Surgical management of colorectal polyps

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List of abbreviations

ACPGBI	**:**	Association of Coloproctology of Great Britain and Ireland
ADR	**:**	adenoma detection rate
AFI	**:**	Autofluorescence imaging
APC	**:**	argon plasma coagulation
APER	**:**	abdominoperineal excision of the rectum
ASA	**:**	American Society of Anesthesiology
BSG/ACP	**:**	British Society of Gastroenterology/Association of Coloproctology
CEA	**:**	carcinoembryonic antigen
CLE	**:**	confocal laser endoscopy
ESD	**:**	Endoscopic submucosal dissection
FAP	**:**	familial adenomatous polyposis
HES	**:**	Hospital Episode Statistics
HNPCC	**:**	hereditary nonpolyposis colorectal cancer
LST	**:**	lateral spreading tumour
MBI	**:**	multiband imaging
MR	**:**	magnetic resonance
mRNA	**:**	messenger RNA
MSTF	**:**	Multi Society Task Force
NBI	**:**	Narrow band imaging
NHS	**:**	National Health Service
NSAIDs	**:**	nonsteroidal anti-inflammatory drugs
PET	**:**	positron emission tomography
POSS	**:**	Physiological and Operative Severity Score
TEMS	**:**	Transanal endoscopic microsurgery
TME	**:**	total mesorectal excision
WLC	**:**	white light colonoscopy
WLE	**:**	White light examination

Introduction

Colorectal polyps are slow-growing overgrowths of the colonic mucosa that carry a small risk (< 1%) of becoming malignant. However, because colorectal polyps are highly prevalent in the general population (especially with increasing age), they confer an important predisposition to colon cancer and are therefore removed when detected **(Nishihara et al., 2013)**.

Colorectal polyps are not usually associated with symptoms. When they occur, symptoms include rectal bleeding, bloody stools, abdominal pain and fatigue. A change in bowel habits may occur including constipation and diarrhoea. Occasionally, if a polyp is big enough to cause a bowel obstruction, there may be nausea, vomiting and severe constipation **(Kumar, 2010)**.

The management of a malignant polyp following endoscopic removal is difficult because the possibility of residual malignant cells within the bowel wall or positive regional lymph nodes varies from patient to patient, depending on a number of prognostic factors. The evidence base for management of these lesions is poor and is mostly based on data from symptomatic patients. Advising patients on the course of action after removal is difficult. It includes surveillance only, where the risk of residual disease is deemed to be low, or major surgical resection for those with a higher risk. However, the level of risk is often difficult to calculate **(Logan et al., 2012)**.

Aim of the work

The aim of this work is to report the etiology, risk factors, clinical progression and types of colorectal polyps and demonstrate the recent surgical modalities in treatment of colorectal polyps.

Anatomy and embryology of colon and rectum

The large intestine is the second-to-last part of the digestive system. Its function is to absorb water from the remaining indigestible food matter, and then to pass useless waste material from the body. It consists of the cecum and colon. It starts in the right iliac region of the pelvis, just at or below the right waist, where it is joined to the bottom end of the small intestine. From here, it continues up the abdomen, then across the width of the abdominal cavity, and then it turns down, continuing to its endpoint at the anus. The large intestine is about 1.5 metres (4.9 feet) long, which is about one-fifth of the whole length of the intestinal canal **(Maton et al., 1993)**.

