Introduction

Worldwide, colorectal cancer is the fourth most frequently diagnosed cancer, in the United States colorectal cancer is the fourth most frequently cancer in men after skin, prostate and lung cancer; it is also the fourth most frequent cancer in women after: skin, lung, and breast cancer. Although colorectal cancer has the second highest cancer related mortality rate after lung cancer ***(Atkin et al., 2003).***

Highest incidence rates occur in North America, North Europe and Australia, lowest rate are found in sub-Saharan Africa and India ***(Inciardi et al., 2000)***.

The rectum which is 12-15 cm in length starts at recto-sigmoid junction opposite the third sacral segment passes downwards in hollow of the sacrum to end at anorectal junction at the level of pelvic floor ***(Skandalakis et al., 2005).***

Histologically the rectal cancer is an adenocarcinoma that arises from the columnar epithelium. It may be well, moderate or poor differentiated ***(Amit et al., 2002).***

Rectal cancer is usually painless unless it spreads outside the rectal wall or infiltrates the anal canal. Most cases presented with bleeding per rectum which is usually slight, other cases

may be presented by tenesmus or passage of mucus ***(Sue Clark, 2008)***.

The most commonly used imaging modalities include trans-rectal ultrasound (TRUS), computerized tomography (CT), magnetic resonance imaging (MRI), and positron emission tomography (PET). The information offered by these imaging modalities, necessary to select appropriate treatment, include depth of tumor and adjacent organs invasion (T stage), lymph node involvement (N stage) and metastatic spread (M stage). A colonoscopy should be performed before surgical resection of rectal cancer. Colonoscopy allows for confirmation of a malignancy through biopsy and the diagnosis ***(Basu et al., 2009).***

Despite remarkable recent advances in new oncologic agents for the treatment of colon and rectal cancer, cure is almost never achieved without surgical resection. However, the current management of rectal cancer is now more varied and complex because of the new approaches with multimodality therapy and the refinements in surgical techniques. For example, small distal rectal cancers with minimal invasion can be treated with a local excision with or without adjuvant therapy. More proximal or more invasive tumors require radical resection ***(Ronald and Julio, 2007).***

Recently, institutional and multicenter randomized trials have shown that laparoscopic surgery for colorectal cancer is safe and an acceptable alternative for open surgery ***(Kosinski et al., 2012).***

In specialized centers, the respectability rate may be as high as 95%, with an operative mortality of less than 5%. Overall, 5-yearsurvival rate is about 50%, but it may be a little higher in these centers. The most likely reason for this difference is the higher proportion of advanced and emergency cases treated in non-specialized hospitals ***(Leung et al., 2004).***

Aim of the Work

The aim of this work is discuss the pathology of rectal cancer and review the recent modalities in diagnosis and treatment of rectal cancer.

Anatomy of the Rectum

Embryology of the Rectum

The distal colon, rectum, and the anal canal above the dentate Line are all derived from the hindgut. Therefore, this segment is supplied by the hindgut (inferior mesenteric) artery, with corresponding venous and lymphatic drainage. Its parasympathetic outflow comes from S-2, S-3, and S-4 via splanchnic nerves. The dentate line marks the fusion between endodermal and ectodermal tubes, where the terminal portion of the hindgut or cloaca fuses with the proctodeum, an ingrowth from the anal pit. The cloaca originates at the portion of the rectum below the pubococcygeal line, whereas the hindgut originates above it. The cloacal part of the anal canal, which has both endodermal and ectodermal elements, forms the anal transitional zone after breakdown of the anal membrane ***(Jorge and Habr-Gama, 2007)***.

Anatomy of the rectum

Both proximal and distal limits of the rectum are controversial

The rectosigmoid junction is considered to be at the level of the third sacral vertebra by anatomists but at the sacral promontory by surgeons, and likewise, the distal limit is

regarded to be the muscular anorectal ring by surgeons and the dentate line by anatomists. The rectum measures 12–15 cm in length and has three lateral curves: the upper and lower are convex to the right and the middle is convex to the left. These curves correspond intraluminally to the folds or valves of Houston. The two left-sided folds are usually noted at 7–8 cm and at 12–13 cm, respectively, and the one on the right is generally at 9–11 cm. The middle valve (Kohlrausch's plica) is the most consistent in presence and location and corresponds to the level of the anterior peritoneal reflection ***(Jorge and Habr-Gama, 2007)***.

