Introduction

Colorectal cancer is the third most common malignant disease and the second most frequent cause of cancer-related death in the western countries, with 145,290 new cases and 56,290 deaths occurred in 2005. Worldwide, colorectal cancer is the fourth most commonly diagnosed malignant disease, with an estimated 1,023,000 new cases and 529,000 deaths each year ***(Jemal et al., 2005).***

The past decade has brought great progress in our understanding of the environmental and genetic basis of this disease and in our ability to treat it successfully. Nowadays we are beginning to see the possibility of preventing or curing most colon and rectal cancers ***(Rozen et al., 2002).***

Factors associated with an increased risk of colorectal cancer include hereditary syndromes such as familial adenomatous polyposis, hereditary nonpolyposis colorectal cancer syndrome, dietary factors (diets high in fat or low in fiber, calcium, or both), obesity, low levels of physical activity, tobacco smoking, and a high alcohol intake. Although lifestyle choices may contribute to the risk of colorectal cancer, there is little evidence that a modification of lifestyle in adults will reduce this risk ***(Whitelock et al., 2008).***

There is considerable evidence that screening of asymptomatic persons who are at average risk can detect cancers at an early and curable stage, resulting in a reduction in mortality. Furthermore, some screening tests may also detect cancer-precursor lesions, which, if removed, may result in a reduced incidence of colorectal cancer. There are several different screening tests, each with advantages, limitations, complexity, and the associated risk complicate the process ***(Levin et al., 2008).***

Fecal screening tests can detect occult blood in small stool samples. These tests can be performed at home, are noninvasive, have a low initial cost, and require few specialized resources ***(Hundt et al., 2009).***

Barium enema examination accurately identifies late-stage cancer, but it is a poor test for important cancer-precursor lesions and is rarely used for colorectal-cancer screening today. Imaging with computed tomographic (CT) colonography renders two-dimensional and three-dimensional images of the colon and requires complete bowel preparation ***(Rockey et al., 2005).***

Colonoscopy is the final assessment step in every screening program for the detection of colorectal cancer. Several large cohort studies have shown the feasibility and safety of colonoscopy as a primary screening test. In case–control studies, colonoscopy is associated with reductions in the incidence of and mortality from colorectal cancer ***(Lieberman et al., 2000).***

Symptoms of colon cancer are numerous and nonspecific. They include fatigue, weakness, shortness of breath, change in bowel habits, narrow stools, diarrhea or constipation, red or dark blood in stool, weight loss, abdominal pain, cramps, or bloating. Other conditions such as irritable bowel syndrome (spastic colon), ulcerative colitis, Crohn's disease, diverticulosis, and peptic ulcer disease can have symptoms that mimic colorectal cancer ***(Hawk et al. , 2004).***

Pathological stage at the time of presentation remains the most important prognostic indicator in colorectal cancer. Although the original Dukes' staging system has been modified, the depth of disease invasion through the bowel wall and the extent of regional lymph-node involvement remain the core of the staging system. The tumor–node–metastasis (TNM) system of the American Joint Committee on Cancer is now the most commonly used system for staging colorectal cancer and serves as a benchmark for predicting the likelihood of five-year survival ***(Greene et al., 2002).***

The treatment depends on the staging of the cancer. When colorectal cancer is caught at early stages (with little spread) it can be curable. However, when it is detected at later stages (when distant metastases are present) it is less likely to be curable.

Surgery remains the primary treatment while chemotherapy and/or radiotherapy may be recommended according to patient's staging. Open colectomy, (sometimes called a hemicolectomy or segmental resection) removes part of the colon, as well as nearby lymph nodes. Laparoscopic-assisted colectomy is a minimally-invasive technique that can reduce the size of the incision and may reduce post-operative pain ***(Parker et al., 2005).***

Chemotherapy is used to reduce the likelihood of metastasis developing, shrink tumor size, or slow tumor growth. Chemotherapy is often applied after surgery (adjuvant), before surgery (neo-adjuvant), or as the primary therapy (palliative) ***(Andre et al., 2004).***

Radiotherapy is not used routinely in colon cancer, as it could lead to radiation enteritis, and it is difficult to target specific portions of the colon. It is more common for radiation to be used in rectal cancer, since the rectum does not move as much as the colon and is thus easier to target ***(Kapiteijn et al., 2001).***

Expandable metal stents have been approved by the Food and Drug Administration for the treatment of gastrointestinal obstruction due to cancer . There are specific clinical indications for which expandable metal stents may be beneficial in some advanced inoperable cases . Gastrointestinal stents are placed by gastroenterologists under endoscopic guidance or by interventional radiologists ***(Todd , 2001).***

Survival is directly related to detection and the type of cancer involved. Survival rates for early stage detection is about 5 times that of late stage cancers. CEA level is also directly related to the prognosis of disease, since its level correlates with the bulk of tumor tissue ***(Desch et al., 2005).***

Aim of the study

The aim of this study is to outline the pathology of different types of cancer colon , how to diagnose and new modalities of treatment whether surgical , laparoscopic , endoscopic or chemotherapy.

EMBRYOLOGY

The embryonic gastrointestinal tract begins developing during the fourth week of gestation. The primitive gut is derived from the endoderm and divided into three segments: foregut, midgut, and hindgut. Both midgut and hindgut contribute to the colon, rectum, and anus ***(Bullard and Rothenberger, 2007).***

The midgut develops into the small intestine, ascending colon, and proximal transverse colon, and receives blood supply from the superior mesenteric artery. During the sixth week of gestation, the midgut herniates out of the abdominal cavity, and then rotates 270 degrees counterclockwise around the superior mesenteric artery to return to its final position inside the abdominal cavity during the tenth week of gestation ***(Chang and Feig, 2006).***

The hindgut develops into the distal transverse colon, descending colon, rectum, and proximal anus, all of which receive their blood supply from the inferior mesenteric artery. During the sixth week of gestation, the distal-most end of the hindgut, the cloaca, is divided by the urorectal septum into the urogenital sinus and the rectum ***(Marcio and Jorg , 2005).***

The distal anal canal is derived from ectoderm and receives its blood supply from the internal pudendal artery. The dentate line divides the endodermal hindgut from the ectodermal distal anal canal ***(Bullard and Rothenberger , 2007).***

ANATOMY OF THE COLON

The colon and rectum constitute a tube of variable diameter about 150 cm in length. The terminal ileum empties into the cecum through a thickened, nipple-shaped invagination, the ileocecal valve. The cecum is a capacious sac-like segment of the proximal colon with an average diameter of 7.5 cm and length of 10 cm ***(Wolff and Larson, 2007).***

The colon extends from the end of the ileum to the rectum. The cecum, ascending colon, hepatic flexure, and proximal transverse colon comprise the right colon. The distal transverse colon, splenic flexure, descending colon, sigmoid colon, and rectosigmoid comprise the left colon.

The ascending and descending portions are fixed in the retroperitoneal space; the transverse colon and sigmoid colon are suspended in the peritoneal cavity by their mesocolons. The caliber of the lumen is greatest at the cecum and diminishes distally ***(George et al., 2003).***

1-THE CECUM AND APPENDIX

The cecum represents the beginning of the large bowel. The ileocecal valve is located in the posteromedial surface of the cecum, and is sustained in place by the superior and inferior ileocecal ligaments, which help maintain the angulation between the ileum and cecum, preventing cecal reflux. The appendix arises also from the posteromedial surface of the cecum approximately 3cm below the ileocecal valve. It ranges from 2 to 20 cm in length and, due to its mobility, can be in different positions: retrocecal (65%), pelvic (31%), subcecal (2.3%), preileal (1.0%), and postileal (0.4%) ***(Moreira and Steven , 2005).***

2-THE ASCENDING COLON

This is the first part of the colon, about 15 cm in length, extends upwards from the ileocecal junction to the right colic (hepatic) flexure. The latter lies on the inferolateral part of the anterior surface of the right kidney, in contact with the inferior surface of the liver. The ascending colon lies on the iliac fascia and the anterior layer of the lumber fascia. Its front and both sides possess a serous coat, which runs laterally into the paracolic gutter and medially into the right infracolic compartment. The original embryonic mesentery is retained in about 10 % of adults ***(Chummy, 2006).***

3-THE HEPATIC FLEXURE

As the colon ascends, it reaches the under surface of the right lobe of the liver, lateral to the gallbladder, where it angulates acutely medially, downward, and anteriorly to the hepatic flexure. This angle is supported by the nephrocolic ligament anterior to the right kidney, and covering the second part of the duodenum. The second portion of the duodenum and right kidney are exposed during mobilization of this flexure ***(Moreira and Steven , 2005).***

4-THE TRANSVERSE COLON

The transverse colon is the longest segment of the colon, very mobile, and enveloped by both layers of the transverse mesocolon attaching the posterosuperior border of the colon to the lower border of pancreas. Moreover, the posterior and inferior layers of the greater omentum are fused on the anterosuperior aspect of the transverse colon. A dissection between the omentum and the mesentery is required to mobilize the transverse colon ***(Moreira and Steven , 2005)***.

5-THE SPLENIC FLEXURE

The splenic flexure, the highest and deepest segment of the colon, is attached to the under surface of the diaphragm at the level of the 10^{th} and 11^{th} ribs by the phrenocolic ligament and represents the distal limit of the transverse colon. Some attachments of mesentery of appendices epiploicae to the splenic capsule make traction on the splenic flexure potentially dangerous. At the time of mobilization, the surgeon should take care to avoid inadvertent splenic injury ***(Moreira and Steven , 2005).***

6-THE DESCENDING COLON

The descending colon extends from the splenic flexure to the iliac crest running downwards and slightly medially and then vertically, a distance usually of about 20 cm ***(Goligher, 1984).***

The descending colon passes over the lateral border of the left kidney, and then descends medially between the psoas and the quadratus lumborum muscles to the junction with the sigmoid. Similar to the ascending colon, the descending colon is covered by peritoneum in the anterior, lateral, and medial surface ***(Moreira and Steven , 2005).***

7-THE SIGMOID COLON

The length of the sigmoid colon varies from 15 to 50 cm. it is mobile, with a generous inverted v-shaped mesosigmoid, creating a recessed intersigmoid fossa. The left ureter lies immediately beneath this fossa and is crossed anteriorly by the spermatic vessels and left colic and sigmoid vessels. The mesosigmoid recess on its lateral surface gives guidance to the left ureter, which is situated posteriorly. The ureter should be seen before any ligation of colonic vessels is attempted ***(Moreira and Steven , 2005).***

ANATOMY OF THE RECTUM AND ANAL CANAL

The rectum is 12 to 15 cm in length and is divided into an upper third, middle third, and lower third (Fig I-1).

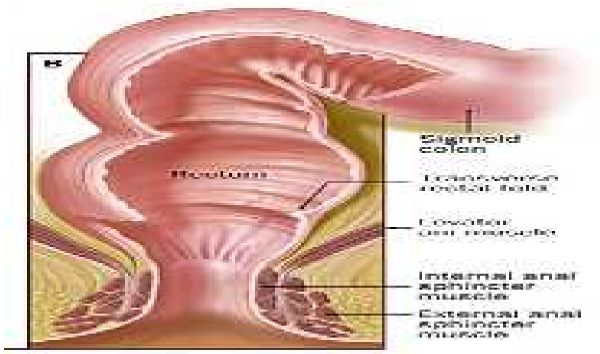

Figure I-1: Distal rectal anatomy and important surgical landmarks

(Yeatman and Bland, 1989).

The anterolateral surface of the upper third is covered by peritoneum, while the middle third is covered only anteriorly; the lower third is completely extraperitoneal. The rectum descends, following the curvature of the sacrum and coccyx, and ends as it passes through the levator muscle. In males, the proximal two thirds are related to the small bowel loops and sigmoid colon while the lower third is related anteriorly to the prostate and seminal vesicles, vas deferens, ureters, and urinary bladder. In females, the distal third is related anteriorly to the posterior vaginal wall. The upper and middle thirds are related to the upper part of the vagina, uterus, fallopian tubes, ovaries, small bowel, and sigmoid colon ***(Moreira and Steven, 2005).***

The proximal margin of the anatomic anal canal is the dentate line at 2 cm from the anal verge. The surgical anal canal extends 2 cm above the dentate line to the level of the anorectal sling. The anal canal is surrounded by two distinct muscle tubes, which completely collapse the lumen. The inner layer, which has autonomic innervation, is the internal sphincter, a continuation of the circular muscle of the rectum that becomes thickened and rounded at its lower end. The outer layer is composed of skeletal muscle: the puborectalis and the external sphincter ***(Moreira and Steven, 2005).***

ANATOMY OF THE MESORECTUM

Posterolaterally the mesorectum lines the inner pelvic wall. Ventrally, to differing degrees in men and women, the mesorectum may be covered with peritoneum. Distal to the peritoneal reflection, the mesorectum borders on the seminal vesicles and prostate in males and on the vagina in females (Fig I-2).

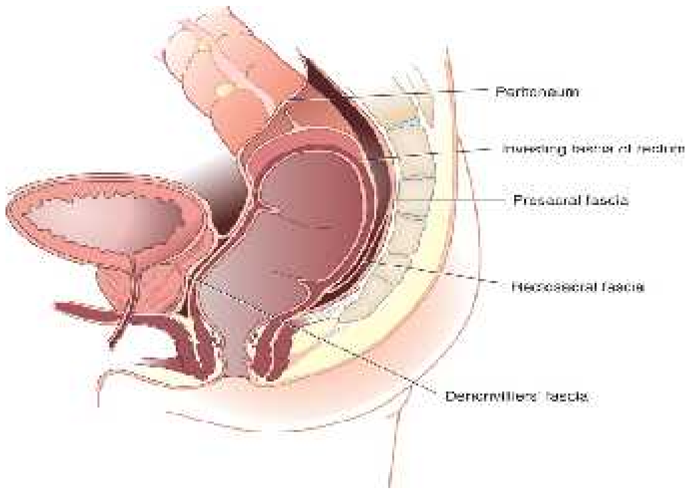

Figure I-2 : Endopelvic fascia ***(Chang and Feig, 2006)***

At the level of upper rectum, where the mesosigmoid shortens and disappears, the mesorectum has the shape of a half moon on a transverse cut ***(Enker and Havenga, 2002).***

Posteriorly, the visceral and the parietal fascia layers are separated by a thin layer of loose connective tissue. This layer is easily entered and divided to open the retrorectal space. The retrorectal space is bounded laterally on a line along the iliac artery, and more caudally, the insertion of the levator ani muscle. Caudally, the retrorectal space ends at the anal sphincter muscle. Cranially, the end of the retrorectal space is ill defined as the visceral fascia thin out over the sacral promontory and aorta. Some small branches of the internal iliac vein and presacral venous plexus cross the retrorectal space. At the level of the fourth sacral vertebra, the retrorectal space is interrupted with a more or less strong connection of fibers running in a craniocaudal direction from the parietal fascia to the visceral fascia. This fascia has been referred to as the rectosacral fascia ***(Enker and Havenga, 2002).***

Anterior to the rectum, Denonvilliers' fascia divides the mesorectum from the seminal vesicles and prostate. The fascia was originally described in males, but in females an equivalent, although thinner, rectovaginal fascia exists ***(Lindsey et al., 2000).***

Laterally the mesorectum is attached to the pelvis in a line along the iliac arteries, along the internal pudendal artery, and along the insertion of the levator ani muscle to the anus. At the upper (meso) rectum, the lateral attachment is formed by the connections of visceral fascia with parietal fascia, the peritoneum, and by fatty and connective tissue in between. At the sacral promontory these attachment diverges laterally, reaching the widest distance from the midline at the peritoneal reflection (mid rectum), before coning down to the anus ***(Goligher, 1984).***

BLOOD SUPPLY OF THE COLON

The pattern of vascular distribution is variable (Fig I-3).

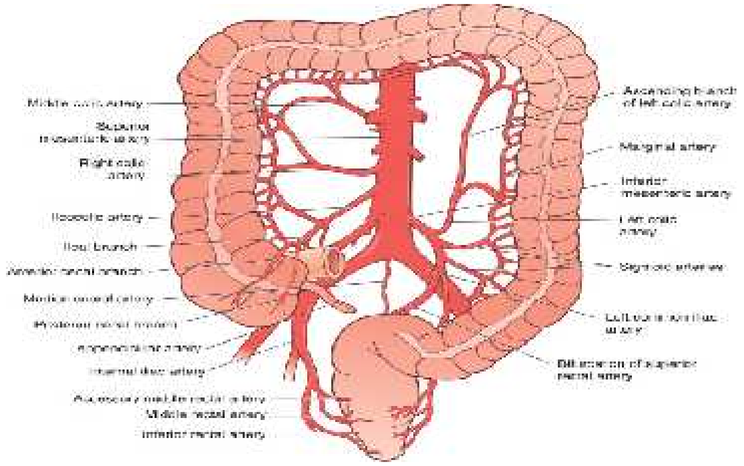

Figure I-3: Arterial supply of the colon ***(Bullard and Rothenberger , 2007)***

The blood supply of the right colon to the middle of the transverse colon is provided by the superior mesenteric artery, while the distal transverse colon, left colon, and superior third of the rectum are supplied by the inferior mesenteric artery.

The superior mesenteric artery arises from the aorta, below the celiac trunk and giving the following branches : Middle colic artery , Right colic artery and Ileocolic artery (Fig I-4).

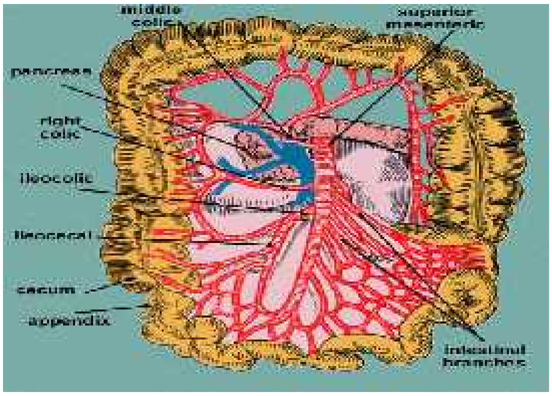

Figure I-4: shows superior mesenteric artery ***(Moreira and Steven, 2005).***

The inferior mesenteric artery arises from the aorta below the third part of the duodenum and giving the following branches : Left colic artery , Sigmoid arteries and Superior rectal artery (Fig I-5) ***(Moreira and Steven, 2005).***

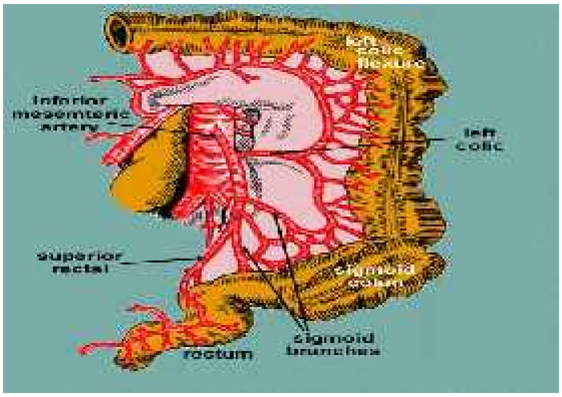

Figure I-5: shows inferior mesenteric artery ***(Moreira and Steven, 2005).***

MARGINAL ARTERY

The anastomosis of the colic arteries around the concave margin of the large intestine forms a single arterial trunk called the marginal artery. This begins at the ileocecal