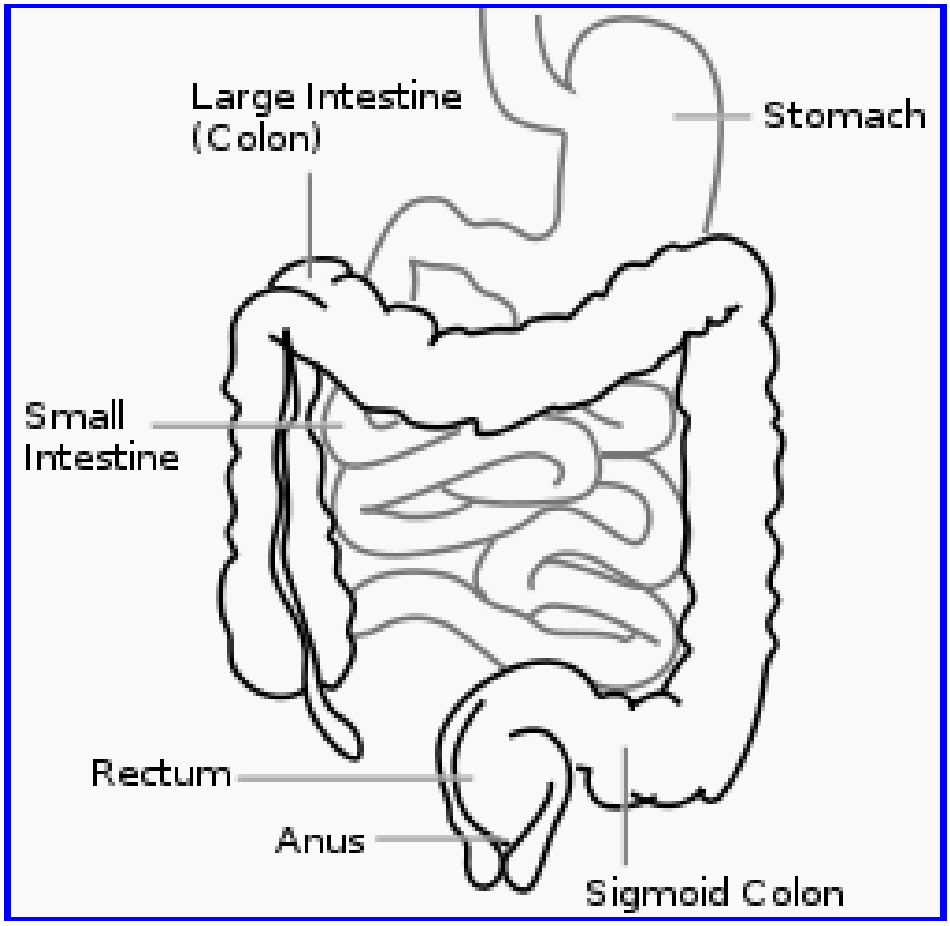

Figure (1): Front of abdomen, showing the large intestine, with the stomach and small intestine in gray outline **(Maton et al., 1993)**.

Colon:

The ascending colon extends up from the cecum at the level of the ileocecal valve to the bend in the colon called the hepatic flexure, which is located beneath and behind the right lobe of the liver; behind, it is in contact with the rear abdominal wall and the right kidney. The ascending colon is covered by peritoneum except on its posterior surface **(Maton et al., 1993)**.

The transverse colon is variable in position, depending largely on the distention of the stomach, but usually is located in the subcostal plane; that is, at the level of the 10th rib. On the left side of the abdomen it ascends to the bend called the splenic flexure, which may make an indentation in the spleen. The transverse colon is bound to the diaphragm opposite the 11^{th} rib by a fold of peritoneum **(Maton et al., 1993)**.

The descending colon passes down and in front of the left kidney and the left side of the posterior abdominal wall to the iliac crest, the upper border of the hip bone. The descending colon is more likely than the ascending colon to be surrounded by peritoneum **(Farr, 2011)**.

The sigmoid colon is commonly divided into iliac and pelvic parts. The iliac colon stretches from the crest of the ilium, or upper border of the hip bone, to the inner border of the psoas muscle, which lies in the left iliac fossa. Like the descending colon, the iliac colon is usually covered by peritoneum. The pelvic colon lies in the true pelvis (lower part of the pelvis) and forms one or two loops, reaching across to the right side of the pelvis and then bending back and, at the midline, turning sharply downward to the point where it becomes the rectum **(Farr, 2011)**.

Rectum:

The rectum is 15- to 20-cm long and can be divided into three parts: the upper, middle, and lower rectum. From anal verge, these three parts are defined as follows: the lower rectum, 0 to 6 cm; the middle rectum, 7 to 11 cm; and the upper rectum, 12 to 15 cm **(Salerno et al., 2006)**.

Radiologically, the rectum extends from the anorectal ring to the sacral promontory as measured on a lateral radiograph **(Herold et al., 2008)**.

The rectum and anal canal are supplied by the superior rectal artery (the continuation of the inferior mesenteric artery), with assistance from the middle and inferior rectal arteries, and by the median sacral artery (figure 2) **(Robert et al., 2007)**.

The rectum is the terminal part of the large intestine. In adults, the rectum is in full continuity with the sigmoid colon at the level of S3 and ends at the anocutaneous line **(Godlewski and Prudhomme, 2000)**.

The rectum exhibits lateral curves, which correspond on the intraluminal aspect to Houston's valves. There are usually three: two on the left side (at 7 to 8 cm and 12 to 13 cm) and one at 9 to 11 cm on the right side. The middle valve, termed Kohlrausch's valve, is the most consistent (figure 3) **(Jorge and Wexner, 1997)**.

Anatomically, the sigmoid colon is differentiated from the rectum by the segmentation of the complete longitudinal muscle layer to form the taenia coli. Most parts of the rectum are extraperitoneal, although anteriorly the upper rectum is covered by a thin layer of visceral peritoneum around the front and sides down to the peritoneal reflection **(Heald and Moran, 1998)**.

