and decarboxylation (APUD) cells are found. The epithelial layer is separated from the underlying connective tissue by an extracellular membrane composed of glycopolysaccharides and seen as the lamina densa of the basement membrane when viewed by electron microscopy ***(Frei, 1978).***

Abnormalities classified as defects, multilayering, or other structural abnormalities have been reported in many types of neoplasms, including those of the colon and rectum. These abnormalities are more common in malignant than in benign neoplasms. The second division of the mucosa is the lamina propria, composed of a stroma of connective tissue containing capillaries, inflammatory cells, and lymphoid follicles that are more prominent in young persons ***(Frei et al, 1978).***

The third division is the muscularis mucosa, a fine sheet of smooth muscle fibers that serves as a critical demarcation in the diagnosis of invasive carcinoma and includes a network of lymphatics. Beneath the muscularis mucosa is the submucosa, a layer of connective tissue and collagen that contains vessels, lymphatics, and Meissner's plexus. It is the strongest layer of the bowel ***(Fenoglio et al, 1973).***

The next layer is the circular muscle, which is a continuous sheath around the bowel, including both the colon and the rectum. On the external surface of the circular muscle are clusters of ganglion cells and their ramifications; these make up the myenteric plexus of Auerbach ***(Fenoglio et al, 1973).***

Arterial supply to the colon

Superior Mesenteric Artery (Fig.1)

The superior mesenteric artery originates from the aorta crossing the uncinate process of the pancreas at L-1, supplying the cecum, appendix, ascending colon, and most of the transverse colon (Fig. 1). Additionally, the superior mesenteric artery supplies the entire small bowel, the pancreas, and occasionally the liver. From its left side arises a series of 12 to 20 jejunal and ileal branches. From its right side arise the colic branches: middle, right, and ileocolic arteries. The ileocolic is the most constant of these vessels, being present in all 600 specimens studied by Sonneland and coworkers ***(Sonneland et al 1958; Marcio & Jorge, 2005).***

The ileocolic artery bifurcates into a superior or ascending branch, which communicates with the descending branch of the right colic artery, and an inferior or descending branch, which gives off the anterior cecal, posterior cecal, and appendicular divisions. The right colic artery may also arise from the ileocolic or middle colic arteries; it is absent in 2% to 18% of specimens. This vessel supplies the ascending colon and hepatic flexure through its ascending and descending branches, both of which join with neighboring vessels to contribute to the marginal artery ***(Michels et al., 1963).***

The middle colic artery is the highest of the three colic branches of the superior mesenteric artery, arising close to the inferior border of the pancreas. Its right branch supplies the right transverse colon and hepatic flexure, anastomosing with the ascending branch of the right colic artery. Its left branch supplies the distal half of the transverse colon. Anatomic variations of this artery include absence in 4% to 20% of cases and the presence of an accessory middle colic artery in 10%; the middle colic artery is the main supply to the splenic flexure in about one third of individuals ***(Marcio & Jorge, 2005).***

Inferior Mesenteric Artery

The inferior mesenteric artery arises from the abdominal aorta approximately 3–4 cm above the aortic bifurcation, about 10cm above the sacral promontory, or 3– 4 cm below the third part of the duodenum ***(Griffiths, 1956).***

The length of the artery prior to its first branch varies from 1.5 cm to 9.0 cm ***(Michels et al., 1963).***

The branches of the inferior mesenteric artery are the left colic artery, with its ascending and descending branches for the descending colon, 1 to 9 sigmoid arteries for the sigmoid colon, and the superior rectal (hemorrhoidal) artery for the rectum. An accessory middle colic artery is present in about 38 percent of subjects ***(Skandalakis et al., 2004).***

