

# Evaluation of functional outcome of rectal cancer: Review Article

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## Abstract

**Background:** Carcinoma is defined as rectal when its distal margin is localized within 12 cm from the anal verge. This definition is arbitrary and is based on epidemiologic data showing significantly higher local recurrence (LR) rates between this subgroup and patients with colon cancer. **Objective:** This study aimed to evaluate the functional outcome of rectal cancer. **Conclusion:** Rectal cancer surgery is not easy job and the surgeon must know anatomic and functional details very well before performing surgery.

**Key words:** Carcinoma , Oncologic

## Introduction:

Carcinoma is defined as rectal when its distal margin is localized within 12 cm from the anal verge. This definition is arbitrary and is based on epidemiologic data showing significantly higher local recurrence (LR) rates between this subgroup and patients with colon cancer<sup>[1]</sup>. The LR rate of rectal cancer is markedly higher than that of colon cancer. This is attributed to anatomic restrictions (narrow bony pelvic field) and technical difficulties in obtaining clear resection margins<sup>[2]</sup>.

The primary principle in the management of localized rectal cancer is similar to that for colon (i.e., complete oncologic resection). In line with this principle are the goals of cancer control (negative margin resection of tumor and resection of all draining lymph nodes), restoration of intestinal continuity, and preservation of anorectal sphincter, sexual, and urinary function<sup>[3]</sup>.

Rectal cancer treatment has become multidisciplinary in nature involving at least surgeons, radiologists, radiotherapists, pathologists, and medical oncologists. This interconnection should commence at the time of the initial diagnosis. The preoperative handling of rectal cancer patients affects LR and survival and very often postoperative therapy schemes cannot compensate for any mistakes during the initial decision making. A multidisciplinary team (MDT) can provide tailor-made treatment options for any given rectal cancer patient<sup>[2]</sup>.

## Rectal Surgery

When planning surgical treatment of rectal cancer, the rectum can be generally divided into three regions: lower, middle and upper thirds. The upper rectum is generally defined as extending 11 to 15 cm from the anal verge. Tumors of the proximal rectum, at the level of the sacral promontory, behave similarly to colonic cancers and are therefore generally considered to be "rectosigmoid" cancers. Tumors 6 to 10 cm from the anal verge are defined as middle rectal cancers and tumors from 0 to 5 cm are defined as low rectal cancers. Note that low rectal cancers can be associated with the internal and external sphincters of anal canal, or levator muscles infiltration<sup>[3]</sup>.

## Carcinologic principles of rectal surgery:

### Radical Surgery:

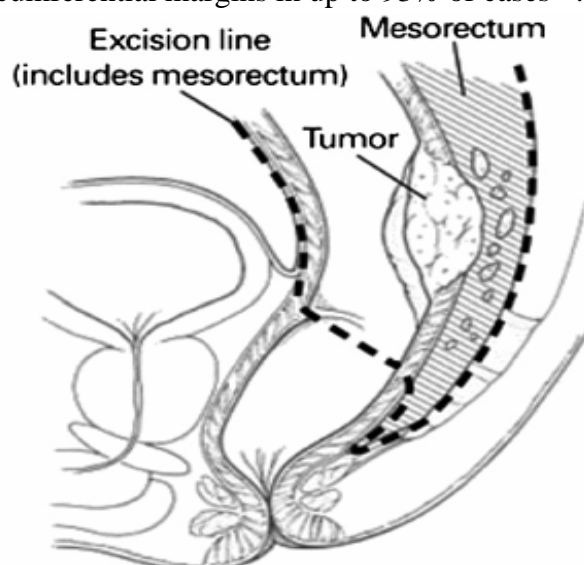
The type and extent of surgery performed on patients who have rectal cancer largely depends on the preoperative tumor stage, the distance from the anorectal sphincter complex, the use of neoadjuvant therapy, histopathologic features, and the patient's projected ability to tolerate radical surgery. For tumors of the mid to upper rectum, low anterior resection (LAR) is generally the preferred approach. For lesions of the lower rectum, either APR or LAR may be performed, depending on involvement of the sphincter mechanism. The goal with all surgical approaches is an R0 resection with negative distal and radial margins, which are important determinants of surgical outcome, overall survival, and recurrence-free survival<sup>[4]</sup>.