The peritoneal reflection is normally found between 7 and 9 cm from the anal verge. In women it may be lower, at 7.5 to 5 cm from the anal verge **(Jorge and Wexner, 1997)**.

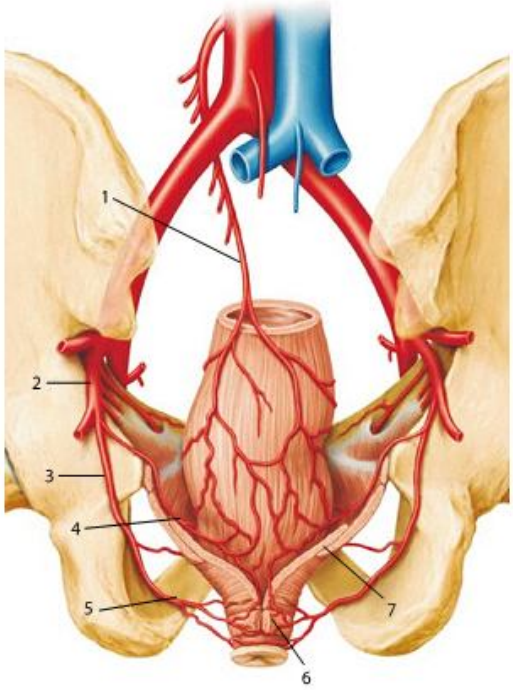

Figure (2): Blood supply of the rectum and anal canal

1. Superior rectal artery (from inferior mesenteric artery).
2. Internal iliac artery. **3.** Pudendal artery.
4. Medial rectal artery. **5.** Inferior rectal artery.
6. External anal sphincter. **7.** Levator ani muscle.

(Herold et al., 2008)

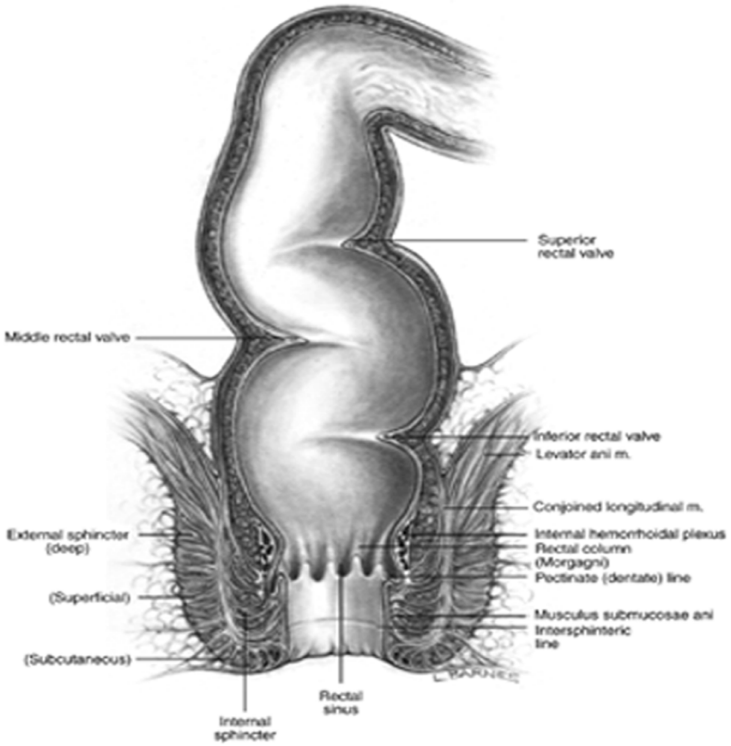

Figure (3): Anorectal anatomy illustrating curves and valves **(Corman, 2005)**

Blood supply:

The arterial blood supply to the large intestine is supplied by branches of the superior and inferior mesenteric arteries (both of which are branches of the abdominal aorta) and the hypogastric branch of the internal iliac (which supplies blood to the pelvic walls and viscera, the genital organs, the buttocks, and the inside of the thighs). The vessels form a continuous row of arches from which vessels arise to enter the large intestine. Venous blood is drained from the colon from branches that form venous arches similar to those of the arteries. These eventually drain into the superior and inferior mesenteric veins, which ultimately join with the splenic vein to form the portal vein. ***The innervation*** of the large intestine is similar to that of the small intestine **(Farr, 2011)**.

Embryology of the gut:

The complex arrangement of the peritoneum in the adult can best be appreciated by a brief consideration of the embryology of the gut. The embryonic gut is at an early satge suspended from the posterior abdominal wall by a median dorsal mesentery. The dorsal mesentery of the stomach region of the gut is called the dorsal mesogastrium, that of the duodenum the mesoduodenum, and the remainder forms the mesenteries of the small and large intestines.The dorsal pancreas grows into the mesoduodenum.The stomach is also attached to the septum transversum and anterior abdominal wall by a ventral mesogasrium which the liver subsequently develops.The ventral mesogastrium has a lower free

edge which passes from the umbilicus to the pylorus.When the liver develops in the latter becomes subdivided into the falceform ligament and lesser omentum. As stated below,the midgut loop is for a time situated in the extra-embryonic (umbilical) coelom. Its return to the abdominal cavity is accompanied by a rotation with a resulting modification of the attachment of the peritoneum **(Hamilton, 2009)**.