Although the rectal valves do not contain all muscle wall layers from a clinical point of view, they are a good location for performing rectal biopsies, because they are readily accessible with minimal risk for perforation***(Jorge and Habr-Gama, 2007) .***

The valves of Houston must be negotiated during proctosigmoidoscopy; they are absent after mobilization of the rectum and this is attributed to the 5-cm length gained after complete surgical dissection. The rectal mucosa is smooth, pink, and transparent, which allows visualization of small and large submucosal vessels. This characteristic "vascular pattern" disappears in inflammatory conditions and in melanosis coli (***Jorge and Habr-Gama, 2007).***

Fig. (1): Houston's valves as seen through a sigmoidoscope ***(Sue Clark, 2008).***

Peritoneal covering and mesrectum

The rectum is characterized by its wide, easily distensible lumen, and the absence of taeniae, epiploic appendices, haustra, or a well-defined mesentery. The prefix "meso," in gross anatomy, refers to two layers of peritoneum that suspend an organ. Normally the rectum is not suspended but entirely extraperitoneal on its posterior aspect, and closely applied to the sacral hollow. Consequently, the term "mesorectum" is anatomically inaccurate. An exception, however, is that a peritonealized mesorectum may be noted in patients with procidentia. But, the word "mesorectum" has gained widespread popularity among surgeons to address the perirectal areolar tissue, which is thicker posteriorly, containing terminal

branches of the inferior mesenteric artery and enclosed by the fascia propria ***(Jorge and Habr-Gama, 2007).***

Mesorectum

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. At the level of upper rectum, where the mesosigmoid shortens and disappears ***(Skandalakis et al., 2005).***

The mesorectum has the shape of a half-moon on transverse cut at the level of the seminal vesicles or upper vagina. The mesorectum is more or less a circle on a transverse cut with the rectum eccentrically located anteriorly. Going down to the low rectum, entering the space between both the levator ani muscles, the mesorectum gets thinner and disappears at the junction with anus ***(Skandalakis et al., 2005).***

Lateral, 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 mesorectum, 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 attachments are closer to the midline ***(Georgeson et al., 2000).***

The lateral attachment diverges laterally, reaching the widest distance from the midline at the peritoneal reflection (mid rectum), before coming down to the anus. The mid rectum it is attached to the pelvic sidewall with a condensation of connective tissue. Within this condensation, rectal branches of the pelvic autonomic nerve plexus are found, as the middle rectal vessels. In the absence of surgical dissection, the oval or circular mesorectum at this level is closely adherent to the lateral pelvic wall ***(Skandalakis et al., 2005).***

The "mesorectum" may be a metastatic site for a rectal cancer and is removed during surgery for rectal cancer without neurologic sequelae, because no functionally significant nerves pass through it. The upper third of the rectum is anteriorly and laterally invested by peritoneum; the middle third is covered by peritoneum on its anterior aspect only. Finally, the lower third of the rectum is entirely extraperitoneal, because the anterior peritoneal reflection occurs at 9.0–7.0 cm from the anal verge in men and at 7.5–5.0 cm from the anal verge in women ***(Jorge and Habr-Gama, 2007).***

Anatomic Relations of the Rectum

The rectum occupies the sacral concavity and ends 2–3 cm anteroinferiorly from the tip of the coccyx. At this point, it

angulates backward sharply to pass through the levators and becomes the anal canal. Anteriorly, in women, the rectum is closely related to the uterine cervix and posterior vaginal wall; in men, it lies behind the bladder, vas deferens, seminal vesicles, and prostate. Posterior to the rectum lie the median sacral vessels and the roots of the sacral nerve plexus ***(Jorge and Habr-Gama 2007).***

Male	Female
Anterior • Bladder • Seminal vesicles • Ureters • Prostate • Urethra	• Pouch of Douglas • Uterus • Cervix • Posterior vaginal wall
Lateral • Lateral ligaments • Middle rectal arter • Obturator internus muscle • Side wall of pelvis • Pelvic autonomic plexus • Levator ani muscl	• Lateral ligaments • Middle rectal artery • Obturator internus muscle • Side wall of pelvis • Pelvic autonomic plexus • Levator ani muscle
Posterior • Sacrum and coccyx • Loose areolar tissue • Fascial condensation • Superior rectal artery • Hypogastric nerves • Lymphatics	• Sacrum and coccyx • Loose areolar tissue • Fascial condensation • Superior rectal artery • Hypogastric nerves • Lymphatics

Table (1): Relations of the rectum ***(Sue Clark, 2008).***

Fascial Attachments

Fascia Propria (Investing Fascia)

The posterior part of the rectum, the distal lateral two thirds, and the anterior one third, are devoid of peritoneum, but they are covered with a thin layer of pelvic fascia, called fascia propria or the investing fascia. At the level of the rectal hiatus, the levator ani is covered by an expansion of the pelvic fascia, which on reaching the rectal wall divides into an ascending component, which fuses with the fascia propria of the rectum, and a descending component, which interposes itself between the muscular coats forming the conjoint longitudinal coat. These fibroelastic fibers run downward to reach the dermis of the perianal skin and split the subcutaneous striated sphincter into 8–12discrete muscle bundles ***(Santhat and Philip, 2007)***.