### Total mesorectal excision (TME) (Fig.1):

The term total mesorectal excision (TME) is based on the concept that cancer spread will stay confined within the embryologic mesorectal envelope at least during the early stages of the disease. Straying into the mesorectal envelope during rectal surgery is a major cause of residual disease and LR. Straying outward may damage the autonomic nerves and is a major factor for sexual and urinary disturbances<sup>[2]</sup>.

TME is the gold standard for the surgical treatment of rectal cancer involving the middle and lower third of the rectum. For the upper third of the rectum, TME is not considered obligatory (removal of the mesorectum to the level of the levator muscles); rather a more conservative resection called tumor-specific TME is preferred (removal of the mesorectum 5 cm distal of the tumor)<sup>[2]</sup>.

The technique of TME requires precise, sharp dissection under direct vision in the plane of areolar tissue between the fascia propria of the rectum and the parietal endopelvic fascia extending down to the levator muscles of the pelvic floor. It allows for a characteristic bilobed specimen with complete extirpation of the surrounding perirectal lymph nodes along with visualized avoidance of the autonomic plexus innervating the pelvis. This technique also improves the ability to obtain an adequate circumferential margin. Sharp, adequate mesorectal excision extending to the endopelvic fascia achieves negative circumferential margins in up to 93% of cases<sup>[5]</sup>.



**Fig.1:** Total mesorectal excision: Dissection planes are shown by the dashed lines<sup>[6]</sup>.

The quality of the TME specimen should be assessed and commented on in the report by an experienced pathologist. The specimen should be assessed both macroscopically and microscopically, and the circumferential as well as distal margins should be accurately documented. Macroscopic assessment should include the quality of the TME specimen and any defects in the mesorectum (Table 1) [7].

**Table 1:** Total Mesorectal Excision Scores as Categorized by Quirke et al. 2009 [7].

Quality of the Mesorectum	
<b>Good</b>	Intact Mesorectum with only minor irregularities of a smooth mesorectal surface. No defect is deeper than 5 mm. No coning on the specimen. Smooth CRM on slicing.
<b>Moderate</b>	Moderate bulk to the mesorectum, but irregularity of the mesorectal surface. Moderate coning of the specimen toward the distal margin. At no site is the muscularis propria visible, with the exception of the insertion of levator muscles. Moderate irregularity of CRM.
<b>Poor</b>	Little bulk to mesorectum with defects down onto muscularis propria and/or very irregular circumferential resection margin.

### Surgical approaches to rectal cancer

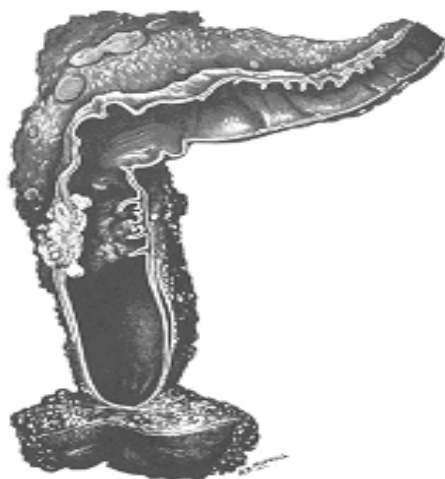
Surgical approaches to the rectum include transabdominal procedures [abdominoperineal resection (APR), anterior resection (AR), low anterior resection (LAR), coloanal anastmosis (CAA)], transanal approaches, and trans-sacral approaches (York-Mason, Kraske) [3].

#### Abdominoperineal Resection (APR):

As described by Miles in 1908, abdominoperineal resection (fig. 2) entails complete extirpation of the rectum and its associated lymphatics in a combined pelvic/perineal approach. This procedure ultimately requires en bloc excision of the rectum in connection with the perineal tissues surrounding the anus and pelvic floor musculature with permanent colostomy formation with or without closure of the perineal wound [8].

Abdominoperineal resection is required for lesions involving the sphincter complex and remains a valuable option in patients with metastatic disease or preoperative sphincter dysfunction as well as in patients with other relative contraindications to restorative proctectomy (such as Crohn's disease) [9].

Patients undergoing APR typically have a worse prognosis and increased morbidity when compared with patients treated with LAR. This result is related to the poorer prognoses seen in cancers of the low rectum when compared with cancers of the midrectum [10].



**Fig.2:** Specimen after Miles' radical abdominoperineal resection<sup>[11]</sup>.

### **Abdominoperineal Resection (APR):**

#### **Preserving the sphincter:**

Despite the improved oncologic outcomes, many surgeons felt the Miles procedure was too radical and morbid accompanied with permanent colostomy, genitourinary dysfunction, and psychosocial implications. Cuthbert Dukes (Dukes classification of colorectal tumors) demonstrated that Miles overestimated the downward and lateral spread seen in recurrence. He observed that the majority of lymph nodes were either parallel or proximal to the level of the primary tumor. Many thought a radical downward resection could be avoided<sup>[6]</sup>.

#### **A-Anterior Resection (AR):**

In 1948, Claude Dixon, removed lesions from 20 cm to 6 cm from the dentate line in a two-staged procedure. Of 426 procedures, only 122 specimens had nodal involvement. There was no statistical difference between specimens from 16 to 20 cm, 11–15 cm, and 6–10 cm with a 2.6% and 6.4% mortality and five-year survival, respectively. Dixon's results shifted the focus of rectal cancer from the radical APR to more sphincter-sparing procedures. Anterior resection became the standard of care for middle and upper rectal tumors<sup>[11]</sup>.

#### **B-Low Anterior Resection (LAR):**

In the 1970s, Alan Park's began restoring continuity following rectal cancer resection. Publishing his technique in 1982, "peranal anastomosis" of the colon and anus permitted lower rectal tumors to be completely excised without the need of a permanent colostomy<sup>[6]</sup>.

When low anterior resection with coloanal anastomosis has been compared with abdominoperineal resection, there have been no significant differences in local recurrence or survival if a 2-cm distal margin is achieved<sup>[9]</sup>.

Absolute contraindications to LAR include sphincter complex invasion and the inability to extirpate the tumor from the pelvic floor. Relative contraindications include significantly compromised sphincter function as determined preoperatively, pelvic fixation with spread to adjacent organs, and distal spread to less than 2 cm from the anal verge<sup>[5]</sup>.

Concern for pelvic sepsis and anastomotic leakage, especially in irradiated fields, have led many to construct a diverting ileostomy. Park's procedure allowed for sphincter preservation even in low lying tumors without compromising oncologic outcomes<sup>[11]</sup>.

### **C-Ultra-Low Anterior Resection (ULAR):**

Ultra-low anterior resection (ULAR) is defined as a procedure in which the entire rectum is removed. This is usually for low rectal cancer, and a coloanal anastomosis will therefore be performed. If a laparoscopic approach is to be considered, it is very useful to mark the lower end of the tumor with a permanent marker to enable easier surgery. This is especially important in patients with a small tumor which may not be easily seen during laparoscopy<sup>[12]</sup>.

### **D-Local approaches to rectal cancer:**

Local excision of a rectal cancer is an excellent operation for a small cancer in the distal rectum that has not penetrated into the muscularis. Local excision is also used for palliation of more advanced cancer in patients with severe comorbid disease, in whom extensive surgery carries a high risk for morbidity or mortality<sup>[13]</sup>.

Local treatment is best applied to rectal cancers within 10cm of the anal verge, less than 3cm in diameter involving less than one-fourth of the circumference of the rectal wall, tumors staged less than T2 by ERUS, highly mobile and of low histologic grade<sup>[3]</sup>.

Local therapy of distal rectal cancers can be accomplished by transanal excision, posterior proctectomy, fulguration, or endocavitary irradiation<sup>[3]</sup>.

Retrospective study designed for evaluating the functional and oncological outcomes of rectal cancer patients in the last three years (2017-2018-2019) in two centers, Zagazig University Hospitals and Meet Ghamr Oncology Center. in which 30 patients with rectal carcinoma

### **Before operation:**

- + Fitness for surgery.
- + History of related operations , family history of colorectal cancer.
- + General Clinical examination including PR and PV.
- + Routine preoperative laboratory investigations (CBC , kidney function test , liver function test , coagulation profile)
- + Serum CEA.
- + Colonoscopy and biopsy for all cases, abdominal ultrasound, MRI staging of all cases , chest X-ray .
- + Was patient take neoadjuvant chemotherapy.

Surgical technique in our study we have 4 operation for rectal cancer according to site of tumor  
Technique of Laparoscopic abdominoperineal resection (LAPR) A- Abdominal part:

#### **- Patient Positioning:**

Modified lithotomy position, the right arm was tucked at the patient's side to facilitate the position of the surgeon and cameraman. The abdomen was prepared with antiseptic solution and draped routinely as shown in the **figure (3)**.

#### **- Trocars Insertion:**

- + Supraumbilical incision 10 mm was done, insertion of Veress needle, insufflation of abdominal cavity by carbon dioxide CO<sub>2</sub>.
- + After insufflation A 10-mm port was inserted through the supraumbilical port.
- + The camera was inserted into the abdomen and an initial laparoscopy performed, carefully evaluating the liver, small bowel, and peritoneal



**Figure 3.** A 10-mm port was inserted through the right lower quadrant approximately 2 to 3 cm medial and superior to the anterior superior iliac spine.

- ✚ A 5-mm port was then inserted in the right upper quadrant at least a hand's breadth superior to the lower quadrant port.
- ✚ A left lower quadrant 5-mm port was also inserted.
- ✚ Optional 5<sup>th</sup>Suprapubic trocar is placed in some cases.



**Fig.(4):** Skin marks for port insertion sites



**Fig.(5):** Trocar position.

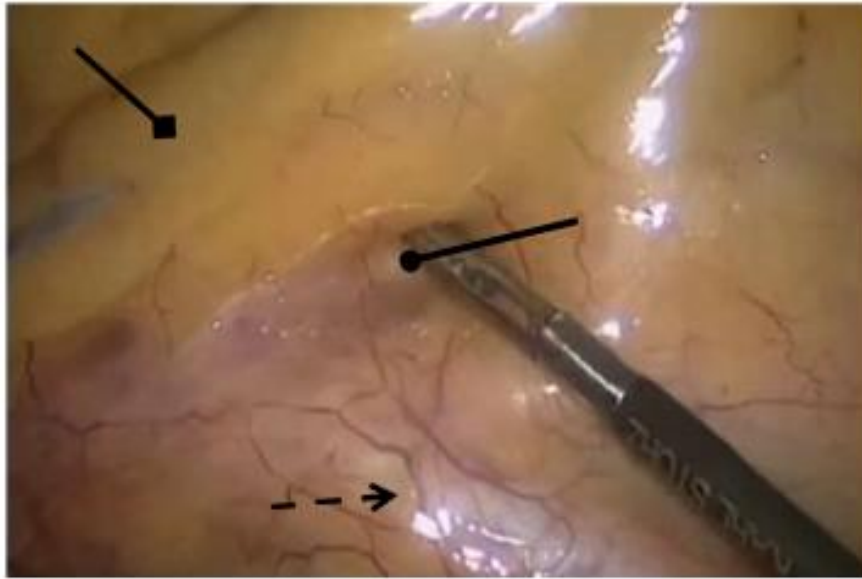
**Definitive Laparoscopic Setup:**

The patient was rotated with the left side up and right side down, to approximately 15 to 20 degrees tilt, and often as far as the table can go. This helped to move the small bowel to the right side of the abdomen. The patient was then placed in the Trendelenburg position. This again helped gravitational migration of the small bowel away from the operative field.

Two atraumatic bowel clamps were inserted through the two right-sided abdominal ports. The greater omentum was reflected over the transverse colon so that it went to lie on the stomach. The small bowel was moved to the patient's right side allowing visualization of the medial aspect of the rectosigmoid mesentery pedicle. This necessitated the use of the assistant's 5-mm atraumatic bowel clamp through the left lower quadrant to tent the sigmoid mesentery cephalad.

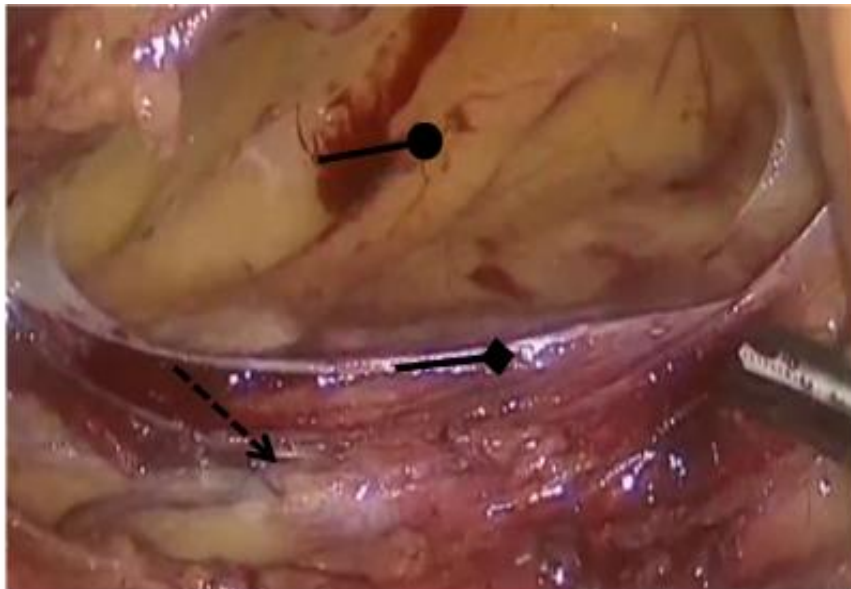
**Defining and Dividing the Inferior Mesenteric Pedicle:**

Medial approach was used to dissect the sigmoid colon from its mesentery and identify the inferior mesenteric artery at its origin, so an atraumatic bowel clamp was placed on the rectosigmoid mesentery at the level of the sacral promontory, approximately half way between the bowel wall and the promontory itself. This area was then stretched up toward the left lower quadrant port, stretching the inferior mesenteric vessels away from the retroperitoneum.



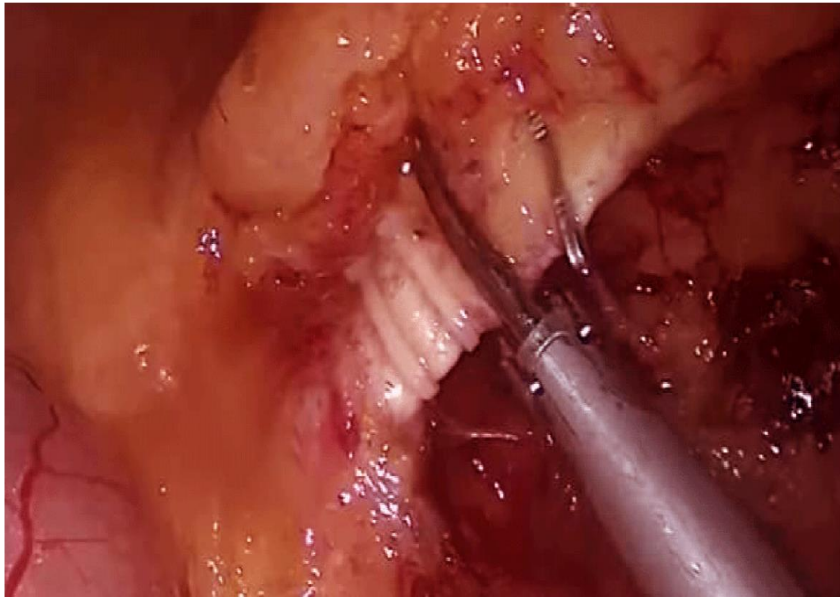
**Fig. (6):** Stretching of rectosigmoid mesentery upward and lateral leads appearance of inferior mesenteric pedicle ( diamond head arrow ), and appearance of plan between the pedicle and the retroperitoneum ( rounded head arrow ) at which the peritoneum was opened to enter the embryological avascular plane between sigmoid mesocolon and Told`s fascia. N.B.: dashed arrow points to left common iliac artery

Open the peritoneum along the groove between the inferior mesenteric pedicle and retroperitoneum up to the origin of the inferior mesenteric artery, and caudally past the sacral promontory. With preserving ureter and iliac vessels



**Fig (7)** Medial to lateral dissection dashed arrow directed to the left ureter diamond head arrow directed to Told`s fascia and rounded head arrow directed to sigmoid mesocolon.





**Fig (8)** ligation and division of IMA.

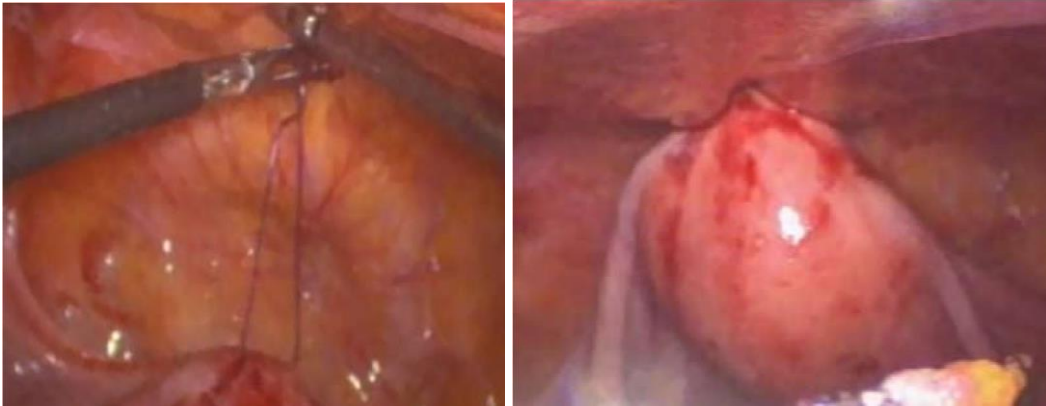
### **Rectal Mobilization:**

Atraumatic bowel clamps that were inserted through the left-sided ports were used to elevate the rectosigmoid colon out of the pelvis and away from the retroperitoneum and sacral promontory, to enable entry into the presacral space.

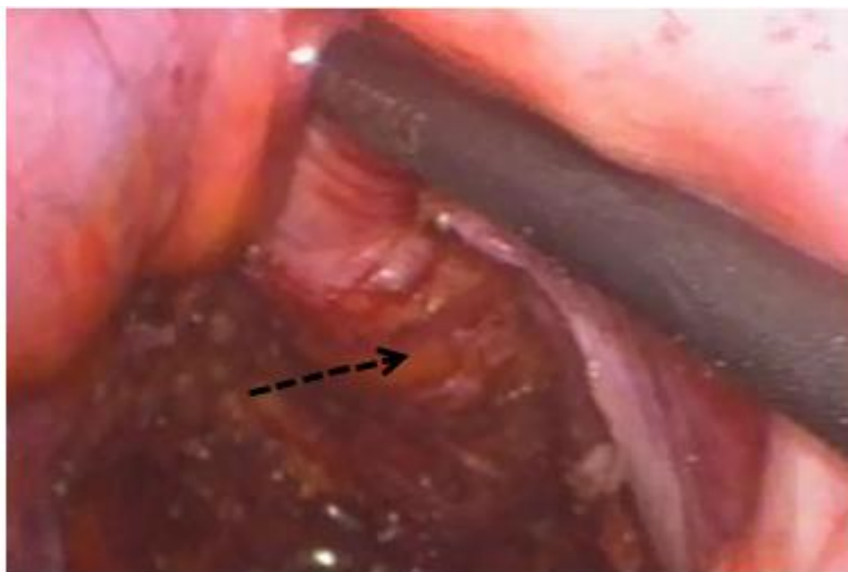
In female cases we usually used a prolene suture on straight needle to lift the uterus towards anterior abdominal wall to facilitate anterior dissection of the rectum.

The posterior aspect of the mesorectum was identified and the mesorectal plane dissected with diathermy, preserving the hypogastric nerves passing down into the pelvis anterior to the sacrum. Dissection continued down the presacral space in this avascular plane toward the pelvic floor. Attention was switched to the peritoneum on the right side of the rectum. This was divided to the level of the seminal vesicles or rectovaginal septum. This was repeated on the peritoneum on the left side of the rectum. This facilitated further posterior dissection along the back of the mesorectum to the pelvic floor, to a level inferior to the lower edge of the mesorectum. Usually, when the approach is low on the posterior surface of the mesorectum, it became necessary to perform a lateral and anterior dissection. The peritoneal dissection was continued from the free edge of the lateral peritoneal dissection, anteriorly. Lateral dissection was continued on both sides of the rectum and was extended anterior to the rectum in front of Denonvillier's fascia, separating the posterior vaginal wall from the anterior wall of the rectum or down past the level of the prostate in men.

Dissection continues till we reach the level of levator ani muscle then division of the sigmoid colon using Endo GIA™ stapler.



**Fig.(9)** uterus was lifted by prolene to anterior abdominal wall to facilitate anterior dissection



**Fig.(10):** Posterior dissection of the rectum , dashed arrow points to the mesorectum .

### **B- Perineal part:**

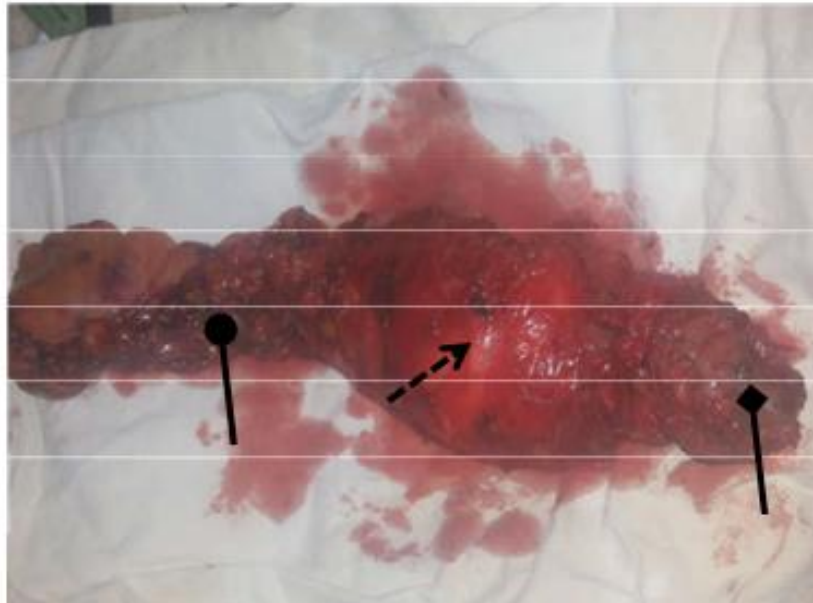
After completeness of abdominal part patient position is modified to lithotomy position then after prepping and drabbing of the perineum was done.

After closure of the anus with purse string suture using silk suture , An elliptical incision is created that extends from the midpoint of the perineal body in the men, or the posterior vaginal introitus in the women back to a point midway between the coccyx and the anus.

The incision was continued down through the subcutaneous tissue into the ischiorectal fat using electrocautery, dissection was continued posteriorly and laterally where the inferior hemorrhoidal artery is encountered and ligated .the index finger was used as a guide to resect the levator muscle , then dissection begun anteriorly where transverse perinei and rectourethralis muscles are divided.

The specimen was delivered through the perineum and the perineum was closed after approximation of the muscles to prevent perineal hernia after irrigation with saline and putting a drain Insufflation of abdomen again with CO2 was done to construct the end colostomy

An intra-abdominal drain Closure of the port sites with interrupted sutures.



**Fig. (11):** Specimen after extraction through the perineum , rounded head arrow points to sigmoid colon , dashed arrow points to rectum and mesorectum (note the condensed fat behind rectum and diamond head arrow points to anus .



**Fig. (12)** perineum wound after closure



**Fig.(13):** Final appearance after fashioning of the colostomy and ports closure

## II. Laparoscopic anterior resection

- ✚ For tumor of the upper rectum the mesorectum is dissected 5 cm anally to the lower border of the tumor.
- ✚ Continue right angled through the mesorectum to the bowel tube at the proper level, thus avoid coning in on the specimen which will render the anal resection margin less than 5 cm.
- ✚ For tumor in the middle/lower rectum the dissection is continued all along to the pelvic floor, and if desired further on to the upper part of the anal canal.
- ✚ Prepare a free bowel wall along the whole circumference. Flush the rectum.
- ✚ Divide the rectum with stapler and try to leave the row of staplers perpendicular on the bowel and close it with one magazine of staplers. More staple shots increase the chance of leakage. Avoid Z-lines.

Situations can develop when it is impossible to divide the bowel sufficiently far anally. Conversion to an open procedure should then be performed.

### Step 7 – Exteriorization of the specimen and division of the oral bowel tube.

- ✚ Make a 6 cm incision transversally above the symphysis (Pfannenstihl incision).
- ✚ Incise the fascia in front of the rectus muscle similarly.
- ✚ Lift both edges of the fascia with Kocker's forceps and dissect it off the underlying muscle. The dissection must be sharp in the midline.
- ✚ Retract both rectus muscles from the midline.
- ✚ Incise the peritoneum.
- ✚ Apply plastic protection to the edges of the wound and exteriorize the specimen with the central vessels.
- ✚ Divide mesentery and bowel at intended location.
- ✚ Cut with scissors in the vascular arcade close to the bowel to visualize adequate blood circulation in the oral bowel end (adequate systolic blood pressure during the test?). Move further orally on the colon in case of inadequate bleeding.

- + Insert the “hat” of the circular stapler and close with a purse-string suture.
- + Interiorize the colon.
- + Close the abdomen.

#### **Step 8 – Anastomosis**

- + Insert the circular stapler very carefully and perforate the bowel with the pin just in front of or behind the staple row.
- + Attach oral and anal parts of the stapler while controlling the rotation of the bowel. Close the stapler and visually control for possible interposition. Fire the stapler.
- + Test the anastomosis enclosed by water and with air in the rectum.
- + Retract the omentum over the small bowel.

#### **Step 9 – Laparoscopic control and closure of ports.**

- + Repeat inspection of the abdominal cavity for possible iatrogenic injury.
- + Close the ports pfennestiel incision which was done to facilitate the pelvic dissection

#### **Assessment of oncological outcome by:**

- + Detailed pathological data including histopathology, grade of differentiation, tumor size, distance of tumor from anal verge, TNM stage, circumferential resection margins and the number of lymph nodes harvested.
- + 6 months follow up for recurrence, port site and distant metastasis were documented.
- + Functional outcome assessment by :

##### **1. Urinary symptoms**

- a. Urinary incontinence
- b. Increase urinary frequency
- c. Urinary retention

##### **2. Sexual symptoms**

- a. Impotence
- b. Retrograde ejaculation

##### **3. Bowel symptoms**

- a. Incontinence
- b. Frequency of defecation
- c. Diarrhea

##### **4. Low anterior resection syndrome**

#### **Conclusion:**

From this study we can conclude

1. Rectal cancer surgery is not easy job and the surgeon must know anatomic and functional details very well before performing surgery
2. Laparoscopic surgery improve oncologic and functional outcome better than open because of good visualization of pelvic anatomy

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