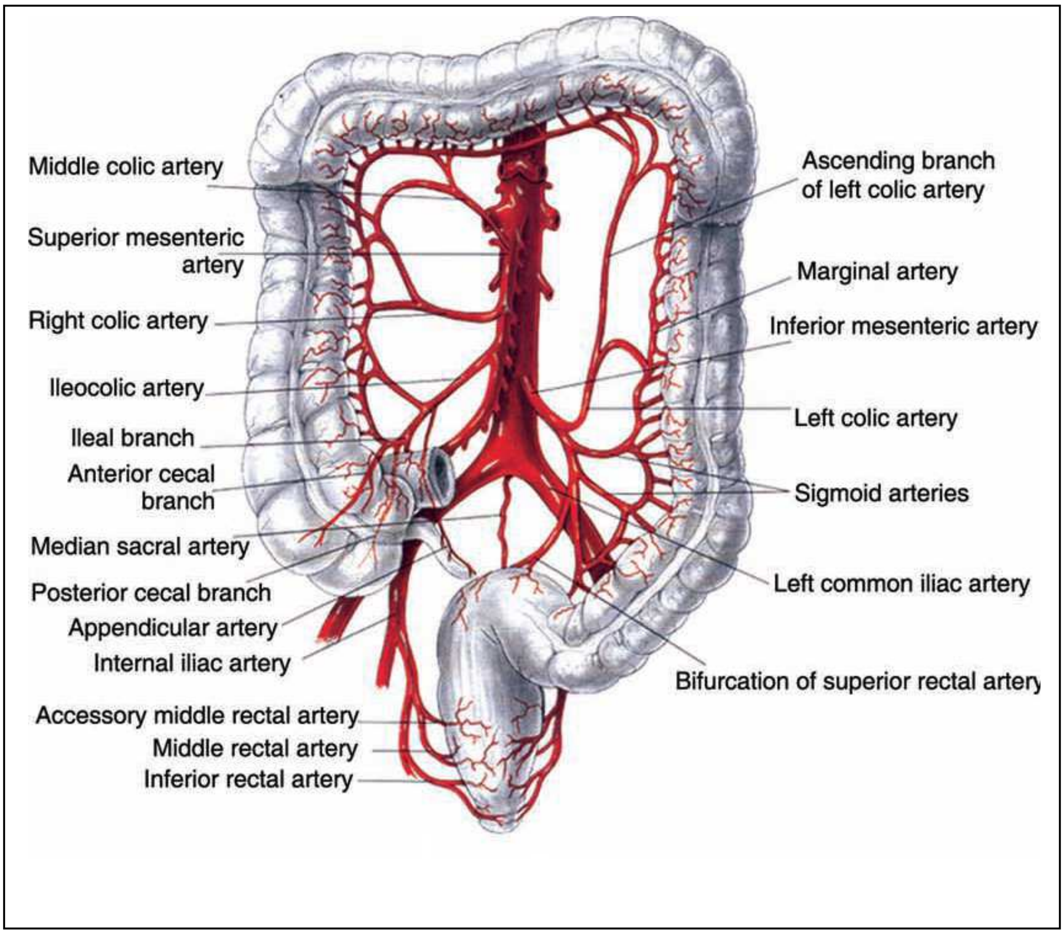

Figure 1: Arterial blood supply of the colon
Source: Nivatvongs and Philip, 2007

Absent left colic artery has been reported by Sonneland, et al. in 1958 ***(Sonneland et al., 1958)***

An intact left colic artery, including its collaterals at the splenic flexure, will supply sufficient blood to the proximal ascending colon after central ligation of the middle and right colic artery ***(Furst et al., 2000).***

Dworkin and Allen-Mersh found that the significant blood flow reduction after ligation of the inferior and distal mesenteric arteries supports the hypothesis that anastomotic leakage after restorative rectal excision may result from ischemia associated with inadequate blood flow in the marginal artery-dependent sigmoid colon. Improvement in inadequate intraoperative colonic perfusion from increased collateral circulation is unlikely to develop in the marginal-artery dependent colon during the first five postoperative days ***(Dworkin & Allen-Mersh, 1996).***

Poor bowel function after low anterior resection is associated with high ligation of the inferior mesenteric artery and injury to the pelvic autonomic nerve, and urged less aggressive surgery. Poor bowel function after sigmoid colectomy was correlated with length of the resected colon ***(Adachi et al., 2000).***

Blood supply of the rectum

Superior rectal artery

The superior rectal artery starts at the last branch of the sigmoid artery. It lies posterior to the right of the sigmoid colon, coming in close contact with the posterior aspect of the bowel at the rectosigmoid junction. It forms a rectosigmoid branch, an upper rectal branch, and then divides into left and right terminal branches ***(Ayoub, 1978).***

The rectosigmoid branch arises at the rectosigmoid junction and divides directly into two diverging branches. One ascends to the sigmoid colon and anastomoses with branches of the last sigmoid artery, and the other descends to