Mechanism of Rotation of the Gut

The midgut loop is at frist lying vertically in the extra-embryonic coelom with a proximal or cephalic limb continuous with the duodenum and stomach, and a distal or caudal limb continuous with the hindgut. The vitelline duct is attached to the apex of the loop. The superior mesenteric artery, which is continuous with the vitelline artery, lies in the mesentery of the midgut loop and forms the axis about which part of the intestine rotates. The loop rotates through 90° so that the proximal limb passes to the right side of the embryo and distal limb to the left. About the same time afusiform dilatation, the future caecum and appendix, appears near the attachment of the vitelline duct. The proximal limb grows more rapidly than the distal limb to form coils of gut which come to occupy the right side of the exra-embryonic coelom. The coils of the proximal (now the right) limb of the loop, return frist to the peritoneal cavity. Their return is accomplished fairly rapidly, while the coils of the distal (now the left) limb, probably because of the coecal dilatation, lag behind for a period. On re-entering the embryonic peritoneal cavity the coils of gut of the right limb undergo a further rotation around the axis of superior mesenteric

artery. The coils of the right limb passes from right to left behind the artery and fill the posterior part of the left and lower portions of the abdominal cavity, while those of the left limb. The coils of the small intestine on the left appear to force the caecum upwards. The caecum, at this stage lying in the right upper quadrant inclose contact with the liver, later decends; this coudal position. The caecum may remain high-the so called hepatic caecum **(Hamilton, 2009)**.

The position of the duodenal loop of the midgut, lying between the stomach and the remainder of the midgut loops, is affected by the returen of the intestine from the extra-embryonic coelom, and by the head of pancreas now comes into its adult position **(Hamilton, 2009)**.

Fixation of the Gut and Fusion of the Peritoneum

The mesenteries of some of those parts of the gut which come to lie against the posterior abdominal wall (that is, duodenum, ascending and descending colon) become fused with the posterior parietal peritoneum and then disappear.As a result, these regions of the gut are more or less fixed in a partially retroperitoneal position. The transverse colon, which crosses the abdominal cavity ventrally, retains its mesocolon which fuses with and is incorporated into the greater omentum adownward extension from the dorsal mesogastrium. The part of the hindgut which becomes the sigmoid colon retains its mesentery but that of the rectum is lost **(Hamilton, 2009)**.

Pathology of colorectal polyps

Colorectal polyps are slow-growing overgrowths of the colonic mucosa that carry a small risk (< 1%) of becoming malignant. However, because colorectal polyps are highly prevalent in the general population (especially with increasing age), they confer an important predisposition to colon cancer and are therefore removed when detected **(Nishihara et al., 2013)**.

Patients with isolated colorectal polyps are usually asymptomatic but can experience overt or occult colonic bleeding. Colorectal polyps can occur as part of inherited polyposis syndromes in which their number is greater and the risk for malignant progression is much greater compared to the risk with isolated colorectal polyps **(Kiesslich et al., 2007)**.

In the context of clinical studies of chemoprevention, efforts are being directed at suppressing colorectal polyp formation (eg, by use of sulindac) and/or at preventing their progression to colon cancer (eg, by use of aspirin) **(Kiesslich et al., 2007)**.

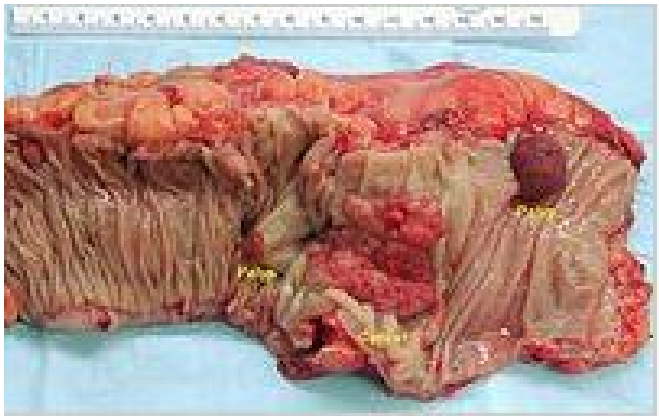

Figure (4): Gross appearance of a colectomy specimen containing two colorectal polyps and one invasive colorectal carcinoma **(Kiesslich et al., 2007)**