Waldeyer's Fascia

The sacrum and coccyx are covered with a strong fascia that is part of the parietal pelvic fascia. Known as Waldeyer's fascia, this presacral fascia covers the median sacral vessels. The rectosacral fascia is the Waldeyer's fascia from the periosteum of the fourth sacral segment to the posterior wall of the rectum. It is found in 97% of cadaver dissections. Waldeyer's fascia contains branches of sacral splanchnic nerves that arise directly from the sacral sympathetic ganglion and may contain branches of the lateral and median sacral vessels. This

fascia should be sharply divided with scissors or electrocautery for full mobilization of the rectum. The posterior space below the rectosacral fascia is the supralevator or retrorectal space ***(Santhat and Philip, 2007)***.

Denonvilliers' Fascia

Anteriorly, the extraperitoneal portion of the rectum is covered with a visceral pelvic fascia, the fascia propria, or investing fascia. Anterior to the fascia propria, or is a filmy delicate layer of connective tissue known as Denonvilliers' fascia. It separates the rectum from the seminal vesicles and the prostate or vagina. Denonvilliers' fascia has no macroscopically discernible layers. Histologically, it is composed of dense collagen, smooth muscle fibers, and coarse elastic fibers. Its attachments have been surrounded by confusion and debates ***(Santhat and Philip, 2007)***.

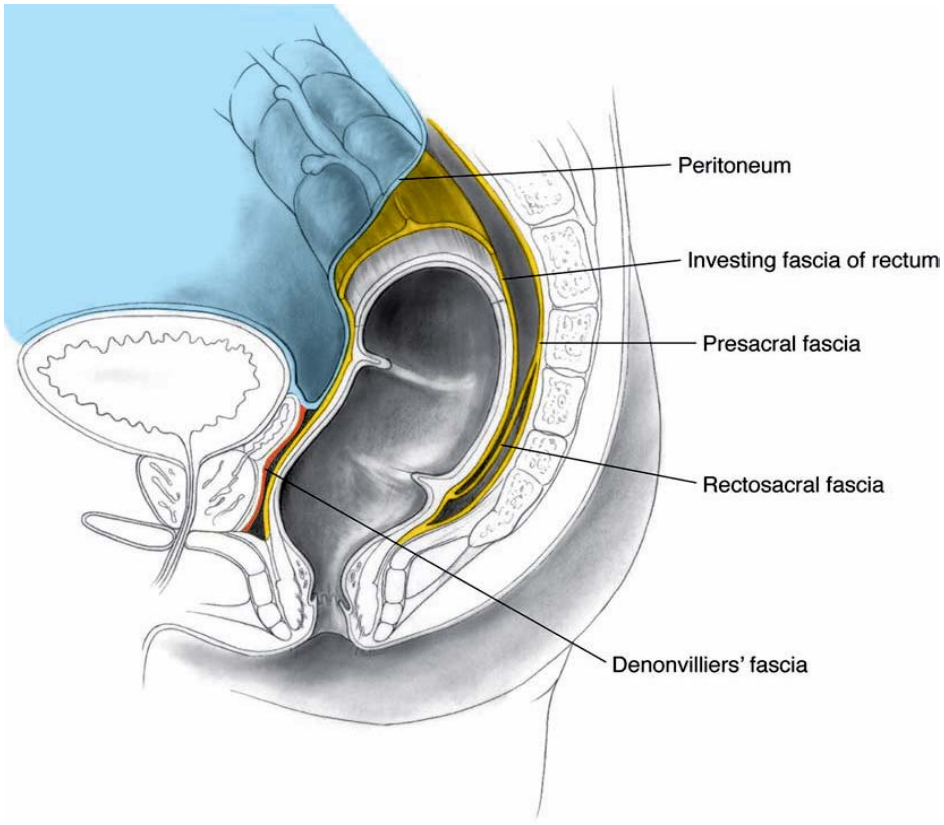

Fig. (2): Denonvilliers' fascia ***(Santhat and Philip, 2007)***.

Lateral Ligament

The distal rectum, which is extraperitoneal, is attached to the pelvic side wall on each side by the pelvic plexus, connective tissues, and middle rectal artery (if present).

Histologically it consists of nerve structures, fatty tissue, and small blood vessels. Recently, the anatomical term of ''lateral ligament'' has been a subject of debate ***(Santhat and Philip, 2007)***.

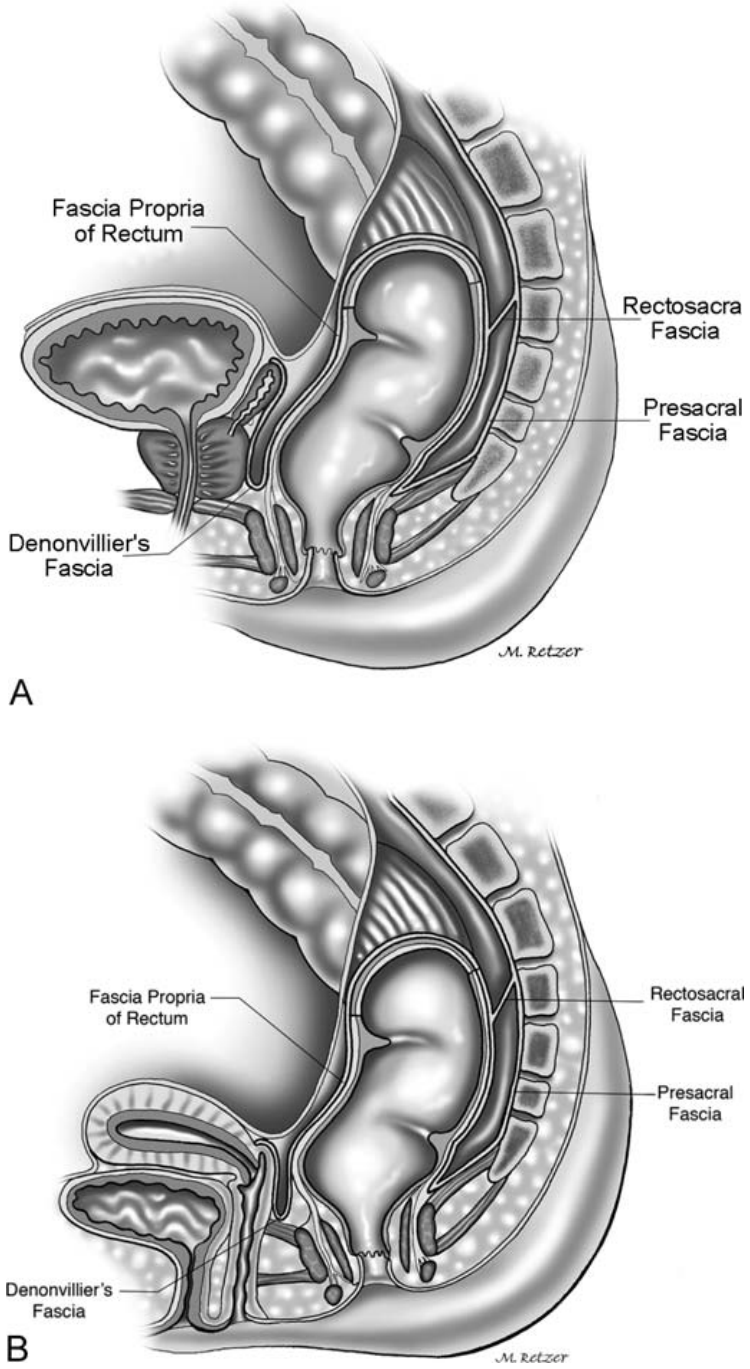

Fig. (3): Fascial relationships of the rectum (A male, B female***)*** ***(Santhat and Philip, 2007).***

Urogenital Considerations

Identification of the ureters is advisable to avoid injury to their abdominal or pelvic portions during colorectal operations. On both sides, the ureters rest on the psoas muscle in their inferomedial course; they are crossed obliquely by the spermatic vessels anteriorly and the genitofemoral nerve posteriorly. In its pelvic portion, the ureter crosses the pelvic brim in front of or a little lateral to the bifurcation of the common iliac artery, and descends abruptly between the peritoneum and the internal iliac artery ***(Jorge and Habr-Gama, 2007).***

Before entering the bladder in the male, the vasdeferens crosses lateromedially on its superior aspect. In the female, as the ureter traverses the posterior layer of the broad ligament and the parametrium close to the side of the neck of the uterus and upper part of the vagina, it is enveloped by the vesical and vaginal venous plexuses and is crossed above and lateromedially by the uterine artery ***(Jorge and Habr-Gama, 2007).***

Perianal and Perirectal Spaces

Surrounding the anorectum are several potential spaces that are normally filled with areolar tissues or fat. These spaces are clinically important because they are sites where abscesses can form. The perianal space immediately surrounds